Abstract

Students with significant cognitive disabilities need to have access to the general curriculum. The Individuals with Disabilities Education Act of 1997 and the Individuals with Disabilities Education Improvement Act of 2004 have made provisions to ensure that all students have the opportunity to participate and progress in the general curriculum, including students with significant cognitive disabilities. One way to promote access to the general curriculum for students with significant cognitive disabilities is through Universal Design for Learning (UDL). The research design for this study was a single-subject design using an ABA approach with both quantitative and qualitative components. This study used the Universal Design for Learning principle of representation specially graphic supports to promote access to the general curriculum for students with significant cognitive disabilities. The study took place in a seventh grade regular education English language arts classroom. The participants in the study include one regular education teacher, one Intellectually Disabled Moderate student, and three Intellectually Disabled Severe students. Data collection was done through a pre- and post- assessment with the teacher participant, task analysis of the instruction, and student engagement recording chart. This study provides both general and special education teachers with knowledge on how to implement UDL and how to effectively collaborate with one another to ensure access and success to all students.

Universal Design for Learning, Access to General Curriculum for Students with Severe Cognitive Disabilities.

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A thesis project in partial fulfillment for the MAEd degree in Special Education

Universal Design for Learning:

Access to General Curriculum for Students with Severe Cognitive Disabilities

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Chapter One: Introduction

Summary of Literature

In past decades, access to the general curriculum for students with significant cognitive disabilities has been very limited. The Individuals with Disabilities Education Act of 1997 and the Individuals with Disabilities Education Improvement Act of 2004 have made provisions to ensure that all students have the opportunity to participate and progress in the general curriculum, including students with significant cognitive disabilities. One reason for the lack of access to the general curriculum has been due to the lack of knowledge and experience of the regular education teachers. It is not that regular education teachers do not want students with disabilities in their classrooms; it is that they lack knowledge and experience on how to teach students with disabilities (Cook, 2001).

One approach to ensuring fuller access to the general curriculum for students with significant disabilities will be through the application of Universal Design for Learning (UDL). "Universal Design for Learning (UDL) is a research-based model for curricular design that ensures participation in the general educational program of all students, including those with disabilities" (Zascavage & Witerman, 2009). UDL provides a framework for multiple means of representation, expression, and engagement (Kortering, McClannon, & Braziel, 2008). A study by Browder, Mims, Spooner, Ahlgrim-Delzell and Lee (2009) used the principles of UDL to enhance participation in shared literacy stories for three students with significant cognitive disabilities. Browder, Trela, and Jimenez (2007) conducted a study using a task analysis to train regular education teachers on how to teach literacy to students with significant cognitive disabilities. Current research suggest that UDL, if implemented correctly, can promote access to

the general curriculum for students with significant cognitive disabilities, as well as, help general education teachers plan and implement lessons.

Statement of Problem Hypothesis and Research Question

This study will be guided by the following research question: Will using the Universal Design for Learning strategy of representation through the use of graphic supports, promote access to the general curriculum for students with significant cognitive disabilities? The following hypothesis was formulated from the research question: The Universal Design for Learning representation strategy of graphic supports will promote access to the general curriculum for students with significant cognitive disabilities.

Definitions

1. Universal Design for Learning: A research-based model for curricular design that ensures participation in the general education program for students with disabilities (Center for Applied Special Technology, 2007).
2. Representation: The demonstration and presentation of content in a variety of ways that include auditory, visual, and tactile methods that includes instructional and assistive technology (King-Sears, 2008).
3. Engagement: A variety of materials and activities that have been designed so that students can have sufficient and varied opportunities to acquire proficiency of the content (Kig-Sears, 2008).
4. Expression: How the student will demonstrate what he or she has learned from the content that has been taught (King-Sears, 2008).

5. Significant Cognitive Disabilities: A student who has an IQ of 34 or below and significant limitations in two or more areas of adaptive behavior.
6. Moderate cognitive disabilities: A student who has an IQ between 35-49 and significant limitations in two or more areas of adaptive behavior.
7. Graphics: Visual representation of materials and concepts that were being taught.

Significance of the Study

The purpose of this study was to promote access to the general curriculum for students with significant cognitive disabilities using the UDL component: representation. This study provides both general and special education teachers with knowledge on how to implement UDL and how to effectively collaborate with one another to ensure access and success to all students. This study is significant because little research has been published thus far on UDL for students with significant cognitive disabilities in a middle school setting. Therefore, this study will provides a basis for more research to be conducted on UDL and students with significant cognitive disabilities. It is important because it identifies ways for students with significant cognitive disabilities to have access to the general educational curriculum.

Limitations

One limitation to the study is the small number of participants with significant cognitive disabilities. Participants included three students who have significant cognitive disabilities and one student with moderate cognitive disabilities. A larger number of participants would have strengthened the study because more data could be collected on the impact of UDL with students with significant cognitive disabilities. This was not an option for the current study because there were only four students with moderate or significant disabilities in the seventh grade at the

school where the study was conducted. A second limitation to the study is that the UDL representation strategy was only examined in one subject area of literacy. Replications of the study for future research on using UDL in other subject areas may also help promote access to the general education classroom. A third possible limitation of the study was attendance of the students with disabilities. If students are consistently absent or missing class, the missing data can affect the validity of the study. Two of the participants missed days during baseline and intervention due to illness. The outcomes are discussed in chapter four.

Chapter Two: Literature Review

The concept of universal design (UD) was first coined in the 1970's , by Ronald Mace who was an architect who used a wheelchair user (McGuire, Scott & Shaw, 2006). Mace suggested that physical environments needed to be designed so that they can be accessible to all people. According to the Center for Universal Design at North Carolina State University, UD is defined as "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." (McGuire et al., 2006). Universal design has seven guiding principles: equitable use, flexibility in use, simple and intuitive, perceptible information, tolerance for error, low physical effort, and size and space for approach and use (McGuire et al., 2006). In 1984, The Center for Applied Special Technology (CAST) started to expand the principles of UD to the learning environment (Jimenez, Graf & Rose, 2007).

