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**INTEGRATING UNIVERSAL DESIGN FOR LEARNING CONCEPTS INTO
SECONDARY GENERAL EDUCATION
INSTRUCTIONAL METHODS COURSES**

by

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B.S. Florida State University, 1998
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A dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
in the College of Education
at the University of Central Florida
Orlando, Florida

Summer Term
2010

Major Professor: Wilfred Wienke

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ABSTRACT

Because many general education teachers feel unprepared to provide students with disabilities with appropriate instruction, changes to teacher education programs are needed (Burdette, 2007; Smith et al., 2010). Teacher education programs need to integrate content regarding instructional methods for teaching and accommodating students with disabilities in secondary, general education classrooms (Burdette, 2007; Smith et al., 2010). The results of the research should provide insight (1) to determine if integrating instruction on UDL into preservice SGE students' instructional methods courses will increase students' knowledge of UDL and (2) to determine if integrating instruction on Universal Design for Learning (UDL) will affect how secondary social studies (SS) students design lesson plans, particularly, content delivery and student assessment, in regards to the three principles of UDL: multiple means of representation (MMR), multiple means of action and expression (MMAE), and multiple means of engagement (MME) (CEC 2005; Rose & Meyer, 2002; Sopko, 2009).

The research design was a quantitative, quasi-experimental design. The researcher proposed two research questions. The first question examined the extent to which integrating instruction on UDL into secondary general education (SGE) instructional methods courses might impact students' pre to posttest scores on an UDL knowledge Tests compared to the pre and posttest scores of SGE instructional methods courses students who do not receive such instruction on UDL. The second question evaluated the extent that integrating instruction on UDL into a SGE social studies (SS) instructional methods course may affect the content delivery and plan for assessment in students' written lesson plans related to UDL principles in a pre to post analysis. The participants in the research study were students enrolled in four content

specific SGE instructional methods courses: Social Studies (SS), Language Arts (LA), Mathematics (M) and Science (S).

Students in SS, LA, and M instructional methods courses comprised the three experimental groups in research question one. Students in the Science instructional methods course served as research question one's reference group. Students in SGE SS who participated in research question one and provided the researcher with a pre and post intervention lesson plan served as the subjects for research question two. The independent variable for both questions was an online, UDL instructional module. Research question one's dependent variable was the students' UDL Knowledge pre and posttest scores. Research question two's dependent variable was the students' pre and post intervention UDL lesson plan rubric scores.

Research question one's data were analyzed both within content area and between content areas. Potential significant differences within each content area's pre to posttest UDL Knowledge test scores were analyzed using the Wilcoxon test for matched-pairs. The difference between pre and posttest scores for each content area were calculated and then the pre/posttest difference scores for each content area were compared for statistical significance using the Mann-Whitney *U* test for independent samples. Potential significant differences in research question two's pre to post intervention UDL lesson plan rubric scores were calculated using the Wilcoxon test for matched-pairs.

The results from research question one indicated a significant difference ($p < .05$) between pre and post UDL Knowledge test scores within the SGE SS participants. Within the other three SGE content areas, M, LA, and S, subjects' UDL Knowledge pre to posttest scores did not significantly change. When each content area's difference score for the UDL knowledge pre and posttest were calculated and compared between content areas, only the SS and S pairing

demonstrated a statistically significant difference score ($p < .05$). Data from research question two indicated no statistically significant difference ($p > .05$) between pre and post intervention UDL lesson plan rubric scores.

The study provides impetus for future research regarding effective delivery of UDL content in teacher preparation programs. The study also provides suggestions for future researchers who may be interested in designing a similar research study. Finally, the study provides teacher education leadership with questions regarding how the three principles of UDL planning, instruction, and assessment align with the current teacher and student educational evaluation practice of standardized assessments.

I wish to dedicate this to my late father, D. H. Pawling (1938-2006), my mother, Patricia, my brother & his family, and God. You have always encouraged me and been by my side.

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The journey toward my doctorate degree officially began three years ago when I embarked on full-time pursuit of the degree. However, the personal and professional growth that lead to me to make the decision to apply and enter the doctoral program began a decade ago, as an undergraduate and graduate student at Florida State University. I owe a tremendous thank-you to Dr. A. Oseroff, Dr. M. Koorland, Dr. S. Lewis, Ms. L. Jones, and the late P. Ponder. I would also like to thank the members of the Council for Exceptional Children. As a student and professional member, I was blessed to have been taught and mentored by some of the most amazing teachers and leaders in the field of special education.

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To my dissertation committee – Thank you for your wisdom, guidance, and patience. The document herein would not have been possible without each of you: Dr. W. Wienke, Dr. L. Dieker, Dr. W. Russell, and Dr. E. Vasquez.

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LIST OF ACRONYMS/ABBREVIATIONS

CAST	Center for Applied Special Technology
CEC	Council for Exceptional Children
DOE	Department of Education
EPRRI	Education Policy Reform Research Institute
HEOA	Higher Education Opportunity Act 2008
IDEIA	Individuals with Disabilities Education Improvement Act 2004
IRIS	IDEA'04 and Research for Inclusive Settings
INTASC	Interstate New Teacher Assessment and Support Consortium
MMAE	Multiple Means of Action and Expression
MME	Multiple Means of Engagement
MMR	Multiple Means of Representation
NCAC	National Center for Accessing General Curriculum
NCCTQ	National Comprehensive Center for Teacher Quality
NCLB	No Child Left Behind Act 2001
NIMAS	National Instructional Materials Accessibility Standards
NLTS2	National Longitudinal Transition Study - 2
OSEP	Office of Special Education Programs
SGE	Secondary General Education
UDL	Universal Design for Learning
UD	Universal Design
WJIII	Woodcock Johnson III Tests of Achievement

CHAPTER ONE: INTRODUCTION

Background: Need for the Study

The 2001 passage of the No Child Left Behind Act (NCLB) requires schools to demonstrate that all students are academically achieving and reported in the schools' annual yearly progress (AYP) (Hardman & Dawson, 2008; Okolo, Englert, Bouck, & Heutsche, 2006), students with disabilities at the secondary school level are not academically achieving when compared to peers without disabilities (Wagner, Newman, Cameto & Levine, 2006). To enhance NCLB's mandate regarding academic progress for all students, the Individuals with Disabilities Education Improvement Act (IDEIA) 2004 least restrictive environment (LRE) component emphasized that students with disabilities have access to the general education curriculum. Both NCLB and IDEIA 2004 have prompted many schools and states to initiate inclusive educational environments in K-12 settings (Hardman & Dawson, 2008; Little & Hahs-Vaughn, 2007; Wagner, Newman & Cameto, 2004; Wagner et al., 2006).

In an inclusive setting, students with disabilities receive academic supports and accommodations in the general education classroom; therefore, the general education teacher often becomes the primary teacher of instruction for students with disabilities. In 2007, approximately 57% of students with disabilities participated in general education classes for 80% of their school day (Smith, Robb, West, & Tyler, 2010; Snyder, Dillow, & Hoffman, 2009). Research on pre-service teacher training and beginning teachers revealed that many general education teachers do not feel prepared to meet the various array of instructional accommodations for students with disabilities in their classrooms (Doyle & Giangreco, 2009; Government Accountability Office [GOA], 2009; Jimenez, Graf, & Rose, 2007; Knockey, 2006; Smith, Robb, West, & Tyler, 2010; VanHover & Yeager, 2003).

Because many general education teachers feel unprepared to provide students with disabilities with appropriate instruction, changes to teacher education programs are needed (Burdette, 2007; Smith et al., 2010). A change could be demonstrated by integrating content regarding instructional accommodations for students with disabilities. When provided with specific training, pre-service and beginning teachers express greater confidence regarding their ability to provide adequate instruction for students with disabilities in their classrooms (Avramidis & Kalyva, 2007; Brownell & Pajares, 1996).

Universal Design for Learning (UDL) is a curricular framework that combines several research based instructional practices to facilitate curriculum access for all students. The three primary research based instructional practices that create the UDL curricular framework are (a) differentiated instruction, (b) cooperative learning, and (c) active learning (Council for Exceptional Children [CEC], 2005; Hall, Strangman & Meyer, 2003; Jimenez et al., 2007; Pisha & Coyne, 2001). Additionally, UDL is based upon neuroscience findings related to learning and the brain, which parallel Vygotsky's three stages to learning theory (CEC, 2005; Pisha & Coyne, 2001; Rose & Meyer, 2002). When teachers utilize a curriculum constructed in a UDL model, they provide students with multiple means of representation (MMR), multiple means of action and expression (MMAE), and multiple means of engagement (MME) related to the content (CEC, 2005; Hall et al., 2003; Jimenez et al., 2007; Pisha & Coyne, 2001; Rose & Meyer, 2002; Sopko, 2008, 2009). By creating a flexible academic learning environment with a UDL framework, general education teachers provide students with disabilities ability to access the content, respond to the content, and receive assistance from other students in a cooperative learning setting (Doyle & Giangreco, 2009). Pisha and Coyne (2001) described a classroom

curriculum based on UDL as an environment where students can "construct, monitor, demonstrate, and communicate their own learning" (p. 199).

Statement of the Problem

NCLB and IDEIA 2004 have improved students with disabilities access to the general education curriculum and classroom; however, secondary students with disabilities are not academically achieving compared to their secondary general education peers. Research on beginning teachers has indicated that many general education teachers do not feel properly trained or prepared to deliver the various array of instructional accommodations for students with disabilities in their classrooms (Doyle & Giangreco, 2009; GOA, 2009; Jimenez et al., 2007; Knokey, 2006; Smith et al., 2010; VanHover & Yeager, 2003). Teacher education programs need to integrate content regarding instructional methods for teaching and accommodating students with disabilities in secondary, general education classrooms (Burdette, 2007; Smith et al., 2010).

Purpose

The purpose of the study was to examine the effects of integrating an instructional lesson on UDL into the secondary general education (SGE) instructional methods courses. The results of the research should provide insight (1) to determine if integrating instruction on UDL into preservice SGE students' instructional methods courses will increase students' knowledge of UDL and (2) to determine if integrating instruction on UDL will affect how secondary social studies (SS) students design lesson plans, particularly, content delivery and student assessment, in regards to the three principles of UDL: MMR, MMAE, and MME.

Research Questions

1. To what extent will integrating instruction on UDL into SGE instructional methods courses impact students' pre to post test scores on a UDL Knowledge Test compared to the pre and posttest scores of SGE instructional methods course students who do not receive instruction on UDL?
2. To what extent will integrating instruction on UDL into a SGE social studies (SS) instructional methods course affect the plan for content delivery and assessment in students' written lesson plans related to the principles of UDL in a pre to post analysis?

Independent variable

The IRIS UDL online instructional module (UDL module) was the independent variable for research question one and research question two.

Dependent variables

The dependent variable data in research question one were the participants' scores on the UDL knowledge posttest. The dependent variable data in research question two were the participants' post intervention scores on the lesson plan rubric.

Research Design

The selected research design is a quantitative, quasi-experimental design. The researcher proposed two research questions. Research question one's participants were divided into four groups: Social Studies (SS), Language Arts (LA), Mathematics (M), and Science (S). the SS, LA, and M SGE instructional methods course students comprised the three experimental groups. Each experimental group received the same intervention. The Science (S) SGE instructional methods students, served as a reference group because they did not participate in the intervention.. The majority of the participants 73.5% were in the experimental group.

Treatment Conditions

Research question one.

The participants for the study were recruited from the four SGE instructional methods courses offered each semester through the university. The SGE instructional methods course instructors were first contacted in Spring 2009 by the researcher regarding the study and provided verbal agreement to participate. In Fall 2009, the researcher met with the SGE instructional methods course instructors again to determine if they were still in agreement to participate in the study and permit the researcher to recruit participants from their January 2010 SGE instructional methods courses. All instructors agreed to the study.

All students enrolled in an SGE instructional methods course and present during the first day of data collection were eligible to participate in the study. Students who were enrolled in an SGE instructional methods course and were not present on the first date of data collection were not permitted to participate in the study. The rationale for excluding students enrolled in SGE instructional methods course who were not present the first day of data collection was that the pretest scores were used to determine sample homogeneity. By excluding students not present on the first day of data collection, the researcher attempted to limit the potential for a student to have information regarding the UDL Knowledge pretest and possibly research the topic prior to receiving the pretest; therefore, reducing the validity of the scores.

The UDL Knowledge pretest data collection occurred during each SGE instructional methods course's regular face to face course meeting time and date. Five weeks after participants completed the pretest, during a regularly scheduled face to face class meeting, participants completed the UDL Knowledge posttest. No other contact between the researcher and the participants occurred during the data collection process.

Research question two.

Study participation was open to students enrolled in the SGE SS instructional methods course during the Spring 2010 semester at the university. The data were collected during two regularly scheduled face to face meetings of the SGE SS instructional methods course on the university's main campus. The population of students in SGE SS instructional methods during Spring 2010 was expected to be 45 students. The researcher planned to have 85% of the population participate ($n = 38$) students. The SGE SS instructional methods course instructor requested that students bring in a previously written lesson plan to the second class meeting. The researcher attended the second class of the semester to introduce the research study regarding the purpose of examining the participants' lesson plans. The researcher did not inform the students that the lesson plan examination was related to the UDL Knowledge pre and posttest. The researcher did not tell students the evaluation criteria for the lesson plans. The researcher did emphasize that the SGE SS course instructor would not evaluate the lesson plans using the research rubric, nor would the course instructor have access to scores she assigned to the lesson plans. Students who agreed to participate in the study were provided with an informed consent form. Participants were asked to sign the form and write the last four digits of their university Personal Identification Number (PID) on the signature line.

Data Collection Procedures

Research question one.

Intervention group.

The research study was completed in six weeks. The study began with volunteering participants' signatures on the consent forms and the completion of the UDL pretest. Approximately two weeks later, students in the SS, LA, and M SGE instructional methods

courses were provided with access to the UDL module via an email message sent by their SGE instructional methods instructor through the university's electronic mail system. Two weeks after completing the UDL module, participants completed the UDL posttest and the Participant Feedback Questionnaire. After completion of the posttest and placing SS, LA, or M and the last 4 digits of his or her PID on the posttest and the Participant Feedback Questionnaire, the individual's participation in the research study was finished.

Reference group.

The study, regarding research question one, was completed in six weeks. The study began with volunteering participants' signatures on the consent forms and the completion of the UDL pretest. Five weeks after completing the UDL pretest, while attending one of the face to face class meetings, participants completed the UDL posttest. After completion of the posttest and placing S and the last 4 digits of his or her PID on the posttest, the individual's participation in the research study was finished. Participants in the reference group did not complete the Participant Feedback Questionnaire because they were not provided access to the intervention.

Research question two.

Data collection for research question two began in week 1 of the Spring 2010 semester, when the investigator recruited SGE SS students' from their instructional methods course to participate in the research by agreeing to submit two lesson plans to the investigator. Volunteer participants signed an informed consent form and agreed to bring an original lesson plan to class the following week. The students were asked to place SS and the last four digits of their PID on the lesson plans they submitted. In week 4 of the semester, the students were provided access to the intervention, the UDL module. Participants submitted the second lesson plan to the investigator during week 6 of Spring 2010 semester.

Instrumentation

Intervention

The UDL module (Appendix A) was designed for teachers of all content areas at the secondary level. The UDL module content, including the comprehension and application questions, was collaboratively developed by researchers at IRIS and experts in UDL, namely, the Center for Applied Special Technology (CAST) founder, Dr. David Rose, and CAST Director of Professional Development, Dr. Grace Meo. The module was released on the IRIS website, www.iriscenter.com, in September 2009

UDL Knowledge Measurement

The UDL Knowledge pretest (Appendix B) and posttest (Appendix C) were created based upon the information provided in the IRIS UDL module. The researcher developed a series of multiple choice questions and then performed a sampling item analysis according to the purposes of UDL. The questions on the UDL Knowledge pre and posttest were identical; however, the numerical order of the questions was altered from pre to posttest. The UDL Knowledge test pilot was completed by 30 SGE students the semester prior to data collection, exceeding the minimum suggested group size (5-10 people) for pretesting an independently designed instrument (Gay & Airasian, 2003). The reliability test was calculated using the Kruder-Richardson 20 (KR-20) formula. The pilot administration of the UDL Knowledge test demonstrated strong reliability by scoring 0.90 on a 0.0 to 1.0 reliability scale.

Lesson Plan Rubric

The lesson plans were scored using a rubric based upon the three UDL principles: MMR, MMAE, and MME. The rubric was developed by the Bartholomew Consolidated School Corporation and was featured, with permission, in a National Association for State Directors of

Special Education (NASDSE) report (Sopko, 2008). The researcher obtained copyright permission to use the rubric (Appendix D).

Data Analysis

The research data were collected quantitatively and analyzed using quantitative statistical measures with SPSS 17.0 software. Participants in the study were in preexisting groups, and the quantitative analysis selected to address the first research question, an ANCOVA, is one recommended statistical procedure for calculating data in nonrandomized studies (Dugard & Todman, 1995; Van Breukelen, 2006; Winkens, Van Breukelen, Schouten, & Berger, 2007). The second research question required a quantitatively scored lesson plan content analysis for SGE SS instructional methods students who met inclusion criteria. The non-parametric formula of the Wilcoxon T test for dependent samples (Shavelson, 1996), also referred to as the Wilcoxon matched-pairs signed-ranked test (Hinkle, Wiersma, & Jurs, 1998) was used to analyze the data for research question two. A Wilcoxon test for matched pairs was selected because the calculation is designed specifically for dependent sampling data. The Wilcoxon is the recommended analysis when each subject has two quantitative measures associated with him or her; i.e. pretest and posttest (Hinkle et al., 1998; Shavelson, 1996).

Definitions and Terms

- Center for Applied Special Technology (CAST): “is a nonprofit research and development organization that works to expand learning opportunities for all individuals, especially those with disabilities, through Universal Design for Learning” (www.cast.org/about/index.html)
- Higher Education Opportunity Act (HEOA) 2008: “This law contains a number of important new provisions that will improve access to postsecondary education for students with

intellectual disabilities. Of particular note are several provisions that address financial aid and create a new model demonstration program and coordinating center for students with intellectual disabilities” (Think College, 2010).

- Individuals with Disabilities Education Improvement Act (IDEIA) 2004: the reauthorized IDEA 1990, 1992, 1997, formerly Education of All Handicapped Children Act (EAHCA) 1975, 1983, 1986. IDEIA was aligned with NCLB which required assessment and accountability for all students. IDEIA defines the least restrictive environment (LRE) for students with disabilities as the general education classroom, unless the student demonstrates an inability to achieve in the general education classroom. IDEIA altered the assessment process to qualify students as having a learning disability. The new process Response to Intervention (RTI) requires the school implements research-based best practice instruction in the classroom for academically struggling students. Students are referred for a formal eligibility assessment after the RTI application was unsuccessful (Gargiulo & Metcalf, 2010; Rosenberg, Westling, & McLesky, 2008).
- Inclusion: “the practice of educating students with disabilities and other learners with exceptionalities in general education classrooms alongside their typical peers with appropriate supports and services provided as necessary” (Gargiulo & Metcalf, 2010, p.446).
- IRIS: a collaboration between OSEP, Vanderbilt University and Claremont Graduate University to create a "comprehensive national resource for faculty teaching preservice courses in general education, school administration, school counseling, and school nursing, resulting in new graduate who can meet the needs of students with disabilities" (Smith, Tyler, Skow, Stark, & Baca, 2003, p.2).

- Lesson plan: Goldman (2000): a lesson is “1. an exercise for student to learn, 2. Something learned by experience” (p.184); a plan is “1. outline; map; 2. Way of doing; scheme” (p. 246). A lesson plan serves as a teacher’s outline or map of instructional content, materials, and activities for students to learn.
- Universal Design (UD): The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design (Connell et al., 1997)
- Universal Design for Learning (UDL): "means 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; and (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 [HEOA, P.L. 110-315, § 103(a)(24)]” (Sopko, 2009, p.1)
- Woodcock Johnson Tests of Achievement (WJ III): a norm referenced test of academic achievement, often used to identify specific academic skill strengths and weaknesses (Flanagan, 2001)

CHAPTER TWO: LITERATURE REVIEW

Introduction

The 2001 passage of the No Child Left Behind Act (NCLB), required schools to demonstrate that all students, with and without disabilities, are academically achieving and reported in the schools' annual yearly progress (AYP) (Hardman & Dawson, 2008). Students with disabilities at the secondary school level are not academically achieving when compared to peers without disabilities (Wagner et al., 2006). To enhance current legislation mandate regarding academic progress for all students, the Individuals with Disabilities Education Improvement Act (IDEIA) 2004 least restrictive environment (LRE) component emphasized that students with disabilities have access to the general education curriculum. Karger (2005) explained that access to the general education curriculum is not synonymous with merely accessing the curriculum. Karger (2005) emphasized that the term access in IDEIA 2004 included students with disabilities “involvement” and “progression” within the curriculum and general education setting. Both NCLB and IDEIA 2004 have prompted many schools and states to initiate inclusive educational environments in K-12 settings (Hardman & Dawson, 2008; Little & Hahs-Vaughn, 2007; Wagner et al., 2004; Wagner et al., 2006).

In an inclusive setting, students with disabilities receive academic supports and accommodations in the general education classroom; therefore, the general education teacher often becomes the primary teacher of instruction for students with disabilities (Causton-Theoharis, Theoharis, & Trezek, 2008). According to Newman (2006), 70% of secondary students with learning disabilities take one or more academic courses in general education classrooms. *The Digest of Education Statistics 2008* reported over half of students with disabilities attended general education classroom settings for 80% of their school day (Snyder et

al., 2009). Research on pre-service teacher preparation and beginning teachers has indicated that many general education teachers do not feel prepared to meet the various array of instructional accommodations for students with disabilities in their classrooms (Jackson, Harper, & Jackson, 2001; Jimenez et al., 2007; Knoockey, 2006; VanHover & Yeager, 2003).

Because many general education teachers feel unprepared to provide students with disabilities with appropriate instruction (GOA, 2009), changes to teacher education programs are needed (Burdette, 2007; Jackson et al., 2001; Smith et al., 2010). A change could be demonstrated by integrating content regarding instructional accommodations for students with disabilities (Burdette, 2007; Rochkind, Ott, Immerwahr, & Johnson; 2008). With targeted instruction, pre-service and beginning teachers expressed greater confidence regarding their ability to provide adequate instruction for students with disabilities in their classrooms (Avramidis & Kalyva, 2007; Brownell & Pajares, 1996).

Universal Design for Learning (UDL) is a curricular framework that combines several research based instructional practices to facilitate curriculum access for all students (Bouck, Courtad, Heutsche, Okolo, & Englert, 2009; Doyle & Giangreco, 2009). Various research based instructional practices are implemented within the UDL curricular framework, including differentiated instruction, background knowledge, graphic organizers, and cooperative learning (CEC, 2005; Hal et al., 2003; Jimenez et al., 2007; Pisha & Coyne, 2001). Additionally, UDL is based upon neuroscience findings related to learning and the brain, which parallel Vygotsky's three elements for learning, "The learner must (a) recognize patterns in sensory data, (b) have one or more strategies for operating on the perceived patterns, and (c) be engaged both by the strategies and the sensory data to which he or she is applying them" (Pisha & Coyne, 2001, p.198).

When teachers utilize a curriculum constructed in a UDL model, they provide students with MMR, MMAE, and MME related to the content (CAST, 2008; CEC, 2005; Hall et al., 2003; Jimenez et al., 2007; Pisha & Coyne, 2001; Rose & Meyer, 2002; Sopko, 2008, 2009). By creating a flexible academic learning environment with UDL, general education teachers support students' ability to access the content, respond to the content, and receive assistance from other students in a cooperative learning setting (Doyle & Giangreco, 2009). Pisha and Coyne (2001) described a classroom curriculum based on UDL as an environment where students can "construct, monitor, demonstrate, and communicate their own learning" (p. 199). Okolo, Englert, Bouck, and Heutsche (2007) conducted a pilot study applying UDL principles: MMR, MMAE, and MME in three middle school SS classrooms. In the pilot study, students with disabilities exhibited content area knowledge gains comparable to their classmates who did not have disabilities.

This chapter synthesized current literature regarding the academic achievement of secondary students with disabilities, UDL, and instructional standards in teacher preparation programs. The chapter concludes by illustrating how integrating UDL instruction into teacher preparation programs facilitates compliance with the 2008 Higher Education Opportunity Act (HEOA), aligns with National Education Technology Standards for Teachers (NETS·T), and enhances SGE teachers' instructional prowess, providing the rationale for the research study.

Secondary Education and Inclusion

Legislative Impact on Secondary Settings

In 2001, the federal government reauthorized the Elementary and Secondary Education Act (ESEA) and renamed the law, NCLB. Today the law has returned to its original name: ESEA. The purpose of NCLB was to begin including all students in state, district, and national

assessments, so that all students' educational progress could be documented and recorded (Okolo et al., 2006). The law, though unfunded, had fiscal implications on schools, districts and states, because it required schools to assess all students in grades 4, 8, and 10. (Gargiulo & Metcalf, 2010; Hardman & Dawson, 2008; Rosenberg et al., 2008). In addition to assessing all students, schools were accountable to meet AYP goals regarding students' academic achievement scores. Schools who did not meet AYP were subjected to critical reviews and possible financial repercussions. Schools who fail to meet AYP for three consecutive years had to provide all students with the opportunity to attend a different public school, and the cost of transportation would be incurred by the failing school (Hardman & Dawson, 2008). Public schools across the nation were finally held accountable for the academic progress or lack thereof for all students. The resulting national data revealed a lack of academic success for students with disabilities, English language learners, as well as, race and economic status differentiation (Education Policy Reform Research Institute [EPRRI], 2004; Hardman & Dawson, 2008; Little & Hahs-Vaughn, 2007; Rosenberg et al., 2008).

In addition to NCLB, in 2004 the U.S. Congress reauthorized the Individuals with Disabilities Education Act (IDEA); renamed the Individuals with Disabilities Education Improvement Act (IDEIA). Individuals with Disabilities Education Improvement Act required schools to provide students with disabilities with access to the general education curriculum (Hardman & Dawson, 2008; Hitchcock, Meyer, Rose, & Jackson, 2002a; Okolo et al., 2007; Rosenberg et al., 2008). Recent data from the *National Longitudinal Transition Study-2* (NLTS2) indicated that students with disabilities who were included in general education courses at the secondary level earned lower grades than their general education peers; however, the same students were closer to performing at grade-level than students in segregated special education

classes (Knockey, 2006; Wagner et al., 2004). Together, NCLB and IDEIA have initiated a movement toward an educational model that will benefit and teach all students (Hardman & Dawson, 2008; Little & Hahs-Vaughn, 2007).

Students with Disabilities Academic Achievement in Social Studies

According to McCoy (2005), the area of social science is defined as “a complex area of study focusing on the integration of social science, behavioral science, and humanities that forms that basis of civic competence in the United States” (p. 2). With such a broad context, SS teachers often rely on standard textbooks to facilitate content mastery (Bouck et al., 2009; Connore & Lagares, 2007; Ellis, 1993; Okolo et al., 2006, 2007; Passe & Beattie, 1994). Okolo et al. (2007) stated, “school textbooks . . . reduce history into a static and uninteresting subject that challenges the literacy skills and motivation of students” (p.4). Additionally, Leming, Ellington, and Schug’s noted the data collected over the past decade indicated that high school graduates do not have a “basic knowledge of history, civics, economics, and geography” (2006, p. 322).

With much of secondary SS content derived from textbooks, teachers need to apply various instructional strategies and techniques to the classroom to support students with disabilities. Many students with disabilities experience deficits in academic skills necessary to effectively access a secondary text; i.e., reading, receptive and/or expressive language, and organization, (Connore & Lagares; Mastropieri & Scruggs, 2007; Passe & Beattie, 1994; Steele, 2007, 2008), students with disabilities struggle with SGE SS coursework. Students with disabilities may find SGE SS content challenging because many assignments require students to access the textbook (Connore & Lagares, 2007). Bouck et al. (2009) noted, “In contrast to other

school subjects, social studies has not received adequate attention in the education of students with disabilities, although it is an important domain of study for all students” (p.14).

Although the research regarding students with disabilities academic achievement in SGE SS is limited, the NLTS2 provided insight to students with disabilities academic achievement in this content area (Wagner et al., 2006). In NLTS2, students’ SS academic achievement levels were assessed with the Woodcock Johnson Achievement Tests (WJIII). The WJIII is a standardized, norm-referenced, assessment designed to evaluate individual’s between 2 and 90 years of age (Flanagan, 2001). The WJIII is comprised of six academic subtests: passage comprehension, synonyms/antonyms, mathematical calculations, applied problems, social studies, and science. The WJIII data were analyzed using standard scores. For the general population, the mean standard score is 100 and an estimated 50% of the general education population scores at or above the mean. Approximately 34.1% of the general education population earn a standard scored between 85 and 100; 13.6% of the general education population scores between 70 and 84.9; finally, a mere 2.3% of the general education population’s score below a standard score of 70 on each WJIII subtest (Wagner et al, 2006).

Each subtest on WJIII evaluates particular elements of a corresponding content area. The social studies subtest examines student knowledge of "history, geography, government, economics, and other aspects of social studies" (Wagner et al., 2006, p.16). On this particular subtest, approximately 16.5% of students with disabilities scored at or above 100, a stark contrast to 50% of general education students. The percentage of students with disabilities who scored between 85 and 100 (30%) was comparable to the general population (34.1%); however, when examining scores below 85, the achievement gap increased. Approximately 39% of students with disabilities scored between 70 and 84.9 verse 13.6% of the general population. Finally, 14.8% of

students with disabilities earned a standard score less than 70; whereas, in the general population only 2.3% of students scored less than a 70 standard score (Wagner et al., 2006).

