TOWSON UNIVERSITY
OFFICE OF GRADUATE STUDIES

UNIVERSAL DESIGN FOR LEARNING, CONCEPTUAL CHANGE AND TEACHER EDUCATION: AN EXPLORATION OF PRECONCEPTIONS AND BELIEFS ABOUT PRACTICE

by

Elizabeth Tessier Berquist

A Dissertation

Presented to the faculty of

Towson University

in partial fulfillment

of the requirements for the degree

Doctor of Education

Department of Educational Technology and Literacy

Towson University

Towson, Maryland 21252

May, 2013

TOWSON UNIVERSITY
OFFICE OF GRADUATE STUDIES

DISSERTATION APPROVAL PAGE

This is to certify that the dissertation prepared by Elizabeth Tessier Berquist entitled Universal design for learning, conceptual change and teacher education: An exploration of preconceptions and beliefs about practice has been approved by her committee as satisfactorily completing the dissertation requirements for the degree Doctor of Education in Instructional Technology.

Chair, Dissertation Committee: Dr. William Sadera — Date 4/18/13

Committee Member: Dr. Katherine Holman — Date 4/18/13

Committee Member: Dr. Elizabeth Neville — Date 4.18.13

Committee Member: Dr. Liyan Song — Date 04/18/13

Dean of Graduate Studies: Dr. Janet V. Delany — Date 5/7/13

DEDICATION

For Bailey and Gracie:

My parents and grandparents have provided me with every opportunity to learn and grow and they have taught me that there is no greater gift than your family and your education. I pass that on to you. Never stop learning.

Love you to the moon and back!

ACKNOWLEDGEMENTS

I am beyond grateful to so many people who have helped me to love learning and teaching, and most recently, to design and build this dissertation of research studies about UDL.

I am indebted to many colleagues and mentors at Towson University:

First and foremost, Dr. Bill Sadera: Bill chaired my dissertation committee and was quite possibly the reason that I completed this program. He allowed me to design a dissertation that was unique and innovative and had never before been done at TU! I am grateful for the five years that I had the opportunity to work with and learn from Bill. I appreciate his continued patience and his invaluable academic support as I transitioned from the classroom to academia. Bill ensures that the doctoral program is relevant and innovative, and I am thankful for the many opportunities that I had while a student: I was able to present at national conferences, meet leaders in our field, and conduct authentic and important research. Finally, Bill's wisdom and willingness to share his own experiences have helped me to grow personally and professionally. Dr. Sadera is a great scholar and an even better person and he will always be a trusted advisor (provided I haven't driven him crazy yet)!

My committee members: Dr. Liyan Song, Dr. Kay Holman and Dr. Betsy Neville: Liyan and Kay served on my dissertation committee and have been wonderful role models of successful women in academia: they are bright and productive scholars, passionate advocates for change, and dedicated teachers. I appreciate their constructive feedback, support throughout my doctoral program. I am proud to call them colleagues and friends. Betsy (and the equally fabulous David Wizer) brought me to Towson University and encouraged me to apply to the doctoral program. Betsy has been a boss and a friend, an advocate and a mentor, and always a voice of reason. Throughout this process, she provided constructive criticism while remaining a constant cheerleader. Her outlook on the world, on children, and on education is a source of inspiration.

The Towson University Special Education Department: Our department is filled with many phenomenal educators and I am privileged to call them friends and colleagues. I am especially indebted to: Cathy March, Toni Guidi, Darlene Fewster and Claire Holmes who welcomed me to TU in 2008 and have been helping me to "learn the ropes" ever since, Dr. Kati Stein for introducing me to phenomenology, and Rob SantaCroce, Barb Cheswick, Andrea Parrish and of course, debi Tessier, for being the BEST supervisory team to work with- thank you all for providing extra support to my interns while I finished this dissertation.

I am forever thankful to three colleagues in the TU College of Education for supporting me for (literally) for decades: Faith Hermann- the most amazing leader I have ever worked for; Jessica Moore- the most graceful and strong teacher and mother I know, and Diane Diven- my very first mentor who, to this day, is the type of teacher I strive to become.

This dissertation is made up of three related studies that involved multiple school systems, participants, instruments and designs. I am thankful for the generous support of:

Cecil County, Howard County, and Baltimore County Public Schools for their support of this research and more importantly, for their support of UDL.

Marsye Kaplan (who introduced me to UDL), Sandra Reid, Nikki Norris, Billy Burke, Julian Katz, Kathy Nye, Lisa Katz, Kathleen McMahon, Pat Lawton, Marcie Thoma and Nancy Grasmick: I am thankful to have worked with and learned from these dedicated school, district, and state leaders who have embraced the UDL framework. Each of these individuals contributed to this research by modeling UDL in their own practice or supporting innovative thinking about teaching, learning and professional development. They give me great hope in the future of education for ALL learners.

The staff at CAST: I am continually awed with the quality of research, product design, and professional development produced by CAST. I am grateful for their assistance with this research. I thank Dr. Tracey Hall and Seoin Lim for allowing me to use their data for this research. I thank Grace Meo and Dr. Peggy Coyne for teaching me about "PD the UDL way," and Dr. Patti Ralabate for her support throughout the UDL PDS project and her willingness to read and comment on article drafts. I have learned so much from Grace, Peggy and Patti- they have made this "North" a better "South, East and West." Finally, David Rose, thank you for being a pioneer and an innovator, I am honored to learn from you and continue your work.

It takes a village and I am thankful for the village that surrounded and supported me while I finished this dissertation:

I never had to worry about my girls when I was working, they were always in good hands and came home safe and happy thanks to my amazing Aunt Janet, Jaime, JT & April, Doozer and Coach, and Gabby. My girlfriends have kept me smiling throughout this process: Mags, Lin, Jordan and Christyl have checked in everyday, the SVH girls keep me around even though I can't always show up and Gillin, Tracey, Kelly, Jaime and Devon have kept me sane! I am fortunate to have all of you in my life.

I am so thankful for the friendship and support that Greg Davis has shared with me over the years. Mr. Greg is a source of strength and wisdom, I value his advice and insight and I am grateful for his encouragement in all aspects of my life.

My largest debt of gratitude is to my family. My mother and father, Jeff and debi Tessier; my brother, Jeff; my grandmother, Nancy Lang; my husband Ben; and our girls, Bailey and Gracie- thank you is inadequate. Mom and Dad, you have been the best teachers anyone could ask for- thank you for your patience, guidance and love. Jeff- I am so proud that you are building a different future for education. Bah, you knew I could do this for longer than I did. Ben, Bailey and Gracie: thank you for being by my side as I wrote these chapters, you three make my world a better place, the next chapters I write will be with you!

ABSTRACT

Universal design for learning, conceptual change and teacher education: An exploration of preconceptions and beliefs about practice

Elizabeth Tessier Berquist

Across the United States, school leaders are focusing on Universal Design for Learning (UDL) as a framework for meeting the challenge of learner variability and designing high-quality, standards-based instruction (Hall, Rose & Meyer, 2012). The three studies presented in this alternate format dissertation describe and analyze the beliefs, knowledge and practices of administrators, teachers, and preservice teachers about UDL. In *Administrators' Conceptions about Universal Design for Learning: An Opportunity for Conceptual Change*, phenomenological research methods were used to analyze data collected from interviews with 15 administrators. Results are presented through six emerging themes based upon the beliefs and understandings of these administrators regarding UDL. In *A Mixed Method Study of Teachers' Conceptions about Universal Design for Learning,* teacher beliefs, knowledge and practices about UDL are examined through a mixed methods study conducted with teachers participating in a UDL professional development system. The article also presents conceptual change as a theoretical framework to assist those responsible for designing professional development relating to the implementation of Universal Design for Learning. Finally, *Preservice Teachers' Conceptions about UDL* reports quantitative data about the conceptions of preservice teachers in regard to UDL. This descriptive study provides insight into the underlying assumptions of the UDL framework and examines results in regard to a dissatisfaction based conceptual change model. In each study, conceptual change is

presented as a theoretical framework to assist school leaders and higher education faculty as they develop an understanding for, and strategies regarding, implementation of Universal Design for Learning. The powerful nature of pre-conceptions and current conceptions and the associated alterations necessary for conceptual change about UDL are challenges for teacher educators and individuals responsible for professional development. If these beliefs are not addressed in the earliest stages of the conceptual change process, there is little chance that they will change. UDL is quickly becoming part of the fabric of our educational system; it is imperative that instruction about UDL is high-quality and relevant. The results of these studies will provide necessary insight into the beliefs, knowledge and practices of administrators, teachers, and preservice teachers, in order to recommend future instructional practices that are fundamental to changing understandings, impacting practices, and ensuring that the UDL framework is wholeheartedly adopted by educators.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I. INTRODUCTION AND REVIEW OF THE LITERATURE

Dani is a first-year teacher assigned to teach seventh grade language arts in a middle school that is located in a large, urban school district. A quick glance at her classroom reveals students categorized as either "typical" or having "special needs." Two students are labeled culturally and linguistically diverse, another is an emerging reader and four more are considered "at-risk" or environmentally disadvantaged. Two others are described as gifted and talented. How will Dani plan for and manage this classroom? Can she truly differentiate her instruction to meet the needs of each individual learner assigned to her classroom? Or, will she teach to the middle and hope for the best? Maybe she will push through the content, knowing that she will remediate unsuccessful students following each unit of study. She has already been briefed on her department assessment calendar, so she is aware of the strict schedule for teaching and re-teaching content.

This scenario is quite familiar to a teacher, department chairperson or a school leader. Each of these educators understands that learner variability is the norm in today's classroom. Every day, well-intended teachers like Dani enter their classrooms and are tasked with adapting their curriculum to meet specific individual needs. Planning for individual learners with a wide range of abilities in one classroom is challenging, if not impossible. Yet, this is the task that is presented to the majority of our teachers. Regardless of their role or responsibility, educators consistently wonder how best to meet the needs of students in the margins. Is there another way?

Across the country, some districts have expanded their instructional paradigms to reach all learners. In an Indiana school system, the adoption of digital textbooks allowed

teachers to customize readings for students based on factors such as readability and interest. Prior to instruction, assignments were quickly modified to provide visual or auditory access and scaffolds were built into text so that all students could gain content information about a topic, regardless of their reading level (Nelson, Arthur, Jensen & Van Horn, 2011). A district in Illinois provided teachers with general strategies for providing outstanding content experiences to all students in an inclusive setting through the use of low and high tech supports. Teachers were provided with numerous web-based tools available at little or no cost that gave students alternate ways to learn content (Anderson & Anderson, 2010). In Loudon County, Virginia, and Montgomery County, Maryland, teachers were provided with sample lesson plans that included instructional accommodations and enabled students to succeed without changing the content or conceptual difficulty of the curriculum (Loudon County Public Schools, 2011; HIAT, 2011). Flexible options were built into these exemplary plans during the design process, rather than added to the plans after the fact. In each of the districts described above, a framework called Universal Design for Learning (UDL) was adopted as a way to address the challenges faced by teachers like Dani while designing lessons that meet the needs of the diverse learners in their classrooms.

Introduction

Rappolt-Schlichtmann, Daley, and Rose (2012) indicated that "over the past five years, there has been exponential growth in interest surrounding the UDL framework, primarily within education policy and practice" (p.1). The purpose of this dissertation is to build upon this emerging body of research by presenting a series of three studies that, combined, will provide data regarding current perceptions of school administrators,

inservice teachers, and preservice teacher about UDL. Much of the existing literature about UDL is related to product development and emerging practices (Rappolt-Schlichtmann, Daley, & Rose, 2012). In their text, *A Research Reader in Universal Design for Learning*, Rappolt-Schlichtmann, Daley, and Rose (2012) call for research that is "explicitly informed by the problems of education practice" (p. 9). The research presented in this dissertation will answer this call to action, in part, by exploring the beliefs, knowledge and practices of educators who are responsible for integrating the UDL framework into practice. Results of this research will directly benefit teacher preparation and professional development programs.

The three studies presented are led by one overarching research question: What are the beliefs, knowledge and practices of preservice teachers, inservice teachers, and administrators about the role of UDL in supporting all learners? This dissertation followed an alternative design consisting of three manuscripts prepared for publication. University IRB for each study can be found in Appendices B, E, and K. This dissertation consists of the following chapters: Introduction and Literature Review; Administrators' Conceptions about Universal Design for Learning: An Opportunity for Conceptual Change; A Mixed Method Study of Teachers' Conceptions about Universal Design for Learning; Preservice Teachers' Conceptions about UDL; and Summary Recommendations and Discussion. Limitations for each study are presented within the corresponding manuscript. This first chapter includes the following sections: literature review, contributions to the field, and research connections.

Literature Review

Universal design for learning (UDL) is a set of principles designed to develop educational environments that give all individuals an equal opportunity to learn (CAST, 2012). UDL is formally defined in the Higher Education Opportunity Act of 2008 (HEOA) as a scientifically validated framework for supporting all learners through flexible curriculum that utilizes the principles of UDL: multiple means of engagement, action and expression and representation. In addition, the HEOA emphasized the importance of instruction on strategies consistent with UDL in teacher training programs. This literature review will provide background on UDL, describe the current context for UDL and review the application of UDL in educational settings. This review will also examine the conceptual change process as it relates to UDL. Finally, this review will address a gap in the research linking UDL principles, conceptual change and teacher and administrator training.

Universal Design for Learning

UDL is a set of principles for curriculum development and implementation that gives all individuals equal opportunity to learn (CAST, 2011). These principles provide educators with a structure for developing goals, materials, methods, and assessments that meet the needs of a wide range of learners by including flexible instructional options in the early stages of the curriculum design process. During the 1980's, educators at the Center for Applied Special Technology (CAST), began to examine their conceptions of disability. The group began with a focus on helping individuals adapt or "fix" themselves, essentially working toward overcoming their disabilities in order to succeed in general education settings (CAST, 2011). CAST quickly determined that this focus

was too narrow and did not consider the very important interaction between the individual and his or her environment.

At the same time, designers working in the field of architecture were experiencing a similar shift. Ron Mace, lead architect at the Center for Universal Design at North Carolina State University, coined the term "universal design" to describe the design of products and environments to be accessed by all people, to the greatest extent possible, without the need for adaptation or specialized design (Center for Universal Design, 1997). In an article detailing features of universal design in housing, Mace (1998) described seven principles of accessible design that would be useful to any individual, not just those with disabilities. These principles included equitable use, flexibility in use, simple and intuitive use, perceptible information, tolerance for error, low physical effort and appropriate size and space for use. He explained that thoughtful design can break down barriers. Mace and his colleagues also stated that considering the needs of multiple users during the design phase is more cost and time effective than retro-fitting a space to make it accessible for a user with a disability. This concept gained momentum with the passage of the Americans with Disabilities Act in 1990; for the first time, all new buildings were required to meet stringent guidelines for accessibility in order to accommodate all individuals. While these new design accommodations were vital to provide access for individuals with physical constraints, they also resulted in advantageous access for the physically-able person who was pushing a stroller or carrying a heavy package. What was intentionally designed to assist those in the minority resulted in making life easier for millions of people every day.

Like Mace and his colleagues, researchers at CAST continued to shift their focus from changing individuals to changing curriculum, working to identify the barriers inherent in curriculum and learning. They found that most curricula was inflexible and designed to fit the illusory "average" learner. Since CAST was interested in learning and not buildings or products, they moved away from direct application of the original architectural principles and began to approach the problem of inaccessible curriculum design by examining advances in the learning sciences. This is an important distinction between Universal Design (UD) and Universal Design for Learning (UDL).

For three decades, CAST has worked with research scientists to apply advances in the neurosciences to the field of education, carefully modifying and refining the UDL framework. This emphasis on learning science sets UDL apart from other frameworks. The UDL framework is buttressed by three supporting principles: multiple means of representation, multiple means of action and expression, and multiple means of engagement. Each of the UDL principles is informed by what is known about the learning sciences and is linked to a corresponding network of the brain. Several authors (e.g.,Higbee, 2009; Jimenez, Graf, & Rose, 2007; McGuire & Scott, 2006; Pace, & Blue, 2010; Rose, 2001; Rose, & Meyer, 2000; Rose, Harbour, Johnston, Daley, & Abarbanell, 2006) have published introductory information about UDL and the brain, noting the following information:

- The recognition network of the brain is responsible for taking in and understanding information. Individuals are highly diverse in the way that they perceive information, offering multiple means of representation, or input, will allow students to attach meaning to new content.

- The strategic network of the brain is responsible for planning and expressing information. Allowing multiple options for physical action, expression, fluency and executive functioning allows learners to more efficiently navigate their environment to express what they know.
- The affective network is the area of the brain responsible for engaging and motivating individuals. Classroom variability dictates multiple options for recruiting interest, maintaining effort and sustaining concentration in the learning environment.

See Appendix A for a chart comparing the UDL principles and corresponding brain networks.

Essential to the success of UDL is the use of digital materials and the ability of teachers to use instructional technology to provide students with multiple means of representation, action and expression and engagement. Rather than retrofit existing curriculum, supporters of UDL proposed that educators seek to create learning experiences and environments that are usable to the greatest number of people possible. UDL and similar models favor a more inclusive way of thinking about education for all students, especially for individuals with disabilities. In the past, society has used a medical model when considering students with disabilities in the classroom: the focus is on "fixing" the student, not the environment. UDL challenged this notion, viewing individuals with disabilities as part of a learning continuum, and as such, the onus of change is on the classroom and the instructor (Orr & Hammig, 2009). The UDL framework has been applied far beyond the disability community, and has entered the field of general education because of its broad applicability and its research foundation in

the learning sciences (National Education Technology Plan, 2010). In fact, the majority of the current references to UDL are found in general education policy.

UDL current context. Since its inception over thirty years ago, the UDL framework has evolved considerably based upon research in numerous fields including developmental psychology, neuroscience, computer science and architecture (Rappolt-Schlichtmann, Daley & Rose, 2012). In 2008, UDL was formally defined in the Higher Education Opportunity Act (HEOA):

The term UNIVERSAL DESIGN FOR LEARNING defines a scientifically valid framework for guiding educational practice that:

A. provides flexibility in the ways information is presented, in the ways students respond or demonstrate knowledge and skills, and in the ways students are engaged;
B. reduces barriers in instruction, provides appropriate accommodations, supports, and challenges, and maintains high achievement expectations for all students, including students with disabilities and students who are limited English proficient.

The framework of UDL has been further extended by scholars at CAST in the texts: Teaching Every Student in the Digital Age, (Rose & Meyer, 2002), The Universally Designed Classroom (Rose, Meyer, & Hitchcock, 2005) and A Practical Reader in Universal Design for Learning (Rose & Meyer, 2006). To support application of the UDL framework in the field, the UDL Guidelines were created based on research from several different disciplines.

The first iteration of the guidelines were based upon research in cognitive science, cognitive neuroscience, neuropsychology and neuroscience (CAST, 2011). This initial

focus was to identify the variability in human learning in order to designate three UDL principles and the corresponding learning networks. The second version of the framework evolved as an articulation of nine guidelines that provided support for each principle. The third, and most specific, iteration involved the multi-year review of research on best practices for reducing barriers in each of the principles; over 1,000 articles were reviewed and were organized around each checkpoint in the UDL guidelines (CAST, 2011). The research reviewed were a mix of experimental and quantitative evidence, scholarly reviews and expert opinions that provided an evidence-base for each guideline, checkpoint and principle included within the UDL framework. Clearly describing the research base that supported the guidelines was an essential step in securing the UDL framework as an essential component in making decisions about educational policy.

The UDL framework is referenced in numerous state and federal policies that guide education. As noted previously, the HEOA provided the statutory definition of UDL. In addition, the HEOA also emphasized a need to train preservice teacher educators on the principles of UDL and validated UDL as a scientific framework for guiding educational practice. The 2010 English Language Arts introduction of the Common Core State Standards Initiative also emphasized the importance of UDL, stating that the standards should be "read as allowing for the widest possible range of students to participate fully from the outset" (Common Core State Standards Initiative, 2010). Many standards, included in the Common Core, have been written to be flexible enough so that all learners can meet the learning goals.

Most recently, UDL was included in the Educational Technology Plan published by the US Department of Education (National Educational Technology Plan, 2010). In a letter prefacing the plan, Secretary of Education Arne Duncan called for using "state-of-the-art technology and Universal Design for Learning concepts to enable, motivate, and inspire all students to achieve, regardless of background, languages, or disabilities" (Paragraph 3, Preface to the National Educational Technology Plan, 2010). Throughout the plan, UDL was presented as a way to design and implement accessible curriculum and assessments, and meet the needs of 21st century learners.

In 2010, the state of Maryland passed House Bill 59/Senate Bill 467, with the purpose of establishing a task force to incorporate the principles of UDL into Maryland's educational policies and curriculum. This state-level task force released their recommendations in April 2011 and clearly endorsed the UDL framework as part of the curriculum design process (Maryland State Department of Education, 2011). This document was unanimously approved by the Maryland State Board of Education. On June 1, 2012, the first draft of Code of Maryland Regulations (COMAR) 13A.03.06 Universal Design for Learning was released for public comment. This marked the first state law regarding UDL. Regulations included the integration of UDL principles into the development and provision of curriculum, instructional materials, instruction, professional development and student assessment by 2014 (Universal Design for Learning, 2012).

References to UDL can also be found in the Race to the Top Assessment Programs Criteria, the LEARN Act bills in the House and Senate, the U. S. Department of Education's guidance on recommended use of American Reinvestment and Recovery

Act funds, and the U. S. Department of Education's Blueprint for Reform: Reauthorization of the Elementary and Secondary Education Act (Maryland State Department of Education, 2011). In April 2012, an article in Education Week cited UDL as an instructional approach originating in special education that is now an ideal tool to implement the Common Core Standards for all learners (Shah, 2012). These references, along with the passage of the Federal HEOA, COMAR 13A.03.06 in the Maryland State Legislature, and the support for UDL in the National Education Technology Plan and the Common Core State Standards exemplify the growing impact of UDL.

Each reference to UDL in current policy demonstrates that multiple means of engagement, representation and action and expression will be woven into the fabric of the future of education and curriculum design. These documents assume that learner variability is the norm in today's classrooms and they outline specific steps needed to develop the content knowledge, skills, and attitudes that will enable ALL learners to reach their maximum potential. UDL is the curricular framework that recognizes this variability and provides a blueprint for creating flexible goals, materials, methods and assessments. However, little attention has been given to determining how best to introduce the UDL framework into the professional development experiences of educators. Research on designing instruction about UDL for preservice and inservice teachers and school administrators is extremely limited.

UDL and preservice teacher training. The majority of studies involving universal design principles in higher education deal with postsecondary students with disabilities (e.g. Burgstahler & Cory, 2008; Higbee, 2009; McGuire & Scott, 2006; Orr & Hammig, 2009; Pace & Schwartz, D, 2008; Rose, Harbour, Johnston, Daley, &

Abarbanell, 2006; Scott, McGuire, & Shaw, 2003; Silver, Bourke, & Strehorn,1998), however, a body of research focusing on teacher education and UDL is developing. A growing number of studies examined the impact of training preservice teachers on the specific principles of UDL. Spooner, Baker, Harris, Ahlgrim-Delzell, and Browder (2007) examined the effects of UDL training on lesson plan development skills of preservice teachers. Researchers found that after a one-hour training session on UDL, the experimental group was able to develop a universally designed lesson. The control group received the training later and was required to redesign an existing lesson plan based upon their knowledge of UDL. These results indicated that teachers needed to be informed about UDL prior to lesson planning. They also indicated the importance of educating preservice teachers on the basic principles of UDL and providing activities that allow them to apply this new knowledge. Courey, Tappe, Siker, and LePage (2012), also studied lesson plans but compared plans created by teacher candidates before and after UDL training. They found that after training, preservice teachers incorporated more UDL principles into their lessons. They also noted that additional UDL options in the lesson did not necessarily translate into increased application in the classroom (Courey et al, 2012).

Pace and Blue (2010), conducted a qualitative study that examined preservice teachers' use of technology within a UDL framework while participating in an afterschool academic support program. The researchers analyzed journal entries from 28 preservice middle school special educators in order to answer questions about how preservice teachers experience and think about integrating technology into a UDL instructional model, focusing on both the planning process and instructional

modifications (Pace and Blue, 2010). The findings related directly to the use of technology in instruction, but the researchers did note that preservice teachers referred to UDL as a way to adapt curriculum without modifying content. This reflects the conception that UDL is an adaptation, rather than part of the initial lesson design.

Evans, Williams, King and Metcalf (2010) described how they integrated the UDL principles into three undergraduate courses on assessment, classroom management and instructional planning. The authors provided examples of how they use modeling, guided practice and application of the principles of representation, action and expression in their course work. While their model is clearly described, they noted that future research should focus on using quantitative measures to determine the effectiveness of preservice teachers ability to apply the UDL framework in the K-12 setting (Evans, et.al, 2010). A related study conducted by the same group of researchers investigated the impact of using direct and guided instruction of UDL lesson planning methodology to increase the self-reported knowledge of preservice elementary teachers (Williams, Evans & King, 2012). Results from a self-report instrument indicated that UDL instruction had a positive impact on the self-assessment of lesson planning skills (Willliams, et. al, 2012). Claflin, Eddins, and Eicher (2012), also asked preservice teachers to report on their comfort level associated with planning using UDL. They found that knowledge of the UDL framework helped preservice secondary science teachers to feel more comfortable planning for students with disabilities who were included in general education classes.

Additional articles examined preservice teachers and UDL in a cursory fashion. An empirical study (Zhang, 2005), focused mainly on a collaborative model between a

College of Education (COE) and a local school. This study reviewed technology training and UDL, which was made realistic through current educational technologies (Zhang, 2005). Although this article did not specifically relate to preservice teacher training, it did take place in a professional development school (PDS); therefore, preservice teachers received benefits of this instruction. Regardless, it is a model of how to conduct UDL training through a collaborative model.

In a qualitative study, McGuire-Schwartz, and Arndt (2007) examined student application of UDL from theory to practice. This article detailed two studies: study one involved action research to implement a UDL strategy; study two introduced teacher candidates to UDL and required them to design lesson plans for their practicum. This article described teaching UDL in the classroom and applied the principles to the real world, however, the article said that students were taught or introduced to the principles of UDL. There is no mention of actual modeling for preservice teachers. Limitations also included an inability to generalize due to a small sample size.

Most notably, Rose, Harbour, Johnston, Daley, and Abarbanell, (2006) described ways that UDL has influenced their course goals, objectives, teaching materials, methods, and assessments in a course at the Harvard Graduate School of Education. In applying universal design principles to the higher education setting, the authors made a clear distinction between learning environments and physical environments, stating that "the distinction between UDL and other domains of universal design is its focus on learning" (Rose, et al., 2006, p. 136). Rose and his colleagues described how they embedded the three principles of UDL into their graduate course, Meeting the Challenge of Individual Differences (T-560). By using this course as a case study, they were able to provide

concrete examples in the hopes that fellow educators will use their ideas as a "set of starter tools" (p. 139). Each suggestion was based on the idea that a universally designed course must be flexible in order to meet the needs of the greater group. Instructors are encouraged to consider accessible information and accessible pedagogy; use of multimedia is inherent in the application of each principle. Although the audience for this course consisted of graduate students seeking doctoral degrees in education, suggestions for modeling UDL when teaching about the framework can be applied to all education instructors covering UDL (Rose, et,al, 2006).

These articles indicate that UDL may become a regular topic of study in preservice teacher programs at both the undergraduate and graduate level. However, the literature has not yet acknowledged the inclusion of the UDL principles as a major component of teacher education. It is also important to note that in most of the studies, universal design principles were introduced to preservice teachers as part of the lesson planning process, rather than as a separate teaching technique reserved for students with disabilities. At the same time, many of the participants in these studies were preservice special educators, a dynamic that is sure to shift as a result of the Higher Education Act of 2008, which provides a formal definition of UDL and guidelines for providing UDL training to all future teachers (HEOA, 2008).

UDL and inservice teacher and administrator training. Literature relating to UDL and inservice teacher and administrator professional development is scarce. Some research is conceptual, offering inservice teachers and administrators ideas for beginning to implement UDL (e.g., Anderson & Anderson, 2010; Basham, et al, 2011; Hunt & Andreasen, 2011). Other research is based on studies completed in individual school

districts (e.g., Meo, 2008; ICF Macro, 2010). There is no current research related to professional development on UDL for inservice teachers or administrators.

Anderson and Anderson (2010) described how to leverage Web 2.0 technologies of the time to provide multiple means of engagement, representation, action and expression in inclusive science classrooms. They encouraged teachers to utilize specific resources that relied on technology to provide flexible options for students. Basham, et al (2011), described the use of "digital backpacks," or self contained technology toolkits, that engaged students in project-based learning experiences. The design of these "backpacks" was grounded in the UDL framework; any hardware or software included in the backpack must provide for multiple means of expression, engagement and representation (Basham, et al, 2011). The authors detailed the use of this "backpack" with an elementary school classroom engaged in project-based learning. Lessons learned from these experiences were applied to middle, high school and higher education instructors, who are encouraged to apply the UDL framework, their knowledge of problem based learning and technology integration to design authentic learning experiences for diverse student populations. Hunt and Andreasen (2011) detailed ways to use UDL to improve math lessons. Specific teaching suggestions were aligned to goals, materials, methods and assessments. This article clearly indicated that UDL was a framework that maximizes learning for all students. The purpose of each of these articles was to provide concrete, "ready-to-apply" teaching suggestions for inservice educators. Secondarily, these articles could be used by school leaders who are tasked with beginning to plan for systemic UDL implementation.

Three additional studies looked at UDL strategies and implementation at the district and school levels. In one mid-sized school district, inservice teachers, school administrators and curriculum specialists participated in a series of UDL trainings that spanned the course of one academic year. ICF Macro, an independent research and evaluation firm, conducted a survey and organized participant focus groups to gather feedback on the quality of the professional development sessions and to learn how participants planned to apply the information they learned in the classroom or at the district level. Survey results indicated that nearly three-quarters of teacher participants (73%) strongly agreed or agreed that they felt prepared to develop lesson plans using the UDL framework; their responses as to how they would incorporate UDL into their lessons varied (ICF Macro, 2011). Examples included providing more student choice, utilizing the websites provided on the UDL checklist, and using Web 2.0 tools. Teachers were also asked to describe what kind of support they would need to effectively apply UDL and integrate technology into their lessons and curricula; suggestions included: increased access to technology, additional time to collaborate with others, continued professional development (both on and off site), and money (ICF Macro, 2011). Curriculum specialist and administrator participants shared the ways in which they would apply what they learned from the workshop in their current positions. Many of their plans involved using what they learned to plan teacher professional development, write and revise curriculum, share information with other administrators/staff, and align the UDL Guidelines with the Common Core Standards (ICF Macro, 2011). This group also indicated that in order to successfully apply their new knowledge they would need additional workshops and assistance with using web tools introduced at the training.

Additionally, they requested on-going or "just-in-time" follow-up support from supervisors and tech staff, as well as guidance from UDL facilitators.

Meo (2008) noted similar findings after working with a group of high school teachers learning to use UDL to redesign curriculum. In a series of focus groups, teachers indicated that after UDL training, they were able to recognize inherent barriers in the curriculum and move toward the use of technology to increase options for learning. This case study also found that a change in understanding about UDL and research based practices was noticeable across all participants (Meo, 2008). By the final focus groups, participants had begun to adopt the language that reflected the underlying principles of UDL and, more importantly, had begun implementing these principles into their instruction.

Coyne (2012) examined the effect of a technology-based UDL approach on the reading achievement of 16 students with significant disabilities. All teachers received training on literacy best practices. The treatment group received additional training on how to teach using three software packages designed using the UDL framework. After controlling for initial reading achievement the treatment group made significantly higher gains in comprehension than the control group, suggesting a significant effect of the intervention (Coyne, et.al, 2012).