"UDL is a research-based model for curricular design that ensures participation in the general educational program of all students, including those with disabilities" (Zascavage & Winterman, 2009). The No Child Left Behind Act and Individuals with Disabilities Education Act have required educators to maximize opportunities for students with disabilities, including students with significant cognitive disabilities to succeed in inclusive classrooms (Clayton, Burdge, Denham, Kleiner, & Kearns, 2006). The appropriate application of UDL principles to instructional planning allows for students with disabilities to have fuller access to the general education classroom. Through the integration of UDL, educators are provided various methodology options for presenting information and content that supports the learner (Zascavage & Winterman, 2009). Representation, expression, and engagement are key components for the UDL framework (Kortering, et.al, 2008).

Search Methods

A literature review for the use of UDL principles with students with moderate to severe disabilities has been completed through educational databases and search engines, including Educational Resources Information Studies (ERIC) via EBSCO Host, JSTOR and Academic Search Premier. In the initial search, the descriptors included: universal design for learning, severe cognitive disabilities, low incidence disabilities, and strategies. The initial search yielded little information on the topic. A second search was conducted using the following additional descriptors: differentiated instruction, methods, learning disabilities, high incidence disabilities, graphic visuals, representation, literacy strategies and interventions. A third search was conducted using the following descriptors: general education teachers, attitudes, special needs, inclusion, teaching, students, and intellectual disabilities. The criteria for the studies that are included in this review are based on the date of publication, relevance to the research topic, and whether or not the study was qualitative, quantitative, or observational. Quantitative studies are important because they contain clear, numerical data offering support through measures of central tendencies. These types of statistics allow researchers to compare and generalize findings across participants and settings. However, due to higher diversity and differences in characteristics among students with low incidence disabilities, it is rare to find quantitative studies that demonstrate a high degree of validity in low incidence research. At best, they may be found in broader topic searches such as application of UDL within literacy settings. Because of the large population size requirements of large quantitative studies, qualitative studies are important because they provide a more in-depth understanding of how and why occurring throughout the integration of the intervention.bservational studies draw from both quantitative and qualitative bases and are able to help the researcher draw inferences on the possible effects of experiments.

Access to General Curriculum

For many years, access to the general curriculum has been limited for students with severe cognitive disabilities this is largely due to general education teachers' lack of knowledge, experience, and attitudes toward inclusion of students with severe cognitive disabilities (Cook, 2001). Through the use of UDL, general education teachers may be able to have the knowledge and experience needed to teach students with severe cognitive disabilities, which can ultimately change the general education teacher's attitude about inclusion of students with severe cognitive disabilities.

Attitudes of General Education Teachers

Cook (2001) examined whether general education teacher's attitudes towards students with disabilities differed as the function of the disability. The study took place in an Ohio school district with 70 general education teachers with inclusive classrooms. The students were divided into one of two categories: students with hidden disabilities and students with obvious disabilities. Each teacher nominated three of his or her students who best represented one of the four attitude categories were: attachment, concern, indifference, and rejection. For a teacher to consider a student for the attachment category, they had to think of one student whom they would want to keep for another year just for sheer joy of having the student. To be considered for the concern category, the teacher had to choose a student to whom they devote all of their attention because of concerns about him or her. To be considered for the indifference category, teachers were asked to choose a student who if his or her parents were to drop by they would be least prepared to talk about. To be considered for the rejection category, teachers had to choose one student who they would like to have removed from their class.

The results of the study showed an overrepresentation of students with obvious disabilities in the indifference category and an overrepresentation of students with hidden disabilities in the rejection category. Cook's theory on the concern and attachment categories demonstrated that there was a positive correlation between students with obvious disabilities and the teachers' attitudes of concern for them and attachment to them. Cook's explanation and interpretation of the findings conclude that students with mild or hidden disabilities fall into the rejection category because of the teacher's tolerance level and the fear of classroom management problems, whereas, students with obvious disabilities were a concern for the teacher because the teachers did not know how to meet the needs of the students.

Cook suggested that in order for teacher's attitudes towards inclusion of students with disabilities to change the teachers should receive support from the special education teachers and that they should receive training on how to teach students with disabilities. Cook also suggested that principals be aware of a teacher's tolerance levels because that can help determine whether or not to put a student in his or her class.

Background to Access

The *Education of all Handicapped Children Act* (EAHCA, Public Law 94-142) of 1975 mandated for the first time that children and youth with disabilities be afforded the right to a free and appropriate public education in the least restrictive environment. It has been over thirty years since the PL 94-142 has been in effect and one major challenge has been ensuring adequate access to the general curriculum for students with disabilities (Jimenez, Graf & Rose, 2007). After the implementation of PL 94-142, the Individual with Disabilities Education Act of 1997 and the Individuals with Disabilities Education Improvement Act of 2004 made provisions to

ensure that all students have the opportunity to participate and progress in the general curriculum including students with significant cognitive disabilities.

Wehmeyer (2006) discusses the importance of moving from access to progress for students with severe cognitive disabilities by stating:

> It is time to move beyond access and strive to ensure progress in the general education curriculum for all students, including students with severe disabilities. It is time to focus on what students are taught and to demand that they be taught in environments that promote progress. Those environments are, our research suggests, general education classrooms (p. 325).

Looking back on the last three decades of special education and challenges in the field of special education, Wehmeyer (2006), focuses on the progression of "what" the student is being taught. The first decade of special education focused on the basics of inclusive practices, the second decade focused on improving practices in the general curriculum classroom, while the third and current decades are building on the first two by focusing not on where a student receives his or her educational program but what the student is being taught (Wehmeyer, 2006). One approach suggested to ensure fuller access to the general education curriculum for students with disabilities is the application of Universal Design for Learning (Jimenez, Graf & Rose, 2007).

Wehmeyer, Lattin, Lapp-Rincker, and Agran (2003) believe that through the implementation of UDL students with significant cognitive disabilities can achieve higher standards and benefit from the access to the general curriculum. Too frequently students with disabilities are held to low expectations and are more likely to be segregated from their peers

without disabilities (Wehmeyer, et.al). Education for students with significant cognitive disabilities needs to focus more on achieving success and progress in the general curriculum (Wehmeye et. al).