In addition to comparing each of the six subtest scores of general education students and special education students, NLTS2 dissected the subtest data according to disability categories: (a) other health impairment, (b) visual impairment, (c) emotional disturbance, (d) learning disability, (e) speech/language impairment, (f) orthopedic impairment, (g) hearing impairment, (h) traumatic brain injury, (i) autism, (j) deaf-blindness, (k) multiple disabilities, and (l) mental retardation. The data indicated that the passage comprehension subtest resulted in the worst mean scaled scores across all disabilities. When compared to other content area subtests in the disaggregated analysis, students in seven disability categories mean scores on the social studies subtest were one or more standard deviations below the general population mean.

The NLTS2 data indicated that students with disabilities have not acquired adequate instruction in the area of social studies, when compared to reading, writing, and mathematics instruction. Considering approximately 70% of students with disabilities participated in general education social studies curriculum (Passe & Beattie, 1994; Newman, 2006), and 38.8% of students with disabilities mean scores fell between 1 and 2 standard deviations below the mean (Wagner et al., 2006), Hardman and Dawson (2008) concluded, "all teachers need to acquire a core of knowledge and skills that facilitates their ability to teach and work collaboratively in meeting the needs of all students" (p.7).

Secondary Student Outcomes

The long term goal for all students is to graduate from secondary school and have the skills necessary to either obtain gainful full-time employment or attend a post-secondary institution to acquire additional skills (Knockey, 2006). Because of NCLB and IDEIA, more

students with disabilities have access to general education courses and subsequently academic instruction (Hardman & Dawson, 2008; Little & Hahs-Vaughn, 2007; Okolo et al., 2006). Researchers have documented all students' academic gains in the literature (Lauer et al., 2005), and for students who are not academically progressing, schools have implemented programs to provide additional assistance to students; i.e., specific strategy instruction (Duffy, 2007; Hock, Pulvers, Deshler, Schumaker, 2001; Kamil et al., 2008; Regional Educational Laboratory (REL) Central, 2008; Scammacca et al, 2007) . Yet, despite the additional academic assistance, the Alliance for Excellent Education (2008) reported that “only about one third of the students who enter ninth grade each year can expect to graduate four years later having learned what they need to be prepared for postsecondary education or the workforce” (p.1).

If statistics indicate that only one-third will graduate from high school ready for work or postsecondary school, what does the future hold for students who do not graduate with employment or postsecondary skills? According to the Alliance for Excellent Education (2008), “another third will graduate, but without the knowledge and skills necessary for success in college, career training, or entry-level jobs. And the final third will drop out of school before graduation day” (p.1). America's failure to properly educate the youth may have created future economic implications. It is estimated that “if the students from 2008 who dropped out had stayed in school and graduated, the nation would have benefitted from an additional \$319 billion in wages, taxes, and productivity over the course of their lifetimes” (Alliance for Excellent Education, 2008, p.2). Though the dollar amount was an estimate, Trilling and Fadel (2009) commented that even a slight increase in a nation's literacy rate can improve the economy. In Miller (2007), the estimated impact on an individual's wages for each year of educational studies was a ten percent increase. Improving the educational outcomes for secondary students with and

without disabilities is key if America plans to continue to be a global economic entity in the “Knowledge Age” (King, Newmann, & Carmichael, 2009; Trilling & Fadel, 2009).

Universal Design for Learning

History

Universal Design for Learning (UDL) is a curricular construct that was developed by the Center for Assistive Special Technology (CAST) (Hall et al., 2003; Rose & Meyer, 2002; Rose, Meyer, & Hitchcock, 2005). A universally designed curriculum can meet the needs of all learners by providing flexible methods of instruction, materials for instruction, learning assessments, learning goals, and actively engaging students (Hall et al., 2003; Rose et al., 2005). The UDL concept was modeled after the architectural concept of Universal Design (UD). Universal Design was implemented in conjunction with the Americans with Disabilities Act (ADA), eliminating environmental barriers that restricted individuals with some disabilities’ access to various public locations; i.e., curb cuts, ramps, elevators, Braille labels on buildings and elevators, etc. (Burgstahler, 2009; Connell et al., 1997; Hall et al., 2003; Hitchcock, Meyer, Rose & Jackson, 2002b; Pisha & Coyne, 2001; Rose et al., 2005; Smith et al., 2010). The architectural and product implementation of ADA benefitted individuals without disabilities, as well; i.e., a woman pushing a baby stroller could access the curb cuts at a street crossing instead of pulling the stroller over the curb (Hall et al., 2003; Ketterlin-Geller, 2005; Pisha & Coyne, 2001; Rosenberg et al., 2008).

Although ADA paved the way for accessible architecture and products, print based, public school curriculum remained inaccessible to many students (Hitchcock & Stahl, 2003; Hitchcock et al., 2002a; Ketterlin-Geller, 2005; Pisha & Stahl, 2005; Rose & Meyer, 2002; Rose et al., 2005). Hitchcock et al. (2002b) defined

“four main components of the general curriculum: 1) goals and milestones for instruction (often in the form of a scope and sequence), 2) media and materials to be used by students, 3) specific instructional methods (often described in a teacher’s edition), and 4) means of assessment to measure student progress” (p.3).

The Individuals with Disabilities Education Act (IDEA) 1997 stated that students with disabilities should access, participate, and academically progress in the general curriculum (Hitchcock et al., 2002b). The Office for Special Education Programs (OSEP) and CAST responded to the accessible curriculum challenge and developed the National Center on Accessing General Curriculum (NCAC) (Casper & Leuchovius, 2005; Rose & Meyer, 2002).

In addition to OSEP and CAST, NCAC included Boston College School of Education, Harvard University Children’s Initiative and Harvard Law School, CEC, and Parent Advocacy Coalition for Educational Rights (PACER) (Rose & Meyer, 2002). The unique assembly of partners and experts at NCAC researched best teaching practices, curriculum design, and educational technology to develop guidelines for accessible curricula. After five years, NCAC released the National Instructional Materials Accessibility Standard (NIMAS). The NIMAS were based on technology and the ability to digitize print-based curricula (Pisha & Stahl, 2005; Rose & Meyer, 2002; Rose et al., 2005). The IDEIA 2004 included language regarding state and local education agency responsibility to purchase curriculum compliant with NIMAS guidelines (Karger, 2005; Pisha & Coyne, 2005; Rose et al., 2005).

CAST took the concept of UD and added the ‘L’ for learning and decided to examine the possibility of designing universal curriculum, accessible by all students (Hitchcock et al., 2002b). Additionally, Hall et al., (2003) reported that UDL “is based on research from neurosciences and effective teaching practices” (p.2). In fact, UDL is based on an identified three learning networks

in the brain: the recognition network (what we see); the strategic network (how we plan and formulate actions or responses), and the affective network (our emotional responses to environmental stimulus (CEC, 2005; Rose & Meyer, 2002). Curriculum created under the theoretical constructs of UDL provide all students with multiple means for representing the instructional content (MMR), multiple means of action and expression to respond to the content (MMAE), and finally multiple means of engaging with the content, creating interest and self-regulation activities (MME) (CAST, 2008; CEC, 2005; Hitchcock & Stahl, 2003; Pisha & Stahl, 2005; Rose & Meyer, 2002; Rose et al., 2005; Sopko, 2008) .

General Instructional Components

With the development of NCAC and NIMAS, students with disabilities' access to general education curriculum improved. In 2005, CEC noted that access to the curriculum does not equate to the ability to learn from the curriculum. In the same way, being able to read a textbook does not necessarily equate to knowledge, understanding, or comprehension (Darling-Hammond, 2008). Universal Design for Learning provides students with accessible content integrated with multiple media, multiple pathways for actions and instructions, multiple ways to engage based on students' interest and motivation (CEC, 2005; Hall et al., 2003; Hitchcock et al., 2002b; Jackson & Harper, 2001; Jimenez et al., 2007; Karger, 2005; Rose & Meyer, 2002; Rose et al., 2005).

With the foundation of UDL being multiple means to access, respond, and engage in curriculum, UDL reflects key concepts from differentiated instruction (Hall et al., 2003; Rose et al., 2005). Differentiated instruction provides teachers with a means for assessing students' academic and social strengths and weaknesses and applying the knowledge to curriculum (Tomlinson, 2001). The three components of differentiated instruction are content, process, and

product. Under the guidelines of differentiated instruction, the content must be accessible; goals and objectives are flexible, and each student is academically challenged at his or her level (Hall et al., 2003; Tomlinson, 2001). When teachers create a flexible curriculum, they provide students with the ability to decide how the students would like to acquire the information (content). Additionally, students are engaged in the learning (process) because of the variety of activities students complete to learn new skills. Finally, the students have multiple ways of demonstrating to the teacher what they learned (product) (CEC, 2005; Hall et al., 2003; Rose & Meyer, 2002).

Each of the three principles of UDL: MMR, MMAE, and MME have been linked to each of the brain's learning networks: recognition, strategic, and affective (Hall et al., 2002; Rose & Meyer, 2002). Additionally, CAST identified various teaching methods and instructional designs to support the three learning networks of the brain and facilitate the three principles of UDL (Hall et al., 2003). Technology, especially digital media, can facilitate UDL teaching methods (Hitchcock & Stahl, 2003; Hitchcock et al., 2002a; Pisha & Stahl, 2005; Rose et al., 2005). According to Rose and Meyer, however, technology is not required to implement the principles of UDL (Rose & Meyer, 2002).

UDL Principles and Teaching Methods

Principle One: Multiple Means of Representation (MMR)

The principle of MMR supports the recognition learning network in the brain (Jackson & Harper, 2001; Jackson et al., 2001; Rose & Meyer, 2002). The recognition learning network is composed of all the body's senses; hearing, sight, taste, smell, and touch, or if a student has one or more sensory impairments, the recognition network is comprised of the sensory organs that provide the individual with environmental information (CAST, 2008; Rose & Meyer, 2002).

Because students cannot learn what they cannot perceive, teachers should consider MMR when planning to deliver content (CAST, 2008). To meet the recognition needs of diverse students, teachers can provide students with multiple examples, highlight salient features for students, use multi-media and technology to stimulate multiple sensory modalities, and support students with background content (CAST, 2008; Rose & Meyer, 2002).

CAST (2008) explained that teachers can present material in multiple formats by adding color, sound, contrast, images, animation, video, etc. to their instructional lesson materials and delivery (Rose & Meyer, 2002; Rose et al., 2005). Even after students are provided with malleable information, they may not attend to the correct elements (Darling-Hammond, 2008; Rose & Meyer, 2002). Teachers can provide support for students by highlighting and indicating the important features (Hall et al., 2003; Hitchcock et al., 2002a; Rose & Meyer, 2002).

To enhance visual recognition, teachers can alter the print with color, text format changes, and adding notations. Graphic organizers can assist students by representing information as a visual image and text (Strangman, Hall, & Meyer, 2003). Teachers may enhance auditory recognition by altering voice pitch, repeating a phrase, or by verbally stating the material is important (Rose & Meyer, 2002). When students experience difficulty perceiving information through sight or hearing, teachers can provide the student with tactile objects or elements related to the content to facilitate comprehension (Dion, Hoffman & Matter, 2000). Teachers can also use multiple media options to stimulate multiple sensory modalities simultaneously, as well as, provide students with the option to access the information through their preferred modality (Jackson & Harper, 2001; Rose & Meyer, 2002; Strangman et al., 2003).

Multiple means of representation includes support for students' background knowledge (Rose & Meyer, 2002; Strangman, Hall, & Meyer, 2004; UDL national design for learning task

force, 2010a). Teachers need to include an assessment of student background knowledge prior to teaching new material, because the brain attaches new knowledge and information to previously known information (Rose & Meyer, 2002). Research on the effect of prior knowledge on students' reading comprehension, interest in a subject, and student study habits has shown that prior knowledge is highly correlated with academic success (Strangman et al., 2004). By supporting students' prior knowledge of the content, teachers can help students fill in their knowledge gaps (Rose & Meyer, 2002; Strangman et al, 2004).

Principle Two: Multiple Means of Action and Expression (MMAE)

The second principle of UDL, MMAE, supports the strategic learning network of the brain (Jackson et al., 2001). The strategic learning network refers to the area of the brain that monitors 'how' people learn (Rose & Meyer, 2002). Students vary in their abilities to physically perform or express what they know. Traditionally, classroom teachers assess students' content knowledge by evaluating the students' abilities to decode, manipulate, and/or create written text or images (Bouck et al., 2009; CAST, 2008). As another option to assess students' knowledge, teachers can provide students with multiple models for completing the task, permit students to practice with support, provide ongoing feedback, and offer flexible means for demonstrating knowledge (Rose & Meyer, 2002).

Providing students with multiple models of a task can be accomplished by altering the setting for the instruction from large group to small group or one-on-one. Additionally, students could participate in a real frog dissection, a virtual frog dissection, or observe an animated frog dissection to learn the dissection process and internal parts of the frog. When students are provided the opportunity for independent, supported practice, teachers can scaffold content (CAST, 2003; Hall et al., 2003; Strangman et al., 2004). Rose and Meyer (2002) provided the

example of learning to ride a bike. First, the learner uses training wheels with parental support; then training wheels without support; then no training wheels and parental supports; and finally, the child rides the bike without support. During the scaffolding process, the teacher can provide feedback regarding the student's skill acquisition. Consistent feedback is essential when students are learning a new skill, so that they can identify areas of success and weakness (Rose & Meyer, 2002; Strangman et al., 2003). Because consistent feedback promotes skill and knowledge acquisition, many computer programs award consistent feedback; i.e. word processing program's automatic underlining of misspelled words (Jackson et al., 2001; Rose & Meyer, 2002).

Teachers facilitate the MMAE principle of UDL when they provide students with a variety of means to demonstrate their knowledge and understanding of content (CAST, 2008; Hall et al., 2003; Hitchcock et al., 2002a; Meo, 2008; Rose et al., 2005; Strangman et al., 2003; UDL national design for learning task force, 2010a). With access to computers and digital media, students have access to a myriad of avenues to demonstrate content knowledge (Okolo et al., 2007). Students can create digital presentations, audio files, web pages, as well as, create digital images (Hitchcock & Stahl, 2003; Hitchcock et al., 2002a; Rose & Meyer, 2002). If students do not have access to technology, they might demonstrate knowledge with an oral presentation, a three-dimensional model, graphic organizer, drawing, or physical performance (Rose & Meyer, 2002; Strangman et al., 2003).

Principle Three: Multiple Means of Engagement (MME)

The affective learning network of the brain is concerned with the "why" of learning (Rose & Meyer, 2002). If a teacher wanted to stimulate students' affective learning networks, the teacher needs to engage the students in the learning process by "tapping into learners' interests and offering appropriate challenges to increase their motivation" (Jimenez et al., 2007,

p.45). When students are provided with the opportunity to integrate their personal interests into the lesson, they are more likely to participate (Hall et al., 2002; Rose & Meyer, 2002). Students are more likely to engage in curriculum when they (a) choose elements of the instructional content and tools, (b) are appropriately challenged, (c) can select rewards, and (d) have input regarding the context of their learning (CAST, 2008; Strangman et al, 2004).

When students have the ability to choose from various aspects of content and tools, they are more likely to be engaged because they are interested in the learning (Bransford, Brown, Cocking, Donovan, & Pellegrino, 2000). Calculating compounded interest is not the most exciting math skill for many students. If however, the students are old enough to own and drive a vehicle, learning how to calculate the true cost of the car after they paid off the loan, they may be more inclined to pay attention. Capturing the students' interests, however, does not equate with effective engagement. Teachers must also assess the students' appropriate level of difficulty (Strong, 2007). If a task is too difficult, the student may become frustrated and quit. The opposite however, can be true as well; if a task is not challenging enough, a student may become uninterested and inattentive (Strangman et al., 2004). To assist in managing the difficulty level for students, as well as, engage them, teachers can have students form cooperative learning groups and peer tutoring pairs (CAST, 2008; Doyle & Giangreco, 2009; Okolo et al., 2006, 2007).

When students are interested in the content and appropriately challenged, they are more likely to be engaged in learning (Strong, 2007). Sometimes, teachers need to reward students for active engagement. Teachers should consider students' interests when they create an incentives program (Strong, 2007). Rose and Meyer (2002) suggested offering a variety of possible rewards, and permitting the student to select his or her reward. Similar to students being able to

select their rewards, teachers should also provide students with the ability to choose the best learning context for themselves. Jackson et al. (2001) explained how tangible rewards are “much like the system of paychecks do for working adults” (Jackson et al., 2001, p.1). The best learning context or environment is different for every student. Some students prefer to work independently without any distractions, and some students prefer independent work and thrive with background noise. Other students prefer to work in collaborative groups where they can share ideas and obtain immediate feedback. A student’s best learning context may be considered his or her “home court.” Along the lines of an athletic team having ‘home court advantage;’ in the student’s ‘academic home court,’ he or she is confident and comfortable (Rose & Meyer, 2002). Whether it is ‘home court,’ cooperative learning, appropriate challenges, or personal interest in content, the research has indicated that engaged students are learning students (Alliance for Excellent Education, 2008).

Teacher Education Programs

Beginning Teacher Standards

Beginning teachers are expected to demonstrate a composition of knowledge and skills that they received in formal teacher training. In 1987, the Council for Chief State School Officers (CCSSO) established The Interstate New Teacher Assessment and Support Consortium (INTASC). The consortium's purpose was to gather state education leaders to discuss and evaluate the process and procedures for teacher certification and licensing among states. In 1992, INTASC released the document *Model Standards for Beginning Teacher Licensing, Assessment and Development: A Resource for State Dialogue*. The consortium established ten standards for beginning teachers. The third principle required new teachers to "create instructional opportunities that are adapted to diverse learners" (INTASC, 1992, p.18). Diverse learners

included students with exceptionalities and English Language Learners. Beginning teachers were expected to have knowledge about students with disabilities, but did teachers apply their knowledge?

In 1992, the Department of Education (DOE) may not have been able to answer that question, but today, states, districts and the DOE can answer it. With the passage of NCLB 2001 and IDEIA 2004, students with disabilities' academic achievement, compared to their general education peers, became a critical measure of school, district, and state educational success (Okolo et al., 2006). Individuals with Disabilities Education Improvement Act prompted the inclusion of students with disabilities into general education classrooms for core content curriculum (Education Policy Reform Research Institute [EPRRI], 2004; Hardman & Dawson, 2008; Knockey, 2006; Newman, 2006; Okolo et al., 2006, 2007; Steele, 2008). "As the line between general education and special education becomes increasingly blurry, we must redefine and renegotiate the roles of all educators" (Hardman & Dawson, 2008, p.10). Because the 'lines are blurring' between general and special education teachers, education researchers investigated general and special education teachers' thoughts on their teacher preparation programs. Researchers found most general education teachers felt unprepared to design instructional lessons for all students (Burdette, 2007; Doyle & Giangreco, 2009; Jackson et al., 2001; Okolo et al., 2006; van Hover & Yeager, 2003). Likewise, special educators expressed concern for their lack of preparation to deliver content instruction; subsequently, special education teachers stated that approximately 61% of their students are poorly prepared for the next year's course work (Lintner & Schweder, 2008).

Teacher educators, researchers, and the DOE have examined students with disabilities lack of academic progress and their practicing teachers' input. They have agreed that the

knowledge and skills required for educators to be successful has changed (Burdette, 2007; EPRRI, 2004; Hardman & Dawson, 2008; Mariotti, 2009). In response, The Education Policy Reform Research Institute (EPRRI) held a national symposium to discuss the future standards for teacher education. Educational leaders and stakeholders attended the symposium, including: state and district educational personnel, individuals in teacher education, national organizations in education, members from the DOE and Office of Special Education Programs (OSEP). At the conclusion of the symposium, the group established a list of ten essential knowledge and skills that all educators should demonstrate prior to certification.

Table 1: *Ten Essential Knowledge & Skills for Educators*

1	Understand state and federal legislation related to academic content and achievement standards and recognize that these laws apply to EVERY student.
2	Understand state and district academic content and achievement standards and recognize that these standards apply to EVERY student.
3	Design instruction that supports the achievement of grade level academic content standards by students with disabilities.
4	Develop IEPs that support the achievement of grade level academic content standards.
5	Design learning environments that support the achievement of grade level academic content standards by students with disabilities.
6	Understand state and federal legislation on state and district assessments and accountability, and recognize that these laws apply to EVERY student.
7	Understand state and district assessment and accountability systems and recognize that EVERY student is expected to participate in general assessments with or without accommodations, or in alternate assessments.
8	Make appropriate participation and accommodation decisions for students with disabilities and document on each student's IEP.
9	Assist students with disabilities in selecting and using accommodations, including assistive technology.
10	Understand the design and use of alternate assessments for students with significant disabilities

(EPRRI, 2004, p.9)

The list developed by EPRRI complemented work completed by the Special Education Committee of INTASC. In 2001, INTASC stated that students with disabilities should have access to general education curriculum. Additionally, the INTASC Special Education Committee declared "all teachers, both general educators and special educators, must have knowledge and skills related to their subject matter discipline and the principles of effective teaching and learning as well as specific knowledge and skills drawn from the field of special education" (INTASC, 2001, p.1).

Despite the support of INTASC and EPRRI, some teachers graduated from general education teacher preparation programs and expressed a lack of training on accommodating students with disabilities in class (Conklin, 2007; Doyle & Giangreco, 2009; GOA, 2008; Knockey, 2006; Rochkind et al., 2008; Smith et al., 2010; van Hover & Yeager, 2003). In fact, van Hover and Yeager (2003) found that their subjects felt history instruction was the same for all students in their classrooms. Of the 13 secondary teachers in their study, all expressed resistance to adapting instruction; "No teachers mentioned the possibility of individualizing or differentiating history instruction and curriculum to meet the learning needs of students with disabilities" (van Hover & Yeager, 2003). Frankly, one teacher referred to required accommodations as "insane," and that his accommodations were limited to only those requested by his special education colleagues (van Hover & Yeager, 2003). In her 1999 study on general education teachers' attitudes toward students with disabilities, deBettencourt found that 37% of participants did not support the idea of mainstreaming students with disabilities. Additionally, 34% of participants felt that mainstreaming did not improve the school experiences for students

without disabilities. Finally, 31% of participants believed that mainstreaming did not improve the academic skills of students with disabilities.

Although some general education teachers expressed resistance toward accommodating students with disabilities in the classroom (deBettencourt, 1999; van Hover & Yeager, 2003), Avramidis and Kalyva (2007) found that teacher attitudes can be changed. When teachers are provided with effective support and preparation to teach students with disabilities, they become more willing to teach students with disabilities in their classes (Brownell & Pajares, 1996; Scruggs & Mastropieri, 1996). In addition to effective supports, teachers expressed a positive sense of self efficacy and reported feeling successful in their efforts to teach inclusive classrooms (Jackson et al., 2001) after they received some training regarding "(a) the needs of students with disabilities, (b) curricular and instructional adaptations for students, and (c) behavior management techniques for students with disabilities" (Brownell & Pajares, 1996, p. 16)

IDEA '04 and Research for Inclusive Settings (IRIS)

Vanderbilt University and Claremont Graduate University collaborated with OSEP to create a "comprehensive national resource for faculty teaching preservice courses in general education, school administration, school counseling, and school nursing, resulting in new graduate who can meet the needs of students with disabilities" (Smith, Tyler, Skow, Stark, & Baca, 2003, p.2). The collaboration developed IRIS to facilitate their vision of providing faculty in general education with a resource for research-based, best practice methods for teaching and accommodating students with disabilities in general education classrooms (GOA, 2009; Smith, et al., 2003). The online IRIS content modules were designed by applying Dr. John Bransford and colleagues' research on adult learning. Bransford and colleagues at the Learning Technology

Center identified five components in the adult learning cycle, and they developed the Star Legacy Module for the content and curriculum provided in IRIS (Smith et al., 2003).

The *Star Legacy Module* is a five point module, hence the Star image. The cycle begins with The Challenge, a presentation of a probable school scenario. The Challenge's problem is designed to activate the participant's prior knowledge and initiate the process for the brain to begin thinking about possible means to solve the problem. The second stage in the cycle is titled, Initial Thoughts. Students are required to record their 'initial thoughts' or brainstorming various probable solutions to the challenge. The participants' brainstorming actions instigates their metacognitive processes. After self-reflection on their 'initial thoughts' for solving the problem, participants advance to the Perspectives portion of the module. The Perspectives section presents students with knowledge and ideas on how to solve the problem from "experts" in the field of education. The Perspectives element also includes a resources section. In the resources section, students may experience simulations, be asked additional questions, and select links to other resources and materials. IRIS designed the resource section to facilitate students' practice of their new skills. The fourth point of the *Star Legacy Module* is the Assessment. The Assessment component provides the student with an opportunity to apply the new skills and information he or she acquired from the module. Additionally, the Assessment delivers immediate feedback to the student. If the participant performs poorly, the student may return to previously completed portions of the module to review information and promote content mastery. The final point, completing the *Star Legacy Module* is titled, Wrap It Up. Wrap It Up is designed to summarize the module's key points of information. The Wrap It Up section also contains an assessment item. The assessment item can be one task or a combination of tasks, a)

essay, b) quiz, or c) written assignment. IRIS provided the module assessments to better measure student learning. (Smith et al., 2003).

The research on teaching and learning is extensive (Bransford et al., 2000; Darling-Hammond, 2008). Within the research and learning theories, three, essential learning steps emerge: prior knowledge, engaged practice, and metacognition (Bransford et al., 2000; Darling-Hammond, 2008). Before introducing new content to students, teachers must access the students' prior knowledge. Accessing prior knowledge provides students with a reference point to begin adding the new information (Bransford et al., 2000; Darling-Hammond, 2008). After accessing prior knowledge and creating a foundation, teachers may introduce new content material. In order to create deep and thorough understanding of factual knowledge surrounding the new concept, students require multiple examples and opportunities to practice or apply the new information. Providing students with depth and multiple examples of a new construct and accessing their prior knowledge about the information, by itself however, does not equate with best teaching practices (Bransford et al., 2000). The third concept that teachers must model for students as they acquire new skills and new information is metacognition (Bransford et al., 2000; Darling-Hammond, 2008). By providing interactive online modules, IRIS has created a research-based, best practices learning environment.

The IRIS modules are designed to support all three learning steps. The modules begin by accessing students' prior knowledge or perceived knowledge on the topic by presenting a frequent classroom "Challenge" scenario (The IRIS Center for Training Enhancements [IRIS], n.d.). After accessing prior knowledge, the modules provide the new informational content and relate the content's application to the original classroom challenge. Throughout the module, students are provided with multiple classroom examples where they can practice applying their

new knowledge (Bransford et al., 2000; Darling-Hammond, 2008). Finally, throughout the module, audio and text questions are presented to students, followed by expert responses to the questions. The expert responses are provided in audio and text format, supporting various learning styles. The experts' responses model metacognitive problem solving strategies for the participants to practice. (IRIS, n.d.). In 2009, IRIS released the first *STAR Legacy Module on UDL: Universal Design for Learning: Creating a Learning Environment that Challenges and Engages All Students*. The IRIS UDL module was the intervention applied in this research study.

Teacher Preparation and UDL

Legislation

The theoretical construct of UDL has become a topic of discussion related to educational policy, curricular design, and research literature. Though UDL had been often discussed, it was frequently confused with other terminology; such as, differentiated instruction (Hall et al., 2003), response to intervention (Edyburn, 2009), and inclusion ("Reaching all students", 2005). Until recently, UDL was a dynamic phrase, as the term had not been defined in law. In 2008, however, UDL was defined in legal terms with the reauthorization of the Higher Education Act, now called the Higher Education Opportunity Act (HEOA). Sopko (2009) and the UDL national design for learning task force (2010b) provide the legal definition from the HEOA.

Universal design for learning (UDL) means 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; and (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 [HEOA, P.L. 110-315, §103(a)(24)] (p.1).

Because UDL was defined in the HEOA, it has definite future implications for curriculum design, instruction, and assessment at the post-secondary levels. Colleges and universities will be expected to provide instruction to the students modeling a UDL construct so that all students may access the curriculum content. Sopko (2009) reported that many instructors in various colleges and schools of education already teach in a manner similar to UDL; however, the remaining college and university instructors often teach in the manner they were taught, lecture and notes.

In addition to the legal implications from HEOA, Project Forum, a two-year, collaborative work-group, recently released its policy recommendations to the U.S. DOE. The recommendations included a suggestion to require all higher education teacher preparation grant applicants to incorporate UDL into their teacher preparation programs, and to add UDL to the evaluation rubric used to score grants. Project Forum also recommended that individual States investigate adding UDL to their teacher evaluation forms; the school district of Greenwich, CT, has already placed UDL on teacher evaluations. The state of Michigan added UDL as a required component of state personnel preparation grants. Project Forum's work will have a definite impact on teacher preparation programs, and maybe education will be one step closer to providing all students with equal access to challenging, accessible, and neurologically appropriate content instruction.