In each of these cases, a significant amount of time and professional resources were devoted to moving teachers and administrators from exploring UDL to implementing UDL. Careful attention was given to providing teachers with the strategies necessary for planning for diverse learners, however no consideration was given to identifying the current beliefs of learners. Sadera and Hargrave (1999, 2005) identified

the importance of designing instruction that takes into account preservice teachers preconceptions in regard to the role of the computer in teaching and learning. They argued that teacher education must develop instruction that is based upon creating dissatisfaction while systematically confronting preservice teacher's existing conceptions (Sadera & Hargrave, 2005). Without this knowledge, colleges of education and those individuals responsible for professional development are forced to design instruction that is not informed by data. As with the adoption of effective classroom technology integration, descriptive studies specific to teacher education, conceptual change and UDL are needed to advance the field and prepare educators to adopt UDL as a viable framework for curriculum design.

Universal Design for Learning and Conceptual Change

Unlike traditional views, Rose and Meyer (2005), defined disability as the interaction of the individual and the environment, rather than something that is part of an individual. As such, educators should focus on changing the "disabled" curriculum. Typical curriculum is often designed to meet the needs of students in the middle to average range; many students in today's classrooms are not able to achieve high standards due to barriers inherent in this "one-size-fits-all" curriculum (Rose and Meyer, 2002).

> The more differentiated use of media for instruction reveals that individuals who are defined as learning disabled within print-based learning environments are not the same individuals who are defined as learning disabled within video-or audio-based learning environments. Such revelations splinter the old categorical divisions between disability

> and ability and create new descriptors that explicitly recognize the interaction between student and environment in the definition of strengths and weaknesses. (Rose & Meyer , 2005, p 4.)

UDL encourages educators to design or redesign their curricula to meet the needs of a diverse group of learners and shifts the focus of change from the student to the curriculum (CAST, 2010). Placing the responsibility to change on the curriculum, rather than on the student, is a paradigm shift for many educators. For this reason, understanding and successfully applying UDL requires a conceptual change (CAST, 2010).

Defining conceptual change. Conceptual change is generally defined as learning that changes an existing conception, such as a belief, an idea, or a way of thinking (Posner, Strike, Hewson & Gertzog, 1982). Conceptual change differs from other types of learning because it is not measured by the acquisition of a specific skill set or by an ability to demonstrate factual knowledge. Rather, conceptual change represents a shift in one's existing ideas and beliefs, and is a method for promoting accommodation of knowledge and belief structures (Tillema, 1997).

All learners enter in to formal learning situations with prior knowledge and beliefs (Sadera & Hargrave, 1999, 2005). This individual schema impacts learners as they process new information and determine how to solve problems. We know learners arrive in classrooms with naïve theories and preconceptions (Dole & Sinatra, 1998). These prior conceptions are resistant to change and a revision to one concept may, in turn, cause a revision to another (Özdemir, G. & Clark, 2007). When exposed to a new set of concepts, these prior experiences and beliefs often present a barrier for learners because

they are inconsistent with the information being presented (Dole & Sinatra, 1998; Özdemir, G. & Clark, 2007). It is a formidable task to change tightly held ideas; students may be willing to listen to new information and add new ideas to their knowledge base, but they may not be willing to truly accept these ideas (Chinn & Brewer, 1993). For new knowledge to occur, learners must progress through a series of stages in which they alter their beliefs (Dole & Sinatra, 1998; Pintrich, Marx & Boyle, 1993; Posner, Strike, Hewson & Gertzog, 1982; Sadera & Hargrave, 2005; Strike & Posner, 1993; Tillema, 1998). This process is called conceptual change.

Posner, Strike, Hewson and Gertzog (1982) originally described the conceptual change model as a method for assisting individuals as they alter their existing beliefs. A belief is defined in conceptual change as an opinion that one regards as true. In this research pre-conceptions and conceptions will serve as synonyms for beliefs. A belief may be a conception or a pre-conception, depending upon whether the belief was formed before or after formal instruction. Knowledge is defined as familiarity with a particular subject and a practice is the process of doing something and is synonymous with implementation. In order for changes to occur in beliefs, knowledge and practices, learners must progress through four specific stages of conceptual change: dissatisfaction, intelligibility, plausibility, and fruitfulness. Students must become dissatisfied with their existing conceptions; before considering a new conception an individual must see the limitations of their existing beliefs. Students must then see the new conception as intelligible, they must understand how the new conception is structured in order to solve the current problem. In the third stage, students begin to see the new conception as plausible; the new alternative must be a viable and effective way to solve the current

problem. Finally, students must view the new conception as fruitful; the new conception must be seen as a way to solve additional problems (Posner, et. al, 1982).

This initial theory of conceptual change was based on the work of Kuhn (1970) and Piaget (1985). Posner et.al, (1982), cited Piaget's definition of accommodation (1972) as the modification or change of existing knowledge structures, and described conceptual change as similar to paradigm shifts described by Kuhn (1970). When students re-organize or replace their central concepts, accommodation occurs (Posner, et. al, 1982, p 212). Posner (1982) also noted that although this process is explained in a linear format, it is important to understand that this accommodation is a gradual process. Accordingly, accommodation, "particularly for the novice, is best thought of as a gradual adjustment in one's conception, each new adjustment laying the groundwork for further adjustments but where the end result is a substantial reorganization or change in one's central concepts" (Posner, et al, 1982, p. 223).

Following this work, Pintrich, Marx, and Boyle (1993), stated that the theory described by Posner et al. (1982) was overly focused on cognition and did not take into account the ways in which motivation can impact conceptual change. They advocated a "hot model of conceptual change," which acknowledged the "personal, motivational, social, and historical processes" that are necessary prerequisites for restructuring ones beliefs (Pintrich, et. al, 1993). Pintrich and his colleagues clearly noted that Posner's (1982) conceptual change model did offer useful insight into the change process, but they proposed the incorporation of goals, values, self-efficacy and control beliefs in order to meet the affective needs of learners (Pintrich, et. al, 1993).

Strike and Posner (1993), later offered a reconceptualization of their theory by supporting the inclusion of motivation as a characteristic of the change process. They explained that dissatisfaction with the existing conception may be the critical factor in determining whether learners will accept a new idea. Dole and Sinatra (1998), took this a step further, proposing a Cognitive Reconstruction of Knowledge Model. This model drew on cognitive psychology, social psychology and science education models of conceptual change and offered four facets of motivation: dissatisfaction, personal relevance, social contexts, and intrinsic motivation (Dole & Sinatra, 1998). These models, also referred to as warm conceptual change, placed great emphasis on beliefs, values and feelings, in addition to basic prior knowledge. Understanding models relating to the change process is a way to help educators create an engaging environment (Dole & Sinatra, 1998).

With a focus on existing beliefs and building dissatisfaction, Sadera and Hargrave argued the following stages of dissatisfaction within the conceptual change process: pre-dissatisfaction, dissatisfaction and post-dissatisfaction. Pre-dissatisfaction addresses the learner's ability to acknowledge their pre-existing beliefs, while dissatisfaction highlights the learners ability to acquire knowledge about the alternative conception (Sadera & Hargrave, 2005). During this dissatisfaction stage it is essential for learners to compare the new conception to their existing beliefs. When learners enter the post-dissatisfaction stage they begin to understand and accept the new conception as intelligible, plausible and fruitful. Understanding where administrators, teachers, and preservice teachers fall with regard to their existing beliefs and dissatisfaction with their beliefs will allow teacher educators and those responsible for professional development to design more

targeted instruction. For example, if it is known that learners are in the pre-dissatisfaction stage, future instruction should be focused on addressing their existing beliefs in regard to ability and disability through an introduction to a discrepant event. Students may be challenged to acquire knowledge about the principles of UDL and corresponding brain networks in order to compare this information with their current conceptions. Alternatively, if participants are in the dissatisfaction stage and have begun to realize that their current conceptions are not adequate to address the challenge of presented by learner variability, instruction should be designed to focus on leveraging the UDL framework to create flexible goals, materials, methods and assessments. Data collected in each study described in this dissertation will be examined through the lens of the dissatisfaction based conceptual change process described by Sadera and Hargrave.

It is clear that knowledge of the conceptual change process is useful to teachers in the K-12 setting; it is equally important to utilize the conceptual change approach when working with preservice and inservice teachers, and school administrators. Teacher educators and those responsible for professional development must understand the pre-conceptions and existing conceptions of their target populations in order to provide quality instruction about UDL. Without knowledge of existing conceptions and pre-conceptions it is difficult to design instruction that helps learners to move beyond their existing beliefs.

Conceptual change and teacher education. Existing literature supports the use of a conceptual change approach to strengthen the experience of preservice teachers (Akar & Yildirim, 2009; Dawson, 2007; Dawson & Dana, 2007; Dhindsa & Anderson, 2004; Huey-Ling & Gorrell, 2002; Miller, Koury, Fitzgerald, Hollingsead, Mitchem, Hui-

Hsien, 2009; Sadera, 2001; Tillema, 1997). Much of this research is situated in the science, technology, engineering and math fields of preservice teacher education. Regardless, the theory is applicable to any instance in which an educator is presenting an alternative and more accurate understanding of a topic with which the learner has some existing knowledge or predetermined conception. Although the content areas examined and the design of each study was unique, each investigation was able to conclude that the conceptual change approach was a useful tool in promoting change.

Dhindsa and Anderson (2004), examined how preservice chemistry teachers were able to reconstruct their own knowledge in order to build a more coherent network of ideas. They also studied the preservice teachers perceptions of the conceptual change process, specifically focusing on the relevance of the process to teaching science (Dhindsa & Anderson, 2004). Akar and Yildirim (2009), studied the conceptual change process during a course on classroom management. By comparing before and after metaphors they found that preservice teachers were able to develop new understandings of classroom management (Akar & Yildrim, 2009). The implications from these studies are twofold. In both studies, changes were noted in the preservice teachers' conceptions of how to teach chemistry and classroom management, respectively. Additionally, the preservice teachers were challenged to consider how the conceptual change approach would be useful, not only for their own learning, but for their instruction as well.

Tillema (1997) also recognized the importance of preservice teacher beliefs and designed a course module according to the conceptual change approach to teaching. In the first stage, experiences and beliefs of the preservice teachers were made explicit. In stage two, new information was introduced and preservice teachers were asked to

evaluate this information in relation to their beliefs. Stage three involved determining whether the new information was intelligible, plausible and fruitful. Finally, in stage four, preservice teachers reconstructed their knowledge and built a new understanding based on acceptance of information (Tillema,1997). Tillema (1997) measured the change in beliefs related to changes in performance during student teaching. Results did show a change in performance, but not a long term change in initial beliefs; Tillema (1997) concluded that the conceptual change module was helpful in bringing about a momentary performance change and recommended increasing the intensity and duration of the conceptual change program in order to provide a structure for preservice teachers seeking to integrate theory into practice. This supports the notion that the conceptual change approach has implications in teacher education programs, but the intensity and duration must be carefully considered. This is especially significant when designing instruction about UDL. Making UDL central to one course is not enough. It is essential for teachers and administrators to see that the UDL framework is central to all areas of the coursework, from foundations to methods to assessment.

Miller, et al. (2009) evaluated conceptual change in preservice and inservice teachers using semantic networking or concept mapping. They used concept maps as a research tool to measure how teachers' concepts of working with students with emotional and behavioral disorders changed over the course of a semester, and additionally, to determine what factors contributed to their changing views (Miller, et al, 2009). Results suggested that using pre and post instruction concept maps was an effective tool for measuring conceptual change related to instruction. In this study the focus was on the use of the concept maps to measure change; the conceptual change approach was not

specifically described. Although the purpose of the article was to describe the process and protocol for using concept maps as a research tool, the findings from comparing the pre and post maps for conceptual change support the inclusion of the conceptual change approach in teacher education programs. Similarly, teachers and administrators should be made aware that UDL requires a conceptual change; dedicating time for reflection on UDL and their own journey toward adopting this framework should be an essential component in the design of professional development.

In order to encourage this time of reflection, Huey-Ling, and Gorrell (2002), designed a series of seminar sessions using the conceptual change approach to help preservice teachers see the connection between their own beliefs about teaching and learning and their practice in the classroom. The study supported the use of self-questioning, reflective journaling, reading of current research and rich classroom discussion as methods for facilitating conceptual change (Huey-Ling & Gorrell, 2002). In this qualitative study, journal entries were coded and analyzed to determine prior knowledge and current conceptions. Entries were examined throughout the course to determine whether students engaged in a transformation in their construction of knowledge based on course activities. One finding indicated that initial beliefs about teaching presented a challenge when new ideas presented differed from prior conceptions (Huey-Ling & Gorrell, 2002). Also of interest was the finding that motivation, or effort to understand, is the "driving force" for conceptual change (Huey-Ling & Gorrell, 2002, pp. 61).

Each of these examples (Akar & Yildirim, 2009; Dawson, 2007; Dawson, Dana & Fichtman, 2007; Dhindsa & Anderson, 2004; Huey-Ling & Gorrell, 2002; Miller,

Koury, Fitzgerald, Hollingsead, Mitchem) emphasized the importance of including conceptual change in the design of preservice teacher education. Findings from these studies can be directly applied to the design of instruction about UDL that focuses on determining current conceptions and comparing them to new frameworks for innovating. Similarly, Dawson (2007) explored teacher inquiry during technology-enhanced field experiences. One finding that resulted from this study was the role of teacher inquiry as a "light-bulb for conceptual change" (Dawson, 2007, p. 10). The inquiry method showed that many participants moved from a technology-centered to a curriculum-centered view of technology integration; using this method in an authentic context helped support a conceptual change with preservice teachers (Dawson, 2007). Dawson, Dana, & Fitchman (2007), also addressed the issue of conceptual change related to teaching with technology. They further supported the notion that prospective teachers need to experience conceptual changes in their beliefs about technology integration in order to become more effective educators (Dawson et.al, 2007). There is a strong connection between effective technology integration and UDL; these studies serve as a foundation for examining teacher preparation for UDL using the conceptual change framework. Understanding the connection between technology and UDL is essential to developing an advanced knowledge of the UDL framework.

In a series of research studies, Sadera (1999, 2001) examined preservice teachers' conceptions about teaching, learning, and the role of the computer in the classroom. Results showed that a conceptual change instructional unit guided participants through the conceptual change process at moderate to strong levels (Sadera, 2001). As a result of this study, Sadera and Hargrave (2005) were able to conclude that dissatisfaction should

be used as a framework for developing instruction that prepares preservice teachers to integrate technology. "It is time for teacher education to accept the challenge and develop instruction based upon creating dissatisfaction and confronting preservice teachers existing conceptions systematically and rationally" (Sadera & Hargrave , 2005, p. 301). While this statement was written in regard to technology integration, it can be applied to any pedagogical framework introduced to preservice teachers, inservice teachers and administrators that may be contradictory to what they see as effective instruction. The research studies described in this dissertation will examine beliefs, knowledge and practices so that instruction can be designed to lead these learners through the conceptual change process.

Summary

UDL has been woven into the fabric of educational reform. References to UDL are found in public policy, schools of education include UDL in their course content, K-12 districts are increasing their professional development offerings on UDL and including the UDL principles as they redesign curricula to prepare for the new National Curriculum. Systemic implementation is beginning; there is an immediate need for quality instruction and professional development on UDL. In order to best design this instruction, it is imperative that leaders in higher education and those responsible for professional development are aware of the existing conceptions of their current and future teachers and administrators in regard to UDL and its role in the design of flexible curriculum. UDL encourages educators to design or redesign their curricula to meet the needs of a diverse group of learners and shifts the focus of change from the student to the curriculum (CAST, 2010). Placing the responsibility to change on the curriculum, rather

than on the student, is a paradigm shift for many educators. For this reason, understanding and successfully applying UDL requires a conceptual change (CAST, 2010). Each of the studies presented in this dissertation will provide K-12 and higher education decision makers with qualitative and quantitative data describing the pre-conceptions or conceptions of educators with regard to UDL. The data obtained from this research will assist these decision makers in designing instruction about UDL for preservice teachers, inservice teachers and administrators that recognizes the importance of the conceptual change process in helping educators to embrace the framework of UDL and apply the principles in their curriculum and instruction.

Contributions to the Field

UDL is changing the landscape of education in America by forging a deeper connection between research and practice (Rose & Gravel, 2012). Important opportunities exist to inform the "theory and research concerning the nature of learning and development" (Schlichtmann, Daley, & Rose, 2012, p.2). The work described in this dissertation explores new avenues that have the potential impact the process of UDL implementation by examining the foundational beliefs of educators about UDL. There is an urgent demand for this information. CAST, the national leader in UDL, reports a dramatic increase in professional development requests from both K-12 school districts and institutes of higher education over the past three years (Meo, 2012). It is imperative that those individuals tasked with introducing the UDL framework to current and future educators are acutely aware of the pre-conceptions and current conceptions of their target populations. David Rose, co-founder of CAST, wrote: "[We must] expand and deepen the kinds of research questions we need to ask…larger and better chosen questions will

drive the kind of research we need" (2012, p.232). Each of the three studies described in this dissertation asked a deeper question not yet studied in the field of UDL: What are the beliefs, knowledge and practices of preservice teachers, inservice teachers, and administrators about the role of UDL in supporting all learners? Understanding these pre-conceptions and current conceptions will help colleges of education and professional development organizations to design instruction about UDL that is purposeful, meaningful, relevant and timely and will contribute to a "robust, varied, active, interdisciplinary field of research…that goes far beyond mere foundations" (Rose, 2012, p. 230).

Research Connections

Conceptual change is not only relevant to teaching in the content area, it is also applicable to inservice teacher and administrator professional development. New instructional strategies are presented to teachers on a regular basis; many of these strategies encourage educators to stretch their current repertoire and consider practices that differ from their current instructional beliefs. In most cases, experienced teachers are able to understand more about educational practices than their less-experienced colleagues (Liu, Jones & Sadera, 2010). This knowledge may help to develop a foundation for connecting new frameworks to existing understandings, essentially helping to facilitate the conceptual change process. Similarly, conceptual change is relevant in preservice teacher education programs. It is important for teacher education programs to address the preconceptions of students as they use these existing beliefs to understand and apply pedagogy (Tillema, 1997; Sadera & Hargrave, 2005). UDL is a framework that clearly forces preservice teachers, inservice teachers and administrators

to think beyond their current conceptions and re-consider what they know about curriculum and instruction (CAST, 2012). However, there are very few best practices for designing instruction about UDL and, although UDL requires a conceptual change there are no descriptions of how best to address learner beliefs as they begin to understand, apply and espouse the principles of UDL.

The powerful nature of pre-conceptions and current conceptions and the associated alterations necessary for conceptual change about UDL are challenges for teacher educators and individuals responsible for professional development. If these beliefs are not addressed in the earliest stages of the conceptual change process, there is little chance that they will change. UDL is quickly becoming part of the fabric of our educational system; it is imperative that instruction about UDL is high-quality and relevant. Without knowledge of the beliefs, knowledge and practices of preservice teachers, inservice teachers, and administrators it is not possible to change understandings, impact practices, and ensure that the UDL framework is wholeheartedly adopted by educators.

Each of the studies presented in this dissertation describe and analyze the beliefs, knowledge and practices of a population of educators (i.e., preservice teachers, inservice teachers and administrators), with regard to the role of UDL in supporting all learners. Discussions are framed in the three-stage dissatisfaction-focused conceptual change model proposed by Sadera and Hargrave (2005). In *Administrators' Conceptions about Universal Design for Learning: An Opportunity for Conceptual Change*, school administrators' beliefs and understandings about UDL are presented using conceptual change as a theoretical framework to assist school leaders as they develop an

understanding for, and strategies regarding, implementation of Universal Design for Learning. Using phenomenological research methods, this study analyzes data collected from interviews with 15 administrators. Results are presented through six emerging themes based upon the beliefs and understandings of these administrators, regarding UDL. In *A Mixed Method Study of Teachers' Conceptions about Universal Design for Learning,* teacher beliefs knowledge and practices about UDL are examined through a mixed methods study conducted with teachers participating in a UDL professional development system. The article also presents conceptual change as a theoretical framework to assist those responsible for designing professional development relating to the implementation of Universal Design for Learning. Finally, *Preservice Teachers' Conceptions about UDL* reports quantitative data about the conceptions of preservice teachers in regard to UDL. This descriptive study provides insight into the underlying assumptions of the UDL framework and examines results in regard to a dissatisfaction based conceptual change model. This information can assist higher education faculty with course design. While the methodology and sample varies for each study, all research described in this dissertation seeks to answer the following question: What are the beliefs, knowledge and practices of administrators, teachers, and preservice teachers about Universal Design for Learning?

CHAPTER II. ADMINISTRATOR CONCEPTIONS ABOUT UNIVERSAL DESIGN FOR LEARNING: AN OPPORTUNITY FOR CONCEPTUAL CHANGE

Authors:

Elizabeth Berquist

William A. Sadera

Abstract

Across the United States, school leaders are focusing on UDL as a framework for meeting the challenge of learner variability and designing high-quality, standards-based instruction (Hall, Rose & Meyer, 2012). In this article, the researchers present conceptual change as a theoretical framework to assist school leaders as they develop an understanding for, and strategies regarding, implementation of Universal Design for Learning. Using phenomenological research methods, this study analyzed data collected from interviews with 15 administrators. Results are presented through six emerging themes based upon the beliefs and understandings of these administrators, regarding UDL. This knowledge will allow future professional development using conceptual change to be designed effectively.

A decade ago, Richard Elmore highlighted the essential role of school leaders in developing tangible, results-oriented improvement plans that provide measurable feedback, resulting in increased student achievement (Elmore, 2000, 2002, 2005). As schools move into the post-No Child Left Behind Era, leadership at all levels continue to be placed in the center of the school reform movement, tasked with all aspects of the improvement process, from sharing research-based best practices, to developing professional learning communities, to ensuring that all staff members are accountable for student success (Aitken & Aitken, 2008). In a meta-analysis focused on student and teacher characteristics and school practices, Waters, Marzano and McNulty (2005) noted a substantial relationship between leadership and student achievement. In review of highly successful schools, Fullan (2005) argued both school and district leadership were foundational to school improvement. Fixsen, Naoom, Blase, Friedman and Wallace (2005), contended the development and identification for identifying evidence-based practices has improved greatly, but the process for sustaining these change initiatives is lacking. Each of these seminal works underscore the significant role of school leaders, from district level to school-based administrators, in improving schools and making change. The beliefs, practices and knowledge of school leaders, at all levels, are clearly foundational to exploring, preparing, implementing, scaling and optimizing any new framework (Ralabate, et.al, 2012). However, little research exists that examines the importance of these beliefs. Identifying, recognizing, and articulating existing beliefs of school leaders is an essential step in planning experiences that support school leaders as

they transition from exploration to implementation. To that end, the purpose of this study was to identify the current conceptions of school leaders about UDL.

In this article, the authors also present conceptual change as a theoretical framework to assist school leaders as they develop an understanding for, and strategies regarding, implementation of Universal Design for Learning (UDL). The conceptual change process focuses on uncovering pre-conceptions or conceptions about an essential topic or issue and then uses various techniques to support individuals as they change their conceptual framework and adopt a better fitting or more feasible option. This knowledge is essential to developing instructional strategies for a district asking their leadership to consider a framework that may differ from their current system of beliefs, such as UDL.

UDL is a framework for creating instructional goals, materials, methods and assessments that address the challenge of variability by utilizing flexible approaches from the inception of a lesson or curriculum (CAST, 2011). UDL was formally defined in the Higher Education Opportunity Act of 2008 (HEOA) as a scientifically valid framework for supporting all learners through flexible curriculum that include multiple means of engagement, representation, action and expression. Since 2008, the UDL framework has been cited in numerous state and federal documents that have had or will have a significant impact on public education, including the Introduction to the Common Core State Standards (2012), the National Education Technology Plan (2010), and the National Instructional Materials Accessibility Standard (2006). Data described in this article were collected in Maryland, a state where regulations now include provisions for applying the UDL framework in the development of curriculum, instructional planning, instructional delivery, material selection, and assessment (COMAR 13A.03.06, 2012). Interest in UDL

has grown exponentially in recent years (Rappolt-Schlichtmann, Daley & Rose, 2012) and large-scale professional development activities at the teacher and administrator levels are well underway. It is both timely and necessary to identify the conceptions held by school leaders about UDL.

Theoretical Framework

Conceptual change is generally defined as learning that changes an existing conception, such as a belief, an idea, or a way of thinking (Posner, Strike, Hewson & Gertzog, 1982). Conceptual change differs from other types of learning because it is not measured by the acquisition of a specific skill set or by an ability to demonstrate factual knowledge. Rather, conceptual change represents a shift in one's existing ideas and beliefs, and is a method for promoting accommodation of knowledge and belief structures (Tillema, 1997).

All learners enter into formal learning situations with prior knowledge and beliefs (Sadera & Hargrave, 1999; 2005). This individual belief, or schema, impacts learners as they process new information and determine how to solve problems. We know learners arrive in classrooms often with naïve theories and preconceptions (Dole & Sinatra, 1998). These prior conceptions are resistant to change and a revision to one concept may cause a revision to another (Özdemir, G. & Clark, 2007). When exposed to a new set of concepts, learners' prior experiences and beliefs often present a barrier because they are inconsistent with the new information being presented (Dole & Sinatra, 1998; Özdemir, G. & Clark, 2007). It is a formidable task to change tightly held ideas; individuals may be willing to listen to new information and add new ideas to their knowledge base, but they may not be willing to truly accept these ideas and abandon their existing conceptions

(Chinn & Brewer, 1993). For new knowledge to occur, learners must progress through a series of stages in which they alter their beliefs: dissatisfaction, intelligibility, plausibility, and fruitfulness (Dole & Sinatra, 1998; Pintrich, Marx & Boyle, 1993; Posner, Strike, Hewson & Gertzog, 1982; Strike and Posner, 1993; Tillema, 1998). This process is called conceptual change. As an alternative to the original conceptual change model, Sadera and Hargrave (2005) argued the following stages of conceptual change focused on the importance of overcoming initial or existing beliefs: pre-dissatisfaction, dissatisfaction and post-dissatisfaction. According to Sadera and Hargrave (2005), pre-dissatisfaction addresses the learner's ability to acknowledge their pre-existing beliefs, while dissatisfaction focuses on acquiring new knowledge and comparing that new knowledge with their current conceptions. Finally, post-dissatisfaction occurs when the learner understands and accepts a new conception that is sustained over time. Data collected in this study were interpreted in order to determine where school leaders fall in the conceptual change process and more specifically where they are with regard to their dissatisfaction of existing beliefs as defined by Sadera and Hargrave (2005).

Understanding where school leadership falls with regard to their existing beliefs about UDL and their dissatisfaction with these beliefs will allow those responsible for introducing the UDL framework to design more targeted instruction. It is clear knowledge of the conceptual change process is useful to preservice educators and teachers in the K-12 setting (Akar & Yildirim, 2009; Dawson, 2007; Dawson & Dana, 2007; Dhindsa & Anderson, 2004; Huey-Ling & Gorrell, 2002; Miller, Koury, Fitzgerald, Hollingsead, Mitchem, Hui-Hsien, 2009; Sadera, 2001; Tillema, 1997); it is equally important to utilize the conceptual change approach when working with school

administrators. Individuals responsible for professional development must understand the pre-conceptions and existing conceptions of their target populations in order to provide quality instruction. Without knowledge of existing beliefs, it is difficult to design instruction that helps learners move beyond their existing beliefs.

UDL and School Change

To support application of the UDL framework in the field the UDL Guidelines were created based on research from several different disciplines (CAST, 2012). The UDL framework and guidelines are buttressed by three supporting principles: multiple means of representation, multiple means of action and expression, and multiple means of engagement. Each of the UDL principles is informed by what is known about the learning sciences and is linked to a corresponding network of the brain. This emphasis on neuroscience sets UDL apart from other frameworks. Several authors (eg.,Higbee, 2009; Jimenez, Graf, & Rose, 2007; McGuire & Scott, 2006; Pace, & Blue, 2010; Rose, 2001; Rose, & Meyer, 2000; Rose, Harbour, Johnston, Daley, & Abarbanell, 2006) have published introductory information about UDL, describing the connection between learning sciences and classroom practice. For example, learner recognition networks are highly diverse in the way that they perceive information; therefore, by offering multiple means of representation, or input, students are more likely to attach meaning to new content. Similarly, strategic networks are responsible for planning and expressing information. Allowing multiple options for physical action, expression and fluency, and executive functioning allows learners to more efficiently navigate their environment to express what they know. Most importantly, affective networks are responsible for engaging and motivating learners. Classroom variability dictates multiple options for

recruiting interest, maintaining effort, and sustaining concentration in the learning environment (CAST, 2011). Essential to the success of offering options to support each of these networks is the use of digital materials and instructional technologies to provide students with multiple means of engagement, representation, action and expression. Finally, the proactive nature of UDL sets the framework apart from other practices, such as differentiated instruction. Rather than retrofit existing curriculum, supporters of UDL proposed educators proactively seek to create learning experiences and environments that are usable to the greatest number of people possible from the development stage.

The UDL framework and guidelines are referenced in numerous federal and state policies that guide education, and are applicable to school leaders. In addition to providing the statutory definition of UDL, the HEOA (2008) also emphasized a need to train preservice teacher educators on the principles of UDL and validated UDL as a scientific framework for guiding educational practice. The 2010 English Language Arts introduction of the Common Core State Standards Initiative also emphasized the importance of UDL, stating that the standards should be "read as allowing for the widest possible range of students to participate fully from the outset" (Common Core State Standards Initiative, 2010). UDL is also paramount in the Educational Technology Plan published by the US Department of Education (National Educational Technology Plan, 2010). Maryland, Michigan, Kentucky, Louisiana and Maine have statewide UDL initiatives, while all other US states have at least one to two UDL activities occurring throughout (National UDL Center, 2012). These references exemplify the growing

importance of UDL in the field of education, specifically in the area of administrator preparation.

Each reference to UDL in current policy demonstrates that multiple means of engagement, representation, and action and expression will be woven into the fabric of the future of education and curriculum design. However, little attention has been directed at how to best introduce the UDL framework to school administrators, and no consideration has been given to identifying the current beliefs of administrators in regard to UDL. Without this knowledge, those individuals responsible for initiating the change process in schools are forced to design instruction that is not informed by data. Descriptive studies specific to administrator professional development, conceptual change and UDL are needed to prepare educators to adopt UDL as viable framework for school reform.

UDL and Conceptual Change

The purpose of this article is to use the conceptual change framework to extend current research by examining the conceptions of school leaders in regard to UDL. School systems across the United States are focusing on UDL as a framework that can support standards-based education for all learners, while continuing to recognize the challenge of learner variability (Hall, Rose & Meyer, 2012). UDL is a framework that provides a structure for developing goals, materials, methods, and assessments that meet the challenge of learner variability by proactively embedding flexible instructional options into the curriculum. This emphasis on viewing the curriculum as flexible and in need of revision is a shift for many educators, who were indoctrinated in the medical

model of change, which focuses on "fixing" or changing a student, rather than revising the curriculum.

Currently no research exists that identifies the current beliefs of those individuals who are most crucial in moving the UDL framework forward: school administrators. Without knowledge and recognition of the strength of the pre-existing beliefs of this group in regard to the foundational assumptions of UDL it will be difficult, if not impossible, to move from exploring UDL to implementing UDL. Furthermore, it may be a difficult for some school leaders to endorse the UDL framework because the foundational assumptions of UDL represent a departure from their current view of a curricular framework. For example, the typical curriculum most often presented to school leaders is designed to meet the needs of students who are considered "average" or "in-the-middle." Inherently, there are a multitude of barriers present in this "one-size-fits-all" curriculum (Rose & Meyer, 2002). UDL encourages educators to design or redesign their curricula to meet the needs of a diverse group of learners and shifts the focus of change from the student to the curriculum (CAST, 2010). Placing the responsibility of change on the curriculum, rather than on the student, is a paradigm shift for many school leaders. For this reason, understanding and successfully applying UDL requires a conceptual change (CAST, 2010). Although CAST has recognized that UDL does require a conceptual change, those responsible for the professional development are not necessarily cognizant of the beliefs of school leaders who are tasked with introducing this framework to teachers. Therein lies the challenge: one must first identify beliefs and then use this knowledge to determine where school leaders fall on the conceptual change

continuum. Data from this study were analyzed using a dissatisfaction based conceptual change model because UDL is a new idea that is often contradictory to traditional beliefs.