The following observational study by Wehmeyer and his colleagues (2003) examines the degree to which students with significant cognitive disabilities in middle school have access to the general curriculum, the impact of the classroom setting, and the students' level of ability on such access. Thirty-three students from two middle schools participated in the study. Each student was identified as having some level of significant cognitive disabilities. The researchers divided the students into one of two groups: those having access to the general educational classroom and those not having access to the general education classroom. The criterion for each group was based on the amount of time spent with nondisabled peers. A time-sample observation method was used to observe students in eight classes for fifteen minute sessions. Observations were conducted over a seven month time span and students were observed once a day. Observational data was collected using two intervals per minute: twenty seconds observing and ten seconds recording. The content of the class and the presence or absence of the student was recorded. The observation included seven specific items: 1) All students working on task based on district standard, 2) target student working on standard identified for grade level, 3) no students in the class working on task associated with standard, 4) target student working on IEP goal or objective, 5) target student receiving accommodation, 6) target student working on adapted task or activity , and 7) target student working on task or activity that augments the curriculum. The results from the observations showed the percentage of time students were engaged in activities related to accessing the general curriculum.

Review of UDL

Universal Design for Learning is a research based model for curricular design that ensures participation in the general educational program for all students, including those with disabilities (Center for Applied Special Technology, 2007). The framework for a UDL classroom begins with curricula designed to maintain high expectations for all types of learners (Zascavage & Winterman, 2009). The three components of UDL are representation, engagement, and expression. Representation is the demonstration and presentation of content in a variety of ways that include auditory, visual, and tactile methods that include instructional and assistive technology (King-Sears, 2008). The engagement component consists of a variety of materials and activities that have been designed so that students can have sufficient and varied opportunities to acquire proficiency of the content. Expression is how the student will demonstrate what they learned from the content that had been taught (King-Sears, 2007). UDL provides educators with the knowledge of how to make the general education curriculum accessible to students with significant cognitive disabilities (Downing, 2006). Pisha and Coyne (2001) stated: "It is time for another step forward in providing all students access to learning; curricula and materials must be made "smarter" from the start through the application of Universal Design for Learning."

Literacy and UDL

Browder et. al (2009) believed that students with severe disabilities required direct instruction and studied the principles of universal design for learning used to plan literacy participation specifically in relation to shared stories for this population. The study took place in a special education classroom consisting of nine students with disabilities, one teacher, and two

paraprofessionals. To qualify for the study the students had to meet three criteria: offered few to no responses during literacy lessons, demonstrated an inconsistent use of augmentative and alternative communication (AAC) and were difficult to interpret intentionality of nonsymbolic communication due to the disability. Three students were chosen: student one was a seven year old female with severe/profound delays; student two was a seven year old male with profound delays; and student three was a ten year old male with profound delays. A multi-probe single subject design across participants was used to examine the results and effects of this study (Browder, et al., 2009). A sixteen step task analysis was created to use during data collection to see how much each student was participating in the shared reading. During baseline, the interventionists presented the student with two books and allowed them to choose which book they would like to read. Once the student made a response or an attempt to respond, the response was scored immediately (Browder, et al., 2009). Baseline data was collected first by the interventiont reading aloud one-on-one to each student and the other interventionist scoring the task analysis. All three students showed stable or decreasing data in the baseline phase. Once the baseline data were collected, the interventionist used a multiple baseline research design for the intervention, which means that second student does not begin receiving intervention until the first student shows improvement in his or her responses. This was done until all three students showed an increase in their responses.

Before the start of the intervention phase, the planning team met to review the baseline data and the task analysis responses, and plan the strategies to be used to increase student responses. During the meeting, the interventionist used a template that listed all sixteen steps of the task analysis and the three UDL components: representation, engagement, and expression. For the steps that the student made independently, no further planning was done. For the steps

that had either no responses or only a brief reaction the team used one of the three UDL components of representation, engagement, and expression to change the format of the shared reading. To determine what intervention would take the place the interventionists would ask the team questions about ways to better represent the steps, alternate methods of response, and other ways to get the student to engage in the story. The team planned to use the least intrusive system of prompts and praise for each step (Browder, et al., 2009). The format of the prompt was individualized for each student and the interventionists used systematic prompting and feedback for each step of the task analysis. Once the intervention was determined, the interventionist conducted daily shared reading stories using the task analysis from the UDL planning.

The results of the study showed an increase of independent responses for each student. Student one showed a 97% increase in responses made during the shared reading; student two showed a 94% increase in responses made during the shared reading; and student three showed a 92% increase in responses made during the shared reading. While the study demonstrated that team planning for UDL lessons is an effective way for teachers to write shared literacy stories and plan strategies, a few limitations were found. One limitation that was identified was AAC devices were identified by the team that might have been beneficial but could not be procured in time for the study.

Browder, Trela and Jimenez (2007) conducted a study examining the effects of training teachers to follow a task analysis for literacy typical of middle school language arts using a multi-probe-across-participants design. Three middle school teachers who taught students with significant cognitive disabilities participated in the study. Eight novels were selected from the school's supplementary reading list and adapted using pictures, shorter chapters and sentences,

and repetition of key points in the chapter. The data collection consisted of three phases: pre-baseline, baseline, and intervention.

During pre-baseline, the teachers were asked to conduct a literacy lesson to determine the extent to which they already were doing story-based lessons. The pre-baseline showed that literacy instruction consisted of reviewing the calendar and the day's schedule. Before baseline observations began, the teachers attended a general workshop on literacy instruction to learn the components of literacy lessons and to plan a literacy lesson with the help of a general education teacher. During baseline, the teachers began to read the adapted book to their students but the literacy components were not demonstrated by the teachers. The intervention took place with one teacher at a time and the next teacher did not start the intervention until the prior teacher had demonstrated all twenty-five steps. The twenty-five components of the task analysis covered four main sections with items to be met under each section. The four main sections were Opening, Word and Sound Study, Text Awareness, and Comprehension. The teachers were taught the following three components to the intervention: follow the template, use systematic prompting for all 25 steps, and self-monitor adherence to the template. In order for the teachers to understand the three components, the interventionists taught each teacher the three components. The first component taught was to follow the template by having the interventionists review and demonstrate each step with the teacher. Once the first component was learned, the second component, use of systematic prompting, was taught. Each teacher was taught time delay and system of least prompts. The final component addressed was self-monitoring adherence to the template which was taught by role-playing between the interventionist and the teacher. Two out of three teachers mastered and maintained all three components of the literacy lesson. The other teacher mastered and maintained all but one step. One limitation to the study was the students

did not participate within general education language arts classes even though the books that were being used were being taught in the general education classroom. The study focused on creating access to the core curriculum for students with moderate to severe disabilities but no student was physically included in the general education classroom.