Presently, educators in K-12 settings are not required to teach via UDL. Why would teacher preparation programs be concerned with providing future teachers with knowledge and competency related to UDL methods? First, not only was UDL first defined in the HEOA, but

HEOA also mentioned UDL in various subcomponents. The HEOA will require state recipients of ‘teacher quality partnership’ grants and ‘teach to reach’ grants to include “strategies consistent with the principles of universal design for learning [P.L. 110-315, §202(d)(1)(A)(ii)]” and “to integrate technology effectively into curricula and instruction, including technology consistent with the principles of universal design for learning [P.L. 110-315, §204(a)(G)(i)]” (Sopko, 2009; UDL national design for learning task force, 2010b). Second, Sopko (2009) reported that with the upcoming reauthorization of NCLB, education advocates are pressuring congressional leaders to add UDL to K-12 education. In a testimony to the Health, Education, Labor and Pensions Committee (HELP) before the United States Senate, Lucinda Hundley included the following in her recommendations for the reauthorization of the ESEA:

assessments must utilize the principles of Universal Design for Learning to ensure that all students including those with disabilities – can meaningfully demonstrate their knowledge and skills, thereby providing a more accurate understanding of student academic performance for evaluation by educators, families and policymakers (ESEA Reauthorization, 2010).

Lucinda Hundley’s statement regarding the application of UDL principles in the assessment of students with disabilities is only one of many ‘voices’ supporting UDL in the reauthorization of ESEA. The National Universal Design for Learning Task Force (2010), which is comprised of over 35 disability organizations, recommended the HEOA definition of UDL be transferred into the reauthorization of ESEA. They echoed the HEOA’s requirement for future teacher preparation grant recipients to include UDL in their curriculum. The National Center for

Learning Disabilities (NCLD) recommended:

The ESEA must broadly incorporate Universal Design for Learning – as recently included in the Higher Education Opportunity Act – to ensure that all students who struggle have better access to grade-level instruction, materials, appropriate assistive technologies, and appropriate teaching methods and assessments ... A curriculum consistent with UDL principles reduces barriers in instruction and provides all learners with appropriate support and scaffolds while also maintaining high expectations and challenge. (Kaloji, 2010, p.4)

Finally, to demonstrate the universal support for UDL throughout the education community, the National Education Association's (NEA), March 2010, *Message to Members of Congress on the Reauthorization of ESEA*, stated:

To appropriately assess students with disabilities and those who are English Language Learners, states should: 1) ensure that appropriate accommodations are available for students who need them, 2) use the principles of universal design for learning (UDL) in developing assessments for all students to increase accessibility ... (NEA, 2010, p.6).

A third reason future teachers need training and information on UDL is reflected in the International Society for Technology in Education (ISTE) standards for teachers' technology standards. Integrating the principles of UDL into the K-12 instructional practices and settings for students has support from disability organizations, general teacher education organizations, and instructional technology organizations. Although K-12 educators are not currently responsible for implementing UDL practices in the classroom, colleges of education and future teachers should become familiar with UDL principles and the application to classroom instructional design and assessment.

Teacher Technology Standards and UDL

Today's mobile technology and social networking technologies have transformed the world of work, which has a direct impact on teaching and learning (Trilling & Fadel, 2009). Recent data from Project Tomorrow revealed that 40% of secondary students' feel online learning should be a component of their educational experience. Students have expressed an interest in online learning because they want to guide their learning experiences; "47% 9-12th graders, 39% of 6-8th graders and one in four 3-5th grade students want to learn online to 'be in control of my learning'" (Blackboard, Inc. & Speak Up, 2009, p.2).

The purpose of education is to develop competent citizens who can contribute to their community (Knockey, 2006). In the past decade, technology has created the ability for people to actively participate in multiple communities, and often, participate simultaneously in multiple communities (Partnership for 21st Century Skills [P21], 2008). With the booming online education industry, today's students can attend several schools or universities simultaneously; students could simultaneously attend courses in two different countries. In many work environments, an employee may have three different meetings, in three different countries, during one, eight hour day (Johnson, Levine, & Smith, 2009). The purpose of education is to prepare students to be productive citizens, contributing positively to the community; today, the student's community is synonymous with the world (Johnson et al., 2009).

By expanding the concept of community, technological innovations have altered the knowledge and skills students need to participate and contribute to the community. In the decade 1995-2005, the economic shift from a manufacturing production base to a knowledge and information base has created approximately 17 million new jobs in the service industries and eliminated approximately 3 million jobs in the manufacturing industry (P21, 2008). According

to the U.S. Bureau of Labor Statistics, approximately one quarter of the jobs projected to grow in the next decade will “require one or more college degrees” (P21, 2008, p.6). Partnership for 21st Century Skills (P21), (2008) describes the current economy as the “Knowledge Age.” In the Knowledge Age, the innovative, creative, and educated are the most likely individuals to be promoted (Johnson et al., 2009; Trilling & Fadel, 2009).

Knowledge and innovation has also fueled cross-cultural collaboration, creating a more diverse workforce that spans culture and country (Johnson et al., 2009; P21, 2008; Trilling & Fadel, 2009). Teachers of online courses have expressed an ability to encourage students “to be more self-directed” and collaborate with other students (Blackboard Inc. & Speak Up, 2009, p. 5). Students who can demonstrate initiative and a collaborative attitude are more prepared for today’s knowledge-based, international job market; countries and companies are searching across countries and cultures for the best future employees (P21, 2008). Additionally, because America is part of a world economic market, individuals must be culturally sensitive and respectful.

In the 2009 *Horizon Report*, Johnson et al. summarize “key trends affecting the practice of teaching, learning, research, and creative expression” (p. 5). Every trend identified in the 2009 report relates to information and communication technologies, and the reality that mobile technology continues to advance and alter the work and school community. (Johnson et al, 2009). The advances in technology and the expansion to a global economy are challenging current practices in teaching and learning. Being able to teach students the three ‘R’s: “reading, riting, and ‘rithmetic” (Trilling & Fadel, 2009, p.176) is no longer sufficient; schools must also teach “information literacy, visual literacy, and technological literacy” (Johnson et al., 2009, p. 6; Little & Page, 2008). Many students can access the world wide web and social networking;

however, most do not understand how to differentiate between reliable sources for information and unreliable sources (Johnson et al., 2009; P21, 2008; Trilling & Fadel, 2009). In addition to the three ‘R’s’, P21 has identified 11 essential 21st century skills necessary for students to contribute to their global community (see Figure 1).

<u>P21 Skills</u>	<u>7Cs Skills</u>
<i>Learning and innovation skills</i>	
Critical thinking and problem solving	Critical thinking and problem solving
Communication and collaboration	Communications, information, and media literacy Collaboration, teamwork, and leadership
Creativity and innovation	Creativity and innovation
<i>Digital literacy skills</i>	
Information literacy	[included in Communications]
Media literacy	[included in Communications]
ICT literacy	Computing and ICT literacy
<i>Career and life skills</i>	
Flexibility and adaptability	Career and learning self-reliance
Initiative and self-direction	[included in Career and learning self-reliance]
Social and cross-cultural interaction	Cross-cultural understanding
Productivity and accountability	[included in Career and learning self-reliance]
Leadership and responsibility	[included in Collaboration]

Figure 1 P21 and 7C Skills Acronym ICT = Information and Communication Technology. Adapted from “Table C.1 P21 and 7C Skills,” by B. Trilling and C. Fadel, 2009, 21st Century Skills: Learning for Life in Our Times, p. 176. Copyright 2009 by John Wiley and Sons, Inc.

If students are expected to have the “7Cs” (Trilling & Fadel, 2009), teachers and schools will need to model and teach the skills. In 2008, the International Society for Technology Education (ISTE) developed the National Educational Technology Standards for teachers (NETS·T):

1. Facilitate and Inspire Student Learning and Creativity
2. Design and Develop Digital-Age Learning Experiences and Assessments
3. Model Digital-Age Work and Learning
4. Promote and Model Digital Citizenship and Responsibility
5. Engage in Professional Growth and Leadership (ISTE, 2008).

All teachers are expected to demonstrate proficiency in NETS. The suggested teaching methods for implementing the three principles of UDL: MMR, MMAE, and MME align with four of the five NETS·T. When teachers provide students with MMR, they are modeling components designing and developing digital learning experiences by providing “customize and personalize learning activities to address students’ diverse learning styles...”; as well as, modeling digital work and learning by “demonstrating fluency in technology systems” (ISTE, 2008). When teachers design and develop digital learning experiences by promoting, supporting, and modeling creative and innovative thinking and inventiveness, they are providing students with MMAE opportunities (ISTE, 2008). Technology applications in lessons provide many opportunities for MME; i.e., teaching digital citizenship and responsibility through social networking; modeling digital-age work by having students work collaboratively and communicate effectively; and designing digital learning experiences that permit students to “pursue their individual curiosity” (ISTE, 2008). When a teacher applies the principles of UDL to his or her curriculum planning and delivery, both teacher and student can increase their 21st century skills.

Curriculum Planning and UDL

For students with disabilities to be successfully included in the general education curriculum, the students must be able to “access, participate, and progress within it” (Hitchcock et al., 2002a, p. 3). To help teachers effectively plan instruction for diverse classrooms, CAST developed the *planning for all learners* (PAL) method for teaching diverse classes (Meo, 2008). “PAL is a four-step process for designing and implementing a curriculum (goals, methods, materials, and assessments) that is accessible and effective for all learners” (Meo, 2008, p.21). Figure 2 illustrates the four steps of PAL are “(a) Set goals, (b) Analyze Status, (c) Apply UDL, and (d) Teach the UDL Lesson” (Hall et al., 2003, p. 17).

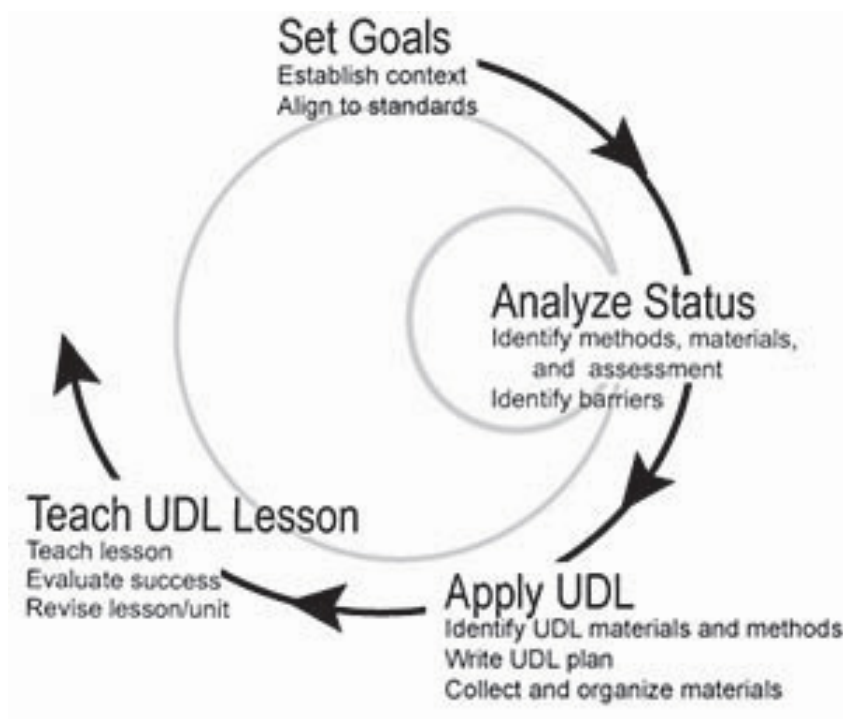


Figure 2 The 4-step UDL lesson-design process
Adapted from N. Strangman, T. Hall, and A. Meyer *Background Knowledge Instruction and the implications for UDL Implementation*, p. 24. Copyright 2004 by the National Center for Accessing the General Curriculum [NCAC].

Setting goals

The teacher's first priority is to decide what the students should learn, and the second priority is to determine how students will learn (Hitchcock et al., 2002b). Goals should be (a) clearly stated, (b) reflect local and state standards, (c) be observable and measurable, (d) provide background knowledge, and (e) considered separately from the methods for instruction and demonstrating knowledge (Hall et al., 2003; Jackson et al., 2001; Meo, 2008). Though goals need to be clearly stated, observable, and measurable, Jackson and Harper (2001) noted that goals should not contain verbs that specify *how* the goal will be achieved. For example, in a language arts class, students may be required to 'write a story'; therefore, the students would be expected to produce a story by writing or typing the text. If a student has a disability that interferes with the ability to produce written or typed text, the student cannot achieve the goal. If the teacher defined the goal as "creating a narrative," the student would be free to verbally provide the story and achieve success (Hitchcock et al., 2002b).

Analyze status

The second step in the UDL lesson planning process investigates the classroom environment and immediate materials for curriculum delivery. The teacher must inventory classroom materials and the items' availability; the students' diverse backgrounds, including cognitive and sensory challenges, and the potential for barriers to accessing the curriculum. Teachers may establish a proactive approach to lesson planning for all students when they focus on UDL principles (Hall, et al., 2003; Meo, 2008). The instructional materials should include MMR, increasing the means by which students with disabilities can access and respond to curriculum (Hitchcock et al., 2002b; Hitchcock & Stahl, 2003; Jackson et al., 2001). Teachers may consider planning instruction to coincide with digital media. Digital media can be altered to

provide additional supports: spell check, images, word definitions. By using digital media as a method for delivering curricular content, the same content can be modified to include higher order thinking skills and problem-solving for some students while providing instructional supports for other students (Hitchcock et al., 2002b; Rose & Meyer, 2002; Rose et al., 2005).

Apply UDL

After the teacher evaluates the classroom environment and immediate materials for curriculum delivery, he or she can progress to the third UDL planning stage: application. Because the teacher already identified instructional materials available, as well as, students' diversity, he or she can begin preparation for a universally accessible instructional lesson (Hall et al., 2003; Meo, 2008). With a defined learning goal and an inventory of instructional materials, the teacher may identify potential curriculum access barriers students may experience. Now, the teacher can be proactive creating a lesson for all students. It is important to note that access to the curriculum does not equate to informational access; rather, access to the curriculum means the student can be an active participant in the lesson and learning (Hitchcock et al., 2002b).

Teach UDL lesson

The final step in the UDL lesson planning process is to teach the lesson. The instructor should teach the lesson with curricular materials that all students can access. The teacher's instructional methods should facilitate students' active engagement (Hall et al., 2003; Jackson et al., 2001). When students are engaged in the lesson, they are essentially "learning how to learn" (Hitchcock et al., 2002b; Rose & Meyer, 2002). Students' active participation in learning provides the instructor with feedback, so that he or she can effectively teach the lesson and reflectively analyze the student learning results (Hall et al., 2003; Meo, 2008). Meo (2008) recommended instruction be provided by both a special educator and a regular educator.

According to Meo, if both general and special educator in the instructional process, each professional's expertise could contribute to improved lesson planning and student engagement. Jackson and Harper (2001) noted that special and general educators contribute "different but complementary perspectives to the [planning] process" (p.5).

Summary

In 2001 NCLB became law, and the law required schools to demonstrate that all students, with and without disabilities, are academically achieving and reported in the schools' annual yearly progress (AYP) (Hardman & Dawson, 2008). The 2004 reauthorization of IDEA (IDEIA) focused on students with disabilities access to general education curriculum (Hardman & Dawson, 2008; Hitchcock et al., 2002a; Okolo et al., 2007; Rosenberg et al., 2008) and academic progress in general education settings (Karger, 2005). Together, NCLB and IDEIA have prompted many schools and states to initiate inclusive educational environments in K-12 settings (Hardman & Dawson, 2008; Little & Hahs-Vaughn, 2007; Wagner et al., 2004; Wagner et al., 2006).

As schools transitioned into inclusive educational environments, they encountered some curricular access challenges for students with exceptional needs. Reflecting on the architectural accessibility challenge created by ADA and the subsequent development of Universal Design in architecture, CAST began investigating UDL (Hall et al., 2003; Hitchcock et al., 2002b; Rose et al., 2005). Universal Design for Learning (UDL) is a curricular framework that combines several research based instructional practices to facilitate curriculum access for all students (Bouck et al., 2009; Doyle & Giangreco, 2009). Various research based instructional practices are implemented within the UDL curricular framework, including differentiated instruction, background knowledge, graphic organizers, and cooperative learning (Council for Exceptional

Children, 2005; Hall et al., 2003; Jimenez et al., 2007; Pisha & Coyne, 2001). Additionally, Hall et al., (2003) reported that UDL “is based on research from neurosciences and effective teaching practices” (p.2). In fact, UDL is based on three learning networks identified in the brain: the recognition network (what we see); the strategic network (how we plan and formulate actions or responses), and the affective network (our emotional responses to environmental stimulus (CEC, 2005; Rose & Meyer, 2002).

In 2008, UDL was defined in legal terms with the reauthorization of the Higher Education Act, now called the Higher Education Opportunity Act (HEOA). Sopko (2009) provided the legal definition from the HEOA. In addition to requiring post-secondary instructors to provide universally accessible content and instruction, the HEOA will require state recipients of ‘teacher quality partnership grants and “teach to reach’ grants to include “strategies consistent with the principles of universal design for learning [P.L. 110-315, §202(d)(1)(A)(ii)]” and “to integrate technology effectively into curricula and instruction, including technology consistent with the principles of universal design for learning [P.L. 110-315, §204(a)(G)(i)]” (Sopko, 2009; UDL national design for learning task force, 2010b).

In an inclusive setting, students with disabilities receive academic instruction in the general education classroom; therefore, the general education teacher often becomes the primary teacher of instruction for students with disabilities (Causton-Theoharis et al., 2008). Research indicates many general education teachers feel unprepared to provide students with disabilities with appropriate instruction (Burdette, 2007; Doyle & Giangreco, 2009; Jackson et al., 2001; Jimenez et al., 2007; Knoockey, 2006; Okolo et al., 2006; VanHover & Yeager, 2003). Education researchers have expressed a need for changes to teacher education programs (Burdette, 2007; Jackson et al., 2001; Smith et al, 2010). The 2008 HEOA provided a new requirement for

universities applying for federal grants (UDL national design for learning task force, 2010b).

Universities applying for federal grants for teacher preparation programs must provide training on UDL to students participating in their programs (Sopko, 2009). New teachers may be expected to provide instruction following UDL principles because the reauthorization of ESEA is fast approaching, and most educational organizations are lobbying to include UDL in the reauthorization language (ESEA reauthorization, 2010; Kaloi, 2010; NEA, 2010).

In addition to implementing UDL into their course instruction, teacher preparation programs must also adjust to modern mobile technology and social networking technologies that have transformed the world of work, directly impacting teaching and learning (Trilling & Fadel, 2009). The advances in technology and the expansion to a global economy are challenging current practices in teaching and learning. Being able to teach students the three 'R's: "reading, riting, and 'rithmetic" (Trilling & Fadel, 2009, p.176) is no longer sufficient; schools must also teach "information literacy, visual literacy, and technological literacy" (Johnson et al., 2009, p. 6; Little & Page, 2008). To increase the quality of technological literacy instruction students receive in school, the International Society for Technology Education (ISTE) developed technology standards for teachers (NETS·T). All teachers are expected to demonstrate proficiency in The National Educational Technology Standards (NETS), and the suggested teaching methods for implementing the three principles of UDL: MMR, MMAE, and MME which align with four of the five of the standards. Modeling, planning, and teaching within the UDL framework will provide beginning teachers with the instructional methods and confidence to provide accessible, academic content and technology literacy to all students.

CHAPTER THREE: RESEARCH METHODOLOGY

Introduction

The purpose of the study was to examine the effects of integrating an instructional lesson on Universal Design for Learning (UDL) into the secondary general education (SGE) instructional methods courses. The selected research design was a quantitative, quasi-experimental design. The researcher proposed two research questions.

1. To what extent will integrating instruction on UDL into SGE instructional methods courses impact students' pre to post test scores on a UDL Knowledge Test compared to the UDL Knowledge Test pre and posttest scores of SGE instructional methods course students who do not receive this instruction on UDL?
2. To what extent will integrating instruction on UDL into a SGE social studies (SS) instructional methods course affect the plan for content delivery and assessment in students' written lesson plans related to the principles of UDL in a pre to post analysis?

Students in SS, LA, and M SGE instructional methods courses comprised research question one's experimental population. The intervention groups received the same intervention. One reference group, Science, did not participate in the intervention. The majority of the participants 73.5% were in the experimental group. Participants in the study were in preexisting groups. The quantitative analysis selected to address the first research question, an ANCOVA, was one recommended statistical procedure for calculating data in nonrandomized studies (Dugard & Todman, 1995; Van Breukelen, 2006; Winkens et al., 2007). The second research question required a quantitative, pre and post lesson plan content analysis for the SS students who participated in the UDL module. The non-parametric formula of the Wilcoxon T test for dependent samples (Shavelson, 1996), also referred to as the Wilcoxon matched-pairs signed-

ranked test (Hinkle et al., 1998) was used to analyze the data for research question two. A Wilcoxon test for matched pairs was selected because the calculation is designed specifically for dependent sampling data. The Wilcoxon is the recommended analysis when each subject has two quantitative measures associated with him or her; i.e. pretest and posttest (Hinkle et al., 1998; Shavelson, 1996). The research data was analyzed using SPSS 17.0 software.

The purposes of the research questions were (1) to determine if integrating instruction on UDL into preservice SGE students' instructional methods courses would increase students' knowledge of UDL and (2) to determine if integrating instruction on UDL will affect how SS students design lesson plans, particularly, content delivery and student assessment, in regards to the three principles of UDL: MMR, MMAE, and MME.

General Research Hypotheses

Null hypothesis question one.

When analyzing UDL Knowledge posttest scores, no significant difference will exist between SGE instructional methods course students who received instruction on UDL and SGE instructional methods course students who did not receive this instruction on UDL.

Null hypothesis question two.

No statistically significant difference exists between the SGE instructional methods SS students' pre and post intervention UDL lesson plan rubric evaluation scores.

Independent Variable

Research question one and research question two shared the same independent variable. The independent variable was the online instructional module on UDL created by IRIS in collaboration with CAST. The module was posted in September 2009 by IRIS on the IRIS center website: www.iriscenter.com/udl/chalcycle.htm.

Dependent Variables

The research study measured two dependent variables. Research question one dependent variable data were participants' scores on the UDL knowledge posttest. Research question two dependent variable data were participants' post intervention scores on the lesson plan rubric.

Setting

The population for the study consisted of SGE students enrolled in the associated secondary instructional methods course in the college of education at a large, public, university in Florida. According to the university's Institutional Research department, the Fall 2009 College of Education undergraduate enrollment was 3,763 students.

The university setting where data collection occurred was classified as a non-residential, research university. The estimated Fall 2009 enrollment was (a) undergraduate: 45,398; (b) graduate: 8,205, and 41 medical school students. Population demographics are found in Table 1.

Table 2: *Fall 2009 University Demographics*

Diversity Profile		Enrollment by Gender	
<u>Ethnicity</u>	<u>%</u>	<u>Undergraduates</u>	
American-Indian	<1	Male	Female
Asian	6	20,566	24,832
Black	9	<u>Graduates</u>	
Hispanic	14	Male	Female
Non Reported	3	3,367	4,838
Non-Resident Alien	3	<u>Medical</u>	
White	65	Male	Female
		19	22

Study Participants

UDL Knowledge Test

The study participants were university students enrolled in the SGE content, (LA), social studies (SS), mathematics (M), and science (S), instructional methods courses offered in the

Spring 2010 semester. The SGE instructional methods courses are designed to prepare content area teachers for grades 6 through 12. Population's demographic information is provided in Table 2.

Table 3: *SGE Instructional Methods Population Demographics*

Demographic Category	Participant Response	<i>n</i>	%
Prior enrolled EEX 4070 or EEX 4242	Yes	24	23.8
	No	70	69.3
	No Response	7	6.9
	TOTAL	101	100
Gender	Male	35	34.7
	Female	58	57.4
	No Response	8	7.9
	TOTAL	101	100
Ethnicity	African American	8	7.9
	Asian	3	3.0
	Caucasian	70	69.3
	Hispanic	12	11.9
	Other	1	1.0
	No Response	7	8.9
TOTAL	101	100	
Age Range	18 – 25 years	63	62.4
	26 – 33 years	20	19.8
	34-41 years	6	5.9
	42 + years	5	5.0
	No Response	7	6.9
TOTAL	101	100	
Academic Level	Undergraduate	69	68.3
	Graduate	21	20.8
	Non-degree seeking	4	4.0
	No Response	7	6.9
	TOTAL	101	100

SGE SS Instructional Methods Students

Study participation was open to all students enrolled in the SGE SS instructional methods course during the Spring 2010 semester at the university. The population of students in SGE SS instructional methods during Spring 2010 was expected to be 45 students. The researcher planned to have 85% of the population participate ($n=38$) students. The SGE SS course instructor requested that students bring in a previously written lesson plan to the second class meeting. The researcher attended the second class of the semester to introduce the research study regarding the purpose of examining the participants' lesson plans. Students who agreed to participate in the study were provided with an informed consent form. Potential participants were asked to sign the form and write the last four digits of their university PID on the signature line.

Table 4 *Social Studies Instructional Methods Lesson Plan Population Demographics*

<u>Gender</u>	<u>n</u>	<u>Race</u>	<u>n</u>	<u>Age</u>	<u>n</u>	<u>Academic Level</u>	<u>n</u>
		African American	0	18-25 yrs	11	Undergraduate	13
Male	6	Caucasian	12	26-33 yrs	1	Graduate	0
Female	7	Hispanic	1	34-41 yrs	0	Non-degree	0
				42+ yrs	1		
Total	13	Total	13	Total	13	Total	13

Sampling

UDL-knowledge test.

The researcher applied a purposeful sampling procedure in the study. Because the focus of the study was SGE students, only SGE students enrolled in the instructional methods course for their content area during the Spring 2010 semester were invited to participate in the research study. At the time of data collection, a total of 112 students were registered for a SGE

instructional methods course. To maintain sufficient power (0.80) with statistical significance set at 0.05 ($\alpha = 0.05$), and detect a minimal one standard deviation difference between the means of the reference groups and the control group UDL Knowledge Test scores, the sample size would need to be 92 or approximately 23 in each of the four groups (Hinkle & Oliver, 1983; Hinkle et al., 1998).

SGE Social Studies Instructional Methods

The researcher's sample for the pre and post lesson plan analysis was a sample of convenience. All SGE SS students in the instructional methods course during the semester of data collection were invited to participate in the study. To be included in the data analysis, however, SGE SS students who agreed to participate and submitted pre and post lesson plans also needed to complete the pre and post UDL Knowledge Test from research question one. After the data were collected, the researcher matched the SGE SS students' four-digit PIDs on the pre and post lesson plans with the PIDs on the pre and post UDL Knowledge Tests. The voluntary participants who met the inclusionary criteria ($n=13$) made up 37% of the possible population ($n=35$) of SGE SS instructional methods students in Spring 2010.

Table 5 *SGE Social Studies Instructional Lesson Plan Data Sample*

	<u>Pre Intervention(<i>n</i>)</u>	<u>Post Intervention(<i>n</i>)</u>
Lesson Plans Collected	13	13
Did not meet inclusion criteria	5	5
Total Lesson Plan Population	8	8

Instrumentation

Intervention

The IRIS instructional module about UDL was designed for teachers of all content areas at the secondary level. The IRIS UDL module content, including the comprehension and application questions, was collaboratively developed by researchers at IRIS and experts in UDL: CAST founder, Dr. David Rose, and CAST Director of Professional Development, Dr. Grace Meo. The module was released on IRIS website, www.iriscenter.org, in September 2009. The module may be accessed via an internet connection and no password or user information is needed. Additionally, IRIS modules, including the UDL module, are available free of charge to anyone. The free, public access to the IRIS UDL instructional module facilitates future research replication of this study, along with, promoting additional research on the impact of integrating UDL instruction into teacher preparation programs. Regarding the module content validity, the IRIS UDL module was designed and reviewed by experts in UDL, an acceptable demonstration of content validity (Senocak, Taskesenligil & Sozbilir, 2007; Stanford, 2008).

All IRIS modules are named *STAR Legacy Modules*. The modules' contents are designed to reflect Bransford's Adult Learning Theory (BALT). Each of the five points of the *STAR Legacy Module* is associated with BALT. The cycle begins with the top point on the STAR: a Challenge, usually a common classroom problem that teachers experience. Next, students are asked to reflect upon the scenario and note their initial Thoughts. After engaging the students cognitive thought process, the module begins to provide instructional information, Perspectives & Resources. After completing the Perspectives & Resources section, students complete a short Assessment activity, the fourth point of the STAR. The final point on the STAR is titled Wrap-Up. In the Wrap-up, students are asked questions, receive a brief synopsis of the module content,

and students are presented with the initial Challenge questions again and asked if their responses to the questions would be different based upon the information they received about UDL.

UDL Knowledge Test

The UDL Knowledge Test pre (Appendix B) and post (Appendix C) assessments were created based upon the information provided in the IRIS UDL module. The researcher developed a series of questions and then performed a sampling item analysis according to the purposes of UDL. "UDL provides a research-based framework for teachers to incorporate flexible materials, techniques, and strategies for delivering instruction and for students to demonstrate their knowledge in a variety of ways" (http://iris.peabody.vanderbilt.edu/udl/udl_03.html). The UDL-Knowledge pre and posttest were multiple choice selection tests. The UDL Knowledge Tests did not include any "all of the above" or "none of the above" selection options (Gay & Airasian, 2003; Slavin, 2007).

Validity.