Methodology

This qualitative study is grounded in phenomenological research, as defined by Moustakas (1994), and explored the experiences of individuals participating in a UDL focused professional development activity and how they made meaning from this experience. Using semi-structured interviews, the administrators participating in this study were asked questions about their professional background, background on UDL, conceptions about UDL and implementation of UDL in their school or district. Their responses provided insight into the participants' conceptions about UDL. Jonassen (1984), argued that "experiencing a mediated event is substantively different from direct experience of an event, the resulting phenomena or conscious perceptions must be substantively different" (p.166). Celisz (2010) cited this seminal argument in a conceptual paper proposing phenomenology as a framework for studying experiences with technology. He stated experience in teaching with technology is a phenomenon distinct from traditional forms of teaching and learning (Cilesiz, 2010). Similarly, UDL represents a departure from traditional frameworks associated with teaching and learning, a factor that necessitates the close study of the beliefs, knowledge and practices of those individuals who are responsible for introducing this framework. This study was designed to address the following research question: What are the conceptions, knowledge and practices held by administrators about the role of UDL in supporting all learners?

Phenomenological Research

Phenomenological research methods are appropriate for studying the lives of ordinary people and is focused on understanding social and psychological phenomena from the perspective of those most involved (Gubrium & Holstein, 2000). UDL, while gaining much recognition in educational settings, is a complex framework that often challenges school leaders to confront tightly held beliefs and accept new ideas. Examining UDL with regard to the conceptual change process calls for a methodology focused on both individual experience and understanding patterns of thought. While there are numerous iterations of phenomenology, this study utilizes a modified van Kaam method as described by Moustakas (1994). Specific strategies described by Moustakas include engaging in the Epoche, pre-data collection, interviewing techniques and data analysis. The research team adhered to these procedures by identifying a topic that was both socially relevant and personally significant. As teacher educators working with school leaders, the research team was also personally connected to the topic.

Participant Researcher

Given my role in this research as first author, lead researcher on this project, and professional development instructor it is important to share my phenomenological lens. Moustakas (1994) describes the researcher as an instrument who collects and interprets data about the phenomenon from a particular phenomenological lens. This lens will vary from researcher to researcher due to differing backgrounds and experiences and will inherently impact the data analysis. The lens in this study is grounded in my personal perspectives and experience teaching educators and administrators about UDL. Before beginning the research process, I engaged in the "Epoche" process, making an explicit

attempt to set aside my own conceptions in order to see the phenomenon with an open mind. Husserl (1969) explained that in any phenomenological study the researcher must make a systematic, disciplined effort to set aside any and all prejudgements about the phenomenon being studied. This Epoche, or bracketing process, is a prerequisite for any participant researcher embarking upon a phenomenological study. Prior to beginning the interview process and again before commencing data collection, I revisited my participant researcher statement.

Sample

In order to address this research question, a form of purposeful called "unique sampling" was used to find participants with unique attributes who had similar experiences with the phenomenon (Merriam, 1998). This type of sampling was appropriate for phenomenological research. A representative from the participating district was asked to identify administrators who met the following criteria: full-time administrators with supervision responsibilities; participation in a half-day professional development about UDL and interest in participating in a research study. The resulting sample included 15 administrators.

All of the administrators were employed in the same mid-sized public school system in the mid-Atlantic. This school system serves over 50, 000 students who live in suburban areas. The student population for this school system included approximately 17% of students who receive free and reduced lunch, 9% of students who receive special education services and 3% of students who are English Language Learners.

The sample included five elementary school administrators, four middle school administrators, four high school administrators and two district administrators. The

administrators ranged in years of experience from two to over thirty. Their backgrounds also varied, including math, social studies, science, English and special education. Each administrator supervised numerous full-time and part-time staff members. Participants were responsible for a wide range of duties including program planning, curriculum implementation, scheduling, hiring, observing, placement, assessment and business related tasks such as purchasing equipment and preparing budgets.

In addition, each administrator recently participated in a four hour professional development about UDL. This professional development was part of a state College and Career Readiness Project (CCR) designed to enhance teaching and learning using technology and UDL. Goals of the project included creating teaching resources and professional development modules, as well as exposing partner systems to innovative ways to incorporate technology into their current professional development and classroom activities.

Great variability existed within this group of participants in regard to knowledge of UDL. Some administrators had no knowledge of UDL prior to the four hour training; others had very little knowledge of UDL prior to the training but had elected to learn more on their own following the training (i.e., examining websites about UDL). Two of the district administrators had somewhat developed knowledge of UDL because they participated in additional UDL trainings with their curriculum staff in the months leading up to this study.

A sample of 15 is within the suggested range of 5-25 for phenomenological research (Cresswell, 2007). In addition, phenomenology calls for a series of in-depth interviews that are informal, flexible and include multiple open-ended questions

(Moustakas, 1994). A semi-structured interview protocol was developed by the research team and implemented in this study.

Interview Protocol

The Administrator UDL Interview protocol was developed by modifying the UDL assumptions found in the UDL Guidelines, seeking feedback from UDL experts and conducting an extensive literature review. The text version of the UDL guidelines includes background on the concept of UDL, vital questions necessary to understand UDL, and a description of the foundational assumptions of the UDL framework. This document was essential in developing open-ended questions that prompted administrators to explore the underlying assumptions of the UDL framework.

The final instrument consisted of four sections: Opening Statements, Background, UDL Conceptions and UDL Implementation. Section one consisted of standard language that was read by the researcher at the beginning of each interview. The purpose of including an opening statement was to maintain consistency in the interview process, provide a standard description of the study and to inform each individual that their participation in the study was voluntary.

Section two, Background, consisted of two items: "Describe your current position" and "What opportunities have you had to participate in professional development about UDL?" The purpose of this section was to gather data on the current roles and responsibilities of each participant and to determine their level of prior knowledge about UDL.

Section three, UDL Conceptions, consisted of nine statements that were developed to uncover participant beliefs and knowledge about UDL. In collecting this data,

participants were asked to respond or react to each statement. Statements, included "UDL is a general education initiative," "UDL requires technology," and "UDL is nothing more than good teaching" were used in this section. These statements were based on common misconceptions held by individuals who have only a basic understanding of UDL. Additional statements, including "the greatest barrier to learning is the curriculum," and "teachers should be responsible for modifying curriculum based on individual student needs" were based upon the fundamental assumptions of UDL as outlined in the UDL Guidelines (CAST, 2011). These statements were designed to gain insight into the beliefs of participants.

Seven items in Section four were designed to identify knowledge and practices related to school and district implementation of UDL. For example, participants were asked to comment on the challenges of implementing UDL in relation to goals, materials, methods and assessments. This question requires participants to have an understanding of the four major components of UDL curriculum and to comment on how to put these understandings into practice.

Research Procedures

Interviews were conducted as a follow-up to a professional development workshop about UDL. All participants received a copy of the interview questions prior to participating in the interviews. Each administrator participated in one face- to- face interview that lasted between sixty and ninety minutes. Interviews occurred approximately one month after the initial UDL training. The face-to-face interviews were conducted at the participants' schools or offices. Before each interview began, the participants were asked to sign a consent form. The semi-structured interview process

was used, which allowed the dialogue to be conversational and exploratory in nature (Holstein & Gubrium, 1995). The interviews were designed to make the participants feel comfortable expressing their beliefs, knowledge and practices related to UDL. The first author conducted each interview and was accompanied by a representative from the school system. All interviews were recorded and transcribed.

It was essential for the first author to engage in the Epoche process prior to beginning each interview in order to set aside biases that may impact the process (Moustakas, 1994). This procedure was especially important because the first author and interviewer conducted the professional development session attended by all participants. Therefore, it was imperative to make a conscious effort to put aside her beliefs and past experiences related to UDL prior to conducting the interviews.

Credibility

The authors triangulated data to ensure credibility of findings. Denzin and Lincoln, (1998) recommend four methods for triangulating data: data, theory, methodological and investigator triangulation. This study utilized investigator triangulation throughout the review process to reduce bias; two research assistants examined the data from different points of view. In addition, a representative from the county observed each interview and was provided with a summary of the themes that were captured through the responses of the participants allowing for further validation.

The research team used the following procedures to ensure credibility: engaging in the Epoche process throughout each stage of research, peer review during data analysis, and triangulation throughout the analysis process. The first researcher wrote a participant researcher statement and returned to this document before each interview,

prior to coding, and during data analysis, with careful attention during the synthesis stage. Peer review was used to ensure that invariant constituents and collective textural and structural descriptions accurately summarized reoccurring themes.

Data Analysis

Phenomenological research methods, as proposed by Moustakas (1994), were used as a structure for analyzing the data. This data analysis procedure consists of seven steps across three major stages: Phenomenological Reduction, Imaginative Variation, and Synthesis (Moustakas, 1994).

The phenomenological reduction stage involved three steps: horizonalizing the data, transforming data into meaning units and creating individual textural descriptions. In horizonalizing, the data the researchers first read each transcript multiple times, treating each statement as having equal value (Moustakas, 1994). From each transcript the research team extracted horizons, which each researcher believed to be expressions of each participants lived experience with UDL; 221 horizons were identified. Each horizon was then reviewed and redundant or repetitive statements were omitted. Peer review was used at this stage to ensure that only relevant statements were selected. This second step in the process allowed the research team to transform the data into meaning units across participants, with attention to which units were present in each participant's data. This stage clustered 221 horizons into 19 invariant constituents. The third step involved the creation of individual textural descriptions, or narratives, of each participant's experience. In this stage data was reorganized into meaning units using excerpts from each participant's transcript. This process helped the research team to understand "what" each participant "experienced."

The imaginative variation stage was a lengthy process that involved re-reading the textural descriptions in order to determine all possible explanations of the structures that might underlie the individual descriptions. The purpose of this second stage, and the fourth step in the overall process, is to arrive at individual structural descriptions that are the essence of the experience (Cilesiz, 2010). At this stage, researchers are encouraged to make comparisons between statements, eliminate elements that contradict the data at large, and transform the participant's standard language into statements reflective of the discipline's terminology (Cilesiz, 2010; Moustakas, 1994). By using imaginative variation, the research team was able to imagine "how" experiences occurred and reflect upon each participant's experience with the underlying assumptions relating to UDL. This helped the research team to understand the existing conditions that impacted the beliefs, knowledge and practices about UDL.

The third stage of phenomenological data analysis consists of three steps designed to provide a structure for synthesizing all data collected. To begin the process of synthesizing data, the research team identified similarities in the textures of each participant's experience. These shared meaning units were listed individually in table format. This fifth step resulted in a list of composite textural descriptions. The sixth step involved determining the "why" of each shared meaning unit listed in the table created through the prior step. Commonalities in the underlying structures of each experience were identified as the composite structural descriptions. These shared structures were listed on the table according to the corresponding composite textural description. Finally, these composite textural and structural descriptions were combined in order to determine

the "essence" of the overall experience. Six themes were identified and are presented in the following section.

Results

Individual textural and structural descriptions were generated for each participant but only collective descriptions are included in this article. Understanding each participant's unique experience with UDL was a necessary component of the data analysis procedure but results are best presented by identifying and describing collective textural-structural descriptions. These descriptions represent reoccurring themes that provide insight into the essence of school leaders' beliefs, knowledge and practices about UDL. As a result of this analysis, the following six themes are presented: viewing UDL as an overarching framework, understanding that UDL is a paradigm shift, expecting the curriculum to "do more," identifying barriers to practicing UDL, acknowledging expectations of teachers, and enhancing professional development practices.

Viewing UDL as an overarching framework

The administrators acknowledged UDL could be a useful framework for meeting the challenge of learner variability in the classroom. For example, one participant stated "many of our teachers are experiencing multiple levels of ability in their classroom and I think that is the piece that is the most challenging for them." This leader indicated that UDL could help teachers to identify the patterns in that variability and was adamant that UDL could not be seen as "one more thing." Similarly, another stated:

> I don't look at it as extra, I look at it as better. So, I don't know if there is a way to convey that to teachers. [UDL is] not an extra thing, it makes you a better person, a better teacher and it helps the kids grow and to love education.

Another school leader expressed:

> So, this…contains a lot of things that we think make sense for us. So, all of the things that we talk about with our teachers in terms of curriculum, planning the assessments, and the learning experience….All of this about motivation and pulling kids in, that fits with the engagement piece of UDL. The instructional strategies, that's part of the "how." [UDL] is at the foundation of our beliefs. That is part of why I think we really liked it.

On the contrary, another group of school leaders felt that UDL was not something new and expressed that "most of the teachers who have heard about it seem to just talk about UDL as being differentiation." Others saw UDL as one more thing to do, as exemplified in the following remark:

> Well, teachers spend a lot of time with their planning and they clearly identify techniques and strategies that they are using to develop that lesson, at what point or how would you differentiate, that now, in this part of the lesson, I am using differentiated strategies to assist multiple learners within that class? Then, would you want another box for them to check, as in, 'yes, now I am going to use the UDL suggestions' or would you have them sort of combine? See, how would you want your teachers to check those boxes and how would you see it as differentiated.

Administrator background and demographic characteristics reflective of the position influenced their perception of UDL as an overarching framework. While some saw it useful and had a perspective on the possibilities UDL could provide to improve student learning, others saw it as an inconvenience.

Understanding that UDL is a paradigm shift

The administrators discussed UDL as a paradigm shift with specific attention given to improving the curriculum as opposed to changing the student to "fit into" the existing environment. For example, one administrator stated:

> The student is the student, you can't change them. You can only give them tools to help them become better at who they are, to find success, no matter how big or little. You are not trying to fix the student, you are fixing how you present the curriculum.

In addition, school leaders consistently referenced the proactive nature of UDL. Excerpts from the transcript reveal the view that planning using the UDL is a departure from traditional methods.

> I guess my current perception of it [UDL] is more of a purposeful planning approach more than like the execution of the lesson. In a sense, if I am sitting down and I know my group of kids and who needs what and where. I just feel it is being more intentional of what I am going to use and when and why.

Another school leader further noted the difference between planning using the UDL framework stating:

> I want them to do it on the front end and not on the back end and I think that is the major difference with UDL. We are always applying something later as a consequence, whereas we want to start being more driven in the beginning because then we are not going to have the need for as many consequences if we get the things up front.

Beyond considering a shift in planning, school leaders also believed that UDL

represents a shift in how educators provide instruction. Many of the school leaders emphasized the importance of providing options for all learners across all settings. They articulated a concern that this paradigm shift could be a challenging leap for some educators. For example, one principal indicated:

> I have always thought that starting as a Kindergarten teacher or Special-education teacher is a benefit. If you can teach Kindergarten in the ideal way of hands-on, motivating, engaging, small groups, interactive, and apply that to fifth grade or High School, well it would be amazing.

Another school leader described this shift in instruction:

> [I observed] an excellent Special education teacher, [She provided] …models and showed how to do [the task], which was the perfect scaffold, but then [in another setting], when the kid has [the same] problem again, [another teacher said] 'well here are these papers, do it'."

In this instance, it is clear that the administrator is comparing traditional instruction to instruction using UDL options. However, she is not yet speaking the language of UDL. While all school leaders expressed significant statements supporting UDL as a paradigm shift there was not consistency in how they were able to articulate these beliefs.

Expectations of Curriculum

In addition to understanding UDL as an instructional and philosophical paradigm shift, administrators also revealed similar experiences with re-considering the critical role of curriculum in light of UDL. They described existing curriculum as "a structure that is not always flexible," documents with "a lot of pieces," and "not that front loaded." As

their knowledge of UDL began to grow, administrators began to compare their existing curriculum with their conceptions of a curriculum designed using UDL.

For example, one administrator stated,

> There isn't any purposeful curriculum that says, well during this lesson, here is a great site to put on your LCD and walk the kids through. And here is this PowerPoint and we will read this. [We] talked in the beginning about barriers [to] creating amazing lessons in the classroom: it is the time to do all that research, to find that technology piece that matches with the objective, to find the manipulatives, to find all the things that connect together.

Another expressed, "Our teachers are really concerned now that things are scattered and they have to go all these different places to find resources. […. Another] challenge is that the shell that delivers our [curriculum] guides is not as flexible as we feel it needs to be." Challenges aside, administrators collectively believed that an intentional and proactive curriculum could be a reality. "I do see an opportunity for [embedding UDL] into the existing curriculum. The way that curriculum is written in [this] County defines the concepts and the topics, but it doesn't define specifically how they have to be taught."

Administrators also felt that current changes in education would allow for a more seamless transition to curriculum designed using UDL. "We are making the transition to common core and a part of common core is this re-thinking of resources, so it all is one [unit] as opposed to a lot of [pieces] and we are trying to figure out how to do that." Further adding that, "In terms of implementation, time is always an issue and we just have to be strategic…because as we make shifts in the core curriculum we have to be careful that we are not delivering [UDL] as an additional piece of the curriculum."

All administrators expressed a belief in the critical importance of embedding UDL into the curriculum from its inception. At the same time they noted issues with the current curriculum and complications with providing options "after the fact." Collectively, the group recognized the importance of being intentional and proactive when designing curriculum for the widest range of users.

Barriers to Practice

As a result of the data analysis, several reoccurring issues were identified as barriers, including: time, resources, technology, and assessments. When learning about the UDL framework, many administrators understood the complexity of the topic and realized that time was a necessary factor in developing an understanding of the framework. One administrator commented:

> How do you buy more than eight staff meetings? Eight staff meetings are not enough. And then year two [of implementation], you have to have on going professional development to answer the questions that arise [in year one]. You have to have ways to monitor. So, that always is a barrier for us for any initiative.

Administrators also expressed apprehension about the availability of resources that they felt would be essential in integrating UDL into practice. For example, one school leader shared the following anecdote:

> I just left an I.E.P. meeting where the mother was talking about the iPad that she has at home, and some of the applications that she is using with [her] child and how nice it would be for a school system to be able to provide each of our students that type of resource. [Providing multiple] means to access curriculum and express themselves and take part in very different engaging, interactive types of things... I

feel that we are obliged to do that. I feel that that is the way of the world.

All administrators expressed a desire to increase the availability of existing resources, from low tech to high tech. Some also noted that access to resources could be a barrier because options vary from school to school. Technology challenges were a common thread across interviews. Many administrators who had plenty of access to technology tools had experienced barriers with technology proficiency. For example, one administrator stated that she had difficulty "helping some of the veteran staff to not be afraid of the technology." She went on to explain "if we aren't keeping up with [the students], how can we teach them? We not only need to keep up with them, we need to be one step ahead."

The final perceived barrier focused on issues of assessment. Current experiences with the UDL framework left administrators wondering about the connection between UDL and high stakes testing. For example:

> A school is deemed to be worthy or unworthy based on our scores. So if we are not cognizant of that in our curriculum, the way we assess children, and we go totally into these menus of different products, we possibly are not going to do well when it comes to those assessments. So the measure at the state level may be very different than our measure in our classroom. So how is that resolved?

Still, others expressed hope that UDL would compliment new assessments aligned to the Common Core State Standards, stating that "we are in a time of transition as to what accountability is going to look like, so it may be that UDL aligns very nicely with that." In all instances, administrators indicated that they had not conceptualized how UDL would look in a high stakes assessment at the state our county level, but they did see a

connection to formative classroom assessment that occurs on a daily basis. School leaders were cognizant that applying UDL to assessment would be a shift for many educators. At the same time, they recognized the necessity of offering multiple options in assessment as in curriculum.

Acknowledgement of Teacher Expectations

When asked questions about their beliefs, knowledge and practices about UDL, administrators were quick to make connections between their personal conceptions and their expectations of their teachers. They acknowledged the importance of additional time for planning and professional development, the necessity of in-school or just-in-time support and the challenge of "thinking outside the box" as they conceive ways to think differently about using the UDL framework to support students and teachers alike. For example, one administrator realized that teacher "buy in" and collaboration would be a key to success. She asked "How would you present [UDL] in a friendly way that is not overwhelming for the teachers?" The administrators were quite cognizant of the demands placed on their teachers and continually reiterated the importance of building a master schedule with collaborative planning time and helping teachers to see that UDL is possible without a huge volume of workload.

Some of the administrators had already begun to embed time to explore and prepare for UDL into their expectations for teachers. One administrator stated, "We have not used the term UDL [directly], but through the nature of our activities and our focus on engagement [we have made UDL an expectation]. Another administrator indicated:

> [I] decided to take seven times during the school year to do [in-school] professional development [on UDL]. [I] asked for the first 20 minutes of a team meeting to do

> that professional development. So, [I] wasn't asking them to stay after school or take time during planning.

In summarizing her ideas, one participant said "I think in terms of implementation, time is always an issue and we just have to be strategic in how we go about it because as we make shifts in the core curriculum we have to be careful that we are not delivering it as an additional piece." Considering alternative ways to support teacher understanding of UDL, while also acknowledging their already intense workload, was a common theme among interviews. School leaders acknowledged that the demands placed upon teachers are great and that introducing any new framework requires careful attention to the expectations that are already in place.

Professional Development Practices

A final theme that administrators experienced was a heightened sense of value for rich professional development experiences. They indicated that professional development designed to introduce UDL and help teachers and administrators to begin to apply the UDL framework should, in essence, be an application of the principals themselves. For example, several administrators indicated that teachers should have access to multiple representations of materials, such as personal copies of the planning tools, several books to peruse at their leisure, concrete lessons examples per grade level, skeleton examples, and examples of resources they can apply immediately. Administrators also shared their concern that if we expect teaching and learning practices to evolve, we should also expect professional development practices to adhere to these same standards. For example:

> If we are going to implement something like [UDL] we need to have the experts;

we need to have professional development [that is] really well planned….] I think it [requires] a year [of] preparation [before we] begin to implement.

In addition, administrators also expressed a need for actual examples that demonstrate successful application of the UDL principles. School leaders stated that authentic examples of teachers, schools and districts that have had success in applying the UDL principles would be a valuable addition to professional development. These type of examples would provide an "appreciation for the power of providing this opportunity for kids," and would "motivate teachers to learn how to create [UDL lessons] their own."

School leaders collectively stated that professional development that is high quality and on-going will impact teacher beliefs, knowledge and practices about UDL. Administrators believed that designing innovative professional development practices was an important factor in advancing the UDL framework. While most school leaders were able to articulate the importance of providing professional development on UDL in the school and at the district level, they were not consistent in their ability to describe or recommend new practices.

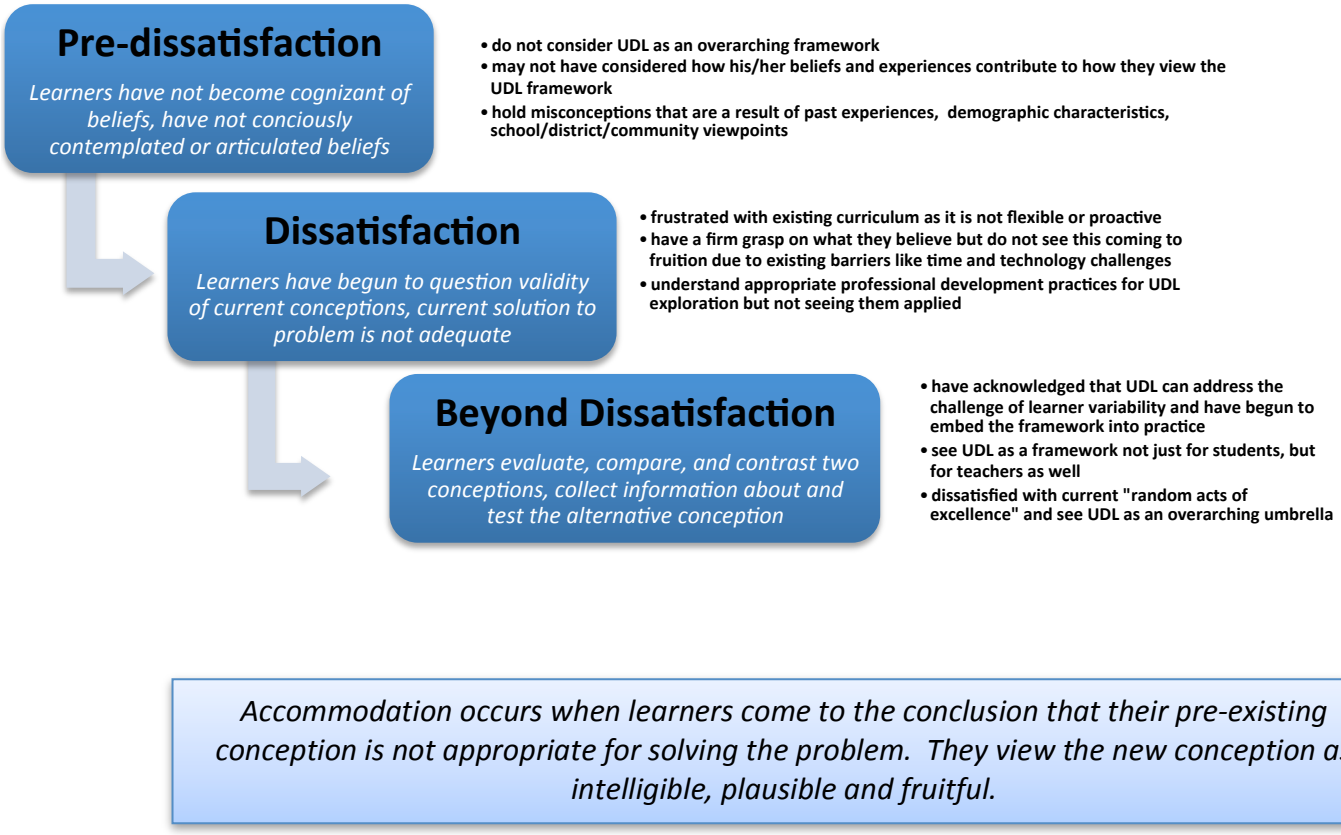
Discussion

It is important to consider how uncovering pre-conceptions or conceptions about UDL could help support leaders as they consider a framework that may differ from their current system of beliefs. In this section, themes that emerged from the composite textural-structural analysis will be discussed with regard to the conceptual change model. See Figure 1 for a graphic depiction.

Pre-dissatisfaction refers to a stage in which learners have not yet deliberately considered their beliefs (Sadera & Hargrave, 2005). In this study, learners in the pre-

dissatisfaction stage are school administrators who have not yet become cognizant of their beliefs about the role of UDL in teaching and learning. These individuals may not have considered UDL as an overarching framework and may see UDL as "another thing to do."

Figure 1: Conceptual Change model and corresponding lived experiences of school administrators



It is likely that these individuals have not had the opportunity to specifically confront their beliefs about the underlying assumptions of UDL. They may hold a variety of misconceptions about the UDL framework and have not had adequate time or

training to confront these misconceptions. These misconceptions may include seeing UDL as a synonym for learning styles or differentiated instruction. These administrators may view UDL as a special education initiative rather than a framework to support all learners. These understandings have developed over time and can be related to past experiences or demographics.

Dissatisfaction is characterized when learners begin to question the validity of their current beliefs (Sadera & Hargrave, 2005). In this study, participants in the dissatisfaction stage are cognizant of their beliefs about UDL and they realize that their current solution to a problem (ie: addressing the challenge of learner variability) may not be adequate. Data from this study indicate that learners in the dissatisfaction stage are administrators who have a firm grasp on their beliefs about UDL, but do not see these beliefs coming to fruition due to existing barriers, such as time constraints and technology challenges. These individuals may have also expressed frustration with current curriculum but have also recognized the benefits of a UDL enhanced curriculum that is flexible and proactive. Similarly, administrators may be able to articulate options for "outside the box" professional development approaches but may not yet see how these approaches can exist within their current environment.

Finally, the beyond-dissatisfaction stage is representative of those learners who are able to evaluate, compare, and contrast two conceptions: their current conception and the new conception being presented (Sadera & Hargrave, 2005). Data from this study indicates that administrators who are in this stage have begun to collect information about UDL and test the alternative conception of UDL. They see UDL as a plausible way to address the challenge of learner variability and they may have begun to explore ways to

embed the framework into their practice. Administrators in this stage see UDL as overarching umbrella that has the potential to tie existing initiatives together.

The purpose of applying this theoretical framework to phenomenological results is to provide a method for first describing conceptions about UDL and then applying these conceptions to a model that could assist in the design and development of instruction about UDL. This research identifies the current beliefs of those individuals who are most crucial in moving the UDL framework forward. When we recognize the strength of these pre-existing beliefs and apply this information to a model of conceptual change, we are one step closer in the move from exploring UDL to implementing UDL.

Implications for Practice

The purpose of this study was to identify the current conceptions of school leaders about UDL. By applying these results to a conceptual change model we hope to provide structure for designing more effective UDL focused professional development. In this section, we offer specific strategies to facilitate movement between each stage, with the end goal being accommodation, a state when learners come to the conclusion that their pre-existing conception is not appropriate for solving the problem and they view the new conception as intelligible, plausible and fruitful (Sadera & Hargrave, 2005). See Figure 2 for a graphic depiction of this information.

To facilitate dissatisfaction in the area of UDL, it may first be useful to identify a specific problem of practice. For example, it may be helpful to challenge school leaders to articulate current barriers relating to goals, materials, methods or assessments. Professional development experiences designed to facilitate dissatisfaction should also provide time for administrators to access, engage and activate their basic beliefs about the

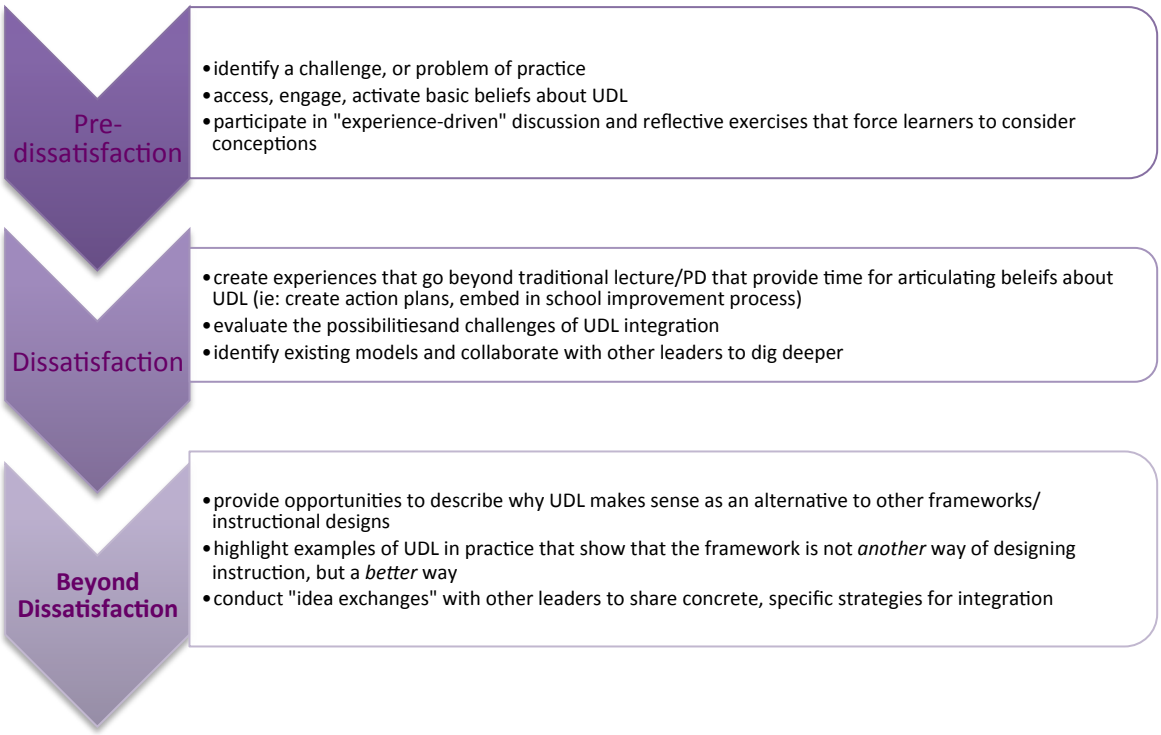
underlying assumptions of UDL. Dedicating time to discussion with colleagues is also foundational in setting up "experience-driven" discussion and reflective exercises that force learners to consider their existing conceptions.