Browder, Ahlgrim-Delzell, Courtade, Gibbs and Flowers (2008) are in year three of a five year longitudinal study on teaching reading to students with significant developmental disabilities. Findings from the first year of study focused primarily on the development of curriculum, the development and selection of appropriate measures and comparative effects of curriculum verses traditional sight word approach.

The Early Literacy Skills Builder (ELSB) curriculum which contains five levels of instruction with five lessons at each level. Each level progressively introduced a more difficult skill and was taught using the system of least prompts because this is a method that has been proven effective for students with significant disabilities (Browder, et.al., 2008). Once a student masters all levels of ELSB, the student will then move on to a standard reading program. The lessons used in ELSB are scripted lessons because the researchers found that many teachers who taught students with significant developmental delays had limited training in literacy (Browder, et al., 2008). For assessment purposes, the team designed the Nonverbal Literacy Assessment (NVLA) as a standardized measure of literacy because they did not find a measure of literacy for students who are nonverbal. In addition, they designed the Early Literacy Skills Assessment (ELSA) to correlate with ELSB. The items generated for the NVLA were based on the five components of reading identified by the National Reading Panel.

The study used a randomized control group design which randomly assigns students to either a treatment or control group. Seven special education teachers who taught students with severe/profound intellectual disabilities, moderate intellectual disabilities or autism identified students from their class who they thought met the study's criteria. The criterion to participate in the study included an IQ of 55 or below or comparable deficits in adapted behavior, enrolled in grades kindergarten to fourth, reading below first grade level, adequate vision and hearing, responsive to ongoing instruction in English, and parental consent. Twenty-three students met the requirements for the study. Eleven students from across classrooms were selected for the treatment group and the other half for the control group. The independent variable for the study was the type of reading instruction and the dependent variables were the two measures that had been created, the ELSA and NVLA.

The experimental or treatment group was taught using the scripted ELSB curriculum. The students could not move on to the next level until they had 75% correct responses on the lessons for the prior level. The control group was taught using the traditional sight words and pictures using Edmark, a commercial sight word curriculum. Each of the experimental group's participants progressed through at least one level of the five levels by the end of the academic year. Six of the students progressed to level 2, three students progressed to level 3 and one student progressed to level 4 and one student progressed through all five levels. The fidelity for the control group's sight words intervention was not feasible because of the variety of methods using by the teachers. Instead the researchers focused on the comparability of the instructional time.

One limitation to this study is the study design of randomized trials because it presents many challenges. One challenge that is presented with randomized trials is differences may have

existed between subgroups: students with autism versus students with severe intellectual disabilities. An advantage to the challenge presented by this design is it can provide strong evidence of the interventions effectiveness by proving the curriculum is effective. A second limitation was the primary findings were based on the instruments that were created by the researchers. The threat to internal validity was addressed by the researchers by providing support for the reliability of the instruments and through the use of published instruments.

Synthesis

Students with intellectual disabilities typically have limited access to the general curriculum. When they do have access, general education teachers are unprepared to teach them because they simply do not know how (Cook, 2001). Some general education teacher's attitudes towards inclusion of students with severe intellectual disabilities include an attitude of resentment (Cook, 2001). The attitude of resentment is due to the lack of knowledge and training general education teachers' receive. Another attitude that can be seen in general education teachers is one of acceptance with fear. The teachers are accepting to the students being a part of their class but they fear that they will not be able to meet their educational needs. UDL, if implemented correctly, can promote access to the general curriculum for students with intellectual disabilities as well as give general education teachers the knowledge and confidence that is needed to teach effectively with diverse learning within the classroom. UDL will be able help teachers plan their lessons and activities with differences in mind. If teachers use the three components of UDL to drive their lessons, all students no matter their disability will be able to learn something from the lesson.

One particular area that is lacking access to the general curriculum for students with intellectual disabilities is the area of literacy. The lack of access in literacy is partially due to the fact general education teachers simply do not know how to teach students with intellectual disabilities. The issue is not the general education teacher's qualifications to teach literacy, it is the lack of training and knowledge that is needed to teach students with severe intellectual disabilities. Access to general curriculum in literacy is lacking because once students reach a certain level such as middle school, teachers are at a loss on how to teach them because of the harder concepts that are seen in middle school curriculum. The best way for general education teachers to teach students with severe intellectual disabilities is effectively differentiate instruction through the implementation of UDL. If teachers are taught how to differentiate instruction by using UDL, students with disabilities will be able to access and progress in the general curriculum.

Access to literacy in the general curriculum is of great value. Literacy is a very important life skill. Everything people do involves some form of literacy whether it is comprehension of something you just read (even something as simple as graphic representation to order from a restaurant menu) or analyzing your bank account. Literacy skills are an everyday occurrence and students with severe cognitive disabilities needed to be afforded the opportunity to build those skills.

This study seeks prove the effectiveness of UDL, specifically in the area of representation through graphic supports, for students with significant cognitive disabilities to promote access to the general curriculum in a seventh grade English Language Arts class.

Chapter 3: Methodology

Research Problem

This research was designed to study the effects of UDL through the use of graphic supports to promote access to the general curriculum for students with significant cognitive disabilities in a seventh grade English Language Arts class. A null hypothesis was developed in order to determine the effects of UDL for students with significant cognitive disabilities. The research collected both quantitative and qualitative data through the use of pre- and post-assessments, task analysis, and an engagement recording chart that was administered to the research participants.