Content validity was established via expert review (Leedy & Ormrod, 2001; Senocak et al., 2007; Stanford, 2008). The knowledge pre and posttest were reviewed by Kimberly A. Skow, Program Coordinator at Peabody College, Vanderbilt University and a member of the IRIS UDL module development team. Ms. Skow responded through electronic mail that the pretest reflected the UDL Module's content. Leedy and Ormrod explained "a measurement instrument has high content validity if its items or question reflect the various parts of the content domain in appropriate proportions" (p. 98). When creating or analyzing a measurement tool, strong content validity is essential, because if content validity is weak, the measurement tool will not provide valid results (Gay & Airasian, 2003).

Reliability.

Measurement tool reliability is not the equivalent of measurement tool validity. Gay and Airasian (2003) explained, "a valid test is always reliable but a reliable test is not always valid" (p. 141). A test is reliable if it produces a consistent measure of the information or skill in question. A test's reliability can be determined by several different methods: test-retest, split-half, Kuder-Richardson formula, and Cronbach's Alpha. An instrument's reliability is estimated based upon a numerical indicator, the reliability coefficient. Scores for the reliability coefficient range from 0 to 1.0, where 1.0 reliability equates to 100% reliability (Gay & Airasian, 2003).

The UDL-Knowledge Test was completed by 30 SGE students the semester prior to data collection, exceeding the minimum suggested group size (5-10 people) for pretesting an independently designed instrument (Gay & Airasian, 2003). The reliability of the test was calculated using the Kruder-Richardson 20 (KR-20) formula. The KR-20 was selected because the reliability calculation is based on test items that only provide two responses: correct or incorrect (Fraenkel & Wallen, 2009; Gay & Airasian, 2003; Slavin, 2007); whereas, the Cronbach's Alpha formula is designed for test items with more than two responses; i.e., Likert scale items (Gay & Airasian, 2003; Slavin, 2007). The UDL-Knowledge Test demonstrated strong reliability by scoring 0.90 on a 0.0 to 1.0 reliability scale.

Fidelity

The participants completed the UDL Knowledge pre and posttest in the face to face presence of the researcher. The researcher visually verified the presence of the participant and the completion of the pre or posttest. The participants were asked to complete the online intervention independently outside of the face to face course meetings. Because the researcher could not observe the participants accessing the UDL module, she needed an alternative method

to provide evidence that participants accessed the module. After discussing possible options, participants were required to print a hard copy of the first and last pages in the UDL module, dated and time stamped by the printer. In addition to the printed pages, intervention participants were asked to complete a small set of feedback questions regarding the UDL module and their experiences. The sixth question on the UDL Feedback Questionnaire asked participants to estimate the percentage of the UDL module completed. By combining participants' UDL Feedback Questionnaire's self-reported module completion and the printed first and last pages of the IRIS module, the researcher planned to enhance the fidelity of the research study.

Lesson Plan Rubric

The lesson plans were scored using a rubric based upon the inclusion of UDL principles of MMR, MMAE, and MME. The rubric was developed by the Bartholomew Consolidated School Corporation (BCSC) and featured, with permission, in a National Association for State Directors of Special Education (NASDSE) report (Sopko, 2008). The rubric evaluated the nine teaching methods associated with the three principles of UDL. The rubric was divided into four scoring categories (1) not yet evident, (2) emerging, (3) intermediate, and (4) advanced (Table 6). The researcher obtained copyright permission to use the rubric. The rubric can be found in Appendix D.

Table 6 *Lesson Plan Rubric Scoring Categories*

Category	Not Yet Evident	Emerging	Intermediate	Advanced
Point Value	0	1	2	3

Validity.

The lesson plan rubric was an adaptation of a lesson plan rubric in Rose, Meyer, and Hitchcock (Eds.) (2005). The original rubric was authored by CAST, and the BCSC received permission from CAST to reprint the rubric for use in their teacher evaluation process. Project Forum, an affiliate of NASDSE, published the BCSC rubric in the Appendix of the 2008 report *Universal Design for Learning: Implementation in Six Local Education Agencies*. The researcher located the rubric in the Project Forum publication. The researcher spoke with Dr. Paula Burdette, Project Forum Director, at NASDSE regarding the copyright and origin of the rubric. Dr. Burdette told the researcher that the original rubric was published by CAST. The rubric was designed by CAST, the expert in UDL; the rubric is valid based upon expert review (Gay & Airasian, 2003; Leedy & Ormrod, 2001; Naizer, 1997; Senocak et al., 2007; Spooner, Baker, Harris, Ahlgrim-Delzell, & Browder, 2007; Stanford, 2008).

Reliability.

Content analysis quantifies written communication that involves more than one word responses and requires coding of phrases and concepts (Gay & Airasian, 2003; Weber, 1990). As Weber (1990) noted the meaning and interpretation of written communication may vary depending on the purpose of the researcher, weakening the reliability of the analysis. Inter-rater, also called inter-judge (Gay & Airasian, 2003), enhances the reliability of the scores. For inter-rater reliability, the researcher and a minimum of two additional people must independently analyze the lesson plans using the scoring codes (Leedy & Ormrod, 2001; Weber, 1990). The researcher asked two doctoral education students who are unaffiliated with the research study to assist in scoring a sample of lessons along with the researcher for inter-rater reliability. The doctoral students providing inter-rater reliability did not participate in the research study,

and they had not participated in the IRIS UDL module. The researcher reviewed the rubric with the inter-raters prior to scoring any lesson plans. After the researcher and inter-raters score a random sample of the lesson plans, inter-rater reliability will be calculated. If inter-rater reliability is less than .90 (Spooner et al., 2007), the process will repeat until adequate reliability was achieved.

Fidelity.

To enhance fidelity of the instructional intervention, the researcher asked the course instructors to refrain from discussing UDL in class during data collection. An instructional observation checklist focused on UDL instruction principles was used to determine if the SS course instructor provided additional information or modeling of UDL principles in class. The observational checklist was developed by Dr. M. Abell at the Center for Innovation and Instruction for Diverse Learners at the University of Louisville, Louisville, Kentucky (Appendix E). The purpose of the instructional observation tool was to utilize inter-observer analysis of the SGE social studies instructor's teaching style and to document possible events where the instructor modeled UDL instructional practices or verbally discussed UDL in the face to face course meetings during data collection.

To enhance the reliability of the results from the observation tool, inter-observer agreement will be calculated. By having an individual unaffiliated with the research study trained in using the observation tool scoring the instructor in addition to the researcher, the reliability of the final observational scores are enhanced (Fraenkel & Wallen, 2009; Krippendorff, 1980; Leedy & Ormrod, 2001; Slavin, 2007; White, 2006). Inter-observer agreement can be calculated using a variety of methods. To increase the reliability of the inter-observer measurement, inter-observer reliability will be calculated using the weighted combined agreement formula

(Krippendorff, 1980; White, 2006). The formula counts the observers' agreements for both occurrence and non-occurrence; therefore, the researcher has more confidence in his or her inter-observer reliability using the weighted combined agreement calculation results because all possibilities for occurrence and non-occurrence of behavior are considered (Krippendorff, 1980; White, 2006).

Research Design

The study demonstrated a quantitative, quasi-experimental research design. An experimental and reference group existed; however, the assignment to either group was not randomized, and the final participants consisted of Spring 2010 students enrolled in a SGE instructional methods content course who volunteered to participate in the study. To answer research question one, pre and post UDL Knowledge Test data were collected quantitatively and analyzed using quantitative statistical measures with SPSS 17.0 software. To answer research question two, pre-intervention and post-intervention lesson plans were collected from the SGE social studies students who volunteered to participate in the study. A content analysis was completed on the pre and post intervention lesson plans, specifically related to the three principles of UDL: MMR, MMAE, and MME. The content analysis was analyzed using the nonparametric, Wilcoxon test for matched pairs, to compare the pre/post intervention lesson plans' UDL content.

Research Timeline

Research question one:

Research data collection began during week 1 and 2 of the Spring 2010 semester at the university. The researcher attended each instructor's SGE instructional methods course to provide information regarding the study and ask for volunteer participants. Participants were

asked to sign an informed consent form, per university IRB requirements. Additionally, students were asked to place their initials, the letter corresponding with their content area for the course: L: language arts, S: science, M: mathematics, and SS: social studies: and the last four digits of their randomly generated university Personal Identification number (PID) on the signature line of the consent form, and write the letter and last four digits of their PID on the UDL Knowledge pretest. The students who volunteered to participate in the study completed the UDL Knowledge pretest.

During week 4 of the Spring 2010 semester, each instructor utilized the university's secured e-mail addresses of all the students in the course to email every student the electronic web link to the IRIS UDL online module. Students were asked to visit the UDL module, print the first page of the module, read through the module content, and print the last page of the module. Data collection for research question one ended during week 6 of the Spring 2010 semester. The investigator returned to each instructor's SGE instructional methods course to collect the two printed pages of the IRIS UDL module, for fidelity; as well as, to disseminate and collect the UDL Knowledge posttest to students who volunteered to participate in the study.

Research question two:

Data collection for research question two began in week 1 of the Spring 2010 semester, when the investigator recruited SGE SS students from the instructional methods course to participate in the research study. The researcher informed the students that they would need to submit two, original lesson plans to her if they wanted to participate in the study. She asked participants to write the last four digits of their PID on each submitted lesson plan. The researcher collected pre lesson plans during week 2 of the semester. The students completed the

IRIS UDL online module during week 4 of the semester. Participants submitted the second lesson plan to the investigator during week 6 of Spring 2010 semester.

Data Collection Procedures

Research Question One

The UDL Knowledge Test data were the pre and post UDL Knowledge Tests. To protect students' identity and prevent the students' scores on pre/post UDL Knowledge Test from being affiliated with the individual, the students wrote the letter associated with the content area for the course: LA: language arts, S: science, M: mathematics, and SS: social studies, and the last four digits of their university PID on each document submitted to the researcher. Every student attending the university was assigned a PID when he or she submitted an application to the university. PIDs are randomly generated numbers and have replaced the use or need of students' social security numbers. The researcher submitted the study to the university's institutional review board (IRB). The IRB determined the research study did not require IRB approval.

Experimental group.

Participants in the study were in preexisting groups, and the quantitative analysis selected for the study, ANCOVA, is one recommended statistical procedure for calculating data in nonrandomized studies (Dugard & Todman, 1995; Van Breukelen, 2006; Winkens et al., 2007). All students enrolled in a SGE instructional methods courses included in the experimental group during at the time of data collection had the opportunity to participate in the study. The researcher attended each SGE experimental group's instructional methods course first class to explain the research study purpose, procedures, and ask for volunteer participants. The researcher provided each student in the course with a copy of the UDL Knowledge pretest. Students were asked to write the letter of the SGE instructional methods course content (L, M,

SS) and the last four digits of their university PID on the UDL pretest, complete or incomplete. signature. The researcher collected a UDL pretest from each student present in the class; therefore, the students and instructor were not able to identify who volunteered to participate in the study, as every student submitted a pretest.

The students' pretest scores were not reflected in the students' course grades. After completing the pretest, the researcher introduced the course instructors and the students to the IRIS Center. Using a university computer, projector, screen, and internet access, the researcher accessed the IRIS Center tutorial *Navigating an IRIS Module* (http://www.iriscenter.com/media/module_nav.html). Then the researcher played her pre-recorded instructional CD while she simultaneously navigated the module. After the demonstration on how to navigate the module, the researcher answered any student questions.

During week 4 of the semester, the experimental group's course instructors sent the students a private electronic mail message using the university electronic mail system. The electronic message provided students with the URL address to access to the instructional module on UDL, www.iriscenter.com/udl/chalcycle.htm. The students completed the IRIS module on UDL prior to the next scheduled class date according to their course syllabi. For treatment fidelity, participants printed the first UDL module page and the last UDL Module page. Because printers are pre-set to time and date stamp printed internet pages, the instructional methods course instructors and the researcher used the printed pages to verify student access of the module. The secondary instructional methods course instructors did not engage in class discussions related to UDL or the module.

Two weeks after students were provided access to the UDL module, the investigator attended each instructors SGE instructional methods course to collect final data. For fidelity of

treatment, the researcher collected the participants' print-out of the first and last page of the online module. Next, the investigator distributed the UDL Knowledge posttest to participants. The researcher attached the Participant Feedback Questionnaire to each posttest and asked participants to complete the questionnaire along with the posttest. The Participant Feedback Questionnaire contained some qualitative questions regarding the participants experience with the UDL module. Additionally, the researcher included a question to support the fidelity of treatment; the researcher asked students to estimate the percent of the UDL module that was completed.

Reference group.

Participants in the study were in preexisting groups, and the quantitative analysis selected for the study, ANCOVA, is one recommended statistical procedure for calculating data in nonrandomized studies (Dugard & Todman, 1995; Van Breukelen, 2006; Winkens et al., 2007). All students enrolled in the SGE instructional methods Reference group course at the university and present in class during at the time of initial data collection had the opportunity to participate in the study.

The researcher attended the SGE instructional methods reference group's course first class to explain the research study purpose, procedures, and ask for volunteer participants. The researcher provided each student in the course with a copy of the UDL Knowledge pretest. The students who agreed to participate, completed the pretest and wrote the letter of the SGE instructional methods content (S) and the last four digits of the university PID on the pretest. The researcher collected the pretest (complete or incomplete) from each student present in the class; therefore, the students and instructor were unable to identify who volunteered to participate in the study, as every student submitted a pretest.

Approximately six weeks after SGE instructional methods reference group students signed the consent form and completed the pre-test, the investigator returned to a SGE instructional methods reference group course face to face course meeting. The investigator distributed the UDL Knowledge posttest to participants. After the participants completed the posttest and provided the letter and last four digits of their PID on the test, the researcher collected the reference group's posttests. The reference group did not complete a UDL Module Feedback Questionnaire because the reference group did not participate in the UDL Module instruction.

Research Question Two

To answer research question two, pre-intervention and post-intervention lesson plans were collected from the SGE SS students who volunteered to participate in the study. The lesson plans were quantitatively analyzed for the instructional methods content, specifically related to the three UDL principles. The researcher used a rubric designed to quantify the extent that students' written lesson plans applied the three UDL principles: MMR, MMAE, and MME. The researcher evaluated the students' lesson plans based on the three principles of UDL; however, the students did not know how the lesson plans would be evaluated. To enhance lesson reliability and treatment fidelity, the SGE SS course instructor did not alter the course requirements for lesson plan assignments. The SGE SS course instructor did not discuss UDL during the six weeks of data collection. Finally, the SGE SS instructor evaluated the student lesson plans using his original lesson plan rubric. The evaluation rubric used by the researcher was not revealed to the students, nor was the score released to the SGE SS course instructor or reflected in the students' course grades.

Lesson plan data collection.

The research setting was the SGE SS instructional methods classroom on the university campus. The course schedule was mixed-mode: face to face and web-based course meetings. The first and second weeks of the semester, the course had regularly scheduled, face to face, class meetings. In the initial class meeting (week 1), the course instructor requested that all students bring a hard copy of an original lesson plan to class the following week (week 2). The researcher attended the face to face class in week 2, introduced herself and explained her research to the students.

The researcher explained that she planned to examine SGE SS students' lesson plans at two different points in the semester, and that she would appreciate volunteers who would provide her with hard copies of their original lesson plans. The students were not told about the intervention or that the researcher planned to evaluate the lesson plans' content for UDL principles in content delivery and assessment. Students were told research participation was voluntary. Additionally, the researcher informed students that the choice to participate or not participate would not affect their SGE SS instructional methods course evaluation. Lastly, the students were told that the researcher's lesson plan analysis was completely confidential, and the students' SGE course instructor would not be provided with access to the lesson plan scores. Students who chose to participate removed their names from the lesson plan. They were asked to write the last four digits of his or her PID on the lesson plan. Finally, the volunteer participants provided the researcher with the print copy, original lesson plan.

During week 4 of the semester, the students completed the intervention, the IRIS UDL module. The students were provided access to the module via an electronic mail message sent to all students enrolled in the course during Spring 2010. The students utilized the hyperlink in the

electronic message from the professor to access and complete the module. The following week (week 5), the students had an assignment for the SGE SS instructional methods course that required them to create a lesson plan and assessment to measure the students' learning. The assignment served as the second lesson plan for the researcher to collect from participants.

During week 6 of the semester, the researcher returned to the face to face meeting of the SGE SS instructional methods course. The SGE SS course instructor asked the students to bring a print copy of the lesson plan and assessment assignment to face to face course meeting. The SGE SS students submitted the assignment to the course instructor online through the university webcourse system. The researcher requested that students who agreed to participate in the study provided her with a copy of the lesson plan and assessment assignment. The students removed their names from the lesson plans and wrote the last four digits of their PID on the lesson plan. The researcher collected the lesson plans.

Instructor observation data.

Lesson plan data collection occurred during the first six weeks of the Spring 2010 semester. Subsequently, the researcher observed the SGE SS instructor during the first six weeks of the semester. The researcher recorded and observed the SGE SS instructor during three face to face class meetings during data collection. The researcher's purpose for the recording and observation of the instructor was to determine if the SGE SS instructor demonstrated or discussed the three principles of UDL: MMR, MMAE, and MME during his face to face class meetings. Because the dependent variable was the students' lesson plan content, the SGE SS instructor's instructional methods could have served as an instructional model for the students. To increase the intervention fidelity, the researcher needed to account for the possible variable of the instructor modeling the three principles of UDL during data collection.

Before recording the SGE SS instructor, the researcher needed video recording release forms from the course instructor (Appendix G) and the students (Appendix H) in the course. With the understanding that the video recordings would not be viewed by anyone other than the researcher and the inter-observer, and the video recordings would be destroyed immediately following data analysis, the SGE SS instructional methods course instructor signed a video release form, authorizing the researcher to video record him teaching three face to face sections of the course that occur during the first six weeks of classes in Spring 2010.

The researcher also provided the SGE SS instructional methods students with the option to participate in the video recorded session of the face to face course. Students were told that the video recorded sessions would not be viewed by anyone other than the researcher and one inter-observer, and the recordings would be destroyed immediately following data collection. During the video recording of the class, the camera remained on the course instructor at all times. Other than audio, to the greatest extent possible, students' physical appearances were not visible on the film. Students had the opportunity to choose to not participate in class on the dates of the video recording. The students who did not wish to participate sat toward the rear of the room on either side of the camera. The camera was placed in the center and rear of the room, and pointed toward the instructor, in the front of room. The researcher provided one other alternative for students who did not want to be heard or seen on the camera; students could schedule a day and time to privately view the class recording with the researcher or course instructor. Because the recording device has a zoom lens, when the researcher reviewed the video, only the rear and top of a few students' heads could be seen. Because the students faced the instructor with their backs to the camera, the students' comments and statements in the video were not audible. The instructor, however, faced the camera, and his voice was clear.

The SGE SS instructional methods course instructor's teaching videos were then independently observed and scored by the researcher and one inter-observer who was not affiliated with the research study, to establish inter-observer reliability. The inter-observer received a UDL observation checklist that focused on the principles of UDL MMR, MMAE, and MME. The researcher explained to the inter-observer the purpose for the observation: intervention fidelity.

Data Analysis

Research Question One

UDL knowledge test.

The researcher planned to analyze the data using an analysis of covariance (ANCOVA). An ANCOVA was selected over a standard analysis of variance (ANOVA), a repeated measures analysis and a dependent or matched-pairs *t* test because the ANCOVA is designed to identify mean differences for both between-subjects (ANOVA) and within-subjects (dependent *t*) (Delaney & Maxwell, 1981; Lowry, 2009; Maxwell, Delaney, & Manheimer, 1985; Reichardt, 1979). Because the study examined the mean differences in scores for four different secondary instructional methods courses, an ANOVA would be required to examine mean differences between groups because more than two groups were involved. The ANOVA was not appropriate because each group was measured twice. The correct calculation for examining the same group twice is the dependent *t* test; however, four groups would require four separate dependent *t* tests, one for each group (Shavelson, 1996). Completing the various independent calculations would increase the probability for both Type I and Type II errors. The probability of errors occurs because none of the above independent calculations can simultaneously control for the interaction effects of differences between groups (ANOVA) or differences within groups

(repeated measure or dependent t) (Delaney & Maxwell, 1981; Dugard & Todman, 1995; Lowry, 2009; Maxwell, et al., 1985; Van Breukelen, 2006; Winkens et al., 2007). .

The addition of the covariate, the pre-test scores, enabled the researcher to compare the mean difference between groups, despite the fact that the groups may not be equal with regards to a true experimental, randomized subject design (Jennings, 2009; Lowry, 2009; Shavelson, 1996). A critical component of ANCOVA analysis is the homogeneity of the regression of scores between groups on the pre-test (Dugard & Todman, 1995; Reichardt, 1979; Van Breukelen, 2006; Winkens et al., 2007). If regression slopes between groups are not homogeneous, "ANCOVA treatment effect estimator is then biased downwards, because it is not corrected for estimating the unknown pre-treatment expectation" (Winkens et al., 2007, p. 715-716).

Winkens et al. (2007) explained "an ANCOVA model the post-treatment measurement y is modeled conditional on the pre-treatment measure" (p. 716); therefore, for the ANCOVA to be robust, the covariate measurement must be both valid and reliable, otherwise the within-group score changes are unreliable, as well as, any between group comparisons. An invalid covariate would not fulfill its role of equalizing the groups (Delaney & Maxwell, 1981; Shavelson, 1996). Additionally, it is important that the covariate measure is independent of the treatment, so that removing the covariate does not affect the treatment measure (Shavelson, 1996). According to Dugard and Todman (1995), utilizing the pre-test score as a covariate, removing it from the calculation of potential differences in post treatment scores, provided "a more powerful test of the hypothesis of interest than will the repeated measures ANOVA approach" (p. 182). In summary, the ANCOVA can "help the researcher decide whether the observed differences between means are due to change or to systemic differences among treatment populations. ...

statistically removing predictable individual differences from the dependent variable, thereby providing a more precise estimate of experimental error than a between-subjects design does and a very powerful statistical test of a null hypothesis” (Shavelson, 1996, p. 507).

UDL knowledge test reliability and fidelity.

The researcher applied inter-rater reliability to the UDL Knowledge pre and posttest scores. The researcher also used inter-rater reliability to the UDL module Participant Feedback Questionnaire responses transfer into SPSS numerical coding for calculation purposes. To establish inter-rater reliability, two education doctoral students, unaffiliated with the research study, independently reviewed : (a) 20% of scored, randomly sampled, UDL knowledge pretests, (b) 20% of scored, randomly sampled posttests, and (c) 20% of Participant Feedback Questionnaire responses transferred to numerical coding. Inter-rater reliability provided confidence that the researcher correctly recorded the data for the UDL Knowledge pre and posttests and the Participant Feedback Questionnaires. Inter-rater reliability was calculated by dividing the number of agreements by the total number of agreements + disagreements (Slavin, 2007). If the resulting reliability coefficient was less than .90, the researcher would review and rescore all items in the sample. After rescoring all sample items, a new random sample of 20% of the data would be selected, and the inter-raters would review the scoring for the new sampling. The process would repeat until a reliability coefficient of .90 was achieved.

In addition to the reliability of the data, the researcher needed to establish treatment fidelity. Treatment fidelity was critical to the data analysis because correctly scored and entered data have little meaning if the intervention’s potential effects were compromised by additional variables. One component of treatment fidelity was the researcher’s request that the SGE intervention group instructors did not discuss the UDL module or its contents in class during data

collection. Another measure of intervention treatment fidelity was established on the Participant Feedback Questionnaire. Question six on the questionnaire requested participants to self-report the percentage of the UDL module they completed. A final measure of fidelity was the participants' submission of the printed paper copy of the first and last page of the UDL module, to demonstrate the student accessed the UDL module.

Research Question Two

Lesson plan data analysis.

The lesson plan data were collected by the researcher during the face to face, regular class meetings in week 2 (pre-intervention) and week 6 (post-intervention) of the Spring 2010 semester. To maintain participant confidentiality, the researcher provided participants with a black marker to 'black out' their name on the lesson and write the last four digits of their university PID on the lesson plans.

The researcher used a rubric to score the lesson plans. The rubric translated the lesson plans written information into a numerical code so that the content of the lesson plans can be transferred into numerical data (Carley, 1993; Johnson & LaMontagne, 1993) for calculation using the nonparametric formula of the Wilcoxon T test for dependent samples (Shavelson, 1996), also referred to as the Wilcoxon matched-pairs signed-ranked test (Hinkle et al., 1998). For the purposes of this protocol, the term, Wilcoxon, represents both nonparametric procedure titles. The Wilcoxon is a nonparametric calculation designed specifically to calculate dependent sampling data. The Wilcoxon is the recommended analysis when each subject has two quantitative measures associated with him or her; i.e. pretest and posttest (Hinkle et al., 1998; Shavelson, 1996).

The researcher applied the method of content analysis to develop a quantitative score for the students' lesson plans. Content analysis is a research method for quantifying indirect human communication, often written communication and text (Carley, 1993; Fraenkel & Wallen, 2009; Johnson & Montagne, 1993; Krippendorff, 1980; Leedy & Ormrod, 2001; Porter, Polikoff, Zeidner, & Smithson, 2008; van der Putten, Vlaskamp, & Poppes, 2009; Weber, 1990). A rubric served as the predefined coding schema for the content analysis of the lesson plans (Carley, 1993; Johnson & LaMontagne, 1993). The rubric was an adaptation of a lesson plan rubric in Rose, Meyer, and Hitchcock (2005). Because the original rubric was authored by CAST and the BCSC rubric was published by Project Forum an affiliate of NASDSE (Sopko, 2008), the BCSC demonstrated content validity based upon expert review (Gay & Airasian, 2003; Leedy & Ormrod, 2001; Naizer, 1997; Senocak et al., 2007; Spooner et al., 2007; Stanford, 2008).

Lesson plan data reliability.

Content analysis quantifies written communication that involves more than one word responses and requires coding of phrases and concepts (Gay & Airasian, 2003; Weber, 1990). As Weber (1990) noted the meaning and interpretation of written communication may vary depending on the purpose of the researcher, weakening the reliability of the analysis. Inter-rater, also called inter-judge (Gay & Airasian, 2003), enhances the reliability of the scores. For inter-rater reliability, the researcher and a minimum of two additional people must independently analyze the lesson plans using the scoring codes. After the independent analysis, the scores were compared and a reliability coefficient was calculated (Leedy & Ormrod, 2001; Weber, 1990). The researcher provided a copy of the BCSC rubric and a copy of CAST (2008) *Universal design for learning guidelines-educator's checklist* (Appendix I), identifying key terms associated with each of the UDL principles identified in the rubric to two exceptional education

doctoral students, unaffiliated with study. The researcher provided training regarding the relationship between the *Universal design for learning guidelines-educator's checklist* and the BCSC rubric.

After the inter-raters demonstrated competence applying the BCSC rubric to the lesson plans, 33% of the lesson plans, pre and post, were randomly selected from the population. Two photo copies of each lesson plan were made so that the researcher and each inter-rater could independently score each of the lesson plans in the sample (Spooner et al., 2007). After each completed scoring the sample, they compared responses and calculated the reliability coefficient. If the reliability coefficient was less than .90, the inter-raters discussed the portions of the rubric where they disagreed. After discussing the rationale behind their disagreements, the inter-raters independently re-scored the sample lessons. When the inter-raters achieved 90% reliability agreement (Spooner et al., 2007), the remaining lesson plans were divided among the three raters to score. Because initial inter-rater reliability was calculated based upon a random sample of 33% of the lesson plans, pre and post, the pre and post lesson plans were not analyzed separately nor were the lessons paired as pre and post per student identification codes prior to scoring.

Lesson plan data fidelity.

The instructor observations were used as an intervention fidelity measure regarding the content analysis of the pre and post lesson plans for SGE SS students in Spring 2010. The purpose of the instructor observation was to record and measure the instructor's teaching as a possible confounding variable. If, during the three face to face SGE social studies course meetings in the first six weeks of the semester, the instructor modeled UDL practices, then participants could be exposed to UDL methods of instruction beyond the intervention; thereby, diminishing the fidelity of the data results.

The instructor observation measurement tool was developed by Dr. Michael Abell, Director for the Center for Innovation and Instruction for Diverse Learners (CIDDL) at the University of Louisville in Louisville, Kentucky. The observational measurement tool, Instructional Walk-through Observation (UDL emphasis) (IWO-UDL) has been used by Clark County School administrators to identify classroom teachers applying UDL principles in their instruction. The IWO-UDL reflects only one effort in Kentucky's Department of Education's "Universal Design for Learning initiatives through statewide model schools" (Lingo, Abell, & Kinney, 2008).

At the time of data collection, neither Dr. Abell nor the Clark County Schools had statistical data regarding the content validity of the IWO-UDL (Abell, M., personal communication, June 12, 2009). The IWO-UDL was reprinted with permission in *Universal Design for Learning: Implementation in Six Local Education Agencies*, a report by Project Forum, a component of NASDSE (Sopko, 2008). The Project Forum report communicated the results of six different local education agencies' implementation of UDL principles in their schools. Prior to publication, the report was reviewed by experts at NASDSE (Sopko, 2008); expert review provides support regarding the content validity of the IWO-UDL measurement tool for instructional observations. (Gay & Airasian, 2003; Leedy & Ormrod, 2001; Naizer, 1997; Senocak et al., 2007; Spooner et al., 2007; Stanford, 2008).

To enhance the reliability of the results from the observations of the instructor, inter-observer agreement was calculated. In addition to the researcher, an individual unaffiliated with the research study was trained in using the observation tool, increasing the reliability of the final observational scores (Fraenkel & Wallen, 2009; Krippendorff, 1980; Leedy & Ormrod, 2001; Slavin, 2007; White, 2006). Inter-observer agreement can be calculated using a variety of

methods. The calculation methods are selected based upon the frequency of the observed behavior(s) and the number of sessions the behavior was observed (Krippendorff, 1980; Slavin, 2007; White, 2006). One method to calculate observational recording is overall reliability. Slavin (2007) defined overall reliability as “a measure of reliability use in behavioral observation that compares the number of observation intervals in which each of two observers agreed divided by the number of intervals” (p. 192).