When school leaders are able to articulate their existing beliefs about UDL they must be provided with learning experiences that challenge those current conceptions. For example, they should be provided with access to information about districts and schools that use the UDL framework. They should examine this information and use it to evaluate the possibilities of UDL integration in their own school. Professional development experiences should move beyond traditional lecture format and provide structured opportunities for collaboration and time to draft authentic documents, such as action plans. The goal of instructional activities in this stage is to engage learners in inquiry based experiences that help them to reflect on their current conceptions and compare those conceptions to new offerings.

Once school leaders have had the opportunity to carefully compare their pre-existing beliefs to the new conception, it is necessary to assist them in building a greater understanding of the new conception, in this case UDL. One strategy for building this knowledge base includes collaborative reflection time for describing why UDL makes sense as an alternative to other frameworks or instructional designs. Facilitating "idea exchanges" with other school leaders may also be a useful way to share specific strategies for UDL integration. It is most important to highlight authentic examples of UDL in practice that show that the UDL framework is not *another* way of designing instruction, but a *better* way. Ultimately, instruction at this stage seeks to move learners toward accommodation, a stage where they see UDL as intelligible, plausible and fruitful. See

Figure 2 for a graphic depiction of suggested instructional practices that correspond to each stage of the Conceptual Change model.

Figure 2. Suggested instructional practices corresponding to stages of conceptual change



Limitations

While every effort was made to control for external impacts, as with any study some limitations exist. A system representative was present during each interview. Although his presence did help to ensure validity in the interview process, his role as a system administrator could have impacted the authenticity of participant responses during their interviews. Each interview participant made a choice to participate in this study. This could be considered a limitation because those who elected to participate may have held a greater interest in UDL. As with all qualitative studies, it is difficult to generalize this study to other school systems that have different demographic characteristics.

However, the goal of this research was to identify beliefs, knowledge and practices, not to generalize results. In addition, the role of a participant researcher may be considered a limitation of this study. As a participant researcher I am aware of how my perceptions, preconceptions and biases could impact the data collection or analysis.

Suggestions for Further Research

Further research using conceptual change and the adoption of UDL must be conducted with different participant groups including preservice teachers, inservice teachers or state level policy makers. It will also be important to examine the stages of conceptual change as they relate to the stages of UDL implementation. CAST has developed an implementation strategy guide that is designed to assist school districts as they progress through the stages of UDL implementation. Future research should also lead to the development of a UDL focused conceptual change based instructional professional development; this should be designed to assist school leaders to progress through the stages of conceptual change toward accommodation. Finally, further research should also explore the ability of school leaders to maintain their new conceptions about UDL following accommodation.

Conclusion

Across the United States, school leaders are focusing on UDL as a framework for meeting the challenge of learner variability and designing high-quality, standards-based instruction (Hall, Rose & Meyer, 2012). Interest in UDL is growing rapidly, but those responsible for designing instruction about UDL are not always aware of the complexity of the framework. It is imperative those responsible for introducing the UDL framework to school leaders are aware of their existing conceptions. These conceptions are based on

prior experiences and impact the way that school leaders make sense of the UDL framework. This knowledge is essential in designing more effective instruction about UDL. The research described in this article provides insight into the beliefs, knowledge and practices of school leaders about UDL. Examining these conceptions through the lens of conceptual change provides a clear and efficient structure for designing more effective professional development about UDL.

References

Aitken, E., & Aitken, A. (2008). Leadership and school improvement. International Journal of Learning., 15(7), 193-202. Retrieved from http://www.Learning-Journal.com

Akar, H., & Yildirim, A. (2009). Change in teacher candidates' metaphorical images about classroom management in a social constructivist learning environment. *Teaching in Higher Education*, *14*, 401-415. doi:10.1080/13562510903050152

CAST (2010). *UDL Pedagogical Considerations*. Wakefield, MA: Author.

CAST (2011). *Universal design for learning guidelines version 2.0.*Wakefield, MA: Author.

CAST (2012). *About UDL.* Wakefield, MA: Author.

Chinn & Brewer. (1993). The role of anomalous data, a theoretical framework and implications for science instruction. *Review of Educational Research*, *63*, 1-49. Retrieved from http://rer.sagepub.com/

Cilesiz, S. (2010). A phenomenological approach to experiences with technology: current state, promise, and future directions for research. *Education Technology Research and Development. 59*:487–510. doi 10.1007/s11423-010-9173-2

Cresswell, W. (2006). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches.* Thousand Oaks, CA: Sage.

Dawson, K. (2007). The role of teacher inquiry in helping prospective teachers untangle the complexities of technology use in classrooms. *Journal of Computing in Teacher Education*, *24*(1), 5-12. Retrieved from

http://www.iste.org/Content/NavigationMenu/Membership/SIGs/SIGTETeacherEducators/JCT E/Journal_of_Computing_in_Teacher_Educatio.htm

Dawson, K., Dana, N., & Fichtman, N. (2007). When curriculum-based, technology enhanced field experiences and teacher inquiry coalesce: An opportunity for conceptual change? *British Journal of Educational Technology*, *38*, 656-667. doi:10.1111/j.1467-8535.2006.00648.x

Denzin, N., & Lincoln, Y. (1998) *The Handbook of Qualitative Research*. Thousand Oaks, CA: Sage.

Dhindsa, H., & Anderson, O. (2004). Using a conceptual-change approach to help preservice science teachers reorganize their knowledge structures for constructivist teaching. *Journal of Science Teacher Education*, *15*(1), 63-85. Retrieved from http://www.springer.com/education+%26+language/science+education/journal/10972

Dole, J., & Sinatra, G. (1998). Reconceptalizing change in the cognitive construction of knowledge. *Educational Psychologist*, *33*(2/3), 109. Retrieved from http://www.informaworld.com/smpp/title~content=t775653642~db=all

Elmore, Richard. (2004). *School Reform from the Inside Out.* Cambridge, MA: Harvard Education Press.

Elmore, R. F. (2000). Building a new structure for school leadership. Washington, DC: Albert Shanker Institute.

Elmore, R. F. (2002). Bridging the gap between standards and achievement: The imperative for professional development in education. Washington, DC: Albert

Shanker Institute.

Fixsen, D. L., Naoom, S. F., Blase, K. A., Friedman, R. M. & Wallace, F. (2005). *Implementation Research: A Synthesis of the Literature* (FMHI Publication #231). Retrieved from University of South Florida, Louis de la Parte Florida Mental Health Institute Website, http://ctndisseminationlibrary.org/PDF/nirnmonograph.pdf

Fullan, M. (2005). Leadership and sustainability. Thousand Oaks, CA: Corwin Press.

Higbee, J. L. (2009). Implementing universal instructional design in postsecondary courses and curricula. *Journal of College Teaching & Learning, 6*(8), 65-77. Retrieved from http://www.cluteinstitute.com/JCTLMain.htm

Higher Education Opportunity Act. 20 U.S.C. § 110-315 (2008).

Huey-Ling, L., & Gorrell, J. (2002). The road to preservice teachers' conceptual change. *Educational Research Quarterly*, *26*(2), 54. Retrieved from http://www.highbeam.com/Educational+Research+Quarterly/publications.aspx

Jimenez, T. C., Graf, V. L., & Rose, E. (2007). Gaining access to general education: The promise of universal design for learning. *Issues In Teacher Education*, *16*(2), 41-54. Retrieved from http://www1.chapman.edu/ITE/.

McGuire, J., & Scott, S. (2006). Universal design for instruction: Extending the universal design paradigm to college instruction. *Journal of Postsecondary Education Disability, 19*(2), 124-134. Retrieved from http://www.ahead.org/publications/jped

McGuire-Schwartz, M., & Arndt, J. (2007). Transforming universal design for learning in

earlychildhood teacher education from college classroom to early childhood classroom. *Journal of Early Childhood Teacher Education, 28*(2), 127-139. Retrieved from http://www.naecte.org/index.php?option=com_content&view=article&id=20&Itemid=33

Miller, K., Koury, K., Fitzgerald, G., Hollingsead, C., Mitchem, K., Hui-HsienTsai. (2009). Concept mapping as a research tool to evaluate conceptual change related to instructional methods. *Teacher Education & Special Education*, *32*, 365-378. doi:10.1177/0888406409346149

Moustakas, C. (1994). *Phenomenological research methods.* Thousand Oaks, CA: Sage.

National UDL Center (2012). *UDL in your state*. Retrieved from http://www.udlcenter.org/advocacy/state.

Özdemir, G. & Clark, D. (2007). An overview of conceptual change theories. *Eurasia Journal of Mathematics, Science & Technology Education, 3*(4), 351-361. Retrieved from http://www.ejmste.com/index2.html

Pace, D., & Blue, E. (2010). Cutting edge educators: Preservice teachers' use of technology within universal design for learning framework. *Insights on Learning Disabilities, 7*(2), 19-29. Retrieved from http://www.ldworldwide.org/educators/ild-educators

Pintrich, Marx, & Boyle. (1993). Beyond cold conceptual change: The role of motivational beliefs and classroom contextual factors in the process of conceptual change. *Review of Educational Research, 63*, 167-200. Retrieved from http://rer.sagepub.com/

Posner, G., Strike, K., Hewson. P., & Gertzog, W. (1982). Accommodation of a scientific conception: Towards a theory of conceptual change. *Science Education, 67,* 489-508. Retrieved from http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1098-237X

Ralabate, P., Dodd, E., Vue, G., Kargar, J., Smith, F., Carlisle, A., Hehir, T., Grindal, T., & Eidelman, H. (2012). *Understanding the impact of the race to the top and ARRA funding on the promotion of universal design for learning*. National Center on Universal Design for Learning. Wakefield, MA.

Rappolt-Schlichtmann, G., Daley, S., & Rose, L. T., Eds. (2012). *A Research Reader in Universal Design for Learning.* Cambridge, MA: Harvard Education Press.

Rose, D. (2001). Universal design for learning: Deriving guiding principles from networks that learn. *Journal of Special Education Technology, 16*(1), 66-70. Retrieved from http://www.tamcec.org/jset/

Rose, D., & Meyer, A. (2000). Universal design for learning. *Journal of Special Education Technology, 15*(1), 66-67. Retrieved from http://www.tamcec.org/jset/

Rose, D. & Meyer, A. (2002) *Teaching every student in the digital age: Universal Design for Learning*. Alexandria, VA: ASCD.

Rose, D., Gravel, J., & Domings, Y. (2010). *UDL unplugged: The role of technology in UDL*. Wakefield, MA: Center for Applied Special Technology.

Rose, D., Harbour, W., Johnston, C., Daley, S., & Abarbanell, L. (2006). Universal design for learning in postsecondary education: Reflections on principles and their application. *Journal of Postsecondary Education Disability, 19*(2), 135-151. Retrieved from http://www.ahead.org/publications/jped

Rose, D. & Meyer, A., (Eds). (2006). *A Practical Reader in Universal Design for Learning.* Cambridge, MA: Harvard Education Press.

Sadera, W. (2001). *Conceptual change-based instruction and preservice teacher technology preparation: A collective case study*. Unpublished doctoral dissertation. Iowa State University, Ames, IA.

Sadera, W. & Hargrave, C. (1999). An identification of preservice teachers' preconceptions about the role of the computer in learning and teaching. *Journal of Computing in Teacher Education*, *15*, 19-23. Retrieved from http://www.west.asu.edu/achristie/journal.html

Sadera, W. & Hargrave, C. (2005). Conceptual Change in Preservice Teacher Preparation. In C. Vrasidas & G.V.Glass (Eds.), *Preparing Teachers to Teach with Technology*. (pp. 291-302). Greenwich, CT: Information Age Publishing.

Scott, S., McGuire, J., & Shaw, S. (2003). Universal design for instruction. A new paradigm for adult instruction in postsecondary education. *Remedial Special Education, 24*(6), 369-379. Retrieved from http://rse.sagepub.com.proxy-tu.researchport.umd.edu/

Sinatra, G. (2005). The warming trend in conceptual change research: The legacy of Paul R. Pintrich. *Educational Psychologist*. *40*(2), 107-115. Retrieved from http://www.informaworld.com/smpp/title~content=t775653642~db=all

Strike, K. A., & Posner, G. J. (1992). A revisionist theory of conceptual change. In R. Duschl & R. Hamilton (Eds.), Philosophy of Science, Cognitive Psychology, and Educational Theory and Practice (pp. 147-176). Albany, NY:SUNY.

Tillema, H. (1997). Promoting conceptual change in learning to teach. *Asia-Pacific*

Journal of Teacher Education, *25*(1), 7. Retrieved from http://atea.edu.au/index.php?option=com_content&task=view&id=16&Itemid=137

United States Department of Education, Office of Educational Technology. (2010). *National Educational Technology Plan*. Retrieved from http://www.ed.gov/sites/default/files/NETP-2010-final-report.pdf.

Universal Design for Learning, Title 13A Maryland State Board of Education. § 13A.03.06 (Annotated Code of Maryland, 2012).

Waters, T., Marzano, R.J., & McNulty, B. (2003). Mid-Continent Regional Educational Lab., A. O. (2003). Balanced Leadership: What 30 Years of Research Tells Us about the Effect of Leadership on Student Achievement. A Working Paper. Retrieved from: http://www.mcrel.org/PDF/LeadershipOrganizationDevelopment/5031RR_Balanced Leadership.pdf

Notes Regarding Manuscript One

Role of the co-author: The co-author served as a guide in the initial design of this research, participated in the data analysis and offered feedback throughout the writing process. In the final stages of writing, the co-author also functioned as an editor.

Journal submission information: This article was submitted to the Journal of Educational Research. This journal has an acceptance rate of 18%. Website: http://www.tandfonline.com/toc/vjer20/current

Appendices: Information related to this chapter that was not included in the journal submission but is necessary to meet dissertation requirements can be found in Appendices B, C, and D.

- Appendix B: Approval from Towson University IRB, Conceptions about UDL
- Appendix C: Letter of Support from Howard County
- Appendix D: Administrator UDL Interview Protocol
- Appendix E: Participant Researcher Statement
- Appendix F: Suggestions for Future Research

CHAPTER III. A MIXED METHOD STUDY OF TEACHERS' CONCEPTIONS ABOUT UNIVERSAL DESIGN FOR LEARNING

Authors:

Elizabeth Berquist

William A. Sadera

Abstract

New representations of professional development will help teachers to confront their current beliefs, construct their own knowledge, and participate in inquiry-based, collaborative experiences that support corresponding shifts in policy (Darling-Hammond & McLaughlin, 2011). One such policy being implemented across the United States is Universal Design for Learning (UDL), a set of principles for curriculum development and implementation that gives all individuals equal opportunity to learn (CAST, 2011). Using mixed methods research, this study analyzed the beliefs, knowledge and practices of teachers participating in a UDL professional development system. In this article, the researchers present conceptual change as a theoretical framework to assist those responsible for designing professional development relating to the implementation of Universal Design for Learning.

Schools across the United States are working to implement the Common Core Standards, develop new teacher evaluation systems, and prepare students for increasingly high stakes assessments. In this era of continuous change, it is imperative to provide teachers with high-quality professional development. In the past decade, research on teacher professional development has focused on a variety of topics, including co-learning, facilitation, collaboration and tools to enhance effectiveness (Avalos, 2011). In many instances, teachers are being asked to construct new expectations of what students should know and be able to do, and in developing this vision, they are being asked to teach in ways that they have never before considered. Reconsidering beliefs and practices, or learning to "unlearn" long-held skills and perspectives is a challenging task that is not currently pursued by most professional development (Darling-Hammond & McLaughlin, 2011). Unfortunately, one size fits all professional development that is conducted in isolation from daily practice is the norm for many school districts (Varela, 2012). This type of professional development forces teachers into passive roles and does not encourage the reflection and collaboration necessary in the complex process of changing an individual's conceptions. It is imperative that individuals responsible for designing professional development are aware of the crucial role that teacher beliefs, knowledge and practices play in affecting change. The purpose of this research is to gather information regarding existing teacher beliefs about instructional practices with a focus on how they align with Universal Design for Learning (UDL) principles. As the ideas expressed within the UDL principles take hold and further professional development on how to integrate these principles as part of the curriculum is administered we must have a clear understanding of teachers' existing conceptions.

Review of the Literature

Universal Design for Learning

UDL is a set of principles for curriculum development and implementation that gives all individuals equal opportunity to learn (CAST, 2011). These principles provide educators with a structure for developing goals, materials, methods, and assessments that meet the need of a wide range of learners by including flexible instructional options at the onset of the curriculum design process. Since 2008, the UDL framework has been cited in numerous state and federal documents that have a significant impact on public education, including the Introduction to the Common Core State Standards, the National Education Technology Plan and the National Instructional Materials Accessibility Standard (CAST, 2011).

School systems throughout the United States are focusing on UDL as a framework for meeting the challenge of learner variability and designing high-quality curriculum (Hall, Rose & Meyer, 2012). If this change is to happen, those responsible for designing professional development must recognize and acknowledge the strength of the pre-existing beliefs of teachers in regard to the foundational assumptions of UDL. Without this knowledge, it will be difficult, if not impossible, to fully integrate UDL.

A recent study commissioned by the National Center on Universal Design for Learning represents the first comprehensive examination of UDL implementation at the state and local levels and brings to light current issues associated with UDL (Ralabate, et. al, 2012). The study, which was conducted by two independent evaluation teams, reviewed data from 14 states that included UDL in their Race to the Top Applications. Data were also collected from 134 local special education directors in districts that

received federal stimulus funds. Findings included a high degree of familiarity with the UDL framework and clear links between the framework and existing education initiatives (Ralabate, et. al, 2012). Challenges identified included limited funding and staffing and the need for more time to achieve implementation.

Universal Design for Learning and Teacher Professional Development

A small number of recent studies have examined UDL and teacher professional development at the school and district level (Meo, 2008; ICF Macro, 2011; Hanuscin, van Garderen, Menon, Davis, Lee & Smith; 2011). Meo (2008) found that after training on UDL, high school teachers were able to recognize inherent barriers in the curriculum and move toward the use of technology to increase options for learning. This case study also found that a change in understanding about UDL and research-based practices was noticeable across all participants (Meo, 2008). Similar findings were noted by a group of teachers in a mid-sized school district who participated in a series of UDL trainings that spanned the course of one academic year (ICF Macro, 2011). A variety of professional development experiences were used, including: hands-on application, interactive lectures, collaborative lesson planning and the introduction of technology tools. Particpants indicated that they were beginning to feel more comfortable in applying the UDL principles, but in order to move closer to full implementation they would need additional workshops, assistance with using web tools introduced at the training, and on-going or "just-in-time" follow-up from supervisors and technology staff, as well as guidance from the UDL facilitators (ICF Macro, 2011). Hanuscin, et. al (2011) described an additional year-long professional development program that began with an introduction to the UDL principles in an academic setting and was followed by an authentic application with

students. Significant gains were noted in teacher content knowledge and their ability to plan using the UDL principles. In each of these examples, a significant amount of time and professional resources were devoted to training the participants; careful attention was given to providing teachers with the strategies necessary for planning for diverse learners, however no consideration was given to identifying the current beliefs of learners.

Teacher beliefs about students and instruction are a dominant force; acquiring and adopting new skills and perspectives about effective teaching and learning is a difficult task and is not often addressed in professional development (Darling-Hammond & McLaughlin, 2011). Rappolt-Schlichtmann, Daley, and Rose call for research about UDL that is "explicitly informed by the problems of education practice" (p. 9). Professional development without attention to teacher conceptions is surely a problem of practice. A significant component of teacher professional development is "accomplishing the serious and difficult tasks of *learning* the skills and perspectives assumed by new visions of practice and *unlearning* the practices and beliefs about students and instruction that have dominated their professional lives to date" (Darling-Hammond and McLaughlin, 2011, pp. 81). It is impossible to accomplish this task without first considering the conceptions about UDL that educators bring to the professional development experience (Berquist & Sadera, 2012).

Conceptual Change

Learners enter into every instructional situation with prior knowledge and beliefs (Sadera & Hargrave, 1999; 2005). These individual beliefs or conceptions are central to how learners process new information and solve existing problems. As described in the conceptual change process (Posner, Strike, Hewson & Gertzog, 1982; Strike & Posner,

1993), in order for new knowledge to occur learners must progress through a series of stages in which they alter their beliefs. This process is characterized by four distinct stages: dissatisfaction, intelligibility, plausibility, and fruitfulness (Posner, Strike, Hewson & Gertzog, 1982; Strike & Posner, 1993). The conceptual change process has been used throughout educational practice in order to help learners accommodate their existing beliefs and adopt new ones (eg: Dawson, Dana, & Fichtman, 2007; Pintrich, Marx & Boyle, 1993; Sadera & Hargrave, 1999, 2005;).

Expanding upon the original conceptual change model, Sadera and Hargrave (2005) argued the following stages of conceptual change focused on the importance of overcoming initial or existing beliefs: pre-dissatisfaction, dissatisfaction and post-dissatisfaction. Data collected in this study were interpreted in order to determine where teachers fall in the conceptual change process and more specifically where they are with regard to their dissatisfaction of existing beliefs as defined by Sadera and Hargrave (2005). Without this knowledge, colleges of education and those individuals responsible for professional development are forced to design instruction that is not informed by data. Descriptive studies specific to conceptual change and UDL are essential in advancing the field and preparing educators to adopt UDL as viable framework for curriculum design.

Methods

This study utilized a mixed methods approach that focused on collecting and analyzing both quantitative and qualitative data in order to identify the current beliefs, knowledge and practices of teachers about UDL. The rationale for mixing both qualitative and quantitative data is that neither method by itself is sufficient to capture the complexity of teacher conceptions. When used in combination, the qualitative and

quantitative methods provide a much more comprehensive picture (Creswell & Plano-Clark, 2011). As with any study, this research is not without limitations. All participants were employees in the same school system, as such, it is difficult to generalize this study to systems with different demographics. While multiple steps were taken to ensure validity of the instrument, the survey has not been used with a large number of participants. Additionally, participants may not have taken the time to include numerous examples in the open-ended question section. While the analysis of the likert-style and open-ended questions confirms our findings, researchers may wish to use different methodologies to find further support of these results.

Research Context and Participants

The setting for this research was a large public school system in the mid-Atlantic. This school system serves over 105, 000 students who live in urban, suburban and rural areas. Forty-five percent (44.8%) of students in this school system receive free and reduced lunches. Students who receive special education services consist of 12.6% of the population and 3.8% of students are designated as English Language Learners.

Purposeful sampling, specifically criterion-based sampling, was employed to identify participants for this study. All participants were part of a larger UDL Professional Development System (UDL-PDS) administered by CAST. The purpose of the UDL PDS project was to support school systems in building capacity in UDL as it applies to reading and writing across content areas. The initial focus of the UDL PDS project was middle school teachers tasked with supporting literacy instruction. School participation in the UDL PDS project and individual participation in a UDL Professional Learning Community (PLC) was voluntary. The UDL PDS was a ten-month project and

included face-to-face and online UDL professional development, technical assistance, UDL implementation resources, facilitated UDL PLCs and multiple instructional resources delivered through an online tool called UDL Exchange. All data presented in this study were collected from one school district prior to any formal professional development.

The final sample identified for this study included 22 middle school teachers, twenty female and two male, who ranged in years of experience from less than three to over 25. Fourteen (14) of the participants had earned a master's degree in a field related to education. These educators were certified in a variety of content areas including math, science, social studies, English, physical education and special education. At the time of the survey implementation, twenty of the teachers were assigned to general education settings and 2 teachers worked predominately with students with disabilities. All teachers were assigned to classrooms with over 25 students.

Permission to analyze these data were obtained from the university Institutional Review Board as well as from CAST's Institutional Review Board. Upon receiving permission from both institutions, the research team began the process of analyzing data. Because the data were part of a larger study designed by CAST to evaluate the UDL-PDS project, CAST reported results in aggregate form to the research team. Participation in each survey was voluntary, no incentives were provided and teachers could cease to answer questions or participate in the study at any time during the survey.

Instrument

Pursuant to the purpose of this research, it was necessary for participants to share information about their background and beliefs. Two instruments were used in this

study: The UDL Knowledge, Practice and Beliefs Survey (UDL KPB) and the Educator Demographic Survey. Both instruments were developed by CAST. The Educator Demographic Survey and the UDL KPB were administered electronically using an online survey tool prior to any participation in UDL trainings. Data were reported to the researcher anonymously; each participant's demographic information and responses to the UDL KPB Survey were represented by a numerical code only.

The Educator Demographic Survey was designed to collect basic information from participants in the UDL PDS project. The Educator Demographic Survey consisted of 18 items across three sections: School Information, Classroom Educators Demographic Information, and Class Demographics. The School Information section asked participants to list the name of their school and indicate how much time they spent in that location. The demographic information section consisted of ten items, including: name, gender, email, degrees and certifications held, and total years of experience in education, with a space to indicate years of service in their current district and in their current school. The final section in the Educator Demographic Survey was designed to gather information about instructional content area, grade level, and student population.

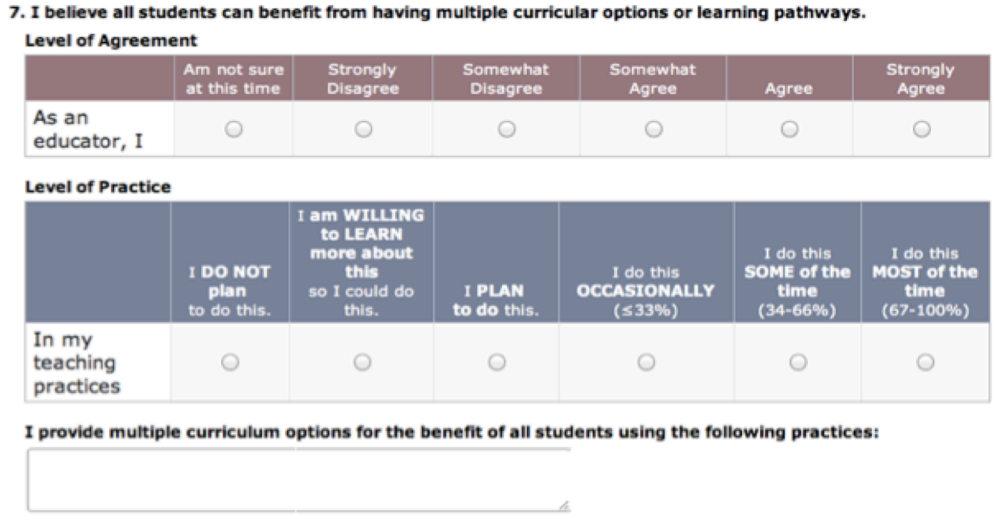
The UDL KPB consisted of 17 items across three sections: Beliefs, Beliefs and Practice, and Knowledge and Practice. The Beliefs section consisted of five items that addressed participants' thinking and beliefs about the fundamental assumptions of UDL. Participants were asked to rate their level of agreement with statements regarding UDL using the following six point Likert-type scale: "As an educator, I: am not sure at this time; strongly disagree; somewhat disagree; somewhat agree; agree; strongly agree. Statements used in this section include: "I believe that all students can learn in general

education settings," "I believe that there is a range of learning variability in students in any educational setting," and "I believe that UDL implementation can occur with or without technology."

The 'Belief and Practice' and 'Knowledge and Practice' sections were similar in design in that each consisted of likert –type scale items along with a request for written examples in practice. The belief and practice section used the following likert-type scale: In my teaching practices, I: DO NOT plan to do this; am WILLING TO LEARN more about this so I could do this; PLAN to do this; do this OCCASIONALLY; do this SOME OF THE TIME; do this MOST of the time.

The Knowledge and Practice section used the following likert-type scale that stated: In my teaching practices: I DO NOT plan to do this; I am WILLING TO LEARN more about this so I could do this; I PLAN to do this; I do this OCCASIONALLY; I do this SOME OF THE TIME; I do this MOST of the time. An open-ended text box followed each item in both sections so that participants could describe the options that they provide to students. See figure 1 for an example.

The structure of these sections allowed researchers to determine if participant beliefs were put into practice. The instrument was designed to first gather data on what teachers know about UDL, and then attempt to measure what they plan to apply or what they are currently applying in their practice. By having participants provide options on their own, rather than choosing from a list, a more accurate assessment of ability to apply UDL can occur.



7. I believe all students can benefit from having multiple curricular options or learning pathways.

Level of Agreement

	Am not sure at this time	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
As an educator, I	○	○	○	○	○	○

Level of Practice

	I **DO NOT plan** to do this.	I **am WILLING to LEARN more about this** so I could do this.	I **PLAN to do** this.	I do this **OCCASIONALLY** (≤33%)	I do this **SOME of the time** (34-66%)	I do this **MOST of the time** (67-100%)
In my teaching practices	○	○	○	○	○	○

I provide multiple curriculum options for the benefit of all students using the following practices:

Figure 1. Sample item from UDL-KBP Survey. Copyright 2012 CAST, Inc., all rights reserved. Funding for the development was provided in part by: The Bill and Melinda Gates Foundation; The Arthur Vining Davis Foundation.

Embedding qualitative options into a quantitative survey allows for triangulation strategies that validate quantitative data in mixed-methods research (Cresswell & Plano Clark, 2007). Supplementing the data collected through likert-style questions with open-ended responses helps to strengthen the findings of this study.

Validity

While multiple steps were taken to ensure reliability of the instrument for the purpose of this research, it is important to note that the survey has not been used with a large number of participants. However, the following methods were used to enhance validity for the Educator Demographic Survey and UDL-KPB Survey, including: an extensive literature review, a careful analysis of existing instruments used to measure systemic implementation, a series of review and revisions by an expert panel and a pilot study. The goal of the KPB Survey was to gather data regarding the beliefs held by educators about the fundamental assumptions of UDL, to compare those beliefs with practices occurring in classrooms and to measure self-reported competency in applying the UDL guidelines in both knowledge and practice. An extensive review of the

literature was conducted in order to ensure that the UDL KPB survey clearly articulated beliefs, knowledge and practices central to UDL. Research focused on the work of Fixsen (2005), Fullan (2011) and Elmore (2004) in the area of school reform in order strengthen the instrument's ability to measure change over time. Existing instruments used to measure the impact of systemic implementation of related initiatives such as Positive Behavioral Interventions and Supports (PBIS) and Response to Intervention (RTI) were also examined. Prior to its design, the UDL KPB survey also went through a series of reviews by UDL experts. These experts were all members of the CAST staff. The process began with sixty to eighty questions, and over a six-month period, was reduced to the final seventeen items used for this study. Lastly, both the Educator Demographic Survey and the UDL KPB Survey were piloted prior to administration.

Analysis

A convergent design (Creswell, 2011) was used to merge quantitative and qualitative results, this process is essential in developing a more complete understanding of a phenomenon. Specifically, the data-validation process was used to confirm the results of the likert-style questions. Analyzing both open-ended and Likert-style questions provided the research team with themes and anecdotes that validate and extend the quantitative findings (Creswell, 2011). The data presented will be focused first on descriptive results, then on connections between beliefs and practices, and finally on emerging qualitative themes related to teacher conceptions.