Research Question/Null Hypothesis

The research of this study was guided by the following research question: Will using the Universal Design for Learning strategy representation through the use of graphic supports promote access to the general curriculum for students with significant cognitive disabilities? The null hypothesis is Universal design for learning through the use of graphic supports will promote access to the general curriculum for students with significant cognitive disabilities.

Setting

The study took place in a seventh grade regular education classroom in eastern North Carolina during the Fall of 2010. The school has a population of 566 students approximately 50 of whom are identified as having some type of disability and receives special education services. Approximately fifty percent of the school population receives free and reduced lunch. For the 2009-2010 school year, the school did not reach Annual Yearly Progress (AYP) but it did meet expected high growth which means the school was ninety percent or better on meeting their

target goals. AYP goals are predetermined meaning the school would have to meet all target goals within all subgroups including special education to officially make AYP.

The English Language Arts class was designed based on a block schedule of ninety minutes. The study took place during the first forty-five minutes of each class period for six weeks. The classroom was equipped with a Smartboard, a Prentice Hall book for each student, and various reading materials. The classroom consisted of thirty-one regular education students, three students with significant cognitive disabilities, and one student with moderate cognitive disabilities. The teacher(s) in the classroom included one general education teacher who has been licensed in English Language Arts for grades 6-8 and social studies for grades 6-12 and who has been nationally board certified. There was also one special education teacher who went to and from class with the students who have disabilities. The special education teacher has been licensed in both general and adapted curriculum for grades K-12, reading K-12, and elementary K-6. The classroom also had two paraeducators who went go to and from class with the students with significant disabilities. For the purposes and duration of this study, the paraeducators did not assist the students in any type of engagement or participation.

Participants

The participants for this study included one regular education teacher and four students with disabilities. The teacher who participated in this study was a thirty-six year old Caucasian female who has been teaching for fourteen years. She has a Bachelor's of Science degree in Social Studies from East Carolina University. She has been Nationally Board Certified and has a license in social studies for grades 6-12 and in English Language Arts for grades 6-8. She has been trained in Early Adolescent English Language Arts.

The students who participated in this study included two male and two females all of whom have a disability. Pseudonyms were given to each student and are used throughout the study. Student one (Bethany) is a fourteen year old female who has been diagnosed with Rett Syndrome. She is a non-verbal student who communicates through eye gaze and sometimes through touch. She spends thirty percent of her day in the regular education class and the other seventy percent in the self-contained ID-Severe class. Student two (Tracy) is a fourteen year old female who has been diagnosed with moderate intellectual disabilities. She is verbal and communicates very well with others. She spends the majority of her day in the self-contained ID-Moderate class. Student three (Addison) is a thirteen year old male who has been diagnosed as having Down Syndrome. He spends most of his day in a self-contained class. He is a non-verbal student who communicates through gestures or through the use of a Dynavox augmentative communication system. Student four (Marcus) is a twelve year old male who has been diagnosed as having multiple disabilities. He is a non-verbal student who normally communicates through facial expressions, gestures, or an augmentative communication device. He spends most of his school day in a self-contained class. All of the students are very social with their peers whether they are disabled or non-disabled.

The researcher was a graduate student in East Carolina University's Special Education master's program for low incidence disabilities and the researcher is an employee of the school in which the study will take place. The researcher has been working that the school for two years and has held two different positions. The first position held was a one-on-one assistant to a student with significant cognitive disabilities who received instruction in the regular education setting for part of the day and the second position held will be the classroom teacher for students n the ID-Severe classroom. The student with whom the researcher was a one-on-one assistant was a

participant in the study (Bethany). The researcher has had experience working with the general education teacher and inclusion for students with significant cognitive disabilities and was the special education teacher of the student participants of the study.

Research Design

The research design for this study was a single-subject design using an ABA approach with both quantitative and qualitative components. Data was collected through the use of pre- and post- assessment, task analysis, and engagement recording chart. The pre-assessment (Appendix A) was administered to the teacher before the study took place in order to determine her knowledge on inclusion and universal design for learning. The researcher used a task analysis (Appendix B) to collect data on the how much graphic supports the teacher used during her lesson. Once pre-assessment was completed and analyzed, the teacher participant completed a self-paced-training module on universal design for learning (Potts, 2010). The module is focused on universal design for learning for students with significant disabilities. Once the training is completed, the teacher was observed using the same task analysis to see if there was an increase in the number of tasks completed.

The student participants were observed to record their level of engagement during all three phases baseline, intervention, and without the intervention. The student participants were observed using an engagement recording chart (Appendix C). The engagement recording chart was designed to document the students' engagement for every two minutes. A check was placed in the appropriate box if the student appeared to be engaged. The criteria for being engaged included: watching the teacher, participating in class, staying on task, and following along. A video recording was be made during each observation and aided in the data collection process.

An inter-observer rating was used to determine the validity by having the second trained observer complete the task analysis and student engagement instrument for minimum of 20% of the sessions.

Once the study was complete, a post-assessment was given to the teacher to see if she had gained knowledge on universal design for learning after completion of the training module and direct classroom experience integrating UDL adaptations.

Instrumentation

A pre- and post- assessment adapted from Gargiulo and Metcalf's book *Teaching in Today's Inclusive Classroom: A Universal Design for Learning Approach* (2010) was designed by the researcher of this study and was given to the participant before the study took place (see Appendix A). The pre- and post- assessment consisted of open ended questions that assessed the teacher's knowledge on inclusion and universal design for learning.

A fifteen -step task analysis (Appendix B) was used during the observation of instruction given by the teacher. The task analysis was developed by the researcher and was adapted from Browder et. al (2009) study and the Center for Applied Technology (CAST). The task analysis was used to determine the amount of graphic supports the teacher used during her literacy instruction.

The engagement recording chart (Appendix C) was designed by the researcher and used before and after the intervention took place. The engagement recording chart was used to determine the amount of time the students were engaged during each lesson. Engagement was recorded every two minutes.

Data Analysis

Quantitative and qualitative data was collected through this prospective screening study Pre- and post- assessments were conducted using identical measurement instruments. The qualitative data assessment focused on characterizing the teacher's UDL knowledge prior to and after to completing the UDL training module. The task analysis was used to assess the teacher and the engagement chart was used to assess the students, quantitatively. The task analysis determined how many steps and graphics the teacher used during each lesson. The engagement recording chart was used to measure the students' total classroom engagement times. The engagement recording chart was analyzed by comparing the baseline data to the intervention data.