The researcher’s purpose for the instructor observations was to increase the fidelity of the intervention, by eliminating the possibility of the instructor modeling UDL principles. Therefore, the inter-observer was provided with a copy *Universal Design for Learning Guidelines* (CAST, 2008) and a copy of the IWO-UDL checklist. The researcher explained to the inter-observer how the UDL guidelines applied to the IWO-UDL checklist (Appendix E). The researcher clarified any questions the inter-observer had regarding either document. Then, the researcher and observer independently viewed and coded one of the three videotaped classroom sessions. Afterwards, the researcher and observer compared and discussed their responses in an effort to clarify any confusing terms and differences in the scores. After the researcher and inter-observer finished the discussion, each independently viewed and scored all three videotaped sessions. From the data, an overall reliability score was calculated (Slavin, 2007). If the resulting reliability score was less than 90%, the procedure was repeated and recalculated until 90% agreement was established. As Slavin (2007) noted, a reliability coefficient of .80 as the absolute minimum; therefore, the researcher established .90 reliability for inter-observer data.

CHAPTER FOUR: RESULTS

Introduction

The purpose of the study was to examine the effects of integrating an instructional lesson on UDL into SGE instructional methods courses. The selected research design was a quantitative, quasi-experimental design. The researcher proposed two research questions.

1. To what extent will integrating instruction on UDL into SGE instructional methods courses impact students' pre to post test scores on a UDL Knowledge Test compared to the UDL Knowledge Test pre and posttest scores of SGE instructional methods course students who do not receive this instruction on UDL?
2. To what extent will integrating instruction on UDL into a SGE social studies (SS) instructional methods course affect the plan for content delivery and assessment in students' written lesson plans related to the principles of UDL in a pre to post analysis?

Initially, two different statistical procedures; an ANCOVA to analyze the data for the first research question and a Wilcoxon test for matched pairs to analyze research question two data, were proposed. Unfortunately, the anticipated population for research question one did not materialize, and the unequal groupings, as well as, the reduced number of participants within the groupings confounded the probability of achieving reliable statistical data from the ANCOVA procedure.

Because the assumptions for the ANCOVA procedure were not met, the researcher exercised non-parametric applications to analyze the data for both research questions. The non-parametric formula of the Wilcoxon T test for dependent samples (Shavelson, 1996), also referred to as the Wilcoxon matched-pairs signed-ranked test (Hinkle et al., 1998) was applied to analyze the results for all, independent content areas' UDL Knowledge pretest and posttest

scores. In addition to the results within each content area, the researcher examined potential significant differences between the content areas.

To compare the content areas, the researcher calculated the difference scores between the posttest and pretest for all forty-nine subjects. The difference score facilitated the reduction of making a Type I error, as it accounts for each individuals' pretest score and posttest score, independent of the other participants' scores within or between the content areas. Applying the difference scores, the researcher conducted a Mann-Whitney *U* test for two independent samples for each content pairing (6 pairs) to examine any potential significant differences between the content areas' pretest and posttest scores. The researcher selected the Mann-Whitney *U* test to detect significant differences between content areas because the Mann-Whitney *U* test "is statistically more powerful and has been shown to be the better alternative to the two-sample *t* test for independent means. ... when the assumptions underlying the *t* test (normality and homogeneity of variance) cannot be adequately met" (Hinkle et al., 1998, p.604).

The second research question focused on one content area, Social Studies. The data, pre and post lesson plans, were analyzed by applying the Wilcoxon matched pairs, non-parametric analysis. A Wilcoxon test for matched pairs was selected because the calculation is designed specifically for dependent sampling data. The Wilcoxon was the recommended analysis when each subject has two quantitative measures associated with him or her; i.e. pretest and posttest (Hinkle et al., 1998; Shavelson, 1996).

The purpose of this chapter is to provide a detailed description of the data, the statistical procedures applied to analyze the data, and the results from the statistical analysis. For research question one, the data analysis required multiple calculations: (a) calculation process to obtain the final participant sample, (b) the descriptive statistics from the final sample, (c) within content

area data analysis, and (d) between content area statistical analysis. Research question two data analysis were less complex. The second research question’s results reflected (a) the descriptive statistics for the sample, (b) the UDL Module Feedback questionnaire results, and (c) the pre and post lesson plan analysis.

UDL Knowledge Test

The UDL Knowledge pretest and demographic information sheet was completed by 101 SGE students; however, only 68 SGE students also completed the posttest. The population for the UDL Knowledge Test included all SGE instructional methods students who completed both the pretest and posttest ($N=68$). The 68 participants were not equally distributed among the four content areas; Language Arts had the least participants ($n=11$), then Science ($n =15$), Mathematics ($n=17$), and Social Studies had the greatest number of subjects ($n =25$). (Table 7)

Table 7. *UDL Knowledge Test Population*

<u>SGE Content Area</u>	<u>Participants (n)</u>	<u>Population (%)</u>
Social Studies	25	36.8
Language Arts	11	16.2
Mathematics	17	25
Science	15	22.1
Total	68	100

In the population sample ($N=68$); approximately 47% of the participants were female ($n=32$), 72% of participants were Caucasian ($n=49$), and over half (60%) of participants reported being 18 – 25 years old ($n =41$). (Table 8). In addition to basic demographic questions,

participants ($n=68$) were asked a few questions referencing their academic status at the university. Participants were asked to report their academic level: 68% ($n=46$) reported they were undergraduate students, 21% ($n=14$) graduate students, and 12% ($n=8$) non-degree seeking or no response. Participants were asked if they had declared secondary education as their major ($n=56$) or minor ($n=7$) course of study. Eight percent ($n=5$) reported they had declared secondary education as neither their major nor minor course of study; however, 4 out of these 5 participants reported that the secondary instructional methods course was a required course for their program course of study. Finally, participants were asked if they had previously completed either EEX 4070: Teaching Exceptional Students in Elementary Settings, or EEX 4242: Teaching Exceptional Students in Secondary Settings. The courses, EEX 4070 and EEX 4242, include instruction and information about UDL and instructional planning based on the three UDL principles. Sixteen (23.5%) participants reported they had previously taken either EEX 4070 or EEX 4242. (Table 8)

Table 8. *SGE Instructional Methods Population Demographics*

Demographic Category	Participant Response	<i>n</i>	%
Prior enrolled EEX 4070 or EEX 4242	Yes	16	23.5
	No	49	72.1
	No Response	3	4.4
	TOTAL	68	100
Gender	Male	29	42.6
	Female	32	47.1
	No Response	7	10.3
	TOTAL	68	100
Ethnicity	African American	3	4.4
	Asian	2	2.9
	Caucasian	49	72.1
	Hispanic	8	11.8
	No Response	6	8.8
	TOTAL	68	100
Age Range	18 – 25 years	41	60.3
	26 – 33 years	13	19.1
	34-41 years	4	5.9
	42 + years	4	5.9
	No Response	6	8.8
	TOTAL	68	100
Academic Level	Undergraduate	46	67.6
	Graduate	14	20.6
	Non-degree seeking	2	2.9
	No Response	6	8.8
	TOTAL	68	100

Before beginning to quantitatively compare the participants' pretest and posttest scores within and between content areas, the researcher must determine if the population ($N=68$) exhibited homogeneity prior to introducing an intervention. The researcher applied a one-way

ANOVA to the participants' pretest scores. The pretest data analysis indicated the groups were not homogenous based on a significant Levene's Statistic ($p < .05$).

To determine which confounding variable, (a) academic year or (b) previously completed EEX 4070 or EEX 4242, which contains content on UDL, may have caused the lack of homogeneity, the researcher removed each variable from the population and reanalyzed the data. First, the researcher eliminated population participants who reported being graduate students at the university; the group was not homogeneous. The researcher returned graduate students to the population and removed the participants who had completed either EEX 4070 or EEX 4242 ($n = 16$), and participants who did not respond to the question ($n = 3$). The new sample data ($n = 49$) were encouraging. The Levene statistic was not significant ($p = .119$), indicating probable sample homogeneity. The one-way ANOVA analysis appeared promising ($F(3,48) = 2.712$, $p = .056$). Because the resulting p value indicated possible significance between groups, the researcher applied a Tukey PostHoc analysis to examine each content area pair for possible significant mean differences. The Tukey analysis revealed no significant between group mean differences.

Descriptive Statistics

SGE UDL Knowledge test sample population.

The final sample ($n = 49$) demonstrated homogeneity across the four content areas based on the UDL Knowledge Pretest. The unequal distribution of participants among the content areas, Social Studies ($n = 17$), Language Arts ($n = 8$), Mathematics ($n = 11$), and Science ($n = 13$), along with the reduction in overall participants, ($n = 68$ to $n = 49$) altered the appropriate selection of statistical analysis from parametric to nonparametric analyses. The final participants' ($n = 49$) demographical data are presented in Table 9.

Table 9 *UDL Knowledge Test Sample Demographics*

	<i>Experimental Groups (n)</i>			<i>Reference Group (n)</i>	
<u>Gender</u>	<u>SS</u>	<u>LA</u>	<u>M</u>	<u>S</u>	
Male	12	6	3	2	
Female	5	2	7	6	
No Response	0	0	2	5	
Total (n)	17	8	12	13	
<u>Ethnicity</u>	<u>SS</u>	<u>LA</u>	<u>M</u>	<u>S</u>	
African American	2	0	0	0	
Asian	0	0	1	0	
Caucasian	13	8	9	7	
Hispanic	2	0	1	1	
No Response	0	0	1	5	
Total (n)	17	8	12	13	
<u>Age</u>	<u>SS</u>	<u>LA</u>	<u>M</u>	<u>S</u>	
18-25 yrs	11	4	5	6	
26-33 yrs	4	2	3	1	
34-41 yrs	1	1	2	0	
42+ yrs	1	1	1	1	
No Response	0	0	1	5	
Total (n)	17	8	12	13	
<u>Academic Level</u>	<u>SS</u>	<u>LA</u>	<u>M</u>	<u>S</u>	
Undergraduate	17	2	7	3	
Graduate	0	6	4	3	
Non-degree	0	0	0	2	
No Response		0	1	5	
Total (n)	17	8	12	13	

Intervention sample response to UDL module.

Upon completing the UDL Knowledge Posttest, participants included in the intervention groups ($n=36$), Social Studies, Language Arts, and Mathematics, were asked to complete the

Participant Feedback Questionnaire for the UDL module. Students in the reference group, Science ($n = 13$), did not complete a questionnaire because they did not participate in the UDL module. The Participant Feedback Questionnaire contained five questions reflecting the individual's personal experience with the UDL module. The questionnaire was designed as a forced choice, a four point, Likert Scale: 1 = Strongly Disagree (SD), 2 = Disagree (D), 3=Agree (A), and 4= Strongly Agree (SA), and for the purpose of data coding, 5= No Response (N). The participants' completion of the feedback questionnaire was voluntary. The researcher collected 30 (83%) completed questionnaires; six intervention participants in mathematics chose not to answer the questionnaire.

The first question asked the participant if the UDL module contained information he or she did not already know; 87% ($n=26$) responded with agree or strongly agree. The second question asked participants if the UDL module was easy to access and understand. Ninety-three percent of the participants agreed or strongly agreed. The third question asked participants to reflect on whether or not the module content affected their perception of teaching students with disabilities. Almost 80% ($n=23$) of the participants agreed or strongly agreed the module did affect their thoughts about teaching students with disabilities. When question four asked participants if they felt that all students enrolled in secondary instructional methods courses could benefit from the UDL module, 93% of the participants agreed or strongly agreed. The final question asked participants if they felt the UDL module would have been more beneficial if the instructional methods instructor had included information on UDL in his or her instructional examples in the instructional methods course. The participants were divided 43% strongly disagreed or disagreed, and 57% agreed or strongly agreed. (Table 10)

Table 10. *UDL Module Participant Feedback Questionnaire*

Feedback Question	SD (n)	D (n)	A (n)	SA (n)	N (n)
<u>Social Studies</u>					
1 New information	1	2	11	3	0
2 Ease of access	1	0	11	5	0
3 Altered my view	1	3	10	3	0
4 All SGE need it	0	2	10	5	0
5 SGE instructor could	1	5	10	1	0
<u>Language Arts</u>					
1 New information	0	1	5	2	0
2 Ease of access	0	1	3	3	1
3 Altered my view	0	1	6	0	1
4 All SGE need it	0	0	3	5	0
5 SGE instructor could	0	4	1	3	0
<u>Mathematics</u>					
1 New information	0	0	5	0	6
2 Ease of access	0	0	3	2	6
3 Altered my view	0	1	2	2	6
4 All SGE need it	0	0	3	2	6
5 SGE instructor could	0	3	2	0	6

KEY: SD = strongly disagree, D = disagree, A=agree, SA= strongly agree, N=No Response

Q1: The UDL module contained information I did not know.

Q2: The UDL module was easy to access and understand.

Q3: I feel the UDL module helped me think differently about teaching students with disabilities.

Q4: I think all students in secondary instructional methods would benefit from the UDL module.

Q5: I think the UDL module would have been more beneficial if my course instructor provided additional information and examples regarding UDL as part of his/her instruction.

UDL Knowledge Test Analysis of Data

The UDL Knowledge pretest and posttest scores for each participant within content areas and between content areas were analyzed to test the null hypothesis that no significant difference

on the UDL Knowledge Posttest mean scores will be apparent within or between intervention and reference groups. The parametric calculation to measure within and between group differences simultaneously is the ANCOVA (Delaney & Maxwell, 1981; Lowry, 2009; Maxwell, Delaney, & Manheimer, 1985; Reichardt, 1979). Unfortunately, nonparametric alternatives do not permit within and between group analyses simultaneously (Green & Salkind, 2005). Therefore, to analyze the data, multiple non-parametric statistical procedures were calculated. The Wilcoxon Test for matched pairs was used to calculate potential pre-posttest differences for each content area (SS, LA, M, S). The Mann-Whitney-*U* test for two independent samples was used to calculate potential pre-posttest differences between the content areas (Hinkle et al., 1998; Shavelson, 1996).

Within group data analysis.

The researcher conducted within group analysis applying the Wilcoxon Test for matched pairs; the nonparametric equivalent to a dependent *t* test (Hinkle et al., 1998; Shavelson, 1996). Table 11 provides a summary of the mean scores and the minimum and maximum raw scores for the UDL Knowledge pretests and posttest in each content area.

Table 11. *Descriptive Statistics UDL Knowledge Test*

Content Area	UDL Knowledge Test	<i>M</i>	<i>SD</i>	Min score	Max score
Social Studies	Pretest	11.53	2.672	8	16
	Posttest	12.71	2.664	8	18
Language Arts	Pretest	11.63	1.685	9	14
	Posttest	13.38	2.066	11	17
Mathematics	Pretest	13.45	1.635	12	17
	Posttest	14.00	2.366	10	17
Science	Pretest	13.38	2.468	10	18
	Posttest	12.69	2.689	8	18

Because each content area sample has fewer than 25 participants, the Wilcoxon results were reported in terms of the $T_{calculated (calc)}$ versus the $T_{critical (crit)}$ value and the affiliated p value instead of reporting the z -scores (Hinkle et al., 1998; Shavleson, 1996). For statistical significance, the T_{calc} must be less than $T_{critical}$. The UDL Knowledge test pre and post scores indicated no significant difference between UDL Knowledge Pre and Posttest was found for two intervention groups: Language Arts ($T_{calc} = 7, p > .05$) and Mathematics ($T_{calc} = 31.5, p > .05$), and the reference group, Science ($T_{calc} = 35, p > .05$). A significant difference between UDL Knowledge pretest and posttest scores was found for Social Studies ($T_{calc} = 19, p < .05$).

The Wilcoxon test determines significance by calculating negative ranks. Table 12 reveals, six Language Arts participants' scores increased (75%), while two Language Arts participants' scores decreased (25%). In Mathematics, less than half (46%) of participants' UDL test scores improved from pre to posttest. In Social Studies, twelve participants' scores increased (71%); three participants' scores did not change (17%); and two participants' scores decreased (12%). Based on the data, 25% of Language Arts participants' decreased their pre to posttest score; compared to 12% of Social Studies participants' scores.

Table 12. *Wilcoxon Results UDL Knowledge Test*

Content Area	Wilcoxon Ranks	No.	$T_{calculated}$	$T_{critical}$
Social Studies Post – Social Studies Pre	Negative: pretest > posttest	2	19*	23
	Positive: pretest < posttest	12		
	Tie: pretest = posttest	3		
	Total	17		
Language Arts Post - Language Arts Pre	Negative: pretest > posttest	2	7	4
	Positive: pretest < posttest	6		
	Tie: pretest = posttest	0		
	Total	8		
Mathematics Post – Mathematics Pre	Negative: pretest > posttest	3	31.5	14
	Positive: pretest < posttest	5		
	Tie: pretest = posttest	3		
	Total	11		
Science Posttest – Science Pretest	Negative: pretest > posttest	7	35	17
	Positive: pretest < posttest	4		
	Tie: pretest = posttest	2		
	Total	13		

*Significant based on the $T_{calculated} < T_{critical}$ ($p < .05$)

The intervention appeared to have an effect on participants' knowledge of UDL principles in 2 out of 3 intervention groups. In Social Studies and Language Arts participants' demonstrated the greatest learning gains pre to posttest. Only 2 of 11 Mathematics participants' knowledge increased from pre-posttest. In the reference group, 4 of 13 participants' scores increased pre to posttest. To respond to the null hypothesis of no significant difference in pre-posttest scores for participants who completed the UDL instruction compared to participants who did not complete the UDL instruction, the researcher would fail to reject the null hypothesis in 2 intervention groups (LA and M), and reject the null hypothesis in 1 intervention group, (SS). After calculating any significant differences in pre-posttest scores within each content area, the

researcher needed to determine if significant differences between scores existed across the content areas.

Between group data analysis.

To calculate any significant difference between the groups, the researcher applied the Mann-Whitney U test for two independent samples to the data. To calculate the specific change from UDL Knowledge pretest to posttest score, the difference score was recorded for each participant ($n=49$). The Mann-Whitney U test compared and ranked the difference between pretests and posttest scores for each content area pairing ($n=6$). After calculating the six content area pairings, the data revealed a probably significant difference ($U_{calc} = 26.5, p < .05$) between the intervention group, Social Studies ($M = 18.65$) and the reference group, Science ($M = 11.38$). Table 13 provides the statistical analysis for all content area pairings and provides the $U_{critical}$ and $U_{calculated}$ value for each pair based upon the number of participants in each group for each pair. (Hinkle et al., 1998).

Table 13. *Mann-Whitney U Results UDL Knowledge Test*

Content Areas' Post-Pre Difference Score		<i>n</i>	<i>M</i> Rank	$U_{\text{calculated}}$	U_{critical}
Social Studies & Language Arts	Social Studies	17	12.38	57.5	34
	Language Arts	8	14.31		
	Total	25			
Social Studies & Mathematics	Social Studies	17	15.82	71	51
	Mathematics	11	12.45		
	Total	28			
Social Studies & Science	Social Studies	17	18.65	57*	63
	Science	13	11.38		
	Total	30			
Language Arts & Mathematics	Language Arts	8	11.5	32	19
	Mathematics	11	8.91		
	Total	19			
Language Arts & Science	Language Arts	8	14.19	26.5	24
	Science	13	9.04		
	Total	21			
Mathematics & Science	Mathematics	11	14.5	49.5	37
	Science	13	10.81		
	Total	24			

* Significance based on $U_{\text{calculated}} < U_{\text{critical}}$ ($p < .05$)

Research question one inquired to what extent would integrating instruction on UDL into SGE instructional methods courses impact students' pre to post test scores on a UDL Knowledge Test when compared to the scores of SGE instructional methods course students who do not receive instruction on UDL. The null hypothesis predicted no significant difference in UDL Knowledge posttest scores between students who received instruction on UDL and students who

did not receive instruction on UDL. The results in Table 13 indicate that in a 2:1 ratio, the researcher would fail to reject the null hypothesis. As the Mann-Whitney U calculation indicated no significant difference between the calculated pretest-posttests difference scores for two pairings: Language Arts: Science ($p > .05$) and Mathematics: Science ($p > .05$). However, in one pairing, Social Studies: Science ($p < .05$), the data would necessitate the rejection of the null hypothesis. No significant differences between the other content area pairings were found.

Research Question One Results

The Mann-Whitney U between group findings supported the Wilcoxon T within group findings. The Mann-Whitney U test results indicated a significant difference between the Social Studies intervention group and the reference group ($p < .05$). The Mann-Whitney U test found no additional statistically significant differences between the other two intervention groups and the reference group. Similarly, the Wilcoxon T test results indicated 88% of the Social Studies participants scoring equal to or greater on the posttest, compared to 46% of Science participants scoring equal to or greater on the posttest. The Wilcoxon T within group calculations also found a statistically significant difference between the pre and posttest scores ($p < .05$) of the Social Studies participants, and no statistically significant difference within any other content area.

Though the Wilcoxon and Mann-Whitney- U test data analyses were similar, the researcher would be remiss to confidently fail to reject the null hypothesis for 2 intervention groups (LA and M), or reject the null hypothesis for 1 intervention group (SS). A critical factor in selecting an intervention rests in the expectation that participants partook in the intervention. In the research study, 30 participants responded to Question 6 on the UDL module Participant Feedback Questionnaire. Question 6 asked participants to self-report the percentage of the UDL

module they completed. Table 14 provides the intervention participants' response results for Question 6: *How much of the UDL module (including activities) did you complete.*

Table 14. *UDL Module Participant Feedback Questionnaire*

Social Studies	<i>n</i>	Language Arts	<i>n</i>	Mathematics	<i>n</i>	Total Participants	<i>n</i>
0-25%	3	0-25%	2	0-25%	2	0-25%	7
26-50%	1	26-50%	1	26-50%	2	26-50%	4
51-75%	8	51-75%	3	51-75%	1	51-75%	12
76-100%	5	76-100%	2	76-100%	0	76-100%	7
No Response	0	No Response	0	No Response	6	No Response	6
Total	17	Total	8	Total	11	Total	36

Table 14 data for Question 6 revealed that Social Studies participants had the largest percentage of students (76%) completing between 50 and 100% of the module. Respectively, Social Studies participants' scores were significantly different pre to posttest ($p < .05$).

Additionally, when compared to the reference group's scores, a statistically significant difference was found between SS participants' scores and the reference group's scores ($p < .05$). In Language Arts, 62% of the participants completed between 50 and 100% of the module. Language Arts participants scores did not reveal a significant difference pre to posttest. Finally, in Mathematics, 9% of participants completed between 50 and 100% of the module, and Mathematics participants' demonstrated the least change in mean scores from pretest ($M=13.45$) to posttest ($M=14.00$). In summary, the UDL Knowledge Test data indicated a relationship between participants' engagement level with the intervention and the difference from pre to posttest scores.

Reliability and fidelity research question one.

The UDL Knowledge test ($n = 30$) was piloted the semester prior to data collection; the KR-20 reliability coefficient was .090, providing confidence in the reliability of the instrument. A reliable instrument, however, may not be scored correctly; thereby, altering the accuracy and reliability of the test statistic results. The researcher applied inter-rater reliability to the UDL Knowledge pretest and posttest (Slavin, 2007). The inter-raters were two, education doctoral students, who were unaffiliated with the research study. Twenty percent ($n=14$) of the UDL Knowledge pretests ($n=68$) were randomly selected, and the inter-raters reviewed them for scoring accuracy. The inter-rater reliability for the UDL Knowledge Pretest was 0.995 or 99.5% inter-rater agreement. Ten (20%) of the UDL Knowledge posttests ($n=49$) were randomly selected, and the inter-raters independently reviewed them for scoring accuracy; the inter-rater reliability coefficient was 1.0 or 100% inter-rater agreement. Additionally, the inter-raters scored 20% ($n=6$) of the intervention participants' feedback questionnaire ($n=30$). The calculated inter-rater reliability for the participants' feedback questionnaire also provided 100% inter-rater agreement.

To increase the probability that intervention participants and reference participants were evaluated with fidelity, after all participants completed the pretest, all intervention participants received an electronic mail message from their content area SGE instructional methods course instructor with a hyperlink to the instructional module in the same instructional week. The intervention group's course instructors sent a message to the researcher confirming they had sent the electronic mail message containing the hyperlink to their students. Two weeks after the intervention participants received the electronic mail message with the hyperlink to the instructional module, all participants completed the posttest during face to face, regularly

scheduled class meeting for their content area SGE instructional methods course. The researcher distributed the posttest to the participants at the beginning of the class meeting. All participants completed the posttest, and only intervention participants completed the feedback questionnaire. Thirty minutes after distributing the posttests and questionnaire, the researcher collected the posttests and participant feedback questionnaires.

The final two measures of fidelity were the intervention participants' answer to Question 6 on the Participant Feedback Questionnaire, and the submission of the print copy of the UDL module's first and last pages. Participants were asked to select one of the four options: 0-25%, 26-50%, 51-75%, 76-100% (Table 14). Intervention participants had also been instructed to print the first page of the UDL module and the last page of the UDL module and bring the printed pages with them to submit to the researcher. The printed module pages provided evidence the student had accessed the module. The researcher collected 17 (47%) printed, first and last page paired, pages of the UDL module from the 36 intervention participants. Half of the Language Arts participants ($n=4$) submitted printed module pages. None of the Mathematics participants ($n=0$) printed the UDL module pages. In Social Studies, 76% ($n=13$) of participants provided printed module pages to the researcher.

UDL Lesson Plan Analysis

The second research question focused on SGE SS instructional methods students' written instructional lesson plans. Students enrolled in the SGE SS instructional methods course during the semester of data collection participated in this portion of the research study. The researcher added the lesson plan analysis to SS because traditionally, SGE SS courses have been text based (Bouck et al., 2009; Connore & Lagares, 2007; Ellis, 1993; Okolo et al., 2006, 2007; Passe & Beattie, 1994), and crafting a lesson plan was judged to be a reasonable application of UDL

knowledge. The UDL module provided examples for UDL classroom instructional planning in middle grades SS (Appendix A). Hence, specific participants in the study who accessed the module would have had the opportunity to view examples of UDL instructional planning in the SS content area.

UDL Lesson Plan Descriptive Statistics

Sample population.

All SGE SS instructional methods students were invited to participate in the research study. Potential participants provided the researcher with one instructional lesson plan written for a previously completed course. Students who met inclusionary criteria: a) completion of UDL Knowledge pretest and posttest and b) provide researcher with a second lesson plan after the intervention had the opportunity to be included in the sample ($n=13$). Only 8 of the 13 participants provided the researcher with a pre and a post lesson plan. Of the 8 participants, 7 were Caucasian and 1 was Hispanic. Four participants were female, and four were male. The majority ($n=6$) reported being between the ages of 18 and 25 years. One reported being between the ages of 26 and 33 years, and one reported being 42 years or older (Table 15).

Table 15. *UDL Lesson Plan Participants' Demographics*

<u>Gender</u>	<u>n</u>	<u>Race</u>	<u>n</u>	<u>Age</u>	<u>n</u>	<u>Academic Level</u>	<u>n</u>
		African American	0	18-25 yrs	6	Undergraduate	8
Male	4	Caucasian	7	26-33 yrs	1	Graduate	0
Female	4	Hispanic	1	34-41 yrs	0	Non-degree	0
				42+ yrs	1		
Total	8	Total	8	Total	8	Total	8

The researcher scored the lesson plans based on the BSBC rubric in Appendix D. The BSBC rubric is based on the three principles of UDL; MMR, MME, and MMAE. The rubric divided the principles into subcomponents, creating 9 categories to apply to the lesson plan

evaluation. The rubric had a four column scoring scale: 0 = not yet evident, 1= emerging, 2= intermediate, 3= advanced. This 0 to 3 rubric scoring scale was applied; therefore, a lesson plan with a perfect rubric score would equal 27 (9 categories x 3 points). Due to the small sample size ($n=8$), the lesson plan data results may be only applied to these study participants. Additionally, the lesson plan results do not generalize to any of the other ($n =24$) SGE social studies content area UDL Knowledge test participants.

Lesson plan participants' response to UDL module.

As a component of the lesson plan analysis, the UDL module Participant Feedback Questionnaire responses for the lesson plan participants ($n=8$) were evaluated. Table 16 displays the participants' responses to the six questions. Six participants agreed or strongly agreed that the UDL module contained information they had not already known. Seventy-five percent ($n=6$) felt the UDL module altered their thoughts about teaching students with disabilities. When asked if they felt all SGE instructional methods students could benefit from the UDL module, all 8 respondents agreed or strongly agreed that the UDL module could benefit all SGE instructional methods students. The majority ($n =7$) of the 8 respondents felt they could have benefitted from additional UDL instructional modeling from the Social Studies methods course instructor. Of the 8 participants, only 2 self-reported completing between 76% and 100% of the UDL module. Six lesson plan participants completed 51% or more of the module, and six agreed or strongly agreed that the module altered their thoughts about teaching students with disabilities.