Triangulation was used as a method to ensure the validity of the findings. According to Denzin (1998) investigator triangulation involves using several researchers to review the data as a way to reduce bias. This was accomplished by training two

research assistants to examine the data from different points of view. A representative from CAST was also provided with a summary of the themes that were captured through the responses of the participants.

Results

Descriptive statistics were used to summarize the likert-style responses. Descriptive data were collected from the beliefs and practices and knowledge and practices sections and are used here to draw a picture of connections. Data will be presented based upon consistencies and inconsistencies. Data were analyzed at the group and singular level. An iterative process was used to analyze qualitative data, results are presented as emerging themes based upon consistencies and inconsistencies regarding beliefs and practice of UDL.

Consistencies in beliefs and practices

Some statements yielded more consistent connections between beliefs and practices. For example, when asked if curricular methods and materials should recruit and sustain student engagement in learning, 20 participants (91%) "agreed or strongly agreed." Nineteen participants (86.5%) indicated that they did this at least "some of the time." Similarly, when asked if they believe that assessment, methods, and materials should be clearly aligned with curriculum goals, 20 participants (91%) "agreed or strongly agreed." Again, 19 participants (86.5%) indicated that they did this "some of the time or most of the time." In each of these examples, teacher beliefs and practices seemed to be more closely aligned.

Similar patterns were identified for Knowledge and Practice. Participants who indicated that they were very knowledgeable and confident in their ability to teach others,

were more likely to respond affirmatively about their practice. For example, five participants (22.7%) indicated that they were competent, knowledgeable and able to teach others about recruiting and sustaining engagement in the instructional environment. Six participants (27.3%) indicated that they provide ways to recruit and sustain engagement in their practice. This pattern was also true when participants did not feel competent in an area. When asked to respond to whether "learners should be provided with options that support goal setting, strategy development, and progress monitoring," half of the respondents (50%) reported that they had some knowledge about the practice or had heard of the practice before but were not sure how to implement. The same six participants indicated that although they did not feel competent, they would be "willing to learn more about this." This pattern was consistent across all knowledge and practice questions. If teachers felt competent or knowledgeable in regard to a statement, they stated that they applied that knowledge to practice. Conversely, if teachers had little or no knowledge they were not practicing the strategy in question.

Inconsistencies in beliefs and practices

During the analysis process it became apparent that teacher beliefs were not always consistent with their practices. For example, question two in the Beliefs and Practices section stated: "I believe all students can benefit from having multiple curricular options or learning pathways." Twenty participants (91%) at least somewhat agreed with this statement. However, only eight participants (32.4%) indicated that they provide multiple curricular options more than "some of the time." A similar pattern followed for the two questions related to assessment. In response to the statement "I believe assessment should remove or reduce barriers for more accurate measurement of

learner knowledge, skills, and engagement," 18 participants (81.8%) indicated that they at least "somewhat agreed" while, only eight participants (32.4%) indicated that they practice this at least "some of the time." An additional question relating to assessment stated "I believe supports and scaffolds available during instruction and practice should also be available during assessment when not related to the construct being measured." Seventeen participants indicated that they at least "somewhat agreed" with the statement, yet only seven participants were able to state that they were "doing this some of the time" or "most of the time." In each of these examples, teachers were able to articulate their beliefs but noted that they were not necessarily able to put those beliefs into practice.

Emerging Themes

Data collected from open-ended questions were analyzed using an iterative process described by Myers and Oetzel, (2003), which was based upon the Glaser and Strauss method of constant comparison and Miles and Huberman's suggestions for coding qualitative data. All open responses were read to obtain a foundational understanding of responses. Labels were then added to each line to reflect an early coding scheme. From this process, themes began to emerge; in order for a theme to be included, at least half of the participants had to identify the topic. As a result of analysis of the qualitative data, four themes emerged: challenges in the written curriculum, competency in identifying options, barriers to the assessment process and willingness to learn more.

Challenges in the written curriculum emerged as a theme through participants comments regarding variation in existing curriculum documents and access to resources related to required curriculum. It was clear that participants had strong beliefs about

what they expected in curricular materials provided by their district. *Participant competency in providing options* emerged as the teachers participating in the study provided examples of their practice. Options for engagement, representation, action and expression were provided by over half of the teachers, but it was apparent from the data analysis that some teachers were more competent in identifying authentic examples than others. For example, one respondent was able to list over ten examples of options for student action and expression, while another respondent was only able to list two examples. *Barriers to assessment* was observed through comments such as: "we do not self- assess a whole lot in my class," and "I'm not sure how to do this in the era of standardized tests." Other participants indicated that they did not feel competent in removing barriers to assessment because they only administered assessments provided by the district and did not design their own assessments. The final theme, *willingness to learn more*, resulted from statements such as "I like this idea in principle, but I have a hard time understanding how to put it into practice," "I would love to more of this," and "I would definitely like to learn more about providing [these] strategies to my students."

Discussion

The purpose of this study was twofold: to identify the beliefs, knowledge and practices of teachers about UDL, and to examine these conceptions in light of the conceptual change framework. Applying this theoretical framework to these data can assist in the design and development of future instruction about UDL. This research identifies the current beliefs of those individuals who are on the front lines of moving the UDL framework forward: teachers. Recognizing the strength of teacher beliefs,

knowledge and practices about UDL in light of a conceptual change model provides insight into strategies for moving from exploring UDL to integrating UDL.

Each theme that emerged from the qualitative component of the data analysis (challenges in the written curriculum, competency in identifying options, barriers to the assessment process and willingness to learn more) is indicative of the dissatisfaction stage of the conceptual change process. Dissatisfaction is characterized when learners begin to question the validity of their current beliefs (Sadera & Hargrave, 2005). In this study, participants were quite aware of their beliefs about UDL and they were beginning to realize that their current solutions to meeting the needs of diverse learners may not be adequate. Without experiencing dissatisfaction, learners will not realize the benefits of restructuring their beliefs (Sadera & Hargrave, 2005). This is an essential part of the process of moving from awareness to integration and has significant implications for practice.

Implications for Practice

Findings of this study include important information for anyone involved with UDL implementation at the school or district level. It is clear that the beliefs, knowledge and practices of teachers in this study are reflective of the dissatisfaction stage of conceptual change. This knowledge can assist those responsible for preparing professional development about UDL to develop instructional activities designed to help teachers articulate their beliefs about teaching, learning and UDL and transform these ideas into practice. For example, we know that dissatisfaction is critical for helping learners to re-conceptualize their ideas. One of the themes that emerged from this study related to challenges in the existing curriculum. Participants clearly articulated the

barriers that they were able to identify in the curriculum provided by their district. They had the knowledge to identify common practices, such as using the same text for the entire class, as a barrier. They also expressed the belief that this "one-size-fits-all" text cannot meet the needs of the diversity existing in their classroom. In practice, they were unsure of how to deal with this challenge, but as a result of their participation in this research they are aware that alternate conceptions were necessary. In order to move these educators beyond dissatisfaction, they should participate in professional development designed to facilitate inquiry. In the traditional teaching model, teachers begin with the same text and provide an intervention when students are unsuccessful. In order to bring about a change in thinking, we argue that teachers should have opportunities to see and experience multiple texts as a method for providing options during first instruction as a more effective way to meet the challenge of learner variability. Deliberate learning activities, such as explicit instruction on how to tier readings and scaffold initial assignments would be a catalyst for moving teachers past dissatisfaction.

A descriptive analysis of quantitative findings revealed that teacher beliefs were not always consistent with their practices. Teachers had definitive positions on topics such as providing students with multiple curricular options or learning pathways. However, according to the data, they were not necessarily providing these options in their practice. In recognizing these inconsistencies, it became apparent that teachers were aware of their beliefs and knowledge and were able to recognize that their conceptions actually differed from what they practice. The challenge for those responsible for professional development is to provide teachers with opportunities to compare, contrast and evaluate their beliefs, knowledge and practices (Sadera & Hargrave, 2005). In an era

of continual school reform, it is necessary to provide high-quality professional development that is also a departure from traditional models of instruction. New representations of professional development will help teachers to confront their current beliefs, construct their own knowledge, and participate in inquiry-based, collaborative experiences that support corresponding shifts in policy (Darling-Hammond & McLaughlin, 2011). Innovative professional development systems, such as the UDL-PDS are a necessity in helping educators to confront their existing conceptions. The UDL-PDS system purposefully addressed the three UDL principles within the UDL-KBP Survey: knowledge questions reflected the recognition networks, belief questions addressed the affective networks, and practice questions provided insight into the strategic networks. Future professional development should be grounded in an understanding of teacher beliefs, knowledge and practices in order to effectively design instruction that supports change. Professional learning activities should include time to speak with colleagues and process new conceptions, to identify technology tools that support the integration of the UDL principles, to practice lesson writing using the UDL principles, and to view lessons and video from teachers and schools where multiple options are the norm. Teachers must be provided with concrete examples of effective first instruction that includes flexible options from the inception of the lesson, a stark contrast to the traditional intervention model. Only then will teachers begin to see the UDL framework as intelligible, plausible and fruitful.

References

Avalos, B. (2001). Teacher professional development in Teaching and Teacher Education over ten years. *Teaching and Teacher Education*, *27* (10-20). Retreived from: http://www.journals.elsevier.com/teaching-and-teacher-education//

Berquist, E., & Sadera, W. (2012). Administrators' Conceptions about Universal Design for Learning: An Opportunity for Conceptual Change. *In press.*

CAST (2011). *Universal design for learning guidelines version 2.0.*Wakefield, MA: Author.

CAST (2012). *UDL Strategy Guide.* Wakefield, MA: Author.

Cresswell, W. (2006). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches.* Thousand Oaks, CA: Sage.

Darling-Hammond, L., & McLaughlin, M. W. (2011). Policies That Support Professional Development in an Era of Reform. *Phi Delta Kappan, 92*(6), 81-92. Retrieved from http://www.pdkintl.org.

Dawson, K., Dana, N., & Fichtman, N. (2007). When curriculum-based, technology-enhanced field experiences and teacher inquiry coalesce: An opportunity for conceptual change? *British Journal of Educational Technology*, *38*, 656-667. doi:10.1111/j.1467-8535.2006.00648.x

Dhindsa, H., & Anderson, O. (2004). Using a conceptual-change approach to help preservice science teachers reorganize their knowledge structures for constructivist teaching. *Journal of Science Teacher Education*, *15*(1), 63-85. Retrieved from

http://www.springer.com/education+%26+language/science+education/journal/10972

Dole, J., & Sinatra, G. (1998). Reconceptalizing change in the cognitive construction of knowledge. *Educational Psychologist*, *33*(2/3), 109. Retrieved from http://www.informaworld.com/smpp/title~content=t775653642~db=all

Fixsen, D. L., Naoom, S. F., Blase, K. A., Friedman, R. M. & Wallace, F. (2005). *Implementation Research: A Synthesis of the Literature* (FMHI Publication #231). Retrieved from University of South Florida, Louis de la Parte Florida Mental Health Institute Website, http://ctndisseminationlibrary.org/PDF/nirnmonograph.pdf

Fullan, M. (2011). *Change Leader*. San Fransisco, CA. Jossey-Bass.

Hall, T., Rose, D., & Meyer, A., Eds. (2011). *Universal Design for Learning: Practical Applications.* Cambridge, MA: Harvard Education Press.s

Hanuscin, D. L., van Garderen, D., Menon, D., Davis, J., Lee, E., & Smith, R. (2011). Teacher? Learner? Both!. *Science & Children, 48*(6), 55-59. Retreived from http://www.nsta.org/elementaryschool/.

Higher Education Opportunity Act. 20 U.S.C. § 110-315 (2008).

ICF Macro (2010). *College and Career Readiness Grant: An Introduction to Universal Design for Learning Post-Workshop Survey Summary.* Calverton, MD: Author.

Meo, G. (2008). Curriculum planning for all learners: Applying universal design for learning (UDL) to a high school reading comprehension program. *Preventing School Failure*, *52*(2), 21-30. Retrieved from http://heldref.metapress.com/app/home/journal

Pintrich, Marx, & Boyle. (1993). Beyond cold conceptual change: The role of

motivational beliefs and classroom contextual factors in the process of conceptual change. *Review of Educational Research, 63*, 167-200. Retrieved from http://rer.sagepub.com/

Posner, G., Strike, K., Hewson. P., & Gertzog, W. (1982). Accommodation of a scientific conception: Towards a theory of conceptual change. *Science Education, 67,* 489-508. Retrieved from http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1098-237X

Ralabate, P., Dodd, E., Vue, G., Kargar, J., Smith, F., Carlisle, A., Hehir, T., Grindal, T., & Eidelman, H. (2012). *Understanding the impact of the race to the top and ARRA funding on the promotion of universal design for learning*. National Center on Universal Design for Learning. Wakefield, MA.

Rappolt-Schlichtmann, G., Daley, S., & Rose, L. T., Eds. (2012). *A Research Reader in Universal Design for Learning.* Cambridge, MA: Harvard Education Press.

Sadera, W. (2001). *Conceptual change-based instruction and preservice teacher technology preparation: A collective case study*. Unpublished doctoral dissertation. Iowa State University, Ames, IA.

Sadera, W. & Hargrave, C. (1999). An identification of preservice teachers' preconceptions about the role of the computer in learning and teaching. *Journal of Computing in Teacher Education, 15*, 19-23. Retrieved from http://www.west.asu.edu/achristie/journal.html

Sadera, W. & Hargrave, C. (2005). Conceptual Change in Preservice Teacher Preparation. In C. Vrasidas & G.V.Glass (Eds.), *Preparing Teachers to Teach with Technology*. (pp. 291-302). Greenwich, CT: Information Age Publishing.

Strike, K. A., & Posner, G. J. (1992). A revisionist theory of conceptual change. In R. Duschl & R. Hamilton (Eds.), Philosophy of Science, Cognitive Psychology, and Educational Theory and Practice (pp. 147-176). Albany, NY:SUNY.

Tillema, H. (1997). Promoting conceptual change in learning to teach. *Asia-Pacific Journal of Teacher Education*, *25*(1), 7. Retrieved from http://atea.edu.au/index.php?option=com_content&task=view&id=16&Itemid=17

United States Department of Education, Office of Educational Technology. (2010). *National Educational Technology Plan*. Retrieved from http://www.ed.gov/sites/default/files/NETP-2010-final-report.pdf.

Universal Design for Learning, Title 13A Maryland State Board of Education. § 13A.03.06 (Annotated Code of Maryland, 2012).

Varela, A. (2010). Three Major Sins of Professional Development How Can We Make It Better? *Education Digest,78* (4), 17. Retreived from http://www.eddigest.com.

Notes Regarding Manuscript Two

Role of the co-author: The co-author served as a guide in the initial design of this research, participated in the data analysis and offered feedback throughout the writing process. In the final stages of writing, the co-author also functioned as an editor.

Journal submission information: This article was submitted to the Journal of Teaching and Teacher Education. This journal has an acceptance rate of 14%.
Website: http://www.journals.elsevier.com/teaching-and-teacher-education/

Appendices: Information related to this chapter that was not included in the journal submission but is necessary to meet dissertation requirements can be found in Appendices E, F, G, H, and I

- Appendix E: Approval from Towson University IRB, In-service Teachers Conceptions about UDL
- Appendix F: Letter of Support from CAST
- Appendix G: Outline of UDL PDS Project
- Appendix H: Educator Demographic Survey Questions-Teachers
- Appendix I: UDL Beliefs, Knowledge and Practices Survey

CHAPTER IV. PRESERVICE TEACHER BELIEFS ABOUT UDL

Authors:

Elizabeth Berquist

William A. Sadera

Abstract

In 2008, Universal Design for Learning (UDL) was formally defined in the Higher Education Opportunity Act as a scientifically valid framework for guiding educational practice that provides flexibility in the ways information is presented, in the ways students respond or demonstrate knowledge and skills, and in the ways students are engaged (HEOA, 2008). As a result, institutes of higher education have begun to focus on UDL as a framework for meeting the challenge of learner variability and designing high-quality, standards-based instruction (Hall, Rose & Meyer, 2012). In this article, the researchers present conceptual change as a theoretical framework to assist university faculty as they develop an understanding for, and strategies regarding, implementation of UDL. Using quantitative research methods, this study provides descriptive data collected from 117 preservice educators. Results are presented based upon the foundational assumptions of UDL. This knowledge will allow future coursework about UDL to be developed using a dissatisfaction-based model of conceptual change.

Many teacher education courses focus on the "nuts and bolts" of teaching, effectively offering a list of methodologies for succeeding in the classroom (Posner & Vivian, 2010). There is no argument that preservice teachers should learn about topics such as constructivist teaching strategies, positive behavioral supports or culturally responsive practices. The problem of practice occurs when preservice teachers are exposed to new content in isolation of a clear examination of their own conceptions about teaching and learning. As with all existing conceptions, preservice teachers' conceptions about teaching and learning are based upon years of informal and formal learning experiences. It is impossible for a preservice teacher to adequately adopt new beliefs and understandings about teaching and learning without first confronting the conceptions that they bring with them to the classroom (Posner & Vivian, 2010; Sadera & Hargrave, 2005). Similarly, teacher educators should not attempt to design instruction that forces preservice teachers to think past traditional views about teaching and learning without first examining their current beliefs and knowledge about practice. To this end, the research presented in this article sought to identify preservice teachers' beliefs regarding Universal Design for Learning (UDL), a pedagogical framework that has become increasingly relevant in schools across the United States.

UDL encourages preservice teachers to proactively consider the interaction of the individual and the environment in order to design curriculum that is flexible enough to meet the needs of diverse learners (Rose & Meyer, 2005). The underlying assumptions of the UDL framework may be contrary to some preservice teachers' experiences and existing conceptions about teaching and learning; if their experiences as learners are traditional "one size fits all", these are the beliefs they will espouse (Sadera & Hargrave,

2005). Some preservice teachers may have participated in inclusive environments that were more closely aligned to the UDL framework while other preservice teachers may fall somewhere along the continuum of exclusion and inclusion. The challenge presented to the teacher educator is how best to design instruction for each of these preservice teachers. Having a clear understanding of existing conceptions is the first step in designing effective change-based instruction that will help preservice teachers to abandon ineffective conceptions and adopt the more fruitful conceptions being presented (Sadera & Hargrave 2005). Teacher educators must work to create instructional practices that directly challenge beliefs about teaching, learning, and UDL that preservice teachers bring to the classroom. In pursuit of this knowledge, the researchers designed this study to answer the following research question: What are the beliefs of preservice teachers about Universal Design for Learning?

Review of Related Literature

Universal Design for Learning

UDL is a set of principles for curriculum development and implementation that gives all individuals equal opportunity to learn (CAST, 2011). These principles provide educators with a structure for developing goals, materials, methods, and assessments that meet the needs of a wide range of learners by including flexible instructional options in the early stages of the curriculum design process. For three decades, CAST has worked with research scientists to apply advances in the neurosciences to the field of education, carefully modifying and refining the UDL framework. This emphasis on learning science sets UDL apart from other frameworks. The UDL framework is buttressed by three supporting principles: multiple means of representation, multiple means of action and

expression, and multiple means of engagement. Each of the UDL principles is informed by what is known about the learning sciences and is linked to a corresponding network of the brain. See Figure 1 for a description of the UDL principles, corresponding neural networks and related application.

Rather than retrofit existing curriculum, supporters of UDL proposed that educators seek to create learning experiences and environments that are usable to the greatest number of people possible. UDL reinforced a more inclusive way of thinking about education for all students, especially for individuals with disabilities. In the past, society used a medical model when considering students with disabilities in the classroom: the focus is on "fixing" the student, not the environment. UDL challenged this notion, viewing individuals with disabilities as part of a learning continuum, and as such, the onus of change is on the classroom and the instructor (Orr & Hammig, 2009). Since its inception over thirty years ago, the UDL framework has evolved considerably based upon research in numerous fields including developmental psychology, neuroscience, computer science and architecture (Rappolt-Schlichtmann, Daley, & Rose, 2012).

The UDL framework has been applied far beyond the disability community, and has entered the field of general education because of its broad applicability and its research foundation in the learning sciences (National Education Technology Plan, 2010). In fact, the majority of the current references to UDL are found in general education policy. In 2008, UDL was formally defined in the Higher Education Opportunity Act as a scientifically valid framework for guiding educational practice that provides flexibility in the ways information is presented, in the ways students respond or demonstrate

knowledge and skills, and in the ways students are engaged (HEOA, 2008). The framework of UDL has been further extended by scholars at CAST in the texts: Teaching Every Student in the Digital Age, (Rose & Meyer, 2002), The Universally Designed Classroom (Rose, Meyer, & Hitchcock, 2005) and A Practical Reader in Universal Design for Learning (Rose & Meyer, 2006).

Conceptual change

Conceptual change is generally defined as learning that changes an existing conception, such as a belief, an idea, or a way of thinking (Posner, Strike, Hewson & Gertzog, 1982). Conceptual change differs from other types of learning because it is not measured by the acquisition of a specific skill set or by an ability to demonstrate factual knowledge. Rather, conceptual change represents a shift in one's existing ideas and beliefs, and is a method for promoting accommodation of knowledge and belief structures (Tillema, 1997).

Posner, Strike, Hewson and Gertzog (1982) originally described the conceptual change model as a method for assisting individuals as they alter their existing beliefs. Conceptual change defines a belief as an opinion that one regards as true. A belief may be a conception or a pre-conception, depending upon whether the belief was formed before or after formal instruction. Knowledge is defined as familiarity with a particular subject, while a practice is the process of doing something and is synonymous with implementation. In order for changes to occur in beliefs, knowledge and practices, learners must progress through the four specific stages of the Conceptual Change Process: dissatisfaction, intelligibility, plausibility, and fruitfulness (Posner, et., al, 1982).

Conceptual change and teacher education

Existing literature supports use of the conceptual change approach to strengthen the experience of preservice teachers across subject areas (e.g., Dawson, 2007; Dawson & Dana, 2007; Huey-Ling & Gorrell, 2002; Sadera, 2001; Tillema, 1997). Although the content areas examined were different and the design of each study unique, each investigation was able to conclude that the conceptual change approach was effective in helping preservice teachers progress through the change process in order to adopt new beliefs. In some instances, preservice teachers were challenged to consider how the conceptual change approach would be useful, not only for their own learning, but for their future students as well. Most importantly, each of these studies support the assertion that beliefs play a major role in preservice teacher preparation. Tillema (1997) recommended the use of conceptual change based instruction in order to provide a structure for preservice teachers seeking to integrate theory into practice. Underlying beliefs must be addressed, especially when they are contradictory to new teaching strategies being presented. In one study by Huey-Ling, and Gorrell (2002), a series of seminar sessions using the conceptual change approach were designed to help preservice teachers see the connection between their own beliefs about teaching and learning and their practice in the classroom. Their study supported the use of self-questioning, reflective journaling, reading of current research and rich classroom discussion as methods for facilitating conceptual change (Huey-Ling & Gorrell, 2002). Dawson (2007) explored an inquiry process during technology-enhanced field experiences. One finding that resulted from this study was the role of teacher inquiry as a "light-bulb for

conceptual change" (Dawson, 2007, pp. 10). Dawson (2007) argued that providing an authentic context for participants to experience curriculum-centered technology integration helped to bring about a change in preservice teacher beliefs. Research conducted by Dana, et.al, (2006), supported the notion that prospective teachers need to experience conceptual changes in their beliefs about technology integration in order to become more effective educators. Regardless of their content area, these studies demonstrate the importance of understanding and confronting the beliefs held by preservice teaches in order to truly affect change and impact behavior.

While understanding the beliefs of preservice teachers is crucially important, it is equally important to ensure that these teachers are ready to confront those beliefs. In a series of research studies, Sadera (1999, 2001) examined preservice teachers' conceptions about teaching, learning, and the role of the computer in the classroom. Results showed that a conceptual change instructional unit guided participants through the conceptual change process at moderate to strong levels (Sadera, 2001). As a result of this study, Sadera and Hargrave (2005) further argued that dissatisfaction should be used as a focal point for developing instruction that prepares preservice teachers to integrate technology. "It is time for teacher education to accept the challenge and develop instruction based upon creating dissatisfaction and confronting preservice teachers' existing conceptions systematically and rationally" (Sadera and Hargrave , 2005, p. 301). While this statement was written in regard to technology integration, it can be applied to any pedagogical framework introduced to preservice teachers that may be contradictory to what they see as effective instruction.

Theoretical Framework

The research described in this article will use Sadera and Hargrave's dissatisfaction-focused model of conceptual change as a framework to examine the beliefs of preservice teachers about UDL. Descriptive data collected in this study was analyzed in order to determine the conceptions held by preservice teachers about UDL. Results were then considered in regard to their dissatisfaction with existing conceptions about UDL using the stages described by Sadera and Hargrave (2005). Sadera and Hargrave (2005) argued the following dissatisfaction-based stages of conceptual change, stemming from the work of Posner, et. al, (1982): pre-dissatisfaction, dissatisfaction and post-dissatisfaction. Understanding where preservice teachers fall with regard to their existing beliefs and their dissatisfaction with these beliefs will allow teacher educators to design more targeted coursework. Without knowledge of existing conceptions and pre-conceptions it is difficult to design instruction that helps students to move beyond their existing beliefs.

Methodology

This quantitative study used a survey to collect descriptive statistics about preservice teachers' beliefs, knowledge, and practices about UDL. Data were collected from participants enrolled in an introductory special education course during the 2012-2013 academic year.

Research Setting

This research was conducted with preservice teachers enrolled in a mid-sized public university in the mid-Atlantic. The College of Education at this university certifies the most teachers in the state, public or private. There are approximately 4,200

undergraduate and graduate students enrolled in the College of Education and 1,200 graduate annually. All participants in this study were enrolled in an introductory special education course (SPED 301 or SPED 637). This is a required course for all students seeking teacher certification. This semester-long course (15 weeks) provides instruction in the historical, philosophical and legal foundations of special education. The overarching purpose of the course is to provide an overview of the field of special education.

Sample

One hundred and twenty four (124) preservice teachers were solicited to participate in this study. Participants in this study were enrolled in 16 sections of SPED 301 and SPED 637. Of the 124 preservice teachers enrolled, 117 completed the survey in its entirety; resulting in a response rate of 94%. Ninety-three (93) participants (79.49%) had no prior experience with UDL, while 24 participants (21%) indicated that they had completed an introductory course where UDL was a topic of study. Because the focus of this research was on beliefs about UDL, not solely preconceptions, data from all participants were analyzed regardless of whether or not they had already experienced formal instruction about UDL. Eighty-five (85) participants (73%) were enrolled in SPED 301 and 32 (27%) were enrolled in SPED 637. Research participants were seeking certification in a variety of content areas including: English, mathematics, science-related fields, social science-related fields, special education, dance education, deaf studies, middle school education, and speech-language pathology.

Instrument

Data for this study were collected through the administration of the UDL Pre-conceptions, Conceptions, Knowledge and Practices (UDL-PCKP) Survey. Participation in the study was voluntary and supported by the University Institutional Review Board. The UDL-PCKP Survey consisted of 25 items across four sections and was administered during the first quarter of the course in the Fall, Minimester and Spring semesters of 2012-2013. Section one of the survey was created to collect background information and contained four items designed to gather demographic data and information regarding participants' exposure to UDL during previous coursework. Section two was designed to identify beliefs about UDL. This section was completed by all participants and consisted of nine conceptual statements that reflected the foundational assumptions about UDL as outlined in the UDL Guidelines (CAST, 2011). Each item in this section asked participants to rate their level of agreement with a UDL assumption using the following five-point scale: strongly agree, agree, neutral, disagree and strongly disagree. Sections three and four were only completed by those preservice teachers who indicated that they had some formal background with UDL; section three focused on measuring the accuracy of the participants knowledge of UDL and section four focused on collecting data about how they see UDL being integrated in practice. The research described in this article specifically focused on beliefs, therefore only data from sections one and two are presented. A copy of the complete instrument is included as an appendix.

Validity

Three methods were used to establish validity for the UDL-PCKP survey, including: a literature review, feedback from an expert panel, and a pilot study. An

extensive review of the literature was conducted to make certain that all questions reflected the complexity of the UDL framework. This literature review synthesized articles ranging from historical foundations of UDL to current implementation initiatives. Following the initial design, comments and suggestions were solicited from UDL experts in the field. These individuals were members of the CAST UDL faculty cadre or members of the UDL Implementation and Research Network (UDL-IRN). Following this expert review, an initial version of the UDL-PCKP was administered to one undergraduate section of SPED 301 and one graduate section of SPED 637 as part of a pilot study. Based on feedback from the expert group and results from the pilot, design and textual revisions were made along with the addition of several items.

Limitations

As with all studies, there are limitations that need to be discussed. All participants were students that attended the same institution. Although student backgrounds varied, all students shared some similarities such as their participation in a preservice teacher education program at a mid-sized public university. In addition, students seeking varied areas of certification participated in different courses leading up to participation in this study. These experiences, as well as their own experiences as learners, impact their responses. Finally, the literature is clear in arguing that UDL is quite complex. While every effort was made to strengthen the design and focus of the instrument and the survey items, it is necessary to acknowledge that a limitation of this study may be the survey instrument itself. It is a challenge to uncover all facets of individual preconceptions by survey alone.

Data Analysis

Data collected through the survey were entered into SPSS for quantitative analysis. To address the focus of this research and specifically identify preservice teachers' conceptions about the foundational assumptions of UDL, the researchers used descriptive analysis to aggregate and determine means from each question in section two of the UDL PCKP survey. The frequency of each response was also calculated and presented by percentage. This information is displayed in Tables 1-9. Results are presented by foundational assumption in order to remain aligned with the instrument design and the focus and purpose of this research: identifying preservice teacher beliefs about the foundational assumptions of UDL. A cross tabulation was used to analyze the differences between certification area and conceptions relating to UDL, however no significant differences were found.

Results and Discussion

Preservice teachers' conceptions of UDL: Goal of Education

The UDL guidelines (CAST, 2011) state that education should help turn novice learners into expert learners, individuals who want to learn, know how to learn and are motivated and prepared for future learning. When asked about the goal of education, a majority of preservice teachers (94%) believed that the goal of education should be the mastery of learning, rather than the mastery of knowledge, with a mean of 4.50. This underlying premise of UDL is not simply the mastery of content knowledge or of emerging technologies, but rather a mastery of the learning process. The preservice teachers' conceptions about UDL regarding the goal of education are shown in Table 1.

Table 1

Preservice teachers' conceptions of UDL: Goal of Education

Response	Frequency	Percent
Strongly Agree	68	58.1
Moderately Agree	42	35.9
Neither Agree nor Disagree	5	4.2
Moderately Disagree	2	1.8
Strongly Disagree	0	0

Note: n=117, M=4.50

Preservice teachers' conceptions of UDL: Expert Learners

In response to a statement about education and expert learners, ninety-four percent (94%) of participants indicated that they strongly agreed or moderately agreed with the statement that education should help turn novice learners into expert learners, with a mean of 4.51. According to the UDL framework, an expert learner is resourceful, knowledgeable, strategic, goal- directed, purposeful and motivated (CAST, 2011). It is essential for educators to recognize their role in developing expert learners. The UDL framework assumes that educators will agree with the assumption that all students can learn to be experts at the learning process. Preservice teachers' conceptions about UDL and expert learners are depicted in Table 2.

Table 2

Preservice teachers' conceptions of UDL: Expert Learners

Response	Frequency	Percent
Strongly Agree	68	58.1
Moderately Agree	42	35.9
Neither Agree nor Disagree	6	5.1
Moderately Disagree	1	.9
Strongly Disagree	0	0

Note: n=117, M=4.51

Preservice teachers' conceptions of UDL: Learner variability

When asked about learner variability, a majority of participants (90.6%) agreed or strongly agreed that diversity is the norm wherever individuals are gathered, with a mean of 4.54. An essential foundation of UDL is the understanding that learner variability is normal in every classroom. In order to embrace the UDL framework, educators must understand that learner variability is the reality in all classrooms. Eleven (11) participants (9%) indicated that they had neutral opinions or moderately disagreed with the statement that diversity is the norm in classrooms. Preservice teachers' conceptions about UDL with respect to learner variability are depicted in Table 3.