Chapter 4: Data Analysis

This study was designed to measure the effects of universal design for learning through the use of graphic supports to promote access to the general curriculum for students with significant cognitive disabilities in a seventh grade English Language Arts class. The following study hypothesis was presented: Universal design for learning through the use of graphic supports will promote access to the general curriculum for students with significant cognitive disabilities. The study participants included one teacher, three students with significant cognitive disabilities, and one student with moderate cognitive disabilities. Section 1 entitled, Pre-and Post-Assessment, provides an evaluation of the teacher's UDL knowledge before and after the intervention using both quantitative and qualitative data evaluation techniques. Section 2, Task Analysis, describes the graphic supports which were used during instruction. The results of the data analysis conducted in Section 3, Student Engagement, compares the students classroom performance in terms of total classroom engagement time during baseline and during intervention. Statistical Analysis Software (SAS) was used to analyze the data.

Section 1: Pre- and Post-Assessment

A written assessment was completed by the teacher before student baseline data was collected and an identical written assessment was completed by the teacher after teacher intervention training was administered. The assessment contained five quantitative questions and three qualitative questions. The quantitative questions all had an equal value of 20 points totaling a score of 100. The qualitative questions were scored using a rubric (Appendix D) rating of 1-4: 1=never, 2=rarely, 3=sometimes, and 4=always. The rubric consisted of three sections: use of

technology during instruction, knowledge and application of UDL, and student engagement. The three sections of the rubric correlated with each qualitative question.

A summary of the quantitative and qualitative teacher assessment scores are shown in Table 1. The pre- and post-assessment scores are representative of the teacher's knowledge and use UDL techniques before and after UDL training, respectively. For both the quantitative and qualitative assessments, the difference between the pre- and post-scores were computed and used to determine a percentage improvement score. The quantitative pre-UDL training score was 40% and post-UDL training score was 100%, which corresponds to an absolute difference of 60% and an improvement percentage score of a 150%.

The qualitative pre-UDL training score was 62.5% and post-UDL training score was 87.5% for a difference of 25% and an improvement score of 40%. The pre-and post-qualitative percentages were determined by dividing the average pre-score (2.5) by the highest average pre-score (4) possible and the average post-score (3.5) by the highest average post-score (4) possible.

Table 1 Summary of Pre- and Post-UDL Training Teacher Assessment

Assessment Questions	**Score Pre-UDL Training %**	**Score Post-UDL Training %**	**Difference In Pre- and Post- Score (Post-Pre) %**	**Score Improvement as Percentage of Pre-Score % 100*Difference/Pre**
Quantitative	40	100	60	150
Qualitative	62.5	87.5	25	40

Table 2 and Table 3 share the teacher participant data from the pre- and post-assessment, quantitative and qualitative sections, respectively. In Table 2, the teacher participant responses to each quantitative question are shown using a + or – to show indicate correct and incorrect. The qualitative questions (Table 3) were scored using the rubric (Appendix D). The average pre-score was 2.5=[(3+2+2.5)/3]. On question 1, the teacher scored 3 points for using at least one type of UDL technology (i.e, Smartboard). For question 2, regarding current use of UDL techniques being implemented in her instruction, the teacher scored 2 points since her response indicated that she was acclimating to the students and interacting with each student in order to include them in the lesson where possible. The teacher received 2.5 points on question 3 because she indicated as specified in the rubric (Appendix D) significance of student engagement time but specific time of engagement for her students she did state how she measures their engagement.

For the post-assessment, the average post-score 3.5=[(4+4+2.5)/3]. An improvement was noted for questions 1 and 2 those questions pertaining to the use and knowledge of UDL technology. For question 3, the same score (2.5) was received as there was not statement defining amount of adequate time of engagement or how to measure engagement time. For question 1, the teacher scored 4 points because she incorporated more types of technology in her instruction, in addition to the Smartboard, she incorporated three types of augmentative speech systems: BIGmack™, iTalk2™, and Step by Step Communicator™. For question 2, the teacher scored 4 points because she used a variety of methods to represent different concepts.

Table 2: Quantitative Results

Question	Answer Pre-UDL Training	+ or −	Answer Post-UDL Training	+ or −
Explain the three principles of universal design	No Answer Given	−	Representation is how you present the material to the students, Expression is how the students demonstrate what they know, Engagement is knowing how your students represent their understanding through different materials.	+
Name the four components of universal design for learning curricular design	No Answer Given	-	Goals, Methods, Materials, and Assessments	+
Define Inclusion	Including special education students in the general education classroom	+	Including students with special needs in the general education classroom	+
Describe the six co-teaching styles	No Answer Given	–	One teaches and one observes One teachers and one assist Parallel Teaching Station Teaching Alternative Teaching Team Teaching	+
Explain the difference between accommodations and modifications	Accommodations are providing least restrictive access to the curriculum and modifications are making changes to the curriculum or grading	+	Accommodations are providing least restrictive access to the curriculum and modifications are making changes to the curriculum or grading	+