Table 16. *Lesson Plan Participants' UDL Module Feedback Questionnaire*

<u>Feedback Question</u>	<u>SD (n)</u>	<u>D (n)</u>	<u>A (n)</u>	<u>SA (n)</u>
1 The module had new information	0	2	3	3
2 Easy to access the module	0	0	5	3
3 Altered my view of teaching	0	2	4	2
4 All SGE need to do UDL module	0	0	4	4
5 SGE instructor could have helped	1	0	6	1
<u>Percentage options</u>	<u>0-25%</u>	<u>26-50%</u>	<u>51-75%</u>	<u>76-100%</u>
6. % of module you completed	1	1	4	2

*Key: SD: strongly disagree D:disagree A:agree SA: strongly agree

Analysis of Data

Based on the Participant Feedback Questionnaire, 6 of 8 respondents reported the UDL module provided them with new information, and a different outlook for teaching students with disabilities. After scoring the pre and post lesson plans, however, the Wilcoxon test analysis indicated no significant difference ($T_{calc} = 13.5, p > .05$) in the participants' lesson plan scores. The sample's ($n=8$) mean lesson plan score actually decreased: pre-intervention lesson plan ($M=6.75$), post-intervention lesson plan ($M=5.88$). Likewise, 3 participants' lesson plan scores increased, while 5 participants' lesson plan scores decreased; creating a larger percentage of negative ranking scores.

When the participants' ($n=8$) UDL Knowledge pre and posttest scores were analyzed, no significant difference was found between the pre and posttest scores ($T_{calc} = 4, p = .05$). The posttest mean score ($M = 13.25$) was greater than the pretest mean score ($M = 11.50$), with 7 (88%) participants' UDL Knowledge test scores increasing pre to post intervention. Only 1 participant's UDL Knowledge test score decreased from pre to post intervention. Table 17 summarizes the SGE Social Studies lesson plan data and the 8 participants' UDL Knowledge pre and posttest scores.

Table 17. Lesson Plan Participants' Rubric and UDL Knowledge Wilcoxon Analysis

	M	SD	Wilcoxon Ranks	No.	$T_{calculated}$	$T_{critical}$
Lesson Plan Pre	6.75	3.20	Negative: pretest > posttest	5	13.5	4
			Positive: pretest < posttest	3		
Lesson Plan Post	5.88	4.19	Tie: pretest = posttest	0		
			Total	8		
UDL Knowledge PreTest score	11.50	3.21	Negative: pretest > posttest	1	4	4
			Positive: pretest < posttest	7		
UDL Knowledge Posttest score	13.25	3.06	Tie: pretest = posttest	0		
			Total	8		

*Significant based on $T_{calculated} < T_{critical}$ ($p < .05$)

Research Question Two Results

After completing the lesson plan data analysis, the researcher fails to reject the null hypothesis that no statistically significant difference exists between the SGE instructional methods SS pre and post intervention UDL lesson plan rubric evaluation scores. The failure to reject the null hypothesis is cautioned due to three data distinctions. First, the small sample size ($n=8$) may have altered the results, because 1 participant's score equated 12.5% of the population score; thereby, each participant's score had a large effect on the overall population. Second, only two lesson plans were analyzed for each participant. As lesson plan content can be varied and complex, the measure of only two lesson plans for each participant does not provide generalizable data. Finally, the reality that only two of the participants completed between 76 and 100 % of the instructional module (Table 16) may have confounded the data results.

Reliability and Fidelity Lesson Plan Analysis

Because the researcher scored the lesson plans based upon a content analysis rubric, which has the potential to be subjective, the researcher utilized two exceptional education doctoral students as an inter-rater to calculate the reliability coefficient for the data scoring and entry. The researcher randomly selected 37.5% of the lesson plan pairs, 3 pre and 3 post, for

independent, inter-rater scoring. The two inter-raters and researcher agreed on 6 out of 6, resulting in a 1.00 reliability coefficient.

For treatment fidelity purposes, the researcher video recorded the three, face to face, instructional course sessions for the Social Studies Instructional Methods course that occurred between week 2: pre lesson plan collection and week 6: post lesson plan collection. The Social Studies instructional methods instructor was observed during face to face instruction in order to determine if the study participants were exposed to UDL instructional design modeling by the course instructor. Additionally, the course instructor was observed to determine if UDL principles or concepts were specifically identified by the instructor; thereby, confounding the possible effects the intervention may have had on the participants' lesson plans. The researcher and an inter-observer, a doctoral student in exceptional education unaffiliated with the study and unfamiliar with the course instructor, reviewed the video recordings of the three face to face SS instructional methods class meetings that occurred during data collection.

The observers utilized the Instructional Walk-through Observation form (Appendix E) to independently score the instructor based upon the three principles of UDL. The inter-observer received training on how to apply the rating scale, and after the first hour of viewing, the inter-observer and researcher examined and discussed their ratings. The initial inter-observer rating was 59 agreements out of 90 total agreements and disagreements (reliability = .065). The scoring discrepancies were discussed; the researcher and inter-observer reviewed the video and independently rescored the footage. The second scoring yielded a .85 reliability coefficient. With clarification on how to apply the form to the video recorded instruction, the observers reviewed two additional hours video and rated the instructor's modeling of UDL principles. The inter-observer agreement was calculated at 77 agreements out of 90 total agreements and

disagreements (0.86). After calculating the Social Studies instructor's IWO scores, the observers agreed that the Social Studies instructor did not model or speak directly about UDL or how to plan instruction based on UDL principles. The SGE instructional methods Social Studies students did not receive additional instruction on UDL from the SGE Social Studies instructional methods instructor.

Summary

For research Question One, the data showed that providing SGE instructional methods students with instruction on UDL can have a positive impact on the students' knowledge related to UDL (Table 12 and Table 13); however, the data also indicated that the significance of the increase in students' knowledge (Table 11) may be correlated with the amount of instruction the students' receive (Table 14). The data also indicated that providing students with instruction on UDL has the potential to positively impact the students' perceptions of teaching students with disabilities (Table 10). The intervention groups' overwhelmingly positive responses to the UDL module on the Participant Feedback Questionnaire (Table 10) are encouraging and suggest that SGE instructional methods instructors' should continue including instruction on UDL in their respective content area instructional methods courses.

The Social Studies pre and post lesson plan analysis sample ($n=8$) was too small to yield a confident expression of correlation regarding the potential impact instruction on UDL had on the participants' lesson plan design related to the three main UDL principles: MMR, MME, MMAE. In addition to the limited sample, the data analysis was also impacted because only two of the participant's reportedly completed 76 – 100% of the UDL instructional module. Finally, the SGE instructional methods course does not require students to complete an instructional lesson plan following a specific format. Without even a general format, consistently and

objectively scoring lesson plans based on the UDL rubric was challenging. The final statistical analysis of the lesson plan rubric data indicated that lesson plans did not significantly vary from pre to post-intervention.

CHAPTER FIVE: DISCUSSION

Introduction

The study investigated the potential effects of integrating UDL content into general education secondary instructional methods courses on student knowledge of UDL principles. The study also examined possible residual effects of acquired UDL knowledge on secondary SS students' instructional lesson plans. The IRIS Center's online instructional UDL module served as the instructional intervention for the study. The researcher selected the IRIS Center UDL module as the intervention because the module contains information co-authored and/or reviewed by CAST Directors: Dr. David H. Rose and Dr. Anne Meyer. Also significant, the IRIS Center's instructional modules are free and available to the general public through a research partnership between Vanderbilt University and Claremont Graduate University and funded by the U.S. DOE Office of Special Education Programs (OSEP).

To determine if students' knowledge regarding UDL principles was effected by accessing the UDL instructional content, the researcher created the UDL Knowledge Test as a pre-post assessment (Appendix B and C), and in a pilot project, the measurement demonstrated high reliability (.90). Students enrolled in four secondary content area methods courses, namely, SS, Language Arts, Mathematics, and Science, were invited to participate. Only the scores from students who completed both UDL Knowledge pre and posttest were included in the analysis ($N=49$). For the lesson plan analysis, the researcher asked the secondary SS instructional methods students to provide her with an instructional lesson plan they had written prior to the Spring 2010 semester, and a copy of a lesson plan assigned and due post intervention. Again only the scores of students who were members of research question one's sample and who submitted both a pre

and post instructional lesson plan were included in the analysis ($n = 8$). To score the students' lesson plans, the researcher applied a UDL Lesson Plan Rubric that had been used by Bartholomew Consolidated School Corporation in Columbus, Indiana (Appendix D). The rubric evaluated students' instructional planning in each UDL Principle, MMR, MMAE, and MME. Each principle was subdivided: MMR, 4 subdivisions, MMAE: 3 subdivisions, and MME: 2 subdivisions, creating a total of 9 fields of measurement. The nine fields were evaluated using a four point rubric scale: 0, 1, 2, 3; the ideal lesson plan would earn a perfect raw score of 27 points. The four content area professors agreed to refrain from discussing the UDL instructional content as well as the application of UDL principles to classroom instruction in each secondary content area prior to the end of the study.

Along with the UDL Knowledge pretest, the researcher distributed a demographic questionnaire to potential subjects. The questionnaire asked participants to identify their major course of study at the university and disclose if they had completed a course containing information on UDL principles, EEX 4070 or EEX 4242. The questionnaire facilitated final sample selection for the statistical analysis. Individuals who reported exceptional education as their major course of study ($n = 2$) were excluded from the final analysis. Individuals who had previously completed EEX 4070 or EEX 4242 ($n = 16$) were excluded from the analysis because the course content contained information and instruction on UDL.

Two weeks after the intervention, participants in the intervention groups (SS, L, and M) completed the UDL Knowledge posttest and the UDL Participant Feedback Questionnaire. Additionally, SS students participating in research question two submitted the post-intervention lesson plan. During the same week, students in the reference group (S) completed the UDL

Knowledge posttest. Students in the reference group did not complete the UDL Participant Feedback Questionnaire because they did not access the UDL module.

Statement of Problem

NCLB and IDEIA 2004 have improved students with disabilities access to the general education curriculum and classrooms; however, secondary students with disabilities are not academically achieving compared to their secondary general education peers (Wagner et al., 2006). Research on beginning teachers has indicated that many general education teachers do not feel properly prepared to meet the various array of instructional accommodations for students with disabilities in their classrooms (Doyle & Giangreco, 2009; GOA, 2009; Jimenez et al., 2007; Knokey, 2006; Smith et al., 2010; VanHover & Yeager, 2003). Teacher education programs need to integrate content regarding instructional methods for teaching and accommodating students with disabilities in secondary, general education classrooms (Burdette, 2007; Smith et al., 2010).

Discussion of the Findings

Research Question One

The research results indicated a significant difference between UDL knowledge pre and post test for SGE SS students. Language Arts and Mathematics students did not demonstrate significant differences between pre and posttest scores; however, few LA and M students completed more than 50% of the UDL module, confounding the results. The reference group, Science, did not demonstrate significant difference in pre to post UDL knowledge test scores.

When the average *M* difference between pre and posttest scores for each content area were calculated, data were compared across content areas to determine if the SGE students' scores varied significantly between specific content areas. The only statistically significant

comparison was found in the SS and Science comparison. The data indicated a significant difference between the average *M* difference in SS and Science scores. Although a significant pre to posttest difference was not established in all content areas, a contributing factor to these results was students' lack of engagement in the UDL module. Certainly, content in an instructional module can only be effective if the individual learner completed the UDL module. The research data show that 17 of 36 (47%) of participants' completed less than half of the module's content, confounding the ability to obtain a true measure of the UDL module's content on participants' knowledge. Hence, the researcher expresses caution when failing to reject the null hypothesis regarding Language Arts and Mathematics and rejecting the null hypothesis with regards to SS.

Aligned with new teachers' reported unpreparedness to teach students in diverse classrooms and the potential benefit that UDL content training could provide new teachers, the research findings most relevant to teacher preparation may not be found in the calculated statistical difference between UDL knowledge pre and posttest scores. The findings most relevant to SGE teacher preparation might be, only, the results from the UDL Knowledge Test Participant Feedback Questionnaire. The research subjects' feedback on the questionnaire aligned with recently published research on teacher preparation, including *The Digest of Education Statistics 2008* (Snyder et al., 2009), the U.S. Government Accountability Office(GOA) report on teacher preparation (2008), the National Comprehensive Center for Teacher Quality (NCCTQ) report on new teachers (Rochkind et al., 2008), and Smith et al. (2010) report on "The changing educational landscape".

The NCCTQ report on new teachers indicated that approximately 67% of teacher preparation programs required students to complete at least one course on teaching students with

disabilities (Rochkind et al., 2008). With the availability of the UDL module from IRIS, teacher educators should be alarmed that only 67% of teacher preparation programs required course content related to teaching students with disabilities. The U.S. GOA (2009) report listed the IRIS Center for Training Enhancements as one of ten federal grant programs designed “to ensure that future generations of general educators are better prepared to meet the needs of students with disabilities who are learning in inclusive settings” (Smith et al., 2010, p.39). SGE teacher preparation programs have free access to DOE approved content reflecting best practice instructional methods for teaching students with disabilities. Additionally, the HEOA (2008) requires teacher preparation programs to “provide assurances that general education teachers receive training about providing instruction to diverse populations, including students with disabilities” (Smith et al., 2010, p. 29).

When 57% of student with disabilities experienced 80% of instruction in general education classrooms (Smith et al., 2010; Snyder et al., 2009), teacher education programs should be preparing future teachers for diverse student aptitude, culture, language, and classrooms. Stronge (2007) explained:

The effective teacher truly believes that all students can learn – it is not just a slogan. These teachers also believe that they must know their students, their subject, and themselves, while continuing to account for the fact that students learn differently. Through differentiation of instruction, effective teachers reach their students, and together they enjoy successes. (p.29).

New teachers’ thoughts on improving teacher quality and effectiveness echo Stronge’s (2007) statement. Eighty-four percent of new teachers felt that “preparing teachers to adapt or vary their instruction to meet the needs of a diverse classroom” (Rochkind et al., 2009, p.33) would

improve teacher quality. If effective teachers “truly believe that all students can learn” (Stronge, 2007, p. 29), integration of the UDL module into teacher preparation programs may contribute to future teacher effectiveness.

Research Question Two

The results from research question two indicated that the content of the UDL module did not have a statistically significant effect on SGE SS students’ pre to post lesson plan writing. Additionally, the SS students who participated in the lesson plan analysis demonstrated no significant change in UDL knowledge on the pre to post UDL Knowledge test ($T_{calc} = T_{critical}$, $p = .05$). Despite the lack of statistically significant difference in pre to posttest scores, the participants’ UDL Knowledge test scores did increase from pretest ($M = 11.5$) to posttest ($M = 13.25$). The students’ improved their knowledge on UDL principles, but the lesson plans did not reflect a knowledge application transfer.

The participants’ lack of integration of UDL principles into their lesson plans aligns with teaching and learning theory that students acquire background knowledge first, then apply and integrate new knowledge with pre-existing information, and finally, learners’ organize and synthesize information (Bransford et al., 2000; Darling-Hammond, 2008). Likewise, according to the NCCTQ report, “more than 8 in 10 (82 percent) [new teachers] say their coursework covered teaching students with special needs. But the training that they received was, in their view, inadequate to prepare them for the reality that they encountered” (Rochkind et al., 2008, p. 7) Eleven of thirteen (85%) of question two participants’ increased their knowledge of UDL principles; however, only 5 of 13 (38%) increased the amount of UDL principles they integrated into their instructional lesson plans. Possessing the background knowledge represents the first step in teaching and learning theory; however, students must apply knowledge to new situations

to acquire mastery (Bransford et al., 2000). Research question two's participants' data indicated that the UDL module's content can increase students' knowledge of UDL principles, but without active practice in applying the UDL module content, it appears to have little impact on students' instructional lesson plans. SGE teacher preparation programs might consider including instructional experiences planning and teaching students with disabilities, fulfilling steps two and three of teaching and learning theories (Bransford et al., 2000; Darling-Hammond, 2008). SGE teacher preparation programs might consider including instructional experiences planning and teaching students with disabilities, fulfilling steps two and three of teaching and learning theories (Bransford et al., 2000; Darling-Hammond, 2008).

Limitations of the Study

The research study evaluated SGE instructional methods students' knowledge of UDL principles both pre and post access to the UDL instructional module. Due to study limitations, the results lack statistical strength for generalization. The research data were affected by the sample size, intervention subjects' failure to participate in the intervention, and some of the data's inability to properly meet all the rules and assumptions for a specific statistical analysis.

Future Research Implications

The study provides impetus for future research regarding effective delivery of UDL content in teacher preparation programs. The fact that new teachers reportedly completed coursework about teaching students with disabilities, yet they felt inadequately prepared to teach students with disabilities, defines the need for continued research regarding the effects of instructional program on teacher knowledge. Due to study limitations, additional research on the IRIS UDL module's affect on student knowledge and application of UDL principles would be a

significant contribution to the literature. The IRIS center's free, online, college level instructional modules, were listed as a federally funded, project to enhance general education teachers' skills to teach students with disabilities (Smith, et al., 2010; GOA, 2009). Though mentioned in literature as an instructional resource, the UDL module's effects on student knowledge have not been reported in research. The researcher hoped this study would have provided strong evidence regarding the UDL module's impact on students' UDL knowledge and application. The results of the study indicate that students' who complete the UDL instructional content can increase their knowledge on UDL principles. However, future research studies with larger sample sizes and improved treatment fidelity are needed to obtain generalization probability.

Conclusion

Recent national statistics indicated that 57% of students with disabilities participate in general education classrooms for a minimum of 80% of the school day (Smith et al., 2010; Snyder et al., 2008). General education teachers, therefore, have an increased responsibility for delivering academic content to students with disabilities (Causton-Theoharis et al., 2008; Smith et al., 2010). Though general education teachers have greater responsibility in educating students with disabilities in present day classroom, research revealed that general education teachers feel unprepared to teach students with disabilities (Jackson et al., 2001; Rochkind et al., 2008; Smith et al., 2010).

Teacher preparation programs need to respond to the feedback from beginning teachers by providing future teachers with training related to teaching students with disabilities (Smith et al., 2010). Training in UDL is one option teacher preparation programs could use to meet preservice teachers' training needs. Universal Design for Learning (UDL) is a curricular framework that combines several research based instructional practices including differentiated

instruction, background knowledge, graphic organizers, and cooperative learning to facilitate curriculum access for all students (CEC, 2005; Hall et al., 2003; Jimenez et al., 2007; Pisha & Coyne, 2001). Teacher preparation programs should provide students with knowledge and guided practice on UDL principles, MMR, MMAE, and MME. In a national survey, 84% of beginning teachers agreed that “preparing teachers to adapt or vary their instruction to meet the needs of a diverse classroom” (Rochkind et al., 2008, p.33) could improve teacher quality and preparation. Similarly, 93% of the participants in this research study felt that all SGE students should complete the IRIS UDL module. Based on national and present study data, SGE teacher preparation programs need to integrate UDL content into future teachers’ instructional program course of study.

If preservice teachers learn and practice instructional planning based on the three UDL principles: MMR, MMAE, and MME, they can engage in the three stages of teaching and learning theories: background knowledge, engaged practice, and metacognition (Bransford et al., 2000; Darling-Hammond, 2008). By providing their students with multiple opportunities to acquire background knowledge, demonstrate understanding of content, and enhance their metacognitive strategies, teachers are better able to meet diverse students’ needs. Additionally, the integration of UDL content into teacher preparation programs will increase future teachers’ knowledge of instructional technology, facilitating their ability to meet the NETS and provide students with 21st century skills (ISTE 2008; Trilling & Fadel, 2009).

Why is the Research Important?

The researcher’s results contribute to literature regarding changes needed in teacher education programs to better prepare future teachers for today’s diverse classrooms. The results are important because they raise questions concerning our research to practice pathway. The

Government Accountability Office (2009) listed IRIS as a free resource for teacher preparation programs to increase integration of content on students with disabilities in to general education teacher preparation programs (Smith et al., 2010); however, to date, no evidence based published data regarding the effects of the IRIS modules on student learning outcomes has been found. Though limited, the present study may be one of the first studies to attempt to methodically measure an IRIS module's impact on university student learning and application in lesson planning. Additionally, this research aligns with the 2008 HEOA requirement for university program instructors to begin integrating UDL principles into their course content and delivery.

Finally, the research is important because SGE students with disabilities continue to perform poorly in academics compared to same age peers. In 2001, the U.S. passed NCLB legislation requiring secondary and elementary teachers of students with disabilities be certified in special education, along with, certification in the content area they teach. The reauthorization of IDEA (IDEIA) in 2004 also required special education teachers to demonstrate content area knowledge. IDEIA 2004 mandated students with disabilities receive instruction in the general education setting unless the IEP team determines a different setting would be most beneficial for the student. The new mandate altered the inclusive landscapes of many schools. Fifty-seven percent of secondary students with disabilities participate in general education classrooms more than 80% of the day. Theoretically, by participating in more general education classrooms, students with disabilities should demonstrate greater academic skills because they are being taught by content area specialists. Still, 9 years after NCLB legislation and 6 years since IDEIA 2004, students with disabilities continue to demonstrate meager academic skills. SGE beginning teachers continue to report inadequate training in their teacher preparation programs with regards to teaching students with disabilities in their classrooms. Through NCCTQ data and this

research study, it can be said, SGE preservice teachers desire training in teaching students with disabilities, and effective programs like the IRIS UDL module, have the potential to play an important role in teacher preparation programs, if properly implemented to include guided practice and implementation.

Final Reflections

The final data may not statistically generalize to the SGE student population at any university; however, the researcher's results provide both special and general teacher educators with a few new ideas for future research. First, if the research study were replicated, the participants' UDL module engagement level must increase; future researchers might investigate what factor(s) will increase students' UDL module participation. In this research study, overall, SGE students lacked engagement in the UDL module. In all SGE instructional methods courses, students' participation in the research study was voluntary. The researcher noted, however, SGE SS students' UDL module engagement was greater than the LA and M students. One possible explanation for the SGE SS students' greater engagement in the UDL module may be the inclusion of the UDL module in the SGE SS instructional methods course syllabus. SGE SS students' participation in the research study was not required; however, completing the UDL module was a course requirement. Future researchers' subjects' participation may, therefore, benefit from SGE course instructors incorporating the UDL module into the required course assignments which require knowledge application.

Other future research study topics may investigate students' application of the three principles of UDL: (a) How to evaluate students' lesson plans applying UDL principles? (b) Do specific instructional methods' strategies increase students' application of UDL principles? and (c) Does instruction applying UDL principles impact student achievement? This research

study's results indicated that SGE students' knowledge of UDL principles may increase by completing the UDL module. However, this research study's results also indicated that increased UDL principles knowledge did not equal increased UDL principles application to instructional planning. Teacher educators, therefore, will need to decide if assessing students' knowledge of UDL principles is satisfactory. If not, teacher educators and evaluators will need to develop tools to assess UDL principle application in instructional components.

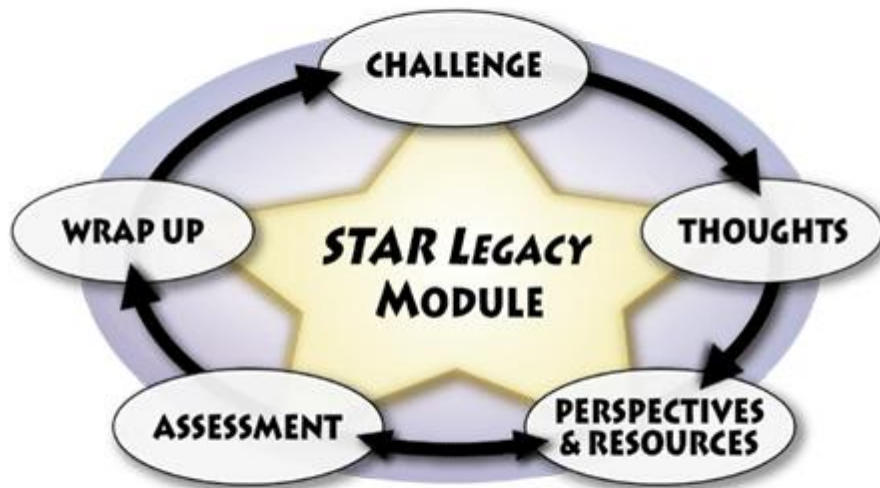
Finally, as W. Wienke (personal communication, May 18, 2010) stated "the elephant in the room" may be the discord between the current practice for evaluating students' academic achievement and teacher effectiveness based on standardized test scores and the principles of UDL, related to assessing students' academic achievement. The 2008 HEOA requires college and university instructors to module UDL practices for their students. Teacher educators will be preparing future teachers to provide classroom instruction based on the principles of UDL. Because today's K-12 student population is so diverse, the flexible principles of UDL: MMR, MMAE, and MME should improve all students' abilities to access curricular content. Additionally, the application of the UDL principles to classroom assessments should provide teachers with flexible means to assess students' content knowledge. Students' access to curriculum and ability to demonstrate curricular knowledge in the classroom may increase with the practice of UDL. Unfortunately, students, teachers, schools, districts, colleges, universities and state departments of education are not evaluated based on students' academic achievement on classroom assessments. Presently, the effectiveness of educational instruction and student academic achievement is measured using standardized achievement tests. Ironically, the method of evaluation by standardized achievement tests directly conflicts with the principles of UDL. With the inclusion of UDL in the 2008 HEOA and the impetus to include UDL in the upcoming

reauthorization of ESEA, education leaders may find themselves in a precarious situation in the future. We may be providing students with classroom instruction and assessments that promote MMR, MMAE, and MME, but then, we assess students' academic achievement and teacher effectiveness using evaluation instruments that prohibit the implementation of the UDL principles. The future is unknown, but the possibility provokes discussion.

APPENDIX A: IRIS MODULE

STAR LEGACY MODULES

Module: Universal Design for Learning: Creating a Learning Environment that Challenges and Engages All Students



To begin this module, click on the Challenge button in the graphic above.

This module examines the three principles of Universal Design for Learning (UDL) and discusses how to apply these principles to the four curricular components (i.e., goals, instructional materials, instructional methods, and assessments).

[The IRIS Center](#)
Special Education Resources for Inclusion,
Scientifically-Validated and Evidence-Based Instructional Strategies

Figure 3. The Challenge Cycle

Adapted from <http://iris.peabody.vanderbilt.edu/udl/chalcycle.htm>

The Challenge introduces students to UDL. As the beginning task, the Challenge video clip provides students with their initial concept of what UDL means and how instruction can become accessible to all students. Demonstrating the UDL principle of multiple means of representation, the Challenge video's content can be accessed in three ways: a video with closed

caption and audio, typed transcript of the narration for the video, and finally, a combination of a typed transcript from the audio, still images from the video, and a 'Notes' column with lines for written notes. The video provides students with background information on Sycamore Middle School (SMS), the school setting scenario that the module will focus on and refer to throughout instruction. The narrator explained that SMS is in an urban setting; 85% of SMS students qualify for free or reduced lunch, and 11% of SMS students have documented disabilities.

Students at SMS, on average, perform well academically; however, the teachers are concerned about the students who are not performing in the "proficient range" on state exams. Teachers at SMS are struggling as they try to balance instruction, making sure all students are academically challenged without becoming academically overloaded. A common concern for many teachers. The Challenge, provided at the end of the video clip was two-fold: "How can teachers at Sycamore Middle School (SMS) meet the educational needs of all of their students? And ... To meet the needs of the widest range of students, what should teachers consider when planning their instruction?" (<http://iris.peabody.vanderbilt.edu/udl/challenge.htm>). With the Challenge questions in mind, students are asked to write down their Thoughts and response to the Challenge.

STAR LEGACY MODULES

Module: Universal Design for Learning: Creating a Learning Environment that Challenges and Engages All Students

Initial Thoughts

Jot down your Initial Thoughts about the Challenge:



How can teachers at Sycamore Middle School meet the educational needs of all of their students?

To meet the needs of the widest range of students, what should teachers consider when planning their instruction?

[previous](#) | [next](#) | [back to Challenge Cycle](#)

[The IRIS Center](#)
Special Education Resources for Inclusion,
Scientificallly-Validated and Evidence-Based Instructional Strategies

Figure 4 Student's Thoughts

Adapted from <http://iris.peabody.vanderbilt.edu/udl/cinit.htm>

After recording their Thoughts, students enter the Perspectives and Resources, the instructional portion of the module. The Perspectives and Resources section is divided into nine mini-lessons: Universal Design for Learning (UDL), UDL Principles, Curricular Components, Goals, Instructional Materials, Instructional Methods, Assessment, UDL in Practice, and Implementation Issues. The first two sections answer the first Challenge question: "How can the teachers at SMS meet the needs of all their students?" (<http://iris.peabody.vanderbilt.edu/udl/cresource.htm>). The remaining seven sections provide ideas to answer the second question: "How can teachers meet all the instructional needs of a diverse student population in the classroom?" (<http://iris.peabody.vanderbilt.edu/udl/cresource.htm>).

Challenge question one:

Pages one and two of the first section provide the learner with background knowledge about UDL: its foundation in architecture and current legislation indirectly related to UDL instructional practices. Students are also introduced, via audio clip and photograph, to Dr. David Rose, CAST founder, and Dr. Grace Meo, CAST director of professional development and outreach services. Consistently modeling UDL instruction, the audio clips are accompanied by a print transcript, so if a student is unable or does not desire to listen to Dr. Rose and Dr. Meo, he or she can select the "View Transcript" option and read the information. Or if a student desires to both see the text and listen to speaker, he or she can do both. Also included in this section, students learn about learning styles, and they can find out their personal learning style through an imbedded learning style quiz. Finally, students are provided with information on the three UDL principles: representation, action and expression, and engagement.