Table 3

Preservice teachers' conceptions of UDL: Learner Variability

Response	Frequency	Percent
Strongly Agree	77	65.2
Moderately Agree	30	25.4
Neither Agree nor Disagree	9	7.6
Moderately Disagree	2	1.6
Strongly Disagree	0	0
Strongly Disagree	0	0

Note: n=117, M=4.54

Preservice teachers' conceptions of UDL: Curriculum design

Participant responses to the curriculum design item were mixed. Less than half of the participants (33%), a mean of 2.71, agreed with the following statement: when curriculum is designed to meet the needs of the middle, it provides all individuals with fair and equal opportunities to learn. Sixteen (16) participants, (13.5%) expressed neutral feelings. Fifty-two percent (52%) of participants moderately disagreed or strongly disagreed with the statement that curriculum should be designed to meet the needs of the middle. This data reveals that participants bring very different conceptions of curriculum design to their course work. This is important information for teacher educators tasked with introducing the UDL framework. Traditional curriculum materials are designed to meet the needs of the average learner while curriculum designed using UDL includes flexible, customizable options from its inception (CAST, 2011). Preservice teachers who believe that curriculum should be designed for the average learner do not hold beliefs that

are consistent with the foundational assumptions of UDL. Preservice teachers' conceptions about UDL with respect to curriculum design are depicted in Table 4.

Table 4

Preservice teachers' conceptions of UDL: Curriculum Design

Response	Frequency	Percent
Strongly Agree	20	16.9
Moderately Agree	19	16.1
Neither Agree nor Disagree	16	13.5
Moderately Disagree	33	27
Strongly Disagree	30	25.4

Note: n=117, M=2.71

Preservice teachers' conceptions of UDL: Access

Sixty-four percent (64%) of participants strongly agree or moderately agree that curriculum should be designed for the greatest number of users from its inception, a mean of 3.73. Curriculum that is accessible from the outset eliminates time-consuming and costly after-the-fact modifications (CAST, 2011). The belief that curriculum should include options for access in the initial design represents a departure from traditional views of curriculum which do not take into account the varied ways that learners interact with, make sense of, and engage with material. Twenty (20%) of preservice teachers neither agreed nor disagreed with the statement that curriculum should be designed for the greatest number of users from the outset while an additional 15% moderately disagreed or strongly disagreed with the statement. These students may have had prior experience, as learners themselves, with curricular materials that are not accessible or flexible and may struggle with the notion that curriculum must be accessible from its

inception. Preservice teachers' conceptions about UDL with respect to access are shown in Table 5.

Table 5

Preservice teachers' conceptions of UDL: Access

Response	Frequency	Percent
Strongly Agree	32	27.1
Moderately Agree	44	37.3
Neither Agree nor Disagree	24	20.3
Moderately Disagree	14	11.8
Strongly Disagree	4	3.3

Note: n=117, M=3.73

Preservice teachers' conceptions of UDL: Modifications

In response to the statement about curricular modifications, most preservice teachers (88%) agreed that classroom teachers should modify curriculum based upon individual students' needs, with a mean of 4.35. This belief is not consistent with the foundational assumptions of UDL. The UDL framework does not encourage teachers to make modifications for a small group of students or individual students (CAST, 2011), instead the learning environment should be proactively designed with flexible options for all learners from the onset. Preservice teachers' conceptions about UDL and curriculum modifications are depicted in Table 6.

Table 6

Preservice teachers' conceptions of UDL: Modifications

Response	Frequency	Percent
Strongly Agree	64	54.2
Moderately Agree	40	33.9
Neither Agree nor Disagree	8	6.8
Moderately Disagree	3	2.5
Strongly Disagree	3	2.5

Note: n=117, M=4.35

Preservice teachers' conceptions of UDL: Technology

Seventy-three percent (73%) of participants agreed with the following statement: technology is essential in creating a flexible curriculum, with a mean of 4.01. While the presence of technology clearly makes the UDL principles easier to apply, it is important to recognize that technology is not the only way to create flexible curriculum (CAST, 2011). A major misconception of the UDL framework is the assumption that teachers must have technology in order to apply the principles of UDL. It is essential for teacher educators to demonstrate methods for offering options in engagement, representation, action and expression through low-tech materials and resources. Preservice teachers' conceptions about UDL and technology are depicted in Table 7.

Table 7

Preservice teachers' conceptions of UDL: Technology

Response	Frequency	Percent
Strongly Agree	49	41.8
Moderately Agree	37	31.6
Neither Agree nor Disagree	17	14.5
Moderately Disagree	11	9.4
Strongly Disagree	3	2.5

Note: n=117, M=4.01

Preservice teachers' conceptions of UDL: Medical model

Responses to the item regarding the "disabled curriculum" were mixed. Forty-seven percent (47%) percent of preservice teachers agreed or strongly agreed with the statement that teachers should view the curriculum as disabled, rather than their students, , with a mean of 3.49. Thirty-one percent (31%) of participants were neutral about the statement and an additional 20% of respondents moderately disagreed or strongly disagreed that curriculum should be considered disabled. The UDL framework argues that the medical model of disability is inadequate for meeting the needs of learner variability, therefore preservice teachers who espouse the beliefs of UDL will view the curriculum as needing to be fixed, rather than students. Information regarding this conception is essential for teacher educators because an underlying foundation of the UDL framework is that belief that curriculum must be changed and made more flexible in order to accommodate diverse learners. The UDL framework challenges the traditional notion of how to address student needs and represents a conceptual shift for many

educators. (CAST, 2011). Table 8 depicts preservice teachers' conceptions of UDL as they relate to the medical model of disability.

Table 8

Preservice teachers' conceptions of UDL: Medical Model

Response	Frequency	Percent
Strongly Agree	30	24.4
Moderately Agree	27	22.8
Neither Agree nor Disagree	37	31.3
Moderately Disagree	19	16.1
Strongly Disagree	5	4.2

Note: n=117, M=3.49

Preservice teachers' conceptions of UDL: Barriers to learning

Preconceptions regarding barriers to learning were also mixed; 35% percent of participants strongly agreed or moderately agreed with the statement: the greatest barrier to learning is the curriculum, while 29% of participants moderately disagreed or strongly disagreed with this statement. The item had a mean score of 3.13. Almost 35% of participants indicated neutral feelings in regard to the statement. The UDL framework addresses curricular disabilities through a process that systematically addresses individual differences by identifying evidence-based best practices originally intended for students in the margins and offering these options to all (CAST, 2011). This process assumes that traditional, or one-size-fits-all, curriculum presents barriers to many learners. Teacher educators must help their students identify the barriers that exist when goals, materials, methods and assessments are designed for the average learner. Table 9 shows preservice teachers' conceptions of UDL in regard to barriers to learning.

Table 9

Preservice teachers' conceptions of UDL: Barriers to Learning

Response	Frequency	Percent
Strongly Agree	17	14.4
Moderately Agree	25	21.2
Neither Agree nor Disagree	41	34.8
Moderately Disagree	26	22
Strongly Disagree	9	7.6

Note: n=117, M=3.13

Implications for Practice

A small number of recent studies have examined the impact of training preservice teachers on the specific principles of UDL (e.g. Claflin, Eddins & Eicher, 2012; Courey, Tappe, Siker & LePage, 2012; Pace & Blue, 2010; Spooner, Baker, Harris, Ahlgrim-Delzell, & Browder, 2007; Williams, Evans & King, 2012). Each of these studies considered preservice teachers' ability to apply the UDL framework in practice. However, none of this research acknowledged the impact of preservice teacher beliefs about the underlying assumptions of UDL. This is a significant issue in practice. The literature is quite clear that preservice teachers draw upon their existing beliefs about teaching and learning to interpret pedagogy (e.g. Posner & Vivian, 2010; Sadera & Hargrave, 2005; Tillema & Knol, 1997). Studies examining the impact of UDL training on UDL application provide a contribution to the field, but they are not enough, an essential step in the process of training preservice teachers to espouse the beliefs of UDL is missing. Preservice teachers must have a thorough and accurate understanding of the foundational assumptions of UDL in order to truly espouse the framework and apply the

principles in their future classrooms. Teacher preparation programs must not neglect the importance of addressing the conceptions held by preservice teachers when they enter into classrooms.

In many preservice programs, teachers arrive with naïve conceptions about UDL, and often leave their preparation program with these beliefs unchallenged. Data from this research revealed that preservice teachers' beliefs were not always consistent with the foundational assumptions of UDL. There were strong connections in the areas of creating expert learners, providing access to curriculum, applying technology, understanding learner variability and conceptualizing the goal of education. At the same time there was a discrepancy in preservice teacher conceptions related to curriculum development, curriculum modifications, barriers to learning and recognizing UDL as a conceptual shift. For example, the UDL framework assumes that teachers believe that curriculum, and not students, must be made more flexible. This assumption is counter to the medical model of disability that has existed in the field of special education. This type of misconception may prevent a preservice teacher from seeing the UDL framework as plausible and must be confronted by the teacher educator. Although the results of this research are reported using means and frequencies, it is essential to understand that this knowledge is not to be used to "teach toward a mean" but to build a picture of where students may fall on a continuum of statements that are essential in understanding and applying the UDL framework. This knowledge is the first step in designing conceptual change based instruction.

Preservice teacher educators tasked with introducing the UDL framework should interpret the data from this study in light of the dissatisfaction-based conceptual change

model (Sadera & Hargrave, 2005). This model is based upon the argument that building dissatisfaction with existing beliefs and helping learners to confront those beliefs is an essential component in the conceptual change process. The varied responses and discrepancies in understandings of UDL principles in practice support the argument that teacher educators must plan for learners who hold beliefs about UDL that are not accurate. Results of this study, or similar inquires into the existing conceptions of learners, can be used to design more targeted instruction about UDL.

Specific implications for practice are based upon the dissatisfaction based conceptual change model: pre-dissatisfaction is the learner's ability to acknowledge their pre-existing beliefs, while dissatisfaction focuses on acquiring new knowledge and comparing that new knowledge with their current conceptions. Finally, post-dissatisfaction occurs when the learner understands and accepts a new conception that is sustained over time. Results of this study indicated that preservice teacher beliefs about UDL are indicative of the pre-dissatisfaction and dissatisfaction stages of the dissatisfaction based model. With this knowledge, instructional strategies can be designed accordingly. For example, this research identified inaccurate conceptions about the role of the teacher in modifying existing curriculum as defined by the underlying assumptions of UDL. When introducing this underlying assumption, preservice educators must plan instructional activities for learners who are pre-dissatisfied and dissatisfied. Students should be challenged to consider their existing beliefs about curriculum design and modifications and be provided with a forum for articulating their beliefs. At the same time, those students who are able to articulate their beliefs should be tasked with sharing and defending these positions, evaluating the pros and cons of their

current conception and comparing their understanding of curriculum design with the UDL perspective of curriculum. It is imperative that teacher educators use these and similar strategies for supporting students as they progress the stages of conceptual change. The dissatisfaction-based model acknowledges the strength of existing conceptions and provides a clear and efficient structure for systematically confronting these beliefs in order to embrace an alternate conception. Similarly, if it is known that learners are in the pre-dissatisfaction stage, future instruction should be focused on addressing their existing beliefs. Students should be challenged to acquire knowledge about the principles being taught in order to compare this information with their current conceptions. Alternatively, if participants are in the dissatisfaction stage and have begun to realize that their current conceptions are not adequate to address the challenges presented by the new information, instruction should be designed to focus on leveraging the UDL framework to create flexible goals, materials, methods and assessments.

Suggestions for Further Research

This research is the first step in designing instruction that acknowledges existing conceptions about UDL held by preservice teachers. This research argues for the design and implementation of conceptual change based instruction in order to help preservice teachers develop more accurate and strongly held beliefs about UDL. The conceptual change model has proven to be a successful instructional tool in preservice education (Dawson, 2007; Dawson & Dana, 2007; Huey-Ling & Gorrell, 2002; Sadera, 2001; Tillema, 1997). Teacher educators must have a clear understanding of the existing conceptions held by their students in order to challenge students to explicitly confront these beliefs. This research revealed that many preservice teachers' conceptions of

curriculum development, curriculum modifications, barriers to learning and recognizing UDL as a conceptual shift may not be consistent with the UDL framework. Further study should focus on the creation and validation of conceptual change based lessons or units that confront these conceptions and challenge preservice teachers to analyze their existing beliefs and compare these beliefs to the assumptions of UDL.

Conclusion

Spooner, Algozzine, Wood and Hicks (2010) noted that teacher beliefs and practices were an essential component in understanding what the field needs to know about teacher education and special education. The research described in this article provides insight into the beliefs of preservice teachers about UDL, a framework that is gaining great credibility as an approach to meeting the challenge of learner variability (CAST, 2011; Rose & Meyer, 2002). The UDL framework has begun to be applied in numerous school systems throughout the United States (Hall, Rose & Meyer, 2012), and until this point, no research has sought to identify the current beliefs preservice teachers about UDL. This knowledge is essential as preservice teachers will be responsible for moving the UDL framework forward. Without knowledge and recognition of the strength of the pre-existing beliefs of future educators in regard to the foundational assumptions of UDL it will be difficult, if not impossible, to move from exploring UDL to implementing UDL.

UDL Principle	Brain Network	Application
Multiple Means of Representation	Recognition Networks (the "WHAT" of learning)	Learners differ in the ways that they perceive and comprehend information that is presented to them. For example, those with sensory disabilities, learning disabilities, language or cultural differences may all require different ways of approaching content. Others learners may grasp information quicker or more efficiently through visual or auditory means rather than printed text. Learning, and transfer of learning, occurs when multiple representations are used, because it allows students to make connections within, as well as between, concepts.
Multiple Means of Action and Expression	Strategic Networks (the "HOW" of learning)	Learners differ in the ways that they can navigate a learning environment and express what they know. For example, individuals with significant movement, those who struggle with strategic and organizational abilities, and those who have language barriers approach learning tasks very differently. Some may be able to express themselves well in written text but not speech, and vice versa. Action and expression require a great deal of strategy, practice, and organization, and this is another area in which learners can differ.
Multiple Means of Engagement	Affective Networks (the "WHY" of learning)	Affect represents a crucial element to learning, and learners differ markedly in the ways in which they can be engaged or motivated to learn. There are a variety of sources that can influence individual variation in affect including neurology, culture, personal relevance, subjectivity, and background knowledge. Some learners are highly engaged by spontaneity and novelty while other are disengaged, even frightened, by those aspects, preferring strict routine. Some learners might like to work alone, while others prefer to work with their peers. **There is not one means of engagement that will be optimal for all learners in all contexts; providing multiple options for engaging learners is essential.**

Figure 1. Summary of UDL Principles, Corresponding Networks and Application. Adapted from CAST (2011). *Universal design for learning guidelines version 2.0*. Wakefield, MA: Author.

References

CAST (2011). *Universal design for learning guidelines version 2.0.* Wakefield, MA: Author.

Claflin, M., Eddins, B., & Eicher, D. (2012). Looking Through an Inclusive Lens: Training Secondary Education Student Teachers to Apply Principles of Universal Design. National Social Science Journal, 39(1), 8-17. Retrieved from http://www.nssa.us/journals.htm

Courey, S., Tappe, P., Siker, J. & LePage, P. (2012). Improved lesson planning with universal design for learning (UDL). *Teacher Education and Special Education, 36,* 7-27. doi: 10.1177/0888406412446178

Dawson, K. (2007). The role of teacher inquiry in helping prospective teachers untangle the complexities of technology use in classrooms. *Journal of Computing in Teacher Education*, *24*(1), 5-12. Retrieved from http://www.iste.org/Content/NavigationMenu/Membership/SIGs/SIGTETeacherEducators/JCT E/Journal_of_Computing_in_Teacher_Educatio.htm

Dawson, K., Dana, N., & Fichtman, N. (2007). When curriculum-based, technology-enhanced field experiences and teacher inquiry coalesce: An opportunity for conceptual change? *British Journal of Educational Technology*, *38*, 656-667. doi:10.1111/j.1467-8535.2006.00648.x

Huey-Ling, L., & Gorrell, J. (2002). The road to preservice teachers' conceptual change. *Educational Research Quarterly*, *26*(2), 54. Retrieved from http://www.highbeam.com/Educational+Research+Quarterly/publications.aspx

Pace, D., & Blue, E. (2010). Cutting edge educators: Preservice teachers' use of

technology within universal design for learning framework. *Insights on Learning Disabilities, 7*(2), 19-29. Retrieved from http://www.ldworldwide.org/educators/ild-educators

Posner, G., Strike, K., Hewson. P., & Gertzog, W. (1982). Accommodation of a scientific conception: Towards a theory of conceptual change. *Science Education, 67,* 489-508. Retrieved from http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1098-237X

Posner, G. & Vivian, C. (2010). Field experience: A guide to reflective teaching. Upper Saddle River, NJ: Pearson.

Rose, D.H., Meyer, A., & Hitchcock, C. (2005). *The universally designed classroom: Accessible curriculum and digital technologies*. Cambridge, MA: Harvard Education Press.

Sadera, W. (2001). *Conceptual change-based instruction and preservice teacher technology preparation: A collective case study*. Unpublished doctoral dissertation. Iowa State University, Ames, IA.

Sadera, W. & Hargrave, C. (1999). An identification of preservice teachers' Preconceptions about the role of the computer in learning and teaching. *Journal of Computing in Teacher Education, 15*, 19-23. Retrieved from http://www.west.asu.edu/achristie/journal.html

Sadera, W. & Hargrave, C. (2005). Conceptual Change in Preservice Teacher Preparation. In C. Vrasidas & G.V.Glass (Eds.), *Preparing Teachers to Teach with Technology*. (pp. 291-302). Greenwich, CT: Information Age Publishing.

Spooner, F., Baker, J., Harris, A., Delzell, L., & Browder, D. (2007). Effects of training in universal design for learning on lesson plan development. *Remedial & Special Education, 2*(2), 108-116. Retrieved from http://rse.sagepub.com/

Tillema, H. (1997). Promoting conceptual change in learning to teach. *Asia-Pacific Journal of Teacher Education*, *25*(1), 7. Retrieved from http://atea.edu.au/index.php?option=com_content&task=view&id=16&Itemid=137

Williams, J., Evans, C., & King, L. (2011). The impact of universal design for learning instruction on lesson planning. International Journal Of Learning, 18(4), 213-222. Retrieved from http://ijl.cgpublisher.com/

Notes regarding Manuscript 3

Role of the co-author: The co-author served as a guide in the initial design of this research, participated in the data analysis and offered feedback throughout the writing process. In the final stages of writing, the co-author functioned as an editor.

Journal submission information: This article has been prepared for submission to the The Journal of Special Education and Teacher Education. This journal has an acceptance rate of 11-20%. Website: http://tes.sagepub.com.

Appendices: Information related to this chapter that was not included in the journal submission but is necessary to meet dissertation requirements can be found in Appendices J, K, L, M and N.

- Appendix J: Approval from Towson University IRB, Conceptions about UDL, Pilot Study
- Appendix K: Approval from Towson University IRB, Pre-conceptions about UDL, Conceptions, Knowledge and Practices about UDL
- Appendix L: SPED 301 Syllabus (*no substantial difference between SPED 301 and SPED 637 syllabi)
- Appendix M: Summary Feedback from Expert Panel
- Appendix N: UDL Pre-conceptions, Conceptions, Knowledge and Practices Survey

CHAPTER V. SUMMARY RECCOMENDATIONS AND DISCUSSION

The purpose of this dissertation was to build upon the emerging body of research about UDL by presenting a series of studies that provide data on the beliefs, knowledge and practices of preservice teachers, in-service teachers and school administrators about UDL. Rappolt-Schlichtmann, Daley, and Rose (2012) recently indicated that research efforts in the field of UDL should be problem centered and transdisciplinary. The research presented through this dissertation addressed both calls by highlighting the challenge of conceptual change in teacher education and professional development and synthesizing literature from the fields of instructional technology, educational psychology, education policy and special education. When reviewed as a combined research agenda, the three studies provide a foundation for understanding the existing beliefs, knowledge and practices held by administrators, teachers, and preservice teachers about the foundational underpinnings of the UDL framework.

Significance of the research

The UDL framework has been effective because it provides a space where researchers and practitioners can interact, not through a common theoretical perspective or methodology, but instead by applying individual expertise with the goal of reaching a more holistic understanding (Schlichtmann, Daley, & Rose, 2012). The research described in this dissertation utilized qualitative and quantitative methodologies and examined data in light of a dissatisfaction model of conceptual change. Presently, there is no research that identifies the current beliefs of those individuals who are most crucial in moving the UDL framework forward: administrators, teachers, and preservice

teachers. The studies described in this dissertation represent the first body of research to specifically examine conceptions regarding the UDL framework.

This information is especially significant in an era of school changes where educators are consistently asked to alter their practice in a seemingly unending revolving door of reform efforts (Liu, Jones & Sadera, 2010). Fixsen, Naoom, Blase, Friedman and Wallace (2005), contended that the development and identification of evidence-based school improvement practices has improved greatly, but the process for sustaining these change initiatives is lacking. One reason for this lack of sustainability may be the fact educators are asked to make changes in their schools or classrooms without first confronting their existing beliefs about practice. This assessment of educator knowledge, beliefs and practices is an essential component of any implementation process (CAST, 2012). However, school administrators, teachers, and preservice teachers are too often presented with new information without being given an opportunity to consider how this new knowledge relates to their current conceptions. Identifying, recognizing, and articulating existing beliefs of educators is an essential step in planning experiences that support any transition or change process.

Consider this scenario: District, school, or university leadership have decided to introduce UDL as a framework for meeting the needs of diverse learners for the following reasons: The framework is found in numerous federal policies and has been defined as a research based practice (HEOA, 2008); school districts that have adopted UDL are beginning to share data that supports increased student achievement (Nelson, Arthur, Jensen & Van Horn, 2011); states have adopted UDL in the curriculum development process (e.g. MSDE, 2012). After the decision to implement UDL has been

made, a group of school administrators, practicing teachers, or preservice teachers learn about UDL during a mandatory professional development session or required course. The UDL framework is presented, background is provided, the guidelines are distributed and educators are sent back to their respective classrooms to apply their new knowledge. Will these educators begin to espouse the beliefs of UDL and apply the guidelines in their classrooms? The literature tells us that the answer is no; for new knowledge to truly occur, learners must progress through a series of stages in which they alter their beliefs (e.g., Dole & Sinatra, 1998; Pintrich, Marx & Boyle, 1993; Posner, Strike, Hewson & Gertzog, 1982; Sadera & Hargrave, 2005; Strike & Posner, 1993; Tillema, 1998). In the scenario presented, no attempt was made to identify the beliefs, knowledge and practices held by educators about the underlying assumptions of UDL. Unfortunately, this pattern of imparting new knowledge with no regard for this process of conceptual change seems to be commonplace in many schools (CAST, 2013). The research described in this dissertation confronted this challenge by moving the conceptual change process to the forefront of the instructional process, and specifically highlighted a dissatisfaction based model of conceptual change. This process focused on understanding where educators fall with regard to their existing beliefs about UDL and their dissatisfaction with these beliefs in order to allow those responsible for introducing the UDL framework to design more targeted instruction in the future.

This focus on dissatisfaction is especially significant in light of the fact that the UDL framework has developed considerably over the past thirty years (CAST, 2011). Research in the modern learning sciences has evolved, new and flexible resources have been designed, and the UDL framework has changed from a theoretical tool to an

actionable construct (Schlichtmann, Daley, & Rose, 2012). Arguably, one of the most critical shifts in the development of the UDL framework was the conclusion that students were no longer the problem, rather, the existing educational environments were too narrow to meet the needs of the diversity of learners in classrooms (Meyer & Rose, 2000; Rose & Meyer, 2002; Rose and Gravel, 2010). Additional developments within the UDL framework related to the design of curriculum, the role of expert learners and the use of technology. Many of these essential foundations of UDL, such as building in options to the curriculum from its inception or teaching students to be expert *learners* rather than expert students may be contrary to the pre-existing beliefs held by administrators, teachers, or preservice teachers about teaching and learning. In order to design future instruction that systematically confronts these conceptions, a dissatisfaction-based model was used as a lens for analyzing findings, a first step in research focused on conceptual change based instruction.

Research Summary

A conceptual change model can be used as method for assisting individuals as they alter their existing beliefs (Posner, Strike, Hewson & Gertzog, 1982). These beliefs may be conceptions or pre-conceptions, depending upon whether the belief was formed before or after formal instruction. Regardless of when the belief originated, all learners enter into formal educational settings with strong ideas based upon their prior experiences (Dole & Sinatra, 1998; Özdemir, G. & Clark, 2007). When exposed to a new conception, these pre-existing beliefs often present a barrier for learners because they may be inconsistent with the new information being presented (Strike & Posner, 1993; Tillema, 1998). These beliefs cannot be modified or advanced without a progression through the

stages of conceptual change. The original model of conceptual change, as proposed by Posner, Strike, Hewson and Gertzog (1982), was designed to help learners alter their beliefs by progressing through four specific stages: dissatisfaction, intelligibility, plausibility, and fruitfulness. The UDL framework and its foundational assumptions represent new ideas for many learners (CAST, 2012). Because the assumptions of UDL may be contradictory to traditional beliefs about teaching and learning held by administrators, teachers, and preservice teachers, it was necessary to frame this research in a conceptual change model that is based in creating dissatisfaction with existing beliefs.

Sadera and Hargrave's (2005) dissatisfaction based conceptual change research was based on the argument that building dissatisfaction with existing beliefs and helping learners to confront those beliefs was essential to the conceptual change process. Sadera and Hargrave's model consisted of three stages of a dissatisfaction continuum: pre-dissatisfaction, dissatisfaction and beyond dissatisfaction. Sadera and Hargrave (2005), explained that pre-dissatisfaction is the learner's ability to acknowledge their pre-existing beliefs, while dissatisfaction focuses on acquiring new knowledge and comparing that new knowledge with their current conceptions. Finally, post-dissatisfaction occurs when the learner understands and accepts a new conception that is sustained over time. Data collected in each of the studies presented in this dissertation was interpreted in order to determine where educators fall in the conceptual change process and more specifically where they are with regard to their dissatisfaction of existing beliefs as defined by Sadera and Hargrave (2005). The findings summarized below are essential for assisting those

responsible for introducing the UDL framework to educators and to design more targeted and effective instruction.

Administrator Conceptions about Universal Design for Learning: An Opportunity for Conceptual Change

The purpose of the first study was to describe school administrators' beliefs, knowledge and practices about UDL using qualitative research methods. While understanding each participant's unique experience with UDL was a necessary component of the data analysis procedure, the final results were presented as collective textural-structural descriptions. These descriptions represented reoccurring themes that provided insight into the essence of school leaders' beliefs, knowledge and practices about UDL. As a result of this research, the following six phenomenological essences were identified: viewing UDL as an overarching framework, understanding that UDL is a paradigm shift, expecting the curriculum to "do more," identifying barriers to practicing UDL, acknowledging expectations of teachers, and enhancing professional development practices.

A Mixed Method Study of Teachers' Conceptions about Universal Design for Learning

The purpose of the second study was to describe teacher beliefs, knowledge and practices about UDL using mixed research methodologies. Descriptive data were presented based upon consistencies and inconsistencies in beliefs, knowledge and practices related to the foundational assumptions of UDL. This data were analyzed at both the group and singular level. Numerous consistencies in teachers beliefs and practices aligned with the UDL framework were noted. For example, when asked if curricular methods and materials should recruit and sustain student engagement in

learning, 20 participants (91%) "agreed or strongly agreed." 19 participants (86.5%) indicated that they did this at least "some of the time." In this example, teacher beliefs and practices seemed to be more consistent with the UDL framework. Similar consistencies were identified in regard to teacher knowledge and practice. During the analysis process it also became apparent that teacher beliefs were not always consistent with their practices. For example, question two in the Beliefs and Practices section of the survey stated: "I believe all students can benefit from having multiple curricular options or learning pathways." Twenty participants (91%) at least somewhat agreed with this statement. However, only eight participants (32.4%) indicated that they provide multiple curricular options more than "some of the time." In this instance, it was clear that teachers were able to articulate their beliefs but were not necessarily able to put those beliefs into practice. Additionally, data collected from open-ended questions were analyzed using an iterative process. From this process, the following themes emerged: challenges in the written curriculum, competency in identifying options, barriers to the assessment process and willingness to learn more.

Preservice Teacher Beliefs about UDL

The purpose of the third study was to describe preservice teacher beliefs about UDL using quantitative research methods. Data from likert-type survey responses were entered into SPSS for quantitative analysis. The frequency of each response was calculated and presented. This descriptive data provided insight into preservice teacher conceptions regarding the foundational assumptions of UDL. A majority of preservice teachers (over 90%) agreed or strongly agreed with the following statements that were aligned to the foundational assumptions of UDL: the goal of education is the mastery of

learning, rather than the mastery of knowledge; education should help turn novice learners into expert learners; diversity is the norm wherever individuals are gathered. Participant responses to questions about curriculum design, modifications to curriculum, the use of technology to apply UDL, and barriers to learning were not consistent with the UDL framework.

Recommendations for Practice

UDL is a framework that forces administrators, teachers, and preservice teachers to think beyond their current conceptions and re-consider what they know about curriculum and instruction (CAST, 2012). However, few best practices exist for designing instruction about UDL. This lack of consistent quality instruction and professional development about UDL is problematic; especially since systemic UDL implementation is already progressing in schools and universities across the nation (Rappolt-Schlichtmann, Daley, & Rose, 2012). A major challenge with existing professional development and university coursework is the lack of attention to the pre-existing beliefs of administrators, teachers, and preservice teachers. It is imperative to recognize these beliefs in order to design quality instruction bout UDL, instruction that utilizes the power of the conceptual change framework to advance and alter the beliefs of learners. The conceptual change process has proven useful in strengthening learning experiences in the field of teacher education (e.g., Akar & Yildirim, 2009; Dawson, 2007; Dawson & Dana, 2007; Dhindsa & Anderson, 2004; Huey-Ling & Gorrell, 2002; Miller, et.al, 2009; Sadera, 2001; Tillema, 1997). This process should be used to guide future instruction about UDL. With professional development and course preparation in mind, results of this series of research studies are presented as recommendations for practice.

Based upon the results of the studies in this dissertation, it is evident that administrator, teacher, and preservice teacher beliefs, knowledge and practices are aligned with all three stages of the dissatisfaction-based conceptual change model. When reviewed as a whole, the results from each study have the potential to assist those responsible for introducing the UDL framework to administrators, teachers and preservice teachers in designing more effective instruction using a dissatisfaction-based conceptual change model. Defining each stage of the dissatisfaction-based model and considering examples from each population examined in this study will help those responsible for professional development or course design to develop more targeted instruction.

Pre-dissatisfaction refers to a stage in which learners have not yet deliberately considered their beliefs (Sadera & Hargrave, 2005). In each of these studies, learners in the pre-dissatisfaction stage were school administrators, teachers or preservice teachers who had not yet become cognizant of their beliefs about the role of UDL in teaching and learning. It is likely that these individuals have not had the opportunity to specifically confront their beliefs about the underlying assumptions of UDL. They may hold misconceptions about the UDL framework and have not had adequate time or coursework or professional development opportunities to confront these misconceptions. Teacher educators and those responsible for professional development must have a clear understanding of the existing conceptions held by their learners in order to challenge them to explicitly confront their beliefs. When introducing any new framework, educators must be certain to first provide time to identify the existing conceptions held by learners. This is especially relevant when introducing UDL, as many of the foundational

assumptions differ from what is considered traditional instruction (Rappolt-Schlichtmann, Daley, and Rose, 2012).