Table 3: Qualitative Results

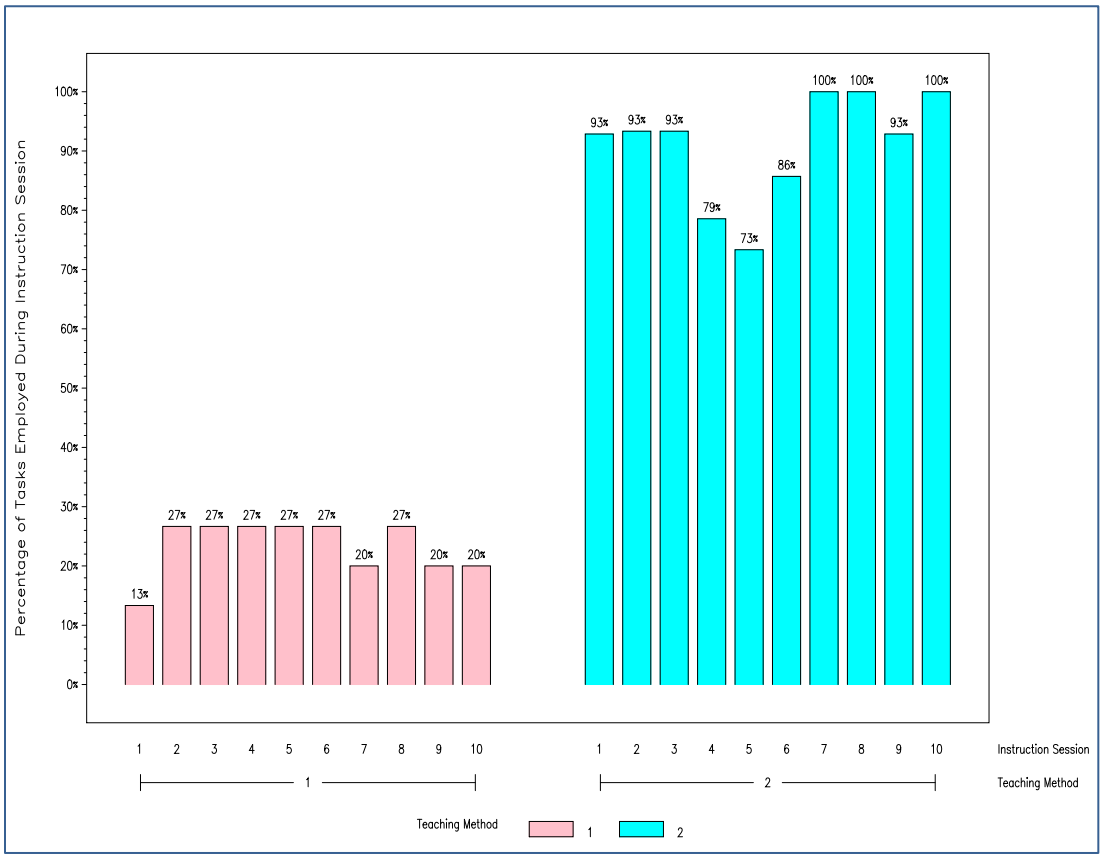
Question	UDL Pre-Training Answer	Rubric (1 to 4)	UDL Post-Training Answer	Rubric (1 to 4)
What technology do you currently use in your classroom?	Smart Board	3	Smart Board, AAC Devices (BIGmack™, iTalk2™, and Step by Step Communicator™.)	4
Given your current knowledge on UDL, describe how you see it reflected in your instructional block	At this point, we have been acclimating the students to the schedule and each other. I try to interact with each student daily and include them in my lesson where I can.	2	I use a variety of methods to represent the material or concepts to my students. I use a lot picture cards to represent the topics. I also use BIGmack™ for them to answer questions and respond to discussions. I also allow for my students to express their knowledge in a variety of ways	4
How do you determine if your students are engaged in the lesson?	Eye Contact, participation, formal/non-formal assessments, discussion, and body language	2.5	Eye Contact, participation, formal/non-formal assessments, discussion, and body language	2.5

Section Two: Task Analysis

A 15-step task analysis was used to measure the number of graphic supports the teacher used during instruction. The researcher collected baseline data for 10 days using the task analysis

for data collection. After the 10 days of baseline, the researcher and the teacher participant completed a UDL module together. Once the module was completed the teacher and researcher discussed the task analysis and suggestions were made by the researcher to the teacher based on baseline data. Some of the suggestions that were made included the use of Alternative Augmentative Communication devices (AAC), picture cards, copies of notes and activities for each student, laminated and Velcro vocabulary charts, and tactile objects. Sheltered Instruction Observation Protocol (SIOP) boards are mandated by the school system for teachers to use daily to inform their students of what they will learn and what their jobs are going to be that day. A SIOP board was created by the special education teacher for the English Language Arts teacher to use in her classroom. Displayed on the SIOP was "Today, I will learn" and "My job today is". Picture cards were used to show what the students were going to learn and what their jobs were going to be. The special education teacher modeled for the teacher how she could incorporate graphic supports into instruction by having her observe the use of graphic supports. The researcher then collected another 10 days of intervention data. The results of the task analysis are illustrated in Figure 1. During day 10 of the intervention, the teacher did not have the opportunity to do two of the tasks because the students were doing group projects and presenting them to the class. The steps that she did not complete on day 10 were task 9 (vocabulary displayed on Smartboard) and task 15 (using AT for repeated story line). This was not counted against her since neither task was appropriate that day. Figure 2 shows the percentage of steps the teacher completed each day during the baseline and the intervention. During baseline, the teacher participant completed an average of 27% of the tasks completed. Some steps were never observed during baseline, while others were seen daily. During the intervention, the teacher participant had an average increase of over 90% tasks completed.

Figure 1: Task Analysis



Section Three: Student Engagement

Student engagement was evaluated using an engagement recording chart. The recording chart (Appendix C) was in sub-divided into intervals of two minutes. The researcher scanned the room every two minutes for a total of 42 minutes. The researcher would look for one of three types of engagement: following along, staying on task, and watching the teacher. A total of twenty days of data collection was performed for each student, ten days for baseline data and ten days for intervention data. Table 4 shows the average engagement time in minutes along with the percentage of time each student was engaged for the total class period (%TCT). The average

engagement time standard deviation, the two-sided 95% confidence interval on the average student engagement time, the observed minimum and maximum baseline engagement time, the difference between baseline and intervention average engagement time, the two-sided 95% confidence interval on the difference between baseline and intervention average engagement time are also provided in Table 4. The difference between each student's baseline engagement time and intervention engagement time is deemed significantly different when tested at the 5% significance level since the two-sided 95% confidence intervals for each set of differences does not contain zero. The baseline and intervention engagement time point estimates of all four students are provided in Figure 2 and Figure 3.

During baseline phase, Bethany (Student 1) had an average engagement time of 14.2 minutes (33.8 %TCT; SD: 5.4 %TCT). The observed minimum and maximum baseline engagement time varied from 6-26 minutes (14.2-16.1 %TCT). During intervention phase, Bethany's average student engagement increased to 33 minutes (78.5 %TCT; SD: 9.8 %TCT), while the minimum and maximum intervention engagement time ranged from 28-40 minutes (66.6-95.2 %TCT). The increase of engagement time from baseline to intervention for Bethany was 18.7 minutes (44.7 %TCT); 95% CI (14.1 %TCT, 23.4 %TCT).

During baseline phase, Tracy (Student 2) had an average engagement time of 26.2 minutes (62.3 %TCT; SD: 7.3 %TCT). The observed minimum and maximum baseline engagement time varied from 10-36 minutes (23.8-85.7 %TCT). During intervention phase, Tracy's average student engagement time increased to 39.8 minutes (94.7 %TCT; SD: 3.1 %TCT) while the minimum and maximum intervention engagement time ranged from 34-42 minutes (80.9-100.0 %TCT). The increase of engagement time from baseline to intervention was 13.6 minutes (32.3 %TCT); 95% CI (8.2 %TCT, 18.9 %TCT).

During baseline phase, Addison (Student 3) had an average engagement time of 10.8 minutes (25.8 %TCT; SD 3.4 %TCT). The observed minimum and maximum baseline engagement time varied from 8 to 10 minutes (19.0-42.8 %TCT). During intervention phase, Addison's average student engagement increased to 32.5 minutes (77.5 %TCT; SD: 6.6 TCP) while the minimum and maximum intervention engagement time ranged from 20-40 minutes (47.6-95.2 %TCT). The increase of engagement time from baseline to intervention for Addison was 21.7 minutes (51.7 %TCT); 95%CI (15.5 %TCT, 27.8 %TCT).

During baseline phase, Marcus (Student 4) had an average engagement time of 10 minutes (23.8 %TCT; SD 4.7 %TCT). The observed minimum and maximum baseline engagement time varied from 4-16 minutes (9.5-38 %TCT). During intervention phase, Marcus's average student engagement increased to 30.2 minutes (71.9 %TCT; SD: 8.1 %TCT) while the minimum and maximum intervention engagement time ranged from 14-38 minutes (33.3-90.4 %TCT). The increase of engagement time from baseline to intervention for Marcus was 20.2 minutes (48 %TCT); 95% CI (12.2 %TCT, 28.1 %TCT).

A statistical analysis was performed to determine if there was a significant difference in engagement time between baseline and intervention. This analysis, a paired t-test, was conducted by computing the two sided 95% confidence interval on the engagement time difference. The average increase for the four students was 18.6 minutes with the corresponding 95% confidence interval of 12.9-24.2 minutes. Since this 95% confidence interval on the average difference in student engagement time does not contain zero, it can be concluded that there is a statistical difference in the observed engagement times at baseline and the intervention student engagement times. This indicates that on average the use of the intervention methodology will increase the student engagement time. Even though this study was based on data from four students and one

teacher, it provides strong evidence as a screening tool to suggest that UDL strategy provides access to the general curriculum for students with significant cognitive disabilities.

Figure 2 Student Engagement Time as Percentage of Class Time

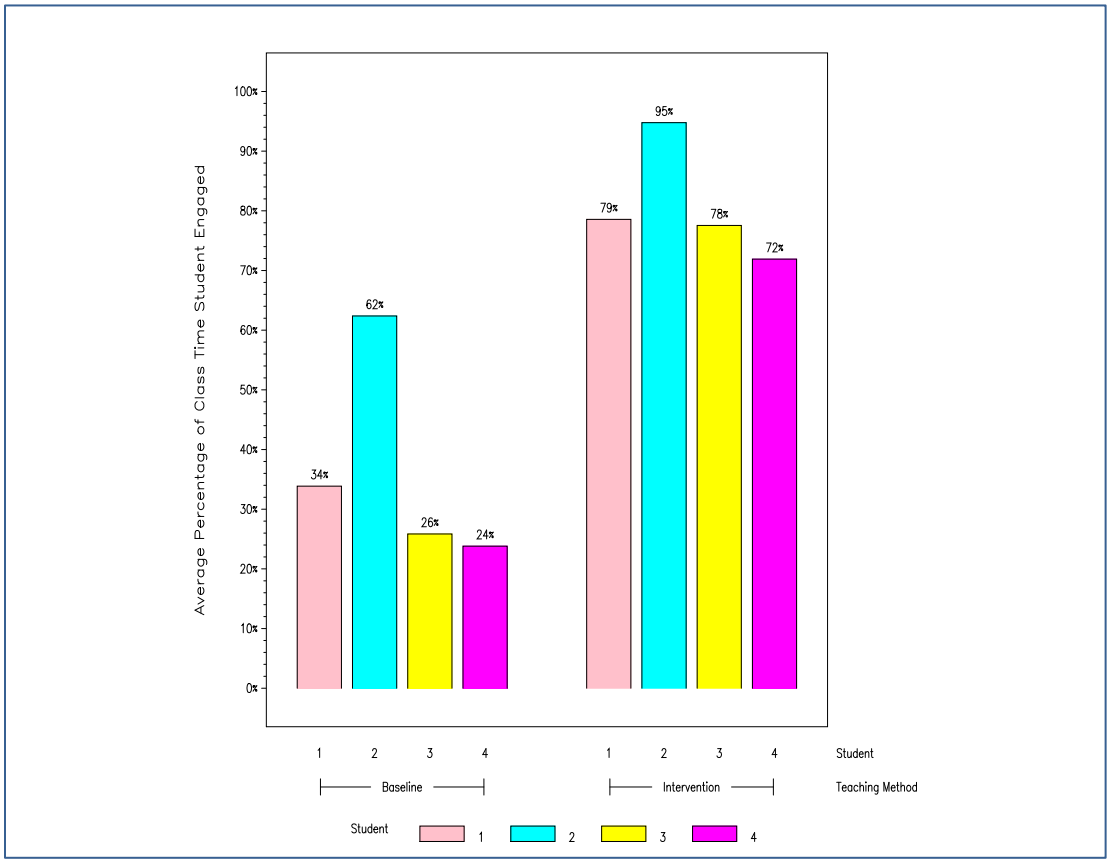


Figure 3 Student Engagement Time in Total Class Minutes