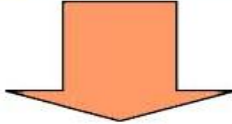
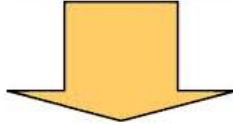
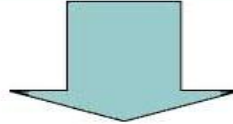
Representation Principle 1	Action and Expression Principle 2	Engagement Principle 3
Presenting information and course content in multiple formats so that all students can access it	Allowing students alternatives to express or demonstrate their learning	Stimulating students' interests and motivation for learning in a variety of ways
		
<p><i>Examples</i></p> <ul style="list-style-type: none"> • Provide alternatives for accessing information (e.g., visual, auditory) • Provide or activate background knowledge in multiple ways (e.g., pre-teaching concepts, using advanced organizers) 	<p><i>Examples</i></p> <ul style="list-style-type: none"> • Provide options for responding (e.g., keyboard instead of pen to complete a writing assignment) • Provide options for completing assignments using different media (e.g., text, speech, film, music) 	<p><i>Examples</i></p> <ul style="list-style-type: none"> • Provide options that increase the relevance and authenticity of instructional activities (e.g., using money to teach math, culturally significant activities) • Provide options that encourage collaboration and communication (e.g., peer tutoring)

Figure 5. UDL Principle Examples
Adapted from http://iris.peabody.vanderbilt.edu/udl/udl_02.html

After introducing the three principles, the module reminds students that planning classroom instruction by applying all three principles may not always be possible. The three principles should be used to help guide instructional planning. Finally, the module content reminded students that "some students may need additional support. Consequently, teachers will sometimes have to make accommodations (e.g., allow the use of a spell checker) to meet an individual students needs" (http://iris.peabody.vanderbilt.edu/udl/udl_02.html). With the inclusion of the last statement Students have been exposed to possible solutions to the first Challenge question: "How can the teachers at SMS meet the needs of all their students?"

Challenge question two

After introducing students to the information that can answer research question one, the module addresses research question two: "To meet the needs of the widest range of students, what should teachers do when they consider instruction?" (<http://iris.peabody.vanderbilt.edu/udl/cresource.htm>). Seven subsections of the module are devoted to developing and answering question two. The topics are addressed in the context of planning for classroom instruction; classrooms at SMS provide the various settings.

As with all instructional planning, future teachers must first identify the curricular components associated with the lesson's instructional objectives: learning goals, instructional materials, instructional methods, and assessment (http://iris.peabody.vanderbilt.edu/udl/udl_03.html; Darling-Hammond, 2008; Meo, 2008). In an audio clip, Dr. David Rose stated, "Choose the methods, choose the materials, and choose the method of assessment that will allow you to achieve the goals" (http://iris.peabody.vanderbilt.edu/udl/udl_03_trans_rose_a.html). Students are presented with the concept that the learning goal is the primary focus of instructional

planning, and the instructional methods, materials, and assessments are selected based upon supporting the learning goal.

- Learning goals
- Instructional materials
- Instructional methods
- Assessment

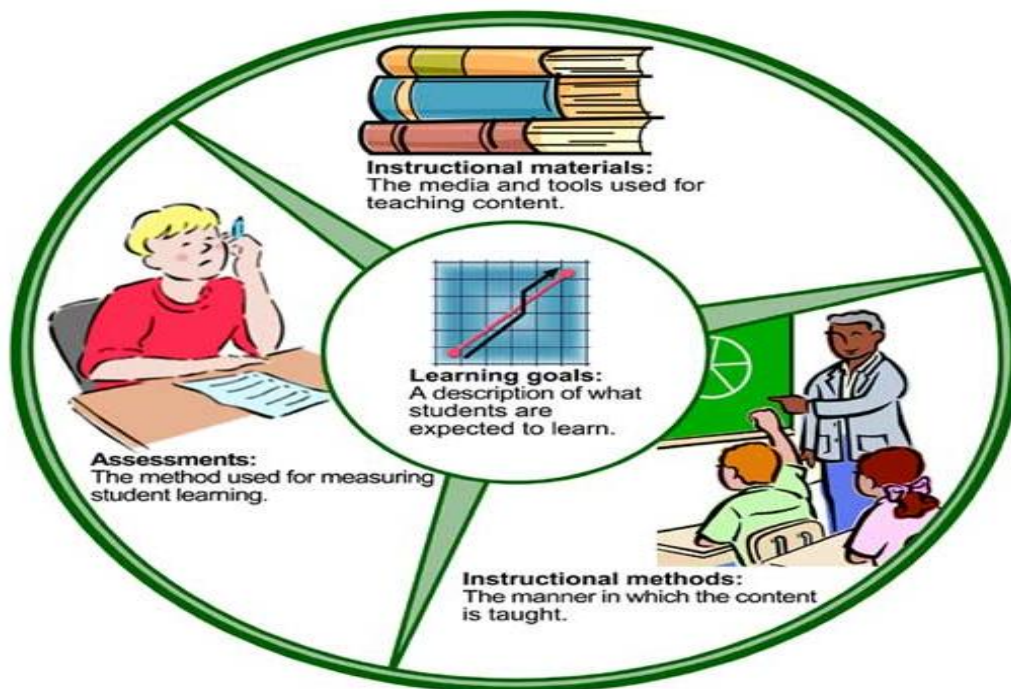


Figure 6. Four Components of Instructional Planning
Adapted from http://iris.peabody.vanderbilt.edu/udl/udl_03.html

If the learning goals are the central focus for instructional planning, the goals must be written to facilitate the UDL principles of flexible representation, action and expression, and engagement. Students in instructional methods courses are taught how to write appropriate and measureable learning goals (Darling-Hammond, 2008; Strong, 2009). Traditionally, learning goals have been written with very specific requirements the learner must complete in order to demonstrate goal mastery (Jackson & Harper, 2001). The instructional module provides students with an example of how traditional learning goals can present achievement barriers for some learners.

Traditional Goal: *The students will read the textbook chapter about ancient Egypt and write in cursive a 500-word report about burial customs.*

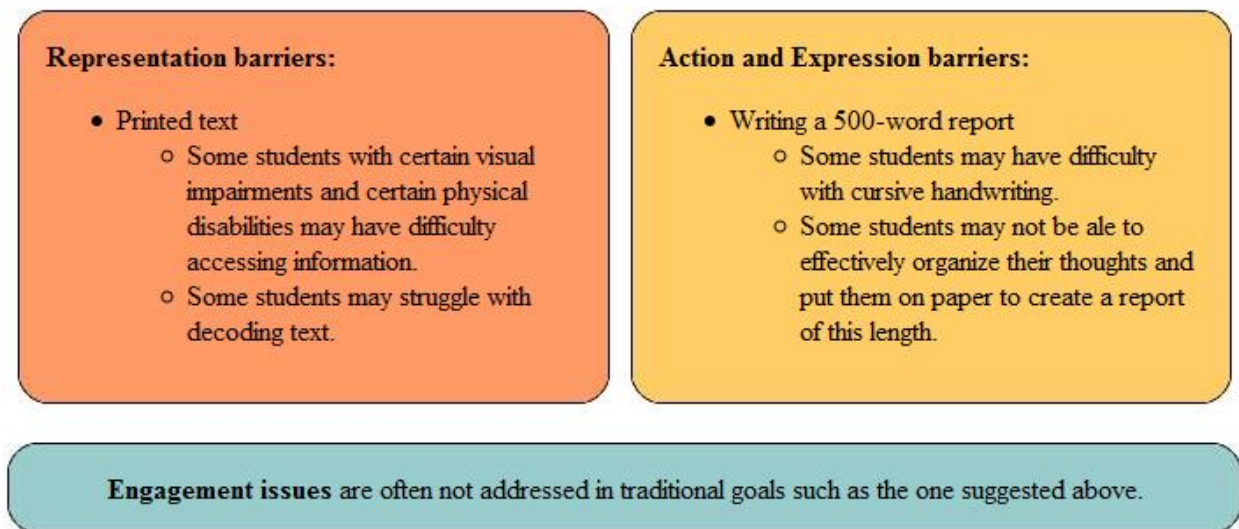


Figure 7. Example Traditional Instructional Goal.
Adapted from http://iris.peabody.vanderbilt.edu/udl/udl_04.html

The traditional goal presented regarding demonstrating knowledge on ancient Egypt meets the traditional requirements for learning goals; the goal is observable and measurable (Causton-Theoharis et al., 2008). Though it is observable and measurable, the learning goal is rigid and provides the learner with only one option for demonstrating goal mastery: "write in cursive a 500-word report about burial customs" (http://iris.peabody.vanderbilt.edu/udl/udl_04.htm). A learning goal written on the principles of UDL must meet the traditional requirements of learning goals: be observable and measurable; however, to meet those two requirements, a goal does not need to identify the precise action; i.e., write or speak (Jackson & Harper, 2001; Rose et al., 2005). The module, therefore, provides the students with an example of the same learning goal: "knowledge of ancient Egyptian burial customs" designed so that all students can demonstrate mastery of the learning goal.

UDL Goal: *The students will learn about and present information about the burial customs of ancient Egypt.*

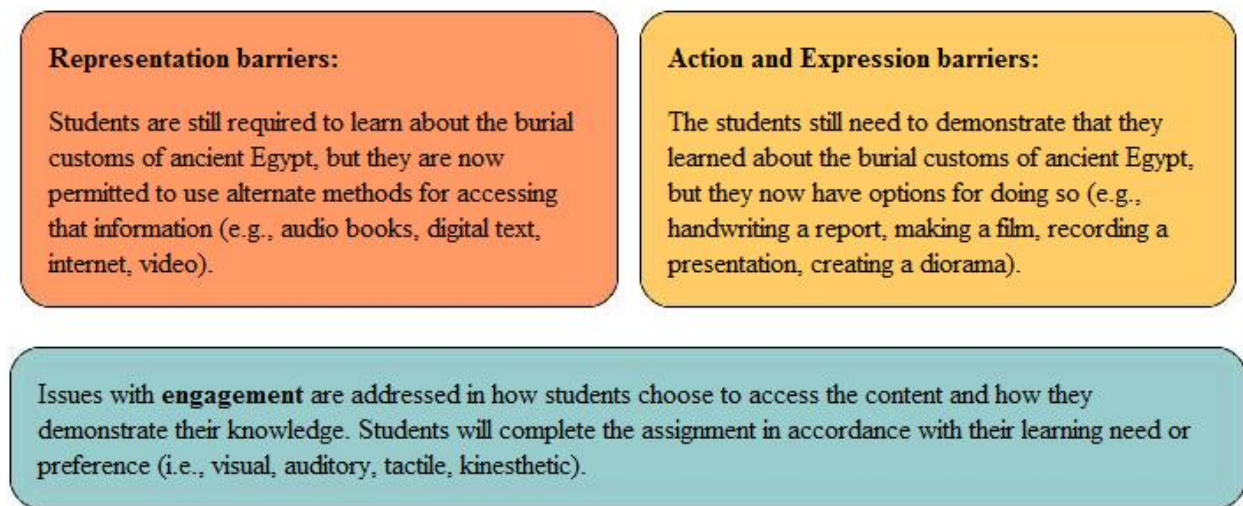


Figure 8. Example UDL Instructional Goal.
Adapted from http://iris.peabody.vanderbilt.edu/udl/udl_04.html

Though the UDL goal lacks specificity, it does meet the learning goal requirements of observable and measurable. When a student 'presents information', the teacher can observe the presentation and create a grading rubric for measuring the final product, whether it is an oral presentation, an artist interpretation, a three-dimensional model, an essay, etc..

To clarify the differences between the traditional goal and the UDL goal, the module addressed the three instructional planning components that are designed based upon the learning goal: instructional materials, methods, and assessments. With learning goals written with UDL principles, the teachers at SMS had to examine the current materials they had to teach the content to students. When the teachers examined their traditional materials, they found that many traditional materials presented accessibility barriers to many students.

Sycamore Middle School Traditional Materials		
Text-based materials <i>(textbook/ handouts)</i>	Audio-based materials <i>(lectures/ video)</i>	Image/ graphic-based materials <i>(video/ handouts)</i>
Barriers		
Requires students to: <ul style="list-style-type: none"> ○ See ○ Decode and comprehend written text ○ Process visual information 	Requires students to: <ul style="list-style-type: none"> ○ Hear ○ Identify key points ○ Process aural information ○ Be physically or cognitively able to take notes 	Requires students to: <ul style="list-style-type: none"> ○ See ○ Process visual information

Figure 9. Traditional Materials.

Adapted from http://iris.peabody.vanderbilt.edu/udl/udl_05.html

After identifying the learning barriers with traditional materials, the SMS teachers needed to begin brainstorming other instructional materials that would provide greater accessibility for all students. Continuing with the learning goal about the burial customs in ancient Egypt, the module provided a chart listing traditional materials, the potential learning barriers, and some possible UDL instructional material options. The possible UDL materials to limit learning barriers for students are often affiliated with technology; however, the SMS teachers' chart identified several options where technology would not be necessary.

Sycamore Middle School: UDL Materials for Ancient Egypt Unit		
Traditional Materials	Potential Barriers	UDL Solutions
<i>Textbook chapter</i>	Requires students to: <ul style="list-style-type: none"> • See • Decode and comprehend written text • Process visual information 	<ul style="list-style-type: none"> • In addition to printed text, provide students with the option of accessing the information through <i>digital text</i>. Digital text can be manipulated for easier visual access or can be converted to speech.
<i>Lectures</i>	Requires students to: <ul style="list-style-type: none"> • Hear • Identify key points • Process aural information • Be physically or cognitively able to take notes 	<ul style="list-style-type: none"> • Accompany lectures with <i>slides</i> to provide students with the option of accessing the information visually; slides can serve as a scaffold for students who have difficulty identifying key points, taking notes, and processing aural information. • Provide students with the option of using <i>graphic organizers</i> for note taking.
<i>20-minute video on archeological finds</i>	Requires students to: <ul style="list-style-type: none"> • See and hear • Process visual or aural information 	<ul style="list-style-type: none"> • Show a video with open captioning. • Provide an oral description of the images.
Additional Materials		
<i>Websites</i>	<ul style="list-style-type: none"> • Offer students the option of accessing the information through digital text. Because digital text is flexible (rather than fixed like printed text), it can be either manipulated for easier visual access or converted to speech. • Allow students of different ability levels to work on content that is challenging for them. • Embedded information allows students to access additional or background information. 	

Figure 10. Applying UDL to curriculum
 Adapted from http://iris.peabody.vanderbilt.edu/udl/udl_05.html

To reduce learning barriers in a lecture situation, the instructor could provide students with a graphic organizer to assist students in organizing notes. The teacher can also accompany the lecture with images. The chart examples refers to images as "slides," which could infer technology, such as, a PowerPoint presentation; however, "slides" can be created on poster board, whiteboards, or printed images on a handout. A third example of limiting learning barriers without technology is mentioned above with students observing a video. The UDL suggestion was to provide students with an oral description of the image to accompany the video. The suggestion could equally apply to any course content visual image; providing students with an oral description of the image.

After a teacher writes a learning goal with UDL principles and reduces the potential learning barriers of traditional content materials, the teacher will need to reflect on his or her IM for teaching the new content. The module provides examples and guidance for teachers to plan their IM so that all students can access the content and be engaged in the learning. The module identified four traditional IM and the potential learning barriers for some students.

Sycamore Middle School Traditional Instructional Methods	
Traditional Methods	Barriers <small>title edit by K.Pawling</small>
Students learn content by independently reading their textbook chapter on Ancient Egypt.	Requires students to: <ul style="list-style-type: none"> • Understand and learn the content, regardless of background knowledge or cultural experiences • Extract the relevant information in the text
During classroom lecture, the teacher summarizes information in the textbook.	Requires students to: <ul style="list-style-type: none"> • Learn by the limited examples in the textbook • Be physically or cognitively able to take notes
During whole-group instruction, the teacher shows a twenty-minute video on archeological finds and follows it with class discussion.	<ul style="list-style-type: none"> • Requires students to engage or participate in whole-class discussion, regardless of disposition (e.g., shy students) • Whole-group instruction usually targets the middle 50 percent of the class (not all ability levels)
Students complete worksheets about pyramids and mummies as independent class work.	<ul style="list-style-type: none"> • Geared toward memorization rather than the transfer of knowledge • Ignores students' learning preferences

Figure 11. Traditional Instructional Methods
Adapted from http://iris.peabody.vanderbilt.edu/udl/udl_06.html

When challenged by IM that may create learning barriers for some students, the teachers at SMS revisited the three principles of UDL: multiple means of representation, action and expression, and engagement. By focusing on the three principles, SMS teachers were able to combine some IM and learning supports to more effectively teach the diverse student population.

Sycamore Middle School: UDL Instructional Methods for Ancient Egypt Unit		
Instructional Methods	Potential Barriers	UDL Solution
Students learn content by independently reading their textbook.	Requires students to: <ul style="list-style-type: none"> • Understand and learn the content, regardless of background knowledge or cultural experiences • Extract the relevant information in the text 	<ul style="list-style-type: none"> • Build or activate background knowledge by 1) asking questions about related experiences during whole-group instruction (e.g., funeral and burial traditions) and 2) preteaching vocabulary prior to assigning the text. • In addition to the text, present content utilizing multiple media and formats, such as audio (lecture), images (video), and manipulatives (models).
During classroom lecture, the teacher summarizes information in the textbook.	Requires students to: <ul style="list-style-type: none"> • Learn by the limited examples provided in the textbook • Identify key ideas • Be physically or cognitively able to take notes 	<ul style="list-style-type: none"> • Provide multiple examples of important concepts or objects (e.g., burial tombs and the afterlife). • Highlight important information by using intonation and by writing important words or concepts on the board. • Provide scaffolds and support by supplying an outline with key ideas highlighted to accompany the lecture.
During whole-group instruction, the teacher shows a twenty-minute video on archeological finds and follows it with class discussion.	<ul style="list-style-type: none"> • Requires students to engage or participate in whole-class discussion • Whole-group instruction usually targets the middle 50 percent of the class (not all ability levels) 	<ul style="list-style-type: none"> • Utilize flexible grouping. Following the video, meet with small groups to discuss and demonstrate the process involved in an archeological dig using an excavation kit. • Provide adjustable levels of challenge and corrective feedback during small-group instruction (students are grouped by ability level). • Allow alternatives for students to express or demonstrate their learning by having students create a picture, story, or model to demonstrate what they think they would find if they excavated the school playground.

Figure 12. UDL Instructional Methods
Adapted from http://iris.peabody.vanderbilt.edu/udl/udl_06.html

The instructional methods alterations were not extensive. The initial lesson plan included students observing a video, followed by the teacher leading a large class discussion on the video.

The UDL suggested instructional alternative changed the large class discussion into teacher led small group discussions. Within the smaller groups, students' learning needs are more easily met, as the teacher can modify the content of discussion based upon the individuals in the small group (Soukup, Wehmeyer, & Bashinski, 2007). Another alternative to the large group discussion provided students with the opportunity to demonstrate their understanding of the content by creating something instead of discussing the video. To make class lectures more accessible for all students, the module suggested providing students with an outline of the lecture, writing key words on the board or where students can see them, and using voice intonation to emphasize important elements. As the teachers' chart at SMS demonstrated, technology is a wonderful tool to facilitate instruction and learning, but technology is not necessary to develop and implement UDL instructional methods so all students can learn and be successful.

Assessing students' academic successes is a critical component of effective teaching (Strong, 2007). Traditionally, student learning is assessed through visual representation of a problem or question, and the student physically responding by writing a response or selecting a response from a set of possible responses (Meo, 2008). Although schools, districts, and the federal government rely heavily on student standardized achievement scores to measure student progress (Johnson et al., 2009; Passe & Beattie, 1994; Newman, 2006), the module identified some of the learning barriers some students encounter with traditional assessments.

Sycamore Middle School Traditional Assessments			
Worksheets <i>(independent work)</i>	Chapter review exercises <i>(homework)</i>	A 500-word written report about burial customs	A chapter test
Barriers			
<p>These traditional assessment materials:</p> <ul style="list-style-type: none"> • Confound the learning goal with the manner in which students are required to demonstrate their learning (e.g., students are required to demonstrate their knowledge by handwriting an essay) • Rely on printed text, ignoring the needs of students who have difficulty decoding and comprehending text and those who have visual impairments • Rely on writing, ignoring the needs of students who have difficulty with fine motor skills and in some cases those who have difficulty with organizing thoughts • Result in a disconnect between the learning context and the testing context, which may impede a student's ability to demonstrate his or her knowledge. For example, if a student learned the content through tactile instructional methods, he could be allowed to demonstrate his knowledge through tactile means. • Preclude the use of some instructional supports (e.g., calculator, text-to-speech reader) • Use a single format (e.g., multiple choice) and testing environment (e.g., timed test) that impede some student's abilities to demonstrate their knowledge • Do not yield information that can be used to guide instruction. <u>Summative assessments</u> are rarely used to guide instruction. 			

Figure 13. Traditional Assessments
Adapted from http://iris.peabody.vanderbilt.edu/udl/udl_07.html

The chart identified the first barrier as one that "confound[s] the learning goal with the manner in which students are required to demonstrate their learning (e.g., students are required to demonstrate their knowledge by handwriting an essay" (http://iris.peabody.vanderbilt.edu/udl/udl_07.html). The module illustrated why relying on printed assessment materials and student written responses to assess students knowledge may provide an inadequate measure of students' learning (Bulgren et al., 2002), as the first element being assessed would be the students' ability to read or interpret the question and the second element would be determining if the student can manipulate a writing utensil or use a keyboard. The challenge teachers at SMS faced

was how to appropriately assess student knowledge and limit confounding variables or entities. The teachers developed several options for assessing student learning.

Sycamore Middle School UDL Assessments	
Barriers of Traditional Assessments (worksheets, chapter review exercises, a 500-word written report about burial customs, a chapter test)	UDL Solutions (paper or digital versions of worksheets, chapter review exercises, and chapter test; a project about burial customs)
<ul style="list-style-type: none"> • Confounds the learning goal 	<ul style="list-style-type: none"> • <i>Reflect the learning goal</i>
<ul style="list-style-type: none"> • Requires students to: <ul style="list-style-type: none"> ○ See ○ Decode and comprehend written text ○ Process visual information ○ Be physically able to write responses ○ Organize thoughts ○ Demonstrate learning in a given format ○ Demonstrate learning in a given testing environment • Results in a disconnect between the learning context and the testing context 	<ul style="list-style-type: none"> • <i>Provide flexible opportunities to demonstrate knowledge or a skill</i> <ul style="list-style-type: none"> ○ Choice of paper or digital version of materials ○ Choice of format and medium of presentation about burial customs
<ul style="list-style-type: none"> • Preclude the use of appropriate instructional supports (e.g., spell checker, text-to-speech reader) 	<ul style="list-style-type: none"> • <i>Allow scaffolds and supports</i> <ul style="list-style-type: none"> ○ Online supports for activity ○ Digital version of test is compatible with supports (e.g., text-to-speech translator)
<ul style="list-style-type: none"> • Do not yield information that can be used to guide instruction (i.e., summative in nature) 	<ul style="list-style-type: none"> • <i>Be conducted in an ongoing manner</i> <ul style="list-style-type: none"> ○ Embedded assessments in activity (e.g., online activity with hyperlinks for vocabulary and background knowledge) ○ Corrective feedback for chapter review exercises

Figure 14. UDL Assessments

Adapted from http://iris.peabody.vanderbilt.edu/udl/udl_07.html

After identifying a variety of formats for assessment, teachers at SMS "had questions about how to grade the variety of assessments equitably and fairly," (http://www.iriscenter.com/udl/udl_07.html). The instructional module suggested rubrics for grading. "A rubric is an objective set of guidelines that defines the criteria used to score or grade an assignment" (http://www.iriscenter.com/udl/udl_07.html) (CEC, 2005; Jackson et al., 2001; Weber, 1990).

After students are introduced to the content and concepts of applying UDL practices to classroom material selection, classroom IM, and student assessment, the module provided them with a "life" example. The module introduced students to "Ms. Sung" a sixth grade teacher at SMS. To help herself and create UDL units and lesson plans, Ms. Sung decided to identify the preferred learning style for each student in her class.

Learning Needs and Preferences Chart

Student	Learning Preference *	Learning Needs	UDL Solution
Abigail	V	Information presented visually due to hearing impairment	Visual materials (textbook, images, videos with closed captioning)
Angel	V	n/a	Visual materials (textbook, images, videos)
Branson	T	n/a	hands-on-activities, models
Cole	A	Information presented aurally due to low vision	audio or digital versions of textbooks
Colin	K	n/a	
Daniel	A	n/a	
Dwight	V	n/a	
Eliana	T	n/a	
Farhiya	V	n/a	
Gary	A	n/a	
Hannah	T	n/a	
Katie	V	Needs help organizing information	graphic organizers
Logan	K	n/a	activities that include physical movement
Margaret	A	n/a	
Marvin	V	n/a	
Max	K	n/a	
Michael	A	Has a learning disability in reading; needs support with reading, especially comprehension	Aural information
Omari	A	n/a	
Quinn	T	n/a	
Renee	V	n/a	
Shaterra	T	n/a	
Suri	A	n/a	

* A=auditory, K=kinesthetic, T=tactile, V=visual

Figure 15. Students' Learning Needs & Preferences
Adapted from http://www.iriscenter.com/udl/udl_08.html

Because she identified each student's best learning modality, Ms. Sung is able to analyze her future lesson based upon the specific learning needs of her students. Ms. Sung can analyze her lesson based on student learning styles. Additionally, Ms. Sung can have greater confidence that her lesson has the potential for success (de Jesus, Almeida, Teixeira-Dias & Watts, 2005).





Learning Style	Examples
 <i>Visual Learners</i>	<ul style="list-style-type: none"> • Printed or digital text • Video • Images of artifacts
 <i>Auditory Learners</i>	<ul style="list-style-type: none"> • Lecture • Narration on video • Small-group discussion
 <i>Tactile Learners</i>	<ul style="list-style-type: none"> • Three-dimensional models of pyramids • Center activity: create a picture, story, or model to demonstrate what they think they would find if they excavated the school playground
 <i>Kinesthetic Learners</i>	<ul style="list-style-type: none"> • Excavation kit

Figure 16. Learning Styles

Adapted from http://iris.peabody.vanderbilt.edu/udl/udl_08.html)

Ms. Sung's approach to planning her lesson and instruction based upon students' learning styles in her class, and constructing a unit that incorporates all the learning styles for all the students is what differentiates UDL instruction from other instructional methods:

accommodations, modifications, differentiated instruction, and assistive technology. Dr. David Rose stated:

UDL differs in that the point of entry is at the design stage, how you begin to design a good learning environment, a good lesson, a good curriculum. UDL seeks to get to the core of the curriculum, to design it so that it is a good curriculum for all students from the beginning. Assistive technologies, accommodations, modifications typically come after, as does differentiated instruction

(http://www.iriscenter.com/udl/udl_09_trans_rose_b.html).

APPENDIX B: UDL KNOWLEDGE PRETEST

UDL KNOWLEDGE PRETEST

STUDENT ID: _____
Content area: S,L,M,SS & LAST 4 of PID

1. UDL adapts and applies the ideas and concepts associated with:
 - a. differentiated instruction
 - b. universal design in architecture
 - c. universal and digital literature

2. UDL is an acronym for:
 - a. Universal Design for Learning
 - b. Understanding Diversity and Learning
 - c. Universal Directions for Learning
 - d. Understanding Diversity and Literacy

3. In 1990, Congress passed legislation that prohibits discrimination against persons with disabilities in employment, transportation, public accommodations, and telecommunications.
The law was called the:
 - a. Americans with Disabilities Act
 - b. No Child Left Behind (NCLB)
 - c. Individuals with Disabilities Education Act (IDEA)
 - d. Section 504 of the Rehabilitation Act

4. CAST stands for:
 - a. Curriculum Accommodations Standards Technology
 - b. Center Applied Special Technology
 - c. Center Assistive Standards and Technology
 - d. Curriculum Applications for Special Teachers

5. The mode by which a person most effectively learns or processes information is:
 - a. right brain or left brain
 - b. type A or type B
 - c. learning style

6. Providing students with background knowledge would be an example of the UDL principle of:
- representation
 - action and expression
 - engagement
7. Providing students with options to demonstrate knowledge would be an example of the UDL principle of:
- representation
 - action and expression
 - engagement
8. The teacher highlighting important information in text would be an example of UDL principle of:
- representation
 - action and expression
 - engagement
9. The four major curricular components for instruction are:
- visual, auditory, kinesthetic, tactile
 - learning goals, instructional materials, instructional methods, assessment
 - provide multiple examples, highlight information, use multiple media, background knowledge
10. When teachers are planning their instruction, what should they consider first?
- goals and objectives
 - students' preferred learning preference
 - curricular materials
11. IDEA 2004 mandated the creation of NIMAS. NIMAS stands for:
- National Intelligences for Media Accommodations in Schools
 - National Instructional Materials Accessibility Standards
 - National Instruction in Media Accommodations Standards
12. A learning style or preference refers to the way that a person processes information most efficiently. How many primary learning styles are there?:
- 4
 - 5
 - 3
 - 2

13. When students *use different media* to learn the *same concepts and skills*, the learning goal should be:

- a. individual for each student
- b. the same for all students
- c. different for different groups of students

14. Read the Instructional Goal written below and answer the corresponding questions.

GOAL: The students will read the book The Diary of Anne Frank and give a five-minute oral presentation about the author's experiences.