Dissatisfaction is characterized when learners begin to question the validity of their current beliefs (Sadera & Hargrave, 2005). Data from these studies indicate that learners in the dissatisfaction stage were administrators, teachers and preservice teachers who have a firm grasp on their beliefs about UDL, but do not see these beliefs coming to fruition due to existing barriers. Administrators and teachers may cite these barriers as time constraints, challenges with the existing curriculum or lack of resources. Preservice teachers may hold some beliefs that are aligned with the UDL framework and others that are contrary to the framework. The challenge for teacher educators and those responsible for professional development is to provide teachers with opportunities to evaluate and to compare and contrast their beliefs, knowledge and practices with the new conceptions being presented (Sadera & Hargrave, 2005). Instructional activities must challenge students to directly confront their conceptions about the foundational assumptions of UDL, whether aligned with the framework or not.

Finally, the *beyond-dissatisfaction* stage is representative of those learners who are able to evaluate, compare, and contrast two conceptions: their current conception and the new conception being presented (Sadera & Hargrave, 2005). Data from the administrator study indicates that school leaders who are in this stage have begun to collect information about UDL and test the alternative conception of UDL. They see UDL as a plausible. Teachers in the dissatisfaction stage were quite aware of their beliefs about UDL and they were beginning to realize that their current solutions to meeting the needs of diverse learners may not be adequate. Preservice teachers in this study were not

yet at the point of dissatisfaction. Coursework and professional development for administrators and teachers about UDL must be grounded in an understanding of conceptual change teaching strategies. Instruction that supports change should include time for learners to build a personal understanding and knowledge base about UDL (Sadera & Hargrave, 2005). Examples of learning activities may include opportunities to speak with colleagues and process new conceptions, identify technology tools that support the integration of the UDL principles, practice lesson writing using the UDL principles, and view lessons and video from teachers and schools where multiple options are the norm. These concrete examples of effective first instruction that includes flexible options from the inception of the lesson are a stark contrast to the traditional intervention model. These experiences will help learners begin to see the UDL framework as intelligible, plausible and fruitful.

Viewing these findings through a dissatisfaction based conceptual change lens is useful in designing deliberate learning activities that will serve as a catalyst for moving teachers past dissatisfaction. Without experiencing dissatisfaction, learners will not realize the benefits of restructuring their beliefs (Sadera & Hargrave, 2005). This is essential to move learners from awareness to integration and has great implications for practice.

Recommendations for Future Research

Results from the research described in this dissertation support the use of dissatisfaction as a theoretical framework in designing and implementing instruction about UDL. Future studies should focus on the creation of conceptual change based lessons, units or professional development experiences that challenge administrators,

teachers, and preservice teachers to analyze their existing beliefs about teaching and learning and compare these beliefs to the assumptions of UDL. Future research should test these learning experiences in order to determine if conceptual change based instruction can effectively prepare educators to apply the UDL framework in practice. It will also be necessary to explore the ability of administrators, teachers and preservice teachers to maintain their new conceptions about UDL, following accommodation. This will help to ensure that educators truly espouse UDL as a better way of meeting the challenge of learner variability.

Future research examining conceptual change and UDL should also be conducted with different populations, including higher education faculty or state level policy makers. These populations were not included in this study, but both play a significant role in impacting change in regard to UDL implementation. Finally, it will be important to examine the stages of conceptual change in light of the stages of UDL implementation proposed by CAST (2012). Applying dissatisfaction-based conceptual change strategies to CAST's stages of implementation could lead to the development of more focused and targeted professional development and classroom instructional modules about UDL.

Conclusion

Spooner, Algozzine, Wood and Hicks (2010) analyzed content published during their time as editors of Teacher Education and Special Education. They noted that teacher beliefs and practices were an essential component in understanding what the field needs to know about teacher education and special education. The research described in this dissertation answered this call by identifying initial beliefs of administrators, teachers and preservice teachers about UDL, a framework that is gaining great credibility as an

approach to meeting the challenge of learner variability (CAST, 2011; Rose & Meyer, 2002). The UDL framework has begun to be applied in numerous school systems throughout the United States (Hall, Rose & Meyer, 2012), and until this point, no research has sought to identify the current beliefs of those individuals who are on the front lines of moving the UDL framework forward: administrators, teachers, and preservice teachers. Without knowledge and recognition of the strength of the pre-existing beliefs of these groups in regard to the foundational assumptions of UDL it will be difficult, if not impossible, to move from exploring UDL to implementing UDL. Taken as a combined body of research, the studies described within this dissertation are a starting point for further exploration of conceptual change models that can facilitate educator growth with regard to UDL. Specifically, the findings described in this dissertation will assist teacher educators and individuals responsible for systemic professional development in creating powerful and dynamic instruction that will effectively prepare preservice teachers, in-service teachers and administrators to implement the UDL framework into classrooms and schools. Designing and integrating this type of instruction is a challenging and critical task that is both timely and necessary given current efforts to embed UDL into classrooms across the US (Rappolt-Schlichtmann, Daley, & Rose, 2012). It is imperative that teacher educators, as well as those responsible for systemic professional development, design coursework and instruction that utilizes dissatisfaction as a strategy for prompting conceptual change. Administrators, teachers, and preservice teachers must confront their existing beliefs about teaching and learning, contrast these beliefs with the assumptions of the UDL framework, and begin to develop a personal understanding of UDL in practice. Only then

will educators see UDL as plausible, fruitful and intelligible, and begin to embrace UDL as a superior framework for meeting the challenge of learner variability.

APPENDICES

APPENDIX A. SUMMARY OF UDL PRINCIPLES, CORRESPONDING NETWORKS AND APPLICATION

Adapted from CAST (2011). *Universal design for learning guidelines version 2.0.* Wakefield, MA: Author.

UDL Principle	Brain Network	Application
Multiple Means of Representation	Recognition Networks (the "WHAT" of learning)	Learners differ in the ways that they perceive and comprehend information that is presented to them. For example, those with sensory disabilities, learning disabilities, language or cultural differences may all require different ways of approaching content. Others learners may grasp information quicker or more efficiently through visual or auditory means rather than printed text. Learning, and transfer of learning, occurs when multiple representations are used, because it allows students to make connections within, as well as between, concepts. **There is not one means of representation that will be optimal for all learners; providing multiple ways to represent what you want students to know and learn is essential.**
Multiple Means of Action and Expression	Strategic Networks (the "HOW" of learning)	Learners differ in the ways that they can navigate a learning environment and express what they know. For example, individuals with significant movement, those who struggle with strategic and organizational abilities, and those who have language barriers approach learning tasks very differently. Some may be able to express themselves well in written text but not speech, and vice versa. Action and expression require a great deal of strategy, practice, and organization, and this is another area in which learners can differ. **There is not one means of action and expression that will be optimal for all learners; providing multiple pathways for learners to demonstrate what they know and have learned is essential.**
Multiple Means of Engagement	Affective Networks (the "WHY" of learning)	Affect represents a crucial element to learning, and learners differ markedly in the ways in which they can be engaged or motivated to learn. There are a variety of sources that can influence individual variation in affect including neurology, culture, personal relevance, subjectivity, and background knowledge. Some learners are highly engaged by spontaneity and novelty while other are disengaged, even frightened, by those aspects, preferring strict routine. Some learners might like to work alone, while others prefer to work with their peers. **There is not one means of engagement that will be optimal for all learners in all contexts; providing multiple options for engaging learners is essential.**

APPENDIX B. APPROVAL FROM TOWSON UNIVERSITY IRB, CONCEPTIONS ABOUT UDL

TOWSON
UNIVERSITY

EXEMPTION NUMBER: 11-1X36

To: Elizabeth Berquist

From: Institutional Review Board for the Protection of Human Subjects, Marcie Weinstein, Member

Date: Sunday, April 10, 2011

RE: Application for Approval of Research Involving the Use of Human Participants

APPROVED
APR 12 2011
TOWSON IRB

Office of University
Research Services

Towson University
8000 York Road
Towson, MD 21252-0001

t. 410 704-2236
f. 410 704-4494

Thank you for submitting an application for approval of the research titled,

Conceptions about UDL

to the Institutional Review Board for the Protection of Human Participants (IRB) at Towson University.

Your research is exempt from general Human Participants requirements according to 45 CFR 46.101(b)(2). No further review of this project is required from year to year provided it does not deviate from the submitted research design.

If you substantially change your research project or your survey instrument, please notify the Board immediately.

We wish you every success in your research project.

CC: Bill Sadera
File

APPENDIX C. LETTER OF SUPPORT FROM HOWARD COUNTY

HOWARD COUNTY
PUBLIC SCHOOL SYSTEM

March 9, 2011

Ms. Elizabeth Berquist
8000 York Road
Towson, Maryland 21252

Dear Ms Berquist:

Thank you for your Universal Design for Learning (UDL) presentations to our school-based administrators last week. We will share the formal evaluations with you as soon as they are completed. However, based on preliminary feedback, participants found your presentation informative and timely.

We are interested in assisting you in the determination of next steps regarding the UDL training and application for the classroom. This can be accomplished by speaking with groups of school administrators and selected curriculum coordinators in order to gain their insights on UDL in classrooms and as a tool for instruction. As staff has discussed with you, all participant names, schools, and the school district will need to be excluded from your findings and subsequent writings. It is also very important that the guidelines as stated in the Howard County Public School System's Policy 3030 (Research Involving Employees and Students) be followed as you prepare to conduct your interviews. Julian Katz, Coordinator of Research and Program Evaluation, will work with you regarding policy compliance and the appropriate procedure to contact participants and conduct interviews.

Again, it was a pleasure to have you with us. I look forward to our continued collaboration.

Sincerely,

Linda T. Wise
Chief Academic Officer

C: Clarissa Evans
Julian Dibble
Julian Katz

10910 Route 108 • Ellicott City, MD 21042 • 410-313-6600 • www.hcpss.org

APPENDIX D. ADMINISTRATOR UDL INTERVIEW PROTOCOL

Interview Protocol

Opening Statements

Thank you for volunteering to participate in this research study today. The purpose of this interview is to help me understand your current conceptions about Universal Design for Learning and its feasibility in the classroom. The results of this study will potentially help me to create and/or revise professional development materials designed to support the introduction of the Universal Design for Learning framework and the subsequent application of the UDL guidelines. You were selected for participation in this study because you are a teacher, curriculum specialistor or administrator in the state of Maryland and you have recently particpated in a training about Universal Design for Learning.

This interview will be recorded in order for me to transcribe our conversation at another time. Recording will also ensure that I am able to accuratley represent your thoughts and ideas. Please know that they are no correct or incorrect answers. I am simply trying to understand your current conceptions. If at anytime you feel uncomfortable, please let me know, and we can move on to the next question or reschedule the interview.

Overarching Research Question:

What are the conceptions, knowledge and practices of administrators about the role of UDL in supporting all learners?

Next Steps: How do these beliefs, knowledge practices inform the design of professional development materials?

1. Background

- Describe your current position.
- What opportunities have you had to participate in professional development about Universal Design for Learning?

2. UDL Conceptions Please comment briefly on each statement and please provide your personal opinion.

- UDL is a general education initiative.

- UDL requires technology.
- UDL is nothing more than good teaching.
- UDL and differentiation are the different names for the same approach.
- Variability is the "norm" in today's classrooms.
- Emphasis should be placed on fixing the student rather than the curriculum.
- The greatest barrier to learning is the curriculum.
- Classroom teachers should be responsible for modifying curriculum based on individual student needs.
- The goal of education is to help turn novice learners into expert learners (individuals who know how to learn and who want to learn).

3. UDL Implementation (Knowledge and Practices)

1) How are teachers in your school/county prepared for implementing UDL?
2) How are teachers in your school/county prepared for working with 21st century or next generation learners?
3) Does UDL complement other initiatives at work in your district? Explain. How is UDL similar to_____? Different from_____?
4) What are the critical elements or "look-fors" that you would like to observe in classrooms where teachers are implementing UDL?
5) What are the challenges to implementing UDL?
    a) Goals?
    b) Materials?
    c) Methods?
    d) Assessments?

6) What is the role of technology in implementing UDL?

7) What resources would you need in order to implement UDL in your school/county?

APPENDIX E. PARTICIPANT RESEARCHER STATEMENT

Participant researcher statement

I am currently a faculty member in a College of Education, where I work with pre-service and in-service educators. I have had a variety of experience in special education, social studies education, and professional development in the K-12 setting. I have also served as a UDL consultant for state projects and as a UDL facilitator for a national project. In addition, I am a member of the CAST UDL faculty cadre and I travel extensively to conduct UDL workshops and institutes for schools and districts across the country. In the case of this study, I provided the initial professional development for the system administrators. On a personal level, I am interested in creating more effective instruction to support understanding and application of universally designed classrooms. I have developed strong foundational beliefs in regard to learner diversity, classroom design and the role of technology to support all learners due to my experiences as a former teacher in the K-12 setting and a current instructor in a higher education setting. Therefore, researcher bias is a limitation of this study. To counter this bias, I engaged in the epoche, or bracketing process, in order to set aside my own preconceptions and theoretical beliefs regarding the phenomenon being studied (Creswell, 2006). In other words, I had to make a conscious effort to put aside my own beliefs and past experiences related to UDL prior to conducting interviews. In addition, I had to be certain to treat each interview as a data collection tool rather than a teaching opportunity.

APPENDIX F. SUGGESTIONS FOR FUTURE RESEARCH

This appendix is included to present recommendations for future research based upon the research described in Chapter Two: Administrator conceptions about Universal Design for Learning: An Opportunity for conceptual change. This information was not included in the chapter due to length requirements stipulated by the journal to which the work was submitted.

Results from the research described in this chapter support the use of dissatisfaction as a theoretical framework in designing and implementing instruction about UDL. Future studies should focus on the creation of conceptual change based professional development experiences that challenge administrators to analyze their existing beliefs about teaching and learning and compare these beliefs to the assumptions of UDL. Future research should test these learning experiences in order to determine if conceptual change based instruction can effectively prepare school leaders to apply the UDL framework in practice. It will also be necessary to explore the ability of administrators to maintain their new conceptions about UDL, following accommodation. This will help to ensure that educators truly espouse UDL as a better way of meeting the challenge of learner variability. It will also be important to examine the stages of conceptual change as they relate to the stages of UDL implementation proposed by CAST (2012). Applying dissatisfaction-based conceptual change strategies to CAST's stages of implementation could lead to the development of more focused and targeted professional development about UDL.

APPENDIX G. APPROVAL FROM TOWSON UNIVERSITY IRB, INSERVICE TEACHER CONCEPTIONS ABOUT UDL

TOWSON
UNIVERSITY

EXEMPTION NUMBER: 13-0X23

To: Elizabeth Berquist
From: Institutional Review Board for the Protection of Human Subjects, Steven Mogge, Member
Date: Tuesday, October 23, 2012 SM/WMP
RE: Application for Approval of Research Involving the Use of Human Participants

Office of University Research Services

Towson University
8000 York Road
Towson, MD 21252-0001

t. 410 704-2236
f. 410 704-4494

Thank you for submitting an application for approval of the research titled,

In-service teacher conceptions about UDL

to the Institutional Review Board for the Protection of Human Participants (IRB) at Towson University.

Your research is exempt from general Human Participants requirements according to 45 CFR 46.101(b)(2). No further review of this project is required from year to year provided it does not deviate from the submitted research design.

If you substantially change your research project or your survey instrument, please notify the Board immediately.

We wish you every success in your research project.

CC: B. Sadera
File

APPENDIX H. LETTER OF SUPPORT FROM CAST

CAST
universal design for learning
40 Harvard Mills Square, Suite 3
Wakefield, MA 01880-3233
Phone: 781-245-2212
Fax: 781-245-5212
TTY: 781-245-9320
www.cast.org

August 6, 2012

Elizabeth Berquist
Department of Special Education
Towson University
eberquist@towson.edu

Dear Liz,

The CAST UDL Implementation Project and IRB approve your request to have access to pre-existing data from our survey research in the current UDL Implementation project contingent on approval from the Towson University IRB.

The data collection process and de-identification of data will be conducted by CAST and made accessible to you for your research purposes specified in your IRB forms. Please include your letter of approval, IRB forms with statements of research goals and process in the materials sent to CAST for our records.

We look forward to collaborating with you on this project and the sharing of your research results.

Sincerely,

Tracey E. Hall, PhD
Chair
CAST Institutional Review Board

APPENDIX I. OUTLINE OF UDL PDS PROJECT

CAST
Universal Design for Learning

INTRODUCTION BRIEF

An Innovative UDL Professional Development System:

Universal Design for Learning Principles to Improve Literacy

Funded by the Bill and Melinda Gates Foundation

What is the Universal Design for Learning Professional Development System?

The *Universal Design for Learning Professional Development System* (UDL PDS) is designed to support districts in building capacity in UDL as it applies to reading and writing across content areas. Although the UDL PDS can be implemented across the entire district and content areas, the initial focus of this project is middle school literacy practices. With a specific focus on applying UDL as the guiding curricular and instructional framework, the UDL PDS draws on research about best practices in adolescent literacy instruction to foster success for *all* learners.

Components of the UDL PDS include:

- Professional development (e.g., face-to-face, online PD collections)
- Technical assistance provided by UDL Facilitator-Leaders
- UDL implementation resources and supports (e.g., UDL Implementation Strategy Guide)
- District Professional Learning Communities (PLCs) led by UDL Coaches
- Professional learning and instructional resources offered through an online dynamic tool - UDL Exchange

After a rigorous RFP process, four district partners were selected:

a) Baltimore County PS, MD
b) Bartholomew Consolidated School Corporation, IN
c) Cecil County PS, MD
d) Chelmsford PS, MA

A History of the Project

With funding from the Bill and Melinda Gates Foundation, three school districts (Philadelphia, PA; Reading, MA; and Bartholomew Consolidated School Corporation, Columbus, IN) participated in the planning and design phase of this work (2010-2011). Each district offered insights into the realities, needs, goals, and challenges faced in districts of a variety of sizes, demographic characteristics, experience with UDL, and literacy approaches which helped to shape CAST's current UDL PDS. The proposed

innovative UDL PDS expands the work of the Planning Grant through the deployment and refinement of an innovative UDL PDS that supports teachers' use of the UDL Framework to incorporate research-based literacy instructional practices across content areas in middle schools, create a professional network of UDL educators, collaborate in planning curriculum and instruction, and incorporate professional coaching specifically related to UDL frameworks.

Project Goals

1. To focus on improved student achievement in one or two identified areas of literacy.
2. To align UDL and research-based literacy instructional practices across content areas through the utilization of the UDL PDS.
3. To show initial indicators of positive change in educator beliefs, knowledge, and skills related to UDL and literacy instructional approaches.

Role of Partner Districts

During this one-year grant period, districts will work with CAST to ***develop and implement*** an effective and sustainable district plan to support the integration of research-based literacy practices using the UDL framework focused on middle school literacy. Partner districts will gain supports and scaffolds that assist in the implementation of UDL in alignment with research-based literacy instructional practices across content areas in middle school. In addition, each district will receive $8,000 to be used for substitutes, stipends, technology resources, etc.

Districts will:

1. Work with the UDL Facilitator-Leader selected for their district to develop and carry out a UDL Implementation Action Plan which will include their vision and anticipated student and educator outcomes linked to **one area of literacy instruction** (e.g., comprehension of narrative texts, academic vocabulary)
2. Identify and support a district UDL Implementation Team to integrate and coordinate plan activities
3. Develop a thriving Professional Learning Community (PLC) which includes:
    - Identifying, selecting, and supporting school-based UDL coaches/mentors who will work with the school PLC teams
    - Participation by PLC members in face-to-face and online professional development
    - Active engagement in an online community that provides supports and resources
4. Create online resources from available templates designed by CAST for use by administrators and teachers
5. Participate in educator surveys and interviews:
    - Demographic Survey (once)
    - Educator Survey (2-4 times)
    - Video-taped interviews

6. Utilize data collection and monitoring procedures for district and PLC decision-making
7. Work with CAST to identify support from additional resource streams (e.g., local district funding, private foundation funding, state and/or federal resources)
8. Develop contingency plans to ensure that UDL remains incorporated in the school district regardless of changes (e.g., changes in district leadership, funding, and/or school-based personnel)

Immediate steps:

- Identify area of literacy
- Identify district UDL Implementation Team representing all levels of district/school-based personnel
- Work with CAST to identify UDL Facilitator-Leader
- Plan for administration of the Demographic Survey and Educator Survey
- Identify 2-3 teachers to review introductory information/video for UDL Exchange

APPENDIX J. EDUCATOR DEMOGRAPHIC SURVEY QUESTIONS-TEACHERS

1. Select your District.
2. Select your school, indicate percent of time spent in each school and its location.
3. Enter your name and email address.
4. Degree Held
5. Certification Held
6. Select your primary role as an educator at this school.
7. Your title/position.
8. Years/Experience in current position.
9. Years/Experience in this district.
10. Years/Experience in education.
11. Gender
12. Class Demographic Table

APPENDIX K. UDL BELIEFS, KNOWLEDGE AND PRACTICES SURVEY

Part 1: Beliefs (Participants rate level of agreement for each question)

1. I believe that all students can learn in general education settings.

2. I believe there is a range of learning variability in students in any education setting.

3. I believe learning occurs as a dynamic interaction of the individual with the environment.

4. I believe the implementation of UDL will lead to better achievement for all students.

5. I believe UDL implementation can occur with or without technology.

Part 2: Belief and Practice (Participants rate both their level of agreement and their level of practice. Participants provide examples of their practice).

6. I believe goals should not include the means by which mastery can be attained and demonstrated.

7. I believe all students can benefit from having multiple curricular options or learning pathways.

8. I believe curricular methods and materials should recruit and sustain student engagement in learning.

9. I believe assessment, methods, and materials should be clearly aligned with the curriculum goals.

10. I believe assessments should remove or reduce barriers for more accurate measurement of learner knowledge, skills, and engagement.

Part 3: Knowledge and Practice (Participants rate both their level of agreement and their level of practice. Participants provide examples of their practice).

11. I believe supports and scaffolds available during instruction and practice should also be available during assessment when not related to the construct being measured.

12. Learners should be provided with a variety of ways for recruiting and sustaining engagement in the instructional environment.

13. Learners should be provided with strategies for personal coping skills, self-assessment, and reflection in support of self-regulation.

14. Learners should be provided with multiple ways to access information including text, oral presentation, and visuals.

15. Varied strategies for a range of learners should be provided to support comprehension/understanding.

16. Learners should be provided with options for action, expression, and communication during instruction/teaching.

17. Learners should be provided with options that support goal setting, strategy development, and progress monitoring.

APPENDIX L. APPROVAL FROM TOWSON UNIVERSITY IRB. CONCPETIONS ABOUT UDL (PILOT STUDY)

TOWSON
UNIVERSITY

EXEMPTION NUMBER: 12-0X28

To: Elizabeth Berquist

From: Institutional Review Board for the Protection of Human Subjects, Gerald Jerome, Member GJ/up

Date: Friday, October 21, 2011

RE: Application for Approval of Research Involving the Use of Human Participants

Office of University
Research Services

Towson University
8000 York Road
Towson, MD 21252-0001

t. 410 704-2236
f. 410 704-4494

Thank you for submitting an application for approval of the research titled,

Conceptions about UDL

to the Institutional Review Board for the Protection of Human Participants (IRB) at Towson University.

Your research is exempt from general Human Participants requirements according to 45 CFR 46.101(b)(2). No further review of this project is required from year to year provided it does not deviate from the submitted research design.

If you substantially change your research project or your survey instrument, please notify the Board immediately.

We wish you every success in your research project.

CC: B. Sadera
File

APPENDIX M. APPROVAL FROM TOWSON UNIVERSITY IRB: PRECONCEPTIONS, CONCPETIONS, KNOWLEDGE AND PRACTICES ABOUT UDL

TOWSON
UNIVERSITY

EXEMPTION NUMBER: 12-1X43

To: Elizabeth Berquist
From: Institutional Review Board for the Protection of Human Subjects, Gerald Jerome, Member GJ/WKP
Date: Tuesday, June 26, 2012
RE: Application for Approval of Research Involving the Use of Human Participants

fice of University
Research Services

owson University
8000 York Road
MD 21252-0001

t: 410 704-2236
f: 410 704-4494

Thank you for submitting an application for approval of the research titled,

Pre-conceptions, Conceptions, Knowledge and Practices about UDL

to the Institutional Review Board for the Protection of Human Participants (IRB) at Towson University.

Your research is exempt from general Human Participants requirements according to 45 CFR 46.101(b)(2). No further review of this project is required from year to year provided it does not deviate from the submitted research design.

If you substantially change your research project or your survey instrument, please notify the Board immediately.

We wish you every success in your research project.

CC: B. Sadera
File

APPENDIX N. SPED 301 SYLLABUS

Towson University
College of Education
"The College that Prepares Teachers as Facilitators of Active Learning"
Department of Special Education

SPED 301-004
INTRODUCTION TO SPECIAL EDUCATION
PY302 Wednesday 1:00-3:40pm

INSTRUCTOR: Elizabeth Berquist, M. Ed.
Electronic Mail: eberquist@towson.edu
Cell Phone: 443.465.5995
Office Phone: 410-704-2703
Office Location: PSYCH 311
Office Hours: Monday 11-2:00pm, By Appointment

TOWSON UNIVERSITY COLLEGE OF EDUCATION'S MISSION: to inspire, educate and prepare facilitators of active learning for diverse and inclusive communities of learners in environments that are technologically advanced.

TOWSON UNIVERSITY'S CONCEPTUAL FRAMEWORK: All student s should be able to identify and discuss the Conceptual Framework. It is our mission statement that is operationalized by required content, professional and pedagogical nation, state, and institutional standards. To review the entire document, visit the following website: http://wwwnew.towson.edu/coe/cf2006/index.asp.

CATALOG DESCRIPTION: This course provides instruction in the historical, philosophical and legal foundations of special education as related to current issues and practices in educational settings.

REQUIRED TEXT: Smith, D. D. & Tyler, N. C. (2009). Introduction to Special Education: Making a Difference. Upper Saddle, NJ: Pearson Education, Inc. (ISBN-13:978-0-13-505604-2)
It is required that students bring the course textbook to class each week as the instructor and students will reference it during class. Other reading relevant to special education issues may be assigned by the instructor as indicated by the needs and interests of the class. Syllabus is subject to change as needed. Common sense and instructor discretion will be the governing forces in dealing with any circumstances that may arise that are not explicitly addressed in this syllabus.

NATURE OF COURSE DELIVERY*:* Learning activities include the following:

- Class lectures, power point handouts, discussions
- Study and independent library research
- Videos & other relevant media presentations
- Application of relevant hardware and software
- Activities & active participation in class participation
- Out of class application activity
- Student presentations
- Classroom observation

OTHER ASSIGNED READINGS: Additional readings will be assigned to supplement the text and class discussion. All readings are available on line as full text. The addresses will be given in class.

COURSE GOALS: The purpose of this course is to provide an overview of the field of special education. Students will learn the historical development of special education, including related legislation and litigation, as well as current trends and issues in special education. Broad areas to be covered in this course are areas of exceptionality, professional collaboration and inclusion, assessment, instructional models, roles of general and special class teachers, individualized educational programs, and family and community involvement.

Council for Exceptional Children (CEC) Program and Interstate New Teacher Assessment and Support Consortium (INTASC) Standards Addressed in this Course

Standard1/Principle 1: Foundations/Making Content Meaningful
Standard 2/Principle 2: Development and Characteristics of Learners/ Child Development and Learning Theory
Standard 3/Principle 3: Individual learning Differences/Learning Styles & Diverse Learners
Standard 4/Principle 4: Instructional Strategies/Problem Solving
Standard 5/Principle 5: Learning Environments and Social Interactions/ Motivation and Behavior
Standard 6/Principle 6: Language/Communication to Foster Learning
Standard 7Principle 7: Instructional Planning
Standard 8/Principle 8: Assessment to Improve Student Learning
Standard 9/Principle 9: Professional and Ethical Practice/Professional Growth and Reflection
Standard 10/Principle 10: Collaboration/Interpersonal Relationships

COURSE OBJECTIVES: Listed below are the specific knowledge and skill standards for each standard that are addressed by the course. An asterisk (*) indicates mastery of the specific standard will be addressed by the course assessment.

COURSE POLICIES:

***Attendance Policy**:* If the student misses portions of two or more classes (e.g., due to lateness, absence, or leaving class early) or does not actively participate, the students grade may be lowered by at least one full letter grade. If the student is absent when an assignment is due, the student is still responsible for submitting the assignment on time, unless prior arrangements are made.

Professionalism: It will be expected that all students in this course will conduct themselves in a professional manner. This includes interpersonal dealings, conflict resolution, and managing responsibilities with college staff, fellow students, and field placement personnel. A student's final grade may be lowered by one full letter grade for inappropriate behavior. **Please see page 13: Essential Dispositions.**

Web-Enhanced Course: This course utilizes Blackboard and the Learn Online Collection. All students will be required to log on to the Blackboard website frequently for updates and information. In addition, selected readings and journal articles/links may be accessed through the Blackboard website. All grades will be posted in the Blackboard Grade Center.

Communication: All electronic communication regarding this course will be through the student's Towson University Email Account only. Please adhere to professional writing standards when communicating via email.

Electronic Devices: The use of electronic devices that produce sound or otherwise interfere with the learning of others (i.e., cell phones, pagers, etc.) is prohibited during class. Please turn these devices off or to vibrate before the start of class. Cell phones should be out of sight during class unless there is an emergency situation that requires attention and the phone should be placed on vibrate so as not to disturb your fellow classmates.

Assignment Standards: Students are expected to apply professional standards to all written and electronic communication. All assignments must be **APA style**, neatly typed, and double-spaced using 12 pt. font. Be sure to **proofread your work** and correct spelling, grammar and punctuation errors. You are expected to use **Person First** language, (e.g., not "disabled students", but "students with disabilities;"see http://www.disabilityisnatural.com/images/PDF/pfl09.pdf). Always make a copy of your work for your records before submitting the original.

Due Dates/Late Assignments: You are responsible for submitting all assignments on time. Assignments must be submitted by class time on the date they are due. Late assignments will not be accepted.

Group Projects: Group projects require equal participation among all members of the group. Upon the discretion of the instructor, individual assignments or one group assignment may be required for submission. In both cases, individual grades will be assigned to each member of the group and the grade assigned may vary among members of the same group. The instructor has the discretion to assign different grades among the group based on participation and quality of work.

Conferences: The instructor is available for conferences by appointment. It is recommended that students who feel they are having difficulty with the course or may need clarification meet with the instructor as early as possible.

Incomplete (I): The grade of (I) is assigned at the end of the term because of verifiable medical reasons or other documented circumstances beyond the control of the student. Unless the course is completed within the 180 days, the grade becomes an F unless changed to another letter grade. It is the responsibility of the student to make arrangements to complete course requirements to change the grade of (I).

Repeating a course: Students may not repeat the course more than once without prior permission from the Academic Standards Committee.

Withdrawals: The last day to withdraw with a grade of "W" is posted on the web. It is the intern's responsibility to verify this information.

Academic Integrity Policy**: **Honesty & Behavior Policy. All students are expected to adhere to the Student Code of Conduct as outlined in the student Policy Book and summarized in the Student Handbook. Plagiarism and cheating are not acceptable behaviors. *Academic Integrity***:** Students in this course are expected to exhibit academic integrity at all times. Be aware plagiarism is presenting someone else's work as your own. **Whether the act is deliberate or unintentional is irrelevant.** You must take great care to give credit to an author when you borrow either exact words or ideas. Generally, if you use 4 or more words consecutive words from a document, you should use quotation marks and a proper citation. Academic dishonesty will be reported to the appropriate authorities and handled as outlined in your student handbook. Students are encouraged to consult the website below for specific details.
http://www.towson.edu/provost/resources/studentacademic.asp

Americans with Disabilities Act Compliance: Towson University is committed to providing equal access to its programs and services for students with disabilities, in accordance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990. Disability Support Services is the office designated to provide reasonable accommodations to students with disabilities. **Students seeking accommodations must identify themselves to DSS, request an appointment to discuss their needs, and provide DSS with up-to-date and complete documentation of their disabilities**. DSS determines what accommodations are reasonable on a case-by-case basis, taking into account the student's disabilities and needs, nature of their learning task, course standards and essential requirements of the program of study, and educational environment. **Students are encouraged to register with DSS as soon as possible after admission to the University to ensure timely provision of services.**

Course/Instructor Evaluation Procedures: Student evaluations play a crucial role in the delivery of this course. This semester, all course evaluations will be administered online during the last two weeks of the course. You will receive an email with a link to the website with directions on how to access the survey. It is vitally important that you complete the survey, as the results are used to modify the course and assess my teaching, and the University uses the results to address technology and facility needs. You can be assured that your responses will be confidential as the results will be transmitted to me after the grading period and they will not include any identifying information. Any questions regarding the procedures governing this evaluation and completion may be directed to Dr. Betsy Neville, Chairperson, Department of Special Education, 410-704-4984.

COURSE REQUIREMENTS

Grading:

Assignment	% of final grade
Participation and In-Class Assessments	30
Homework/Reading and Quizzes	30
Universal Design for Learning Project	30
Final Exam	10
Total	**100**

Undergraduate Grading Scale

Grade	Grade Points Per Credit Unit
A = 93.5-100% (935 to 1000 pts)	4.00
A- = 90-93.4% (895 to 934 pts)	3.67
B+ = 87-89% (865 to 894 pts)	3.33
B= 83-86% (830 to 864 pts)	3.00
B- = 80-82% (795 to 820 pts)	2.67
C+ = 77-79% (765 to 794 pts)	2.33
C = 70-76% (700 to 764 pts)	2.00
D+ = 67-69% (670 to 699 pts)	1.33
D = 60-66% (600 to 669 points)	1.00
F = 0-59% (0 to 599 points)	0.00

Participation and In-class Assessments (30%): The format of this course includes cooperative groups, discussions, and multimedia presentations. Students are expected to be actively involved, prepared to discuss all assigned readings on the day they are due, and willing to share their perspectives, knowledge, and experiences. On occasion, we will have the privilege of having parents of children with special needs share their experiences with us. Students should come prepared to ask questions in response to each parent's story. In addition, during each class specific topics will be covered that are of great importance in working with students with disabilities (ex: IDEA regulation, communication strategies, etc). At the end of each session, students may be asked to complete a brief in-class assessment in order to determine whether they have mastered the learning objectives for the session.

Homework/Reading & Quizzes (30%): Each week, a specific written homework assignment will be assigned. Specific details will be posted on Blackboard each week. In addition, the instructor will periodically assess knowledge and comprehension of assigned readings through short quizzes. It is imperative that assigned readings are completed prior to class.

Universal Design for Learning Project (30%): Throughout the semester, we will discuss the principles of UDL and related classroom application. Students will be required to apply this knowledge of UDL to their own discipline/content area in an individual application activity that also demonstrates the use of instructional technologies. Specific details and a rubric will be posted on Blackboard.

Final Exam (10%): The final exam will be based on assigned readings, handouts, lectures, media presentation, and class activities/discussions. The final exam will be held on Monday, 12-13-10 at 12:30pm.

COURSE SCHEDULE

SPED 301.004: *Tentative* Schedule Fall 2010

PSYCH 302, W 1-3:40pm unless otherwise noted

Session/Date	Topic	Assignments Due

		***Chapters noted must be read prior to class** ***Written Assignments will be posted on Blackboard weekly**
1 **Wednesday, August 25th**	Course and Syllabus Overview and Expectations Pre-Assessment Intro to Special Ed KWL Reflective Teaching	
2 **Wednesday, September 1**	Perspectives on Disability Challenging Current Conceptions People First Universal Design For Learning: Part One	Smith, Chapter One Check Bb for written assignment
3 **Wednesday, September 8**	Overview of Services and Programs: Who, What, Why, When, Where and How!	Smith, Chapter Two Check Bb for written assignment
4 **Wednesday, September 15**	UDL Intro, UDL Module 1 UDL and Learner Variability (selected sections)	Smith, Chapter Two Check Bb for written assignment

5 **Wednesday, September 22nd**	Cultural and Linguistic Diversity Working with Families Universal Design For Learning: Part Two, Recognition through Affective Networks	Smith, Chapter Three Katie's Blog: linked to Bb Check Bb for written assignment
6 **Wednesday, September 29th**	Speech-Language Impairments Using the UDL Guidelines	Smith, Chapter Four Check Bb for written assignment
7 **Wednesday, October 6th**	Learning Disabilities UDL Goals: UDL module 2, MD Learning Links	Smith, Chapter Five Check Bb for written assignment
8 **October 13th**	ADD/ADHD UDL Materials: Module 2, MD LL	Smith, Chapter Six Check Bb for written assignment
9 **Wednesday, October 20th**	Emotional Behavioral Disorders UDL Methods: Module 2, MD LL	Smith, Chapter Seven Check Bb for written assignment
10 **Wednesday, October 27th**	Intellectual Disabilities UDL Assessments: Module 2, MD LL	Smith, Chapter Eight Check Bb for written assignment
11 **Wednesday,**	Physical or Health Disabilities Planning using UDL Tools, I	Smith, Chapter Nine

November 3rd		Check Bb for written assignment
12 **Wednesday, November 10th**	Deaf or Hard of Hearing Low Vision and Blindness Planning using UDL Tools, II-CAST LESSON BUILDER IS UNDER CONSTRUCTION, SHOULD BE UP SUMMER 2012	Smith, Chapter Ten Smith, Chapter Eleven Check Bb for written assignment
13 **Wednesday, November 17th**	Autism Spectrum Disorders Planning using UDL Tools, III	Smith, Chapter Twelve Check Bb for written assignment
14 **Wednesday, November 24th**	**Thanksgiving Holiday-TU Closed**	
15 **Wednesday, December 1st**	Low-Incidence Disabilities	Smith, Chapter Thirteen Check Bb for written assignment
16 **Wednesday, December 8th**	Online Class-TASH Conference in Denver, CO See directions posted to Blackboard	Study for Final Complete Electronic Course Evaluations
Final **Exam**	**Monday, December 13th, 2010 12:30pm**	Have a wonderful winter break!

ESSENTIAL DISPOSITIONS FOR EDUCATORS-Overview

At Towson University, we recognize the importance of preparing candidates who are worthy to join the education profession. All students enrolled in the Professional Education Unit programs are expected to develop a professional conscience by

demonstrating important human characteristics and dispositions necessary to work with diverse and inclusive communities of learners. Following is a list of dispositions, including important diversity proficiencies, which have been identified as core behaviors expected of all graduates of all Unit programs. As candidates progress through coursework and field experiences, they are expected to demonstrate increased understanding and eventual mastery of these dispositions.

- **Commitment to Professional Practice**
  The successful candidate:

  - Respects and models high academic standards, and demonstrates proficiency in academic writing and professional oral presentation.
  - Demonstrates a repertoire of pedagogical skills that develop *all* students' critical and independent thinking, and performance capabilities.
  - Uses ongoing assessment as an integral part of the instructional process.
  - Reflects on practice regularly in order to improve student learning.
  - Makes decisions based on ethical and legal principles, including respect for confidentiality.

- **Caring for the Success and Well-being of *All* Students**
  The successful candidate:

  - Believes that *all* students can learn and persists in facilitating their success.
  - Accepts and demonstrates responsibility for improving learning for *all* students.
  - Values co-operation with colleagues, students, and families by respecting their views on improving student achievement.
  - Models the virtues of an educated person, including the drive to work hard and become flexible.
  - Demonstrates culturally responsive teaching and celebrates cultural differences.

- **Collaboration with Colleagues and Stakeholders**
  The successful candidate:

  - Establishes and contributes to a positive learning climate for *all* students.
  - Engages in continual learning and discussion with other professionals.
  - Recognizes families, colleagues, and supervisors as partners in teaching and learning by creating opportunities to involve them in instructional decisions.
  - Seeks expert knowledge in order to improve teaching and learning.
  - Accepts suggestions and implements changes to improve professional practice.

APPENDIX O. SUMMARY FEEDBACK FROM EXPERT PANEL

	1	2	3	4	5	6	7	8
EXPERT 1	What is the difference between full time and part time?		Should it be PK-12?	title doesnt match	Define UDL the first time you list			
EXPERT 2	ok	ok	ok	title-UDL Preconceptions (this is still Background)	title-UDL Preconceptions (this is still Background)	Does your survey system have question logic? If so, you should use it.	all good questions, it is obvious that they came from the guidelines-- have a few wordsmithing suggestions which I indicated in the corresponding box	The goal of education i create expe learners.
EXPERT 3	may want to clarify percentages for part time and full time	ok	ok	ok	If they answer yes to this question you are no longer talking about pre-conceptions, you are talking about conceptions (if my definition is the same as yours)	can you skip these questions if they do not apply	can you remove UDL from the title- these are preconceptions about education, or the underlying assumptions made by the UDL framework	ok
EXPERT 4	Are there directions for this survey? I do not see them on this attachment. I am sure that you have them, but I would think they should be part of the survey as well. Also, informed consent?	NC	NC.	Consider structuring this survey so that if you respond yes to the question prior you will answer this question.	NC. *After reviewing the entire survey I am wondering if there may be an option to have two sets of questions depending on the response to this question?	Again, question logic would be useful.	I have seen other instruments that only list the the scale once (at the top) and then list each question in a column on the left. You may want to consider this for a more streamlined/efficien look to your instrument.	NC

	9	10	11	12	13	14	15	16
EXPERT 1			change outset to a different term	think about the word should-- is that the best choice?			might be confusing, not sure what that means	If they have never heard of UDL they cannot answer this question
EXPERT 2	take out including schools (UDL is about all settings)	is fair always equal? you are using them as synonyms here		on to upon		I have used this question in workshops- people always need me to clarify- think about adding a descriptor here. This is confusing if you do not know about the framework.	define curriculum in UDL terms (goals, materials, methods, assessments) See above. Similar feedback to using this question in workshops.	Title says preconceptions, then next title is knowledge, make this consistent What is the purpose in asking these questions? What if you have no background in UDL? Can all participants answer?
EXPERT 3	ok	ok	ok	ok	ok		NC Were these developed from the text version of 1.0 or 2.0? If 2.0 you may need to add a statement about variability.	You may wish to consider making a change to application rather than knowledge.
	NC	NC	NC	NC	NC	NC		

	17	18	19	20	21	22	23	24	25
EXPERT 1	ame as above	same as above	all of the true/false make sense..... same questions that they asked us at CAST?						
EXPERT 2	hat is the rpose in asking ese questions? hat if you have background in DL? Can all rticipants nswer?	What is the purpose in asking these questions? What if you have no background in UDL? Can all participants answer?	Thoughts on UDL– is there a stronger word that you can use?	no change	Why approach and not framework?	no change	no change	no change	remove this question no change
EXPERT 3	C	NC	There is an extra space after 19 and before your answer choices (only in #19, not in the other questions in this set).	NC	NC	NC	NC	NC	Need some ty closure at the so that partici understand th they have completed the survey. I think these questions are representatio the guidelines

APPENDIX P. UNIVERSAL DESIGN FOR LEARNING- PRE-CONCEPTIONS, CONCEPTIONS, KNOWLEDGE AND PRACTICES (UDL-PCKP)

UDL Pre-conceptions, Knowledge and Practices

Section 1: Background

Question 1

Which course are you currently enrolled in?

- SPED 637
- SPED 301

Question 2

What is your current student status?

- Full-time undergraduate
- Part-time undergraduate
- Full-time graduate
- Part-time graduate
- Other (please specify)

Question 3

What is your current major?

- Elementary Education
- Early Childhood Education
- Secondary Education (please specify area of certification, i.e. history, dance)
- Special Education (please specify track) (i.e., secondary-math, infant primary)
- Other (please specify)

Question 4

Have you participated in an undergraduate or graduate course that covered UDL?

- Yes (please specify name of the course)
- No

Section 2: UDL Preconceptions

Questions 5 - 13

Please indicate your level of agreement with the following statements:

	5 Strongly agree	4 Moderately agree	3 Neither agree nor disagree	2 Moderately disagree	1 Strongly disagree
The goal of education is not simply the mastery of knowledge; it is the mastery of learning.	○	○	○	○	○
Education should help turn novice learners into expert learners - individuals who know how to learn, and who want to learn.	○	○	○	○	○
Diversity is the norm, not the exception, wherever individuals are gathered, including in schools.	○	○	○	○	○
When curriculum is designed to meet the needs of the middle, it provides all individuals with fair and equal opportunities to learn.	○	○	○	○	○
Curriculum should be designed for the greatest number of users from the outset.	○	○	○	○	○
Classroom teachers should modify curriculum based on individual student needs.	○	○	○	○	○
Technology is essential in order to create flexible curriculum.	○	○	○	○	○
Teachers should view curriculum, and not students, as disabled.	○	○	○	○	○
The greatest barrier to learning is the curriculum.	○	○	○	○	○

Section 3: UDL Knowledge

Questions 14 - 20

Please indicate whether the following statements are "true" or "false":

	True	False
UDL principles must be applied through the use of technology.	○	○
UDL is a special education initiative.	○	○
UDL and differentiation are different names for the same approach.	○	○
UDL and assistive technology are the same.	○	○
UDL will not benefit students who are gifted.	○	○
UDL and universal design principles are synonymous.	○	○
UDL is basically the same thing as good teaching.	○	○

Section 4: UDL Practices

Question 21

How comfortable are you with explaining the principles of Universal Design for Learning?

- Extremely comfortable
- Very comfortable
- Moderately comfortable
- Not very comfortable
- Not at all comfortable

Question 22

How comfortable are you with explaining the organization of the Universal Design for Learning guidelines?

- Extremely comfortable
- Very comfortable
- Moderately comfortable
- Not very comfortable
- Not at all comfortable

Question 23

How confident are you in applying the principles of UDL to a lesson or unit plan?

- Extremely confident
- Very confident
- Moderately confident
- Not very confident
- Not at all confident

Questions 24 - 25

Please indicate your level of agreement with the following statements:

	Strongly agree (5)	Moderately agree (4)	Neither agree nor disagree (3)	Moderately disagree (2)	Strongly disagree (1)
I am confident locating materials and resources that will support my application of UDL.	○	○	○	○	○
I have applied the UDL principles to an undergraduate or graduate project.	○	○	○	○	○

REFERENCES

Aitken, E., & Aitken, A. (2008). Leadership and school improvement. International Journal of Learning., 15(7), 193-202. Retrieved from http://www.Learning-Journal.com

Akar, H., & Yildirim, A. (2009). Change in teacher candidates' metaphorical images about classroom management in a social constructivist learning environment. *Teaching in Higher Education*, *14*, 401-415. doi:10.1080/13562510903050152

Anderson, K. & Anderson, C. (2010) Science access for ALL. *Special Education Technology Practice. 12*(5), 19-24. Retrieved from http://www.setp.net/

Avalos, B. (2001). Teacher professional development in Teaching and Teacher Education over ten years. *Teaching and Teacher Education*, *27* (10-20). Retrieved from: http://www.journals.elsevier.com/teaching-and-teacher-education/

Basham, J. D., Perry, E., & Meyer, H. (2011). It's in the bag: Digital backpacks for project-based learning. Learning and Leading with Technology, 39 (2), 24-27. Retrieved from http://iste.org/learn/publications/learning-and-leading.aspx

Berquist, E., & Sadera, W. (2012). Administrators' Conceptions about Universal Design for Learning: An Opportunity for Conceptual Change. *In press.*

Burgstahler, C. E., & Cory, R. C. (Eds.). (2008). *Universal design in higher education : From principles to practice*. Cambridge, MA: Harvard Education Press.

CAST (2010). *UDL Pedagogical Considerations*. Wakefield, MA: Author.

CAST (2011). *Universal design for learning guidelines version 2.0.*Wakefield, MA: Author.

CAST (2012). *About UDL.* Wakefield, MA: Author.

CAST (2012). *UDL Strategy Guide.* Wakefield, MA: Author.

Center for Universal Design. (1997). *About UD: universal design principles.* Retrieved from http://www.ncsu.edu/project/design-projects/udi/center-for-universal-design/the-principles-of-universal-design/

Chinn & Brewer. (1993). The role of anomalous data, a theoretical framework and implications for science instruction. *Review of Educational Research*, *63*, 1-49. Retrieved from http://rer.sagepub.com/

Cilesiz, S. (2010). A phenomenological approach to experiences with technology: current state, promise, and future directions for research. *Education Technology Research and Development. 59*:487–510. doi 10.1007/s11423-010-9173-2

Claflin, M., Eddins, B., & Eicher, D. (2012). Looking Through an Inclusive Lens: Training Secondary Education Student Teachers to Apply Principles of Universal Design. National Social Science Journal, 39(1), 8-17. Retrieved from http://www.nssa.us/journals.htm

Courey, S., Tappe, P., Siker, J. & LePage, P. (2012). Improved lesson planning with universal design for learning (UDL). *Teacher Education and Special Education, 36*, 7-27. doi: 10.1177/0888406412446178

Coyne, P., Pisha, B., Dalton, B., Zeph, L., & Smith, N. (2012). Literacy by design: A universal design for learning approach for students with significant intellectual disabilities. *Remedial & Special Education*, *33*, 162-172. doi: 10.1177/0741932510381651

Cresswell, W. (2006). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches.* Thousand Oaks, CA: Sage.

Darling-Hammond, L., & McLaughlin, M. W. (2011). Policies That Support Professional Development in an Era of Reform. *Phi Delta Kappan, 92*(6), 81-92. Retrieved from http://www.pdkintl.org.

Dawson, K. (2007). The role of teacher inquiry in helping prospective teachers untangle the complexities of technology use in classrooms. *Journal of Computing in Teacher Education*, *24*(1), 5-12. Retrieved from http://www.iste.org/Content/NavigationMenu/Membership/SIGs/SIGTETeacherEducators/JCT E/Journal_of_Computing_in_Teacher_Educatio.htm

Dawson, K., Dana, N., & Fichtman, N. (2007). When curriculum-based, technology-enhanced field experiences and teacher inquiry coalesce: An opportunity for conceptual change? *British Journal of Educational Technology*, *38*, 656-667. doi:10.1111/j.1467-8535.2006.00648.x

Dhindsa, H., & Anderson, O. (2004). Using a conceptual-change approach to help preservice science teachers reorganize their knowledge structures for constructivist teaching. *Journal of Science Teacher Education*, *15*(1), 63-85. Retrieved from http://www.springer.com/education+%26+language/science+education/journal/10972

Dole, J., & Sinatra, G. (1998). Reconceptalizing change in the cognitive construction of knowledge. *Educational Psychologist*, *33*(2/3), 109. Retrieved from http://www.informaworld.com/smpp/title~content=t775653642~db=all

Elmore, R. (2000). Building a new structure for school leadership. Washington, DC: Albert Shanker Institute.

Elmore, R. (2002). Bridging the gap between standards and achievement: The imperative for professional development in education. Washington, DC: Albert Shanker Institute.

Elmore, R. (2004). *School Reform from the Inside Out.* Cambridge, MA: Harvard Education Press.

Fixsen, D. L., Naoom, S. F., Blase, K. A., Friedman, R. M. & Wallace, F. (2005). *Implementation Research: A Synthesis of the Literature* (FMHI Publication #231). Retrieved from University of South Florida, Louis de la Parte Florida Mental Health Institute Website, http://ctndisseminationlibrary.org/PDF/nirnmonograph.pdf

Fullan, M. (2005). Leadership and sustainability. Thousand Oaks, CA: Corwin Press.

Ganley, P. & Ralabate, P. (2013). *UDL Implementation: A Tale of Four Districts*. National Center on Universal Design for Learning. Retrieved from http://www.udlcenter.org/implementation/fourdistricts

Hall, T., Rose, D., & Meyer, A., Eds. (2011). *Universal Design for Learning: Practical Applications.* Cambridge, MA: Harvard Education Press

Hanuscin, D. L., van Garderen, D., Menon, D., Davis, J., Lee, E., & Smith, R. (2011). Teacher? Learner? Both!. *Science & Children, 48*(6), 55-59. Retreived from http://www.nsta.org/elementaryschool/.

High Incidence Assistive Technology Team. (2011). Universal Design for Learning. Retrieved from: http://www.montgomeryschoolsmd.org/departments/hiat/udl/

Higbee, J. L. (2009). Implementing universal instructional design in postsecondary courses and curricula. *Journal of College Teaching & Learning, 6*(8), 65-77. Retrieved from http://www.cluteinstitute.com/JCTLMain.htm

Higher Education Opportunity Act. 20 U.S.C. § 110-315 (2008).

Huey-Ling, L., & Gorrell, J. (2002). The road to preservice teachers' conceptual change. *Educational Research Quarterly*, *26*(2), 54. Retrieved from http://www.highbeam.com/Educational+Research+Quarterly/publications.aspx

Hunt, J. (2011). Making the most of universal design for learning. *Mathematics Teaching in the Middle School, 17* (3), 166. Retrieved from http://www.nctm.org/publications/mtms.aspx

ICF Macro (2010). *College and Career Readiness Grant: An Introduction to Universal Design for Learning Post-Workshop Survey Summary*. Calverton, MD: Author.

Jimenez, T. C., Graf, V. L., & Rose, E. (2007). Gaining access to general education: The promise of universal design for learning. *Issues In Teacher Education*, *16*(2), 41-54. Retrieved from http://www1.chapman.edu/ITE/.

Kuhn, T. (1970) *The structure of scientific revolutions*. Chicago, IL: University of Chicago Press.

Liu, L., Jones, P., & Sadera, W. (2010). An investigation on experienced teachers' knowledge and perceptions of instructional theories and practices. *Computers in Schools.27*, 20-34. doi: 10.1080/07380560903536256

Loudon County Public Schools (2011). *Universal Design for Learning.* Retrieved from http://cmsweb1.loudoun.k12.va.us/50910068152053/blank/browse.asp?a=383&BMDRN=2000&BCOB=0&c=91433

Mace, R. (1998). Universal design in housing. *Assistive Technology, 10*(1), 21-28. Retrieved from http://www.tandfonline.com/toc/uaty20/current.

Maryland State Department of Education. (2011). *A Route for All Learners.* Retrieved from:http://www.udlcenter.org/sites/udlcenter.org/files/Route_for_Every_%20Learner_Report_NSG_%2032511.pdf

McGuire, J., & Scott, S. (2006). Universal design for instruction: Extending the universal design paradigm to college instruction. *Journal of Postsecondary Education Disability, 19*(2), 124-134. Retrieved from http://www.ahead.org/publications/jped

McGuire-Schwartz, M., & Arndt, J. (2007). Transforming universal design for learning in earlychildhood teacher education from college classroom to early childhood classroom. *Journal of Early Childhood Teacher Education, 28*(2), 127-139. Retrieved from http://www.naecte.org/index.php?option=com_content&view=article&id=20&Itemid=33

Meo, G. (2008). Curriculum planning for all learners: Applying universal design for learning (UDL) to a high school reading comprehension program. *Preventing School Failure*, *52*(2), 21-30. Retrieved from http://heldref.metapress.com/app/home/journal

Miller, K., Koury, K., Fitzgerald, G., Hollingsead, C., Mitchem, K., & Hui-HsienTsai. (2009). Concept mapping as a research tool to evaluate conceptual change related to instructional methods. *Teacher Education & Special Education*, *32*, 365-378. doi:10.1177/0888406409346149

Moustakas, C. (1994). *Phenomenological research methods.* Thousand Oaks, CA: Sage.

National Governors Association Center for Best Practices, Council of Chief State School Officers. (2010). Common Core State Standards. Washington D.C., Author.

National UDL Center (2012). *UDL in your state*. Retrieved from http://www.udlcenter.org/advocacy/state.

Nelson, L., Arthur, E., Jensen, W., & Van Horn, G. (2011). Trading textbooks for technology: New opportunities for learning. *Kappan*, *4,* 46-50. Retrieved from http://www.kappanmagazine.org/

Orr, A. C., & Hammig, S. B. (2009). Inclusive postsecondary strategies for teaching students with learning disabilities: A review of the literature. *Learning Disability Quarterly, 32*(3), 181-196. Retrieved from http://www.cldinternational.org/Publications/LDQ.asp

Özdemir, G. & Clark, D. (2007). An overview of conceptual change theories. *Eurasia Journal of Mathematics, Science & Technology Education, 3*(4), 351-361. Retrieved from http://www.ejmste.com/index2.html

Pace, D., & Blue, E. (2010). Cutting edge educators: Preservice teachers' use of technology within universal design for learning framework. *Insights on Learning Disabilities, 7*(2), 19-29. Retrieved from http://www.ldworldwide.org/educators/ild-educators

Pace, D., & Schwartz, D. (2008). Accessibility in post secondary education: Application of UDL to college curriculum. *US-China Education Review, 5*(12), 20-26. Retrieved from http://www.teacher.org.cn/

Piaget, J. (1985). *The equilibrium of cognitive structures.* Chicago, IL: University of

Chicago Press.

Pintrich, Marx, & Boyle. (1993). Beyond cold conceptual change: The role of motivational beliefs and classroom contextual factors in the process of conceptual change. *Review of Educational Research, 63*, 167-200. Retrieved from http://rer.sagepub.com/

Posner, G., Strike, K., Hewson. P., & Gertzog, W. (1982). Accommodation of a scientific conception: Towards a theory of conceptual change. *Science Education, 67,* 489-508. Retrieved from http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1098-237X

Posner, G. & Vivian, C. (2010). Field experience: A guide to reflective teaching. Upper Saddle River, NJ: Pearson.

Ralabate, P., Dodd, E., Vue, G., Kargar, J., Smith, F., Carlisle, A., Hehir, T., Grindal, T., & Eidelman, H. (2012). *Understanding the impact of the race to the top and ARRA funding on the promotion of universal design for learning*. National Center on Universal Design for Learning. Wakefield, MA.

Rappolt-Schlichtmann, G., Daley, S., & Rose, L. T., Eds. (2012). *A Research Reader in Universal Design for Learning.* Cambridge, MA: Harvard Education Press.

Rose, D. (2001). Universal design for learning: Deriving guiding principles from networks that learn. *Journal of Special Education Technology, 16*(1), 66-70. Retrieved from http://www.tamcec.org/jset/

Rose, D., Gravel, J., & Domings, Y. (2010). *UDL unplugged: The role of technology in UDL*. Wakefield, MA: Center for Applied Special Technology.

Rose, D., Harbour, W., Johnston, C., Daley, S., & Abarbanell, L. (2006). Universal

design for learning in postsecondary education: Reflections on principles and their application. *Journal of Postsecondary Education Disability, 19*(2), 135-151. Retrieved from http://www.ahead.org/publications/jped

Rose, D., & Meyer, A. (2000). Universal design for learning. *Journal of Special Education Technology, 15*(1), 66-67. Retrieved from http://www.tamcec.org/jset/

Rose, D. & Meyer, A. (2002) *Teaching every student in the digital age: Universal Design for Learning*. Alexandria, VA: ASCD.

Rose, D. & Meyer, A., (Eds). (2006). *A Practical Reader in Universal Design for Learning.* Cambridge, MA: Harvard Education Press.

Rose, D., Meyer, A., & Hitchcock, C. (2005). *The universally designed classroom: Accessible curriculum and digital technologies*. Cambridge, MA: Harvard Education Press.

Sadera, W. (2001). *Conceptual change-based instruction and preservice teacher technology preparation: A collective case study*. Unpublished doctoral dissertation. Iowa State University, Ames, IA.

Sadera, W. & Hargrave, C. (1999). An identification of preservice teachers' Preconceptions about the role of the computer in learning and teaching. *Journal of Computing in Teacher Education, 15*, 19-23. Retrieved from http://www.west.asu.edu/achristie/journal.html

Sadera, W. & Hargrave, C. (2005). Conceptual Change in Preservice Teacher Preparation. In C. Vrasidas & G.V.Glass (Eds.), *Preparing Teachers to Teach with Technology*. (pp. 291-302). Greenwich, CT: Information Age Publishing.

Scott, S., McGuire, J., & Shaw, S. (2003). Universal design for instruction. A new

paradigm for adult instruction in postsecondary education. *Remedial Special Education, 24*(6), 369-379. Retrieved from http://rse.sagepub.com.proxy-tu.researchport.umd.edu/

Shah, N. (2012). Standards open the door for best practices from special ed. *Education Week*, *31*, 32-33. Retrieved from http://www.edweek.org/ew/index.html

Silver, P. Bourke, A., & Strehorn, K. (1998). Universal instructional design in higher education: An approach for inclusion. *Equity Excellence in Education, 31*(2), 47-51. Retrieved from http://www.tandf.co.uk/journals/titles/10665684.asp

Sinatra, G. (2005). The warming trend in conceptual change research: The legacy of Paul R. Pintrich. *Educational Psychologist*. *40*(2), 107-115. Retrieved from http://www.informaworld.com/smpp/title~content=t775653642~db=all

Spooner, F., Baker, J., Harris, A., Delzell, L., & Browder, D. (2007). Effects of training in universal design for learning on lesson plan development. *Remedial & Special Education, 2*(2), 108-116. Retrieved from http://rse.sagepub.com/

Strike, K. A., & Posner, G. J. (1992). A revisionist theory of conceptual change. In R. Duschl & R. Hamilton (Eds.), Philosophy of Science, Cognitive Psychology, and Educational Theory and Practice (pp. 147-176). Albany, NY:SUNY.

Tillema, H. (1997). Promoting conceptual change in learning to teach. *Asia-Pacific Journal of Teacher Education*, *25*(1), 7. Retrieved from http://atea.edu.au/index.php?option=com_content&task=view&id=16&Itemid=137

United States Department of Education, Office of Educational Technology. (2010).

National Educational Technology Plan. Retrieved from http://www.ed.gov/sites/default/files/NETP-2010-final-report.pdf.

Universal Design for Learning, Title 13A Maryland State Board of Education. § 13A.03.06 (Annotated Code of Maryland, 2012).

Varela, A. (2010). Three Major Sins of Professional Development How Can We Make It Better? *Education Digest,78* (4), 17. Retreived from http://www.eddigest.com.

Waters, T., Marzano, R.J., & McNulty, B. (2003). Mid-Continent Regional Educational Lab., A. O. (2003). Balanced Leadership: What 30 Years of Research Tells Us about the Effect of Leadership on Student Achievement. A Working Paper. Retrieved from: http://www.mcrel.org/PDF/LeadershipOrganizationDevelopment/5031RR_Balanced Leadership.pdf

Williams, J., Evans, C., & King, L. (2011). The impact of universal design for learning instruction on lesson planning. International Journal Of Learning, 18(4), 213-222. Retrieved from http://ijl.cgpublisher.com/

Zhang, Y. (2005). Collaborative professional development model: Focusing on universal design for technology utilization. *ERS Spectrum, 23*(3), 31-38. Retrieved from http://www.ers.org/periodicals.php

CURRICULUM VITA

NAME: Elizabeth Tessier Berquist

PROGRAM OF STUDY: Instructional Technology

DEGREE AND DATE TO BE CONFERRED: Ed D. May, 2013

Secondary education: Hereford High School, Parkton, MD 21120, 1996

Collegiate institutions attended:

Washington College, Chestertown, MD
B.A., 2000
Major: History and American Studies, Concentration: Education

Towson University, Towson, MD
M Ed., 2003
Major: Special Education

Goucher College, Towson, MD
Advanced Professional Certificate, 2005
Certification: Administration and Supervision

Towson University, Towson, MD
Ed D., 2013
Major: Instructional Technology

Professional positions held:

2000-2008
Teacher
Baltimore County Public Schools, Towson, MD

2008-2013
Lecturer
Towson University, Towson, MD

2013-
Assistant Professor
Towson University, Towson, MD