Which of the statement (s) below is (are) true about the above goal? (may be more than 1 answer)

- a. the goal is observable and measurable
- b. the student learning objective(s) is (are) clearly stated
- c. the goal is appropriate for all students in a regular education class

15. Read the Instructional Goal written below and answer the corresponding questions.

GOAL: The students will access a book about a child's experiences during the Holocaust through their preferred medium and will complete a project to summarize the main character's experiences.

Which of the statement (s) below is (are) true about the above goal? (may be more than 1 answer)

- a. the goal is observable and measurable
- b. the student learning objective(s) is (are) clearly stated
- c. the goal is appropriate for all students in a regular education class

16. Providing students with a lecture on *Romeo and Juliet* would be an example of the UDL principle of:

- a. representation
- b. action and expression
- c. engagement

17. Having students create an illustrated book or presentation about the three stages of cell division would be an example of the UDL principle of:
- a. representation
 - b. action and expression
 - c. engagement
18. Providing students with a chapter test in alternative formats, i.e. paper-pencil or computer format would be an example of the UDL principle of:
- a. representation
 - b. action and expression
 - c. engagement
19. Assigning groups of students with the challenge to write an alternative ending of *Romeo and Juliet* would be an example of the UDL principle of:
- a. representation
 - b. action and expression
 - c. engagement
20. According to Dr. Rose and Dr. Meyer, many teachers feel that assessments designed to favor UDL are:
- a. too challenging to create
 - b. unfair
 - c. creating an environment for subjective grading
21. Traditional assessment formats: worksheets, chapter review exercises, written essays, chapter tests, often
- a. confound the learning goal
 - b. reflect the learning goal
 - c. provide instructional support
22. How can a teacher effectively and objectively grade different assignments for the same objective?
- a. grade each assignment based on a percent scale
 - b. make different assignments worth different points
 - c. grade assignments based on a rubric

23. Which of the following instructional tools could meet the needs of more than one type of student learning style or preference:

- a. three dimensional models
- b. reading text
- c. lecture
- d. narrated video

24. One of the primary objectives of UDL is

- a. to challenge and engage all students
- b. to add 21st century skills to curriculum
- c. to eliminate the need for IEPs

Participant ID _____
 (letter of content area: S,L,M, SS & LAST 4 PID)

PARTICIPANT BACKGROUND INFORMATION

****NOTE:** Answering the following questions is **OPTIONAL**. You may choose to answer all, some, or none of the questions below. **REMINDER:** All your personal information will remain confidential.

DIRECTIONS: Please circle your answers.

1. Your gender is: Male or Female

2. Your ethnicity is:

- | | |
|---------------------|--------------------|
| a. African American | d. Hispanic |
| b. Asian | e. Native American |
| c. Caucasian | f. Other |

3. Your age is:

- a. < 18 yrs
- b. 18 - 25 yrs
- c. 26 - 33 yrs
- d. 34 - 41 years
- e. 41+ yrs

4. Are you a: A. undergraduate B. Graduate C. non-degree seeking student?

5. Is Secondary Education your declared major of study? Yes or No

6. Is Education your declared minor area of study? Yes or No

7. Is this class a REQUIRED class for your degree of study? Yes or No

8. Have you previously taken: EEX 4242 or EEX 4070? Yes or No

9. Are you currently enrolled in EEX 4242 or EEX 4070? Yes or No

APPENDIX C: UDL KNOWLEDGE POSTTEST

UDL KNOWLEDGE POSTTEST

STUDENT ID: _____
Content area: S,L,M,SS & LAST 4 of PID

1. CAST stands for:
 - a. Curriculum Accommodations Standards Technology
 - b. Center Applied Special Technology
 - c. Center Assistive Standards and Technology
 - d. Curriculum Applications for Special Teachers

2. The mode by which a person most effectively learns or processes information is:
 - a. right brain or left brain
 - b. type A or type B
 - c. learning style

3. Providing students with background knowledge would be an example of the UDL principle of:
 - a. representation
 - b. action and expression
 - c. engagement

4. In 1990, Congress passed legislation that prohibits discrimination against persons with disabilities in employment, transportation, public accommodations, and telecommunications. The law was called the:
 - a. Americans with Disabilities Act
 - b. No Child Left Behind (NCLB)
 - c. Individuals with Disabilities Education Act (IDEA)
 - d. Section 504 of the Rehabilitation Act

5. Providing students with options to demonstrate knowledge would be an example of the UDL principle of:
 - a. representation
 - b. action and expression
 - c. engagement

6. One of the primary objectives of UDL is
- to challenge and engage all students
 - to add 21st century skills to curriculum
 - to eliminate the need for IEPs
7. The teacher highlighting important information in text would be an example of UDL principle of:
- representation
 - action and expression
 - engagement
8. The four major curricular components for instruction are:
- visual, auditory, kinesthetic, tactile
 - learning goals, instructional materials, instructional methods, assessment
 - provide multiple examples, highlight information, use multiple media, background knowledge
9. When teachers are planning their instruction, what should they consider first?
- goals and objectives
 - students' preferred learning preference
 - curricular materials
10. IDEA 2004 mandated the creation of NIMAS. NIMAS stands for:
- National Intelligences for Media Accommodations in Schools
 - National Instructional Materials Accessibility Standards
 - National Instruction in Media Accommodations Standards
11. Read the Instructional Goal written below and answer the corresponding questions.

GOAL: The students will access a book about a child's experiences during the Holocaust through their preferred medium and will complete a project to summarize the main character's experiences.

Which of the statement (s) below is (are) true about the above goal? (may be more than 1 answer)

- the goal is observable and measurable
- the student learning objective(s) is (are) clearly stated
- the goal is appropriate for all students in a regular education class

12. A learning style or preference refers to the way that a person processes information most efficiently. How many primary learning styles are there?:
- a. 4
 - b. 5
 - c. 3
 - d. 2
13. When students *use different media* to learn the *same concepts and skills*, the learning goal should be:
- a. individual for each student
 - b. the same for all students
 - c. different for different groups of students
14. UDL is an acronym for:
- a. Universal Design for Learning
 - b. Understanding Diversity and Learning
 - c. Universal Directions for Learning
 - d. Understanding Diversity and Literacy

15. Read the Instructional Goal written below and answer the corresponding questions.

GOAL: The students will read the book The Diary of Anne Frank and give a five-minute oral presentation about the author's experiences.

Which of the statement (s) below is (are) true about the above goal? (may be more than 1 answer)

- a. the goal is observable and measurable
 - b. the student learning objective(s) is (are) clearly stated
 - c. the goal is appropriate for all students in a regular education class
16. Providing students with a lecture on *Romeo and Juliet* would be an example of the UDL principle of:
- a. representation
 - b. action and expression
 - c. engagement

17. Having students create an illustrated book or presentation about the three stages of cell division would be an example of the UDL principle of:
- representation
 - action and expression
 - engagement
18. How can a teacher effectively and objectively grade different assignments for the same objective?
- grade each assignment based on a percent scale
 - make different assignments worth different points
 - grade assignments based on a rubric
19. Providing students with a chapter test in alternative formats, i.e. paper-pencil or computer format would be an example of the UDL principle of:
- representation
 - action and expression
 - engagement
20. Assigning groups of students with the challenge to write an alternative ending of *Romeo and Juliet* would be an example of the UDL principle of:
- representation
 - action and expression
 - engagement
21. Which of the following instructional tools could meet the needs of more than one type of student learning style or preference:
- three dimensional models
 - reading text
 - lecture
 - narrated video
22. Traditional assessment formats: worksheets, chapter review exercises, written essays, chapter tests, often
- confound the learning goal
 - reflect the learning goal
 - provide instructional support

23. According to Dr. Rose and Dr. Meyer, many teachers feel that assessments designed to favor UDL are:

- a. too challenging to create
- b. unfair
- c. creating an environment for subjective grading

24. UDL adapts and applies the ideas and concepts associated with:

- a. differentiated instruction
- b. universal design in architecture
- c. universal and digital literature

APPENDIX D: LESSON PLAN RUBRIC

		Not Yet Evident	Emerging	Intermediate	Advanced
Individual Goals	Clarity of goals and evidence of different objectives for various learners	No students are clear on the overall goal and all students are expected have the same objectives.	Few students are clear on the overall goal for the lesson and their learning objectives.	Some students are clear on the overall goal for the lesson and their learning objectives.	Every student is clear on the overall goal for the lesson and their learning objectives.
TBI Principle	TBI Teaching Method	Not Yet Evident	Emerging	Intermediate	Advanced
<i>Teachers assess multiple representations</i>	Provide multiple examples	Students are only given one example of skills needed to complete the assignment.	In preparation for a lesson, the teacher has few examples that identify skills and concepts needed to complete the assignment.	In preparation for a lesson, the teacher creates some examples in hand and identify skills and concepts needed to complete the assignment.	In preparation for a lesson, the teacher and students create multiple examples of finding and identifying skills and concepts needed to complete the assignment.
<i>Teachers assess critical features of representation</i>	Highlight critical features	Teacher provides critical information for this lesson through only one modality.	Teacher provides critical information for the lesson through only two modalities.	The teacher provides critical information for the lesson through oral and visual presentation and highlights critical features in written and visual form, then monitors students to check their focus on important features of the lesson.	The teacher provides critical information for the lesson through oral and visual presentation and highlights critical features in written and visual form, then monitors students to check their focus on important features of the lesson. Additionally, by having tests available in digital format, the teacher or students could literally highlight critical features of the text while preparing the lesson assignments.

L101 Principle Teaching Method	Not Yet Evident	Emerging	Intermediate	Advanced
<p><i>Adaptiva provides multiple media formats</i></p>	<p>Students are only given one resource such as a text book.</p>	<p>The teacher locates several (1-2) resources, such as books of different reading difficulty.</p>	<p>The teacher locates several (2-3) resources, such as books and websites of different reading difficulty.</p>	<p>The teacher and students locate several (4-5) resources, such as videos and books and websites of different reading difficulty. The materials are then made available digitally as well as on audio tape for flexible accessibility.</p>
<p><i>Adaptiva allows adjustable levels of challenge</i></p>	<p>Students are only given one text to gather information from.</p>	<p>The teacher offers few texts, representing a range of difficulty levels, and different means to access these texts. This helps ensure that researching the answers to the essential questions is appropriately challenging for each student. For example, if decoding is challenging, the student could use a simpler text and/or access the information via audio or digital read-aloud.</p>	<p>The teacher offers some resources, representing a range of difficulty levels, and different means to access these texts. This helps ensure that researching the answers to the essential questions is appropriately challenging for each student. For example, if decoding is challenging, the student could use a simpler text and/or access the information via audio or digital read-aloud.</p>	<p>The teacher and students collaborate to identify multiple resources that represent a range of difficulty levels, and different means to access these texts. This helps ensure that researching the answers to the essential questions is appropriately challenging for each student. For example, if decoding is challenging, the student could use a simpler text and/or access the information via audio or digital read-aloud.</p>

1-DL Principle Teaching Method	Not Yet Evident	Emerging	Intermediate	Advanced
<p><i>Adaptive systems of assessment</i></p> <p>Support background context</p>	<p>Prior to the lesson or assignment, the teacher identifies no background knowledge needed by the students for the lesson.</p>	<p>Before the assignment, the teacher identifies background knowledge that the students will need to know in order to prepare the students for the lesson.</p>	<p>Several levels of preparation are designed to support background context: * Before the assignment, the teacher identifies background knowledge that the students will need to know in order to prepare the students for the lesson. * Before this assignment students and teachers find examples of concepts and skills in real world situations that are relevant and meaningful to them.</p>	<p>Several levels of preparation are designed to support background context: * Before the assignment, the teacher identifies background knowledge that the students will need to know in order to prepare the students for the lesson. * Before the assignment, the teacher and students find examples of concepts and skills in real world situations that are relevant and meaningful to them. * Careful instruction is organized to reach students the concept of finding a book or other type of reading passage that is “just right” helping them find a book that is challenging yet not too difficult. The helps students keep students in their “zone of proximal development” when obtaining background information for the lesson.</p>
<p><i>Students receive opportunities for demonstrating skill</i></p>	<p>Students are offered only one way to demonstrate knowledge or skill.</p>	<p>The design of the lesson allows students varied approaches (2-3) throughout the lesson.</p>	<p>The design of the lesson allows students varied approaches (3-5) throughout the lesson.</p>	<p>The design of the lesson allows students to choose varied approaches (3-5) throughout the lesson. Students can select their best or preferred type of working situation and means of responding.</p>

1.D1. Principle Teaching Method	Not Yet Evident	Emerging	Intermediate	Advanced
<p><i>Multiple means of representation</i></p> <p>Provide opportunities to practice with support</p>	<p>During independent practice, no supports are provided to the students.</p>	<p>During guided and independent practice portions of each lesson, the teacher provides supports by checking and prompting.</p>	<p>*At times, students have the option to work in selected pairs or groups as they search for answers to the essential and guiding questions.</p> <p>During guided and independent practice portions of each lesson, the teacher provides supports by checking and prompting.</p>	<p>*On a regular basis, students have the option to work in selected pairs or groups as they search for answers to the essential and guiding questions.</p> <p>During guided and independent practice portions of each lesson, the teacher provides supports by checking and prompting.</p>
<p><i>Multiple means of engagement and expression</i></p> <p>Offer choice of learning contexts</p>	<p>Students are only given one source in which information is input and only one output for expressing information learned.</p>	<p>Throughout the lesson the teacher organizes few choices that help diversify the available learning contexts:</p> <ul style="list-style-type: none"> *Students can select from a variety of methods to respond to the essential questions (written, recorded, scribed, recorded). *Students can opt to work independently or with a partner during the assignment completion portion of the lesson. *Students can select the "right material" based on difficulty and/or interest. 	<p>Throughout the lesson the teacher organizes some choices that help diversify the available learning contexts:</p> <ul style="list-style-type: none"> *Students can select from a variety of methods to respond to the essential questions (written, scribed, recorded). *Students can opt to work independently or with a partner during the assignment completion portion of the lesson. *Students can select the "right material" based on difficulty and/or interest. 	<p>Throughout the lesson the teacher and students organize multiple choices that help diversify the available learning contexts:</p> <ul style="list-style-type: none"> *Students can select from a variety of methods to respond to the essential questions (written, scribed, recorded). *Students can opt to work independently or with a partner during the assignment completion portion of the lesson. *Students can select the "right material" based on difficulty and/or interest.

L1 DL Principle Teaching Method	L1 DL Method	Not Yet Evident	Emerging	Intermediate	Advanced
<p><i>Adaptive systems of content and tools</i></p> <p>Adaptive systems of content and tools</p>	<p>Students are given no choice of content and tools.</p>	<p>The teacher organizes the lesson at a few points for choice of tools:</p> <ul style="list-style-type: none"> • Choice of resource materials. • Choice of access (text, digital, audio). • Choice of response style. 	<p>The teacher organizes the lesson at some points for choice of tools:</p> <ul style="list-style-type: none"> • Choice of resource materials. • Choice of access (text, digital, audio). • Choice of response style. 	<p>The teacher organizes the lesson at multiple points for choice of tools:</p> <ul style="list-style-type: none"> • Choice of resource materials. • Choice of access (text, digital, audio). • Choice of response style. 	

APPENDIX E: INSTRUCTOR OBSERVATION FORM

APPENDIX D

Sample UTE Observation Tool shared by Clark County Schools, KY and created by Dr. Michael Abell, Director of Center for Innovation and Instruction for Diverse Learners (CLIDL) at University of Louisville, KY

Instructional Walk-through Observation (IWO) emphasis:
(Please answer each item with a check mark in the appropriate space)

Teacher Name:		Date:				
Subject:		Grade Level:				
CURRICULUM MATERIALS Materials are available outside of class time (website, technical report, etc.)	RESPONSES					COMMENTS (optional)
	Yes	No				
	Yes	No				
	Yes	No				
	None	Some	All			
	Never	Sometimes	Always			
	Never	Sometimes	Always			
Digital materials are readily available for student use	1 (Not at all)	2	3	4	5 (Always)	
STRATEGIC ENGAGEMENT Group work is utilized as appropriate	RESPONSES					COMMENTS (optional)
	Yes	No				
	Yes	No				
	Yes	No				
	90% teacher (direct instruction)	50% teacher/ 50% student	50% student (independent work)			
Level of teacher student conferencing and feedback	1 (None)	2	3	4	5 (Extensive)	
AFFECTIVE EXPRESSION	RESPONSES					COMMENTS (optional)
	Yes	No				
Instruction offers choices of content & tools	Yes	No				
Students can alter or customize digital learning	Yes	No				

Resources					
Variable level of challenge	1 (No Variation)	2	3	4	5 (Great Variation)
Choices for learning in framework (visual, auditory, etc.)	None	Some	Many		
ENVIRONMENT	RESPONSES				COMMENTS (optional)
Teacher establishes positive tone	1 (Not at all)	2	3	4	5 (Very positive)
Classroom is technology rich	1 (Not at all)	2	3	4	5 (Extensively)
Virtual supports for learners?	Yes	No			
Current student were employed	Yes	No			
Students are engaged	No	Somewhat	Yes		
Classroom is print rich	1 (Not at all)	2	3	4	5 (Extensively)
ASSESSMENT	RESPONSES				COMMENTS (optional)
Students demonstrate skill & knowledge in multiple ways	1 (Not at all)	2	3	4	5 (Extensively)
Assessment of student work/understanding present in class	1 (Not at all)	2	3	4	5 (Extensively)
Assessment is part of teaching	Yes	No			
Teacher uses various types of assessments & supports (e.g. online, demonstration, presentation, paper/pencil, text to speech)	No	Somewhat	Yes		
TECHNOLOGY	RESPONSES				COMMENTS (optional)
Available in class	Yes	No			
On and ready for student/teacher use	Yes	No			
Students using technology to engage w/ curriculum	No	Somewhat	Yes		
Read & Write Gold software installed and running	No	Yes, with problems	Yes, without problems		
Classroom organized to maximize technology use	1 (Not at all)	2	3	4	5 (fully)

Final Date/Signature: Observer _____ Teacher: _____

APPENDIX F: UDL PARTICIPANT FEEDBACK QUESTIONNAIRE

Participant ID _____
 (letter of content area: S,L,M, SS & LAST 4 PID)

UDL MODULE PARTICIPANT FEEDBACK

**NOTE: Answering the following questions is OPTIONAL. You may choose to answer all, some, or none of the questions below. REMINDER: All your personal information will remain confidential.

DIRECTIONS: Please circle your answers.

SD = strongly disagree	SA = strongly agree
D = disagree	A = agree

1. The UDL module contained information I did not know.	SD	D	A	SA
2. The UDL module was easy to access and understand.	SD	D	A	SA
3. I feel the UDL module helped me think differently about teaching students with disabilities.	SD	D	A	SA
4. I think that all students in secondary instructional methods would benefit from the UDL module.	SD	D	A	SA
5. I think the UDL module would have been MORE beneficial if my course instructor provided additional information examples regarding UDL as part of his/her instruction.	SD	D	A	SA
6. How much of the UDL module (including activities) did you complete?	< 25%	26-50%	51-75%	76-100%
7. Approximately how much time you devote to the UDL module & activities?	< 45 minutes	46-90 minutes	91 - 135 minutes	135-180 minutes
8. If you have additional comments, you may write them here. For additional space: use the back of this questionnaire.				

THANK YOU FOR YOUR FEEDBACK & PARTICIPATION

APPENDIX G: INSTRUCTOR VIDEO-TAPE RELEASE FORM

UNIVERSITY LOGO

INSTRUCTOR VIDEO TAPING & USE CONSENT FORM

As part of the SGE SS IM lesson plan research project, I, _____, the SGE SS IM course instructor, will be videotaped during THREE different face-to-face class sessions.

By initialing on each line below, I have indicated that I read, understand, and agree with the statement(s) immediately following my initials.

- _____ 1. I understand that the purpose for the videotaping is to evaluate my face-to-face instructional style and methods related to the three principles of Universal Design for Learning (UDL).
- _____ 2. I understand that none of the three videotaped sessions are formal, instructional evaluations, nor will the results be shared with my immediate or future supervisors and employers, unless I choose to personally disclose the data.
- _____ 3. I understand that I will be provided with a copy of each videotaped class session for my own personal professional development and reflection.
- _____ 4. I understand that I will be provided with a copy of the videotaped session so that students who did not consent to be videotaped may schedule a private viewing of the video with me to acquire the missed instruction.
- _____ 5. I understand that I am responsible for maintaining student privacy per the consent forms and that each student provided his or her consent or refusal of consent to the following options:
 - _____ a. The SGE SS IM course instructor MAY view the videotape his personal, professional development and reflection.
 - _____ b. The SGE SS IM course instructor MAY apply 'clips' of the videotape in his personal professional profile for review by potential employers and promotions.
 - _____ c. When appropriate, the SGE SS IM course instructor MAY apply 'clips' of the videotape in professional presentations including local, state, national, and international professional organization conferences, guest speaking/lecturing, and professional, educator workshops and trainings.

I have indicated my consent or refusal of consent to each potential use of the videotape by providing my initials, indicating consent, or an 'X', indicating refusal of consent, to each item on this form.

- 1. The videotape can be reviewed by the research team for use in the research project.**

Consent Initials _____

Refusal of Consent _____

- 2. The researcher may apply ‘clips’ of the videotape in her personal, professional profile for review by potential employers**

Consent Initials _____

Refusal of Consent _____

- 3. The researcher may apply ‘clips’ of the videotape in professional presentations including local, state, national, and international professional organization conferences, guest speaking/lecturing, and professional, educator workshops and trainings.**

Consent Initials _____

Refusal of Consent _____

I have read the above description and give my consent for the use of the videotape as indicated above. I have NOT given my consent for any other application or use of the videotape, not limited to: public viewing of the videotape, additional copying of the videotape, uploading any component of the videotape to social, professional, or personal networking internet sites, use in promotional materials (private and/or public)

SIGNATURE _____ DATE _____

Print name _____ DATE _____

NOTE: PLEASE INDICATE:

I would like a copy of my signed consent form for my personal records.

____ YES or ____ NO

APPENDIX H: STUDENT VIDEO-TAPE RELEASE FORM

STUDENT VIDEO TAPING & USE CONSENT FORM

As part of the SGE SS IM lesson plan research project, the SGE SS IM course instructor was videotaped during this face-to-face class session. The researcher may have incidentally recorded my image and voice while focusing on my SGE SS IM course instructor. I have indicated my consent or refusal of consent to each potential use of the videotape by providing my initials, indicating consent, or an 'X', indicating refusal of consent, to each item on this form.

- 4. The videotape can be reviewed by the research team for use in the research project.**

Consent Initials _____

Refusal of Consent _____

- 5. The SGE SS IM course instructor will receive a copy of the videotape.**

Consent Initials _____

Refusal of Consent _____

- 6. The SGE SS IM course instructor MAY view the videotape his personal, professional development and reflection.**

Consent Initials _____

Refusal of Consent _____

- 7. The SGE SS IM course instructor MAY apply 'clips' of the videotape in his personal, professional profile for review by potential employers and promotions.**

Consent Initials _____

Refusal of Consent _____

- 8. When appropriate, the SGE SS IM course instructor MAY apply 'clips' of the videotape in professional presentations including local, state, national, and international professional organization conferences, guest speaking/lecturing, and professional, educator workshops and trainings.**

Consent Initials _____

Refusal of Consent _____

- 9. The researcher may apply 'clips' of the videotape in her personal, professional profile for review by potential employers**

Consent Initials _____

Refusal of Consent _____

- 10. The researcher may apply 'clips' of the videotape in professional presentations including local, state, national, and international professional organization**

conferences, guest speaking/lecturing, and professional, educator workshops and trainings.

Consent Initials _____

Refusal of Consent _____

If I do NOT wish to participate in today's (____) videotaped, face-to-face session of my SGE SS IM course, I have indicated with an "X" which alternative option I agree to complete:

1. _____ I choose to remain in class and sit behind the video camera.
2. _____ I choose to leave class, and in the next 7 days, schedule a private meeting with the course instructor to view the videotape, so that I may obtain the instructional content provided during class.

I have read the above description and give my consent for the use of the videotape as indicated above. I have NOT given my consent for any other application or use of the videotape, not limited to: public viewing of the videotape, additional copying of the videotape, uploading any component of the videotape to social, professional, or personal networking internet sites, use in promotional materials (private and/or public)

SIGNATURE _____ DATE _____

Print name _____ DATE _____

NOTE: PLEASE INDICATE:

I would like a copy of my signed consent form for my personal records.

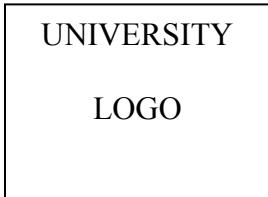
____ YES or ____ NO

APPENDIX I: UDL GUIDELINES–EDUCATOR’S CHECKLIST

CAST (2008) UDL Guidelines – Educator’s Checklist

1. Provide options for perception (examples)
1.1 Customize the display of information
1.2 Provide alternatives for auditory information
1.3 Provide alternatives for visual information
2. Provide options for language and symbols (examples)
2.1 Define vocabulary and symbols
2.2 Clarify syntax and structure
2.3 Decode text and mathematical notation
2.4 Promote cross-linguistic understanding
2.5 Illustrate key concepts non-linguistically
3. Provide options for comprehension (examples)
3.1 Provide or activate background knowledge
3.2 Highlight critical features, big ideas, and relationships
3.3 Guide information processing
3.4 Support memory and transfer
4. Provide options for physical actions (examples)
4.1 Provide varied ways to respond
4.2 Provide varied ways to interact with materials
4.3 Integrate assistive technologies
5. Provide options for expressive skills and fluency (examples)
5.1 Allow choices of media for communication
5.2 Provide appropriate tools for composition and problem solving
5.3 Provide ways to scaffold practice and performance
6. Provide options for executive functions (examples)
6.2 Guide effective goal setting
6.2 Support planning and strategy development
6.3 Facilitate managing information and resources
6.4 Enhance capacity for monitoring progress
7. Provide options for recruiting interest (examples)
7.1 Increase individual choice and autonomy
7.2 Enhance relevance, value, and authenticity
7.3 Reduce threats and distractions
8. Provide options for sustaining effort and persistence (examples)
8.1 Heighten salience of goals and objectives
8.2 Vary levels of challenge and support
8.3 Foster collaboration and communication
8.4 Increase mastery-oriented feedback
9. Provide options for self-regulation (examples)
9.1 Guide personal goal-setting and expectations
9.2 Scaffold coping skills and strategies
9.3 Develop self-assessment and reflection

APPENDIX J: COPYRIGHT PERMISSION DOCUMENTATION



Department of Child, Family
and Community Sciences

September 14, 2009

IRIS Center for Training Enhancements
Vanderbilt University
Peabody College Box 275
1114 19th Ave. South
Nashville, TN 37203

Dear Dr. Naomi Tyler and Kim Skow:

This letter will confirm our recent communication via electronic mail. I am completing a doctoral dissertation at the [redacted] entitled "Investigating the Integration of Universal Design for Learning Content into Secondary General Education Instructional Methods Course Content."

I would like your permission to reprint in my dissertation images from the following:
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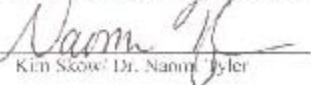
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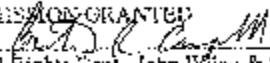
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Kim Skow, Dr. Naomi Tyler



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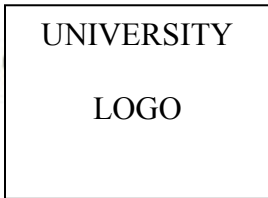
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A14_Book_Author: Trilling, B. & Fadel, C.
A15_Book_ISSN: 978-0-470-67538-6
A16_Journal_Month:
A17_Journal_Year:
A18_Journal_Volume:
A19_Journal_Issue_Number:
A20_Copy_Pages: page 176, Appendix C: Table C.1. P21 and 7C skills
A21_Maximum_Copies: Doctoral Dissertation
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Department of Child, Family
and Community Sciences

September 15, 2009

REC'D SEP 21 2009

Dr. George Van Horn
Director of Special Education
Bartholomew Consolidated School Corporation
1200 Central Avenue
Columbus, IN 47201

Dear Dr. Van Horn:

This letter will confirm our recent communication via electronic mail. I am completing a doctoral dissertation at the [redacted] entitled "Investigating the Integration of Universal Design for Learning Content into Secondary General Education Instructional Methods Course Content."

I would like your permission to reprint in my dissertation excerpts from the following:
Napko, K. M. (2008). *Universal design for learning: Implementation in six local education agencies*. Retrieved from Project Forum website: <http://www.projectforum.org>

The excerpts to be reproduced are: *Appendix E: Sample UDL Rubric shared by Bartholomew Consolidated School Corporation, IN*. The rubric is adapted from information available in Rose, D.H., Meyer, A., & Hitchcock, C. (2005). *The Universally Designed Classroom: Accessible Curriculum and Digital Technologies*. Boston, MA: Harvard Education Press.

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Sincerely,

Kimberly Pawling

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George Van Horn, Ed.D. Date: 9/24/09





Department of Child, Family
and Community Sciences

September 14, 2009

Michael Abell, Ph.D.
31 Spring Meadow Dr
Taylorsville, KY 40071

Dear Dr. Abell:

This letter will confirm our recent communication via electronic mail. I am completing a doctoral dissertation at the [redacted] entitled "Investigating the Integration of Universal Design for Learning Content into Secondary General Education Instructional Methods Course Content"

I would like your permission to reprint in my dissertation excerpts from the following:
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Sincerely,

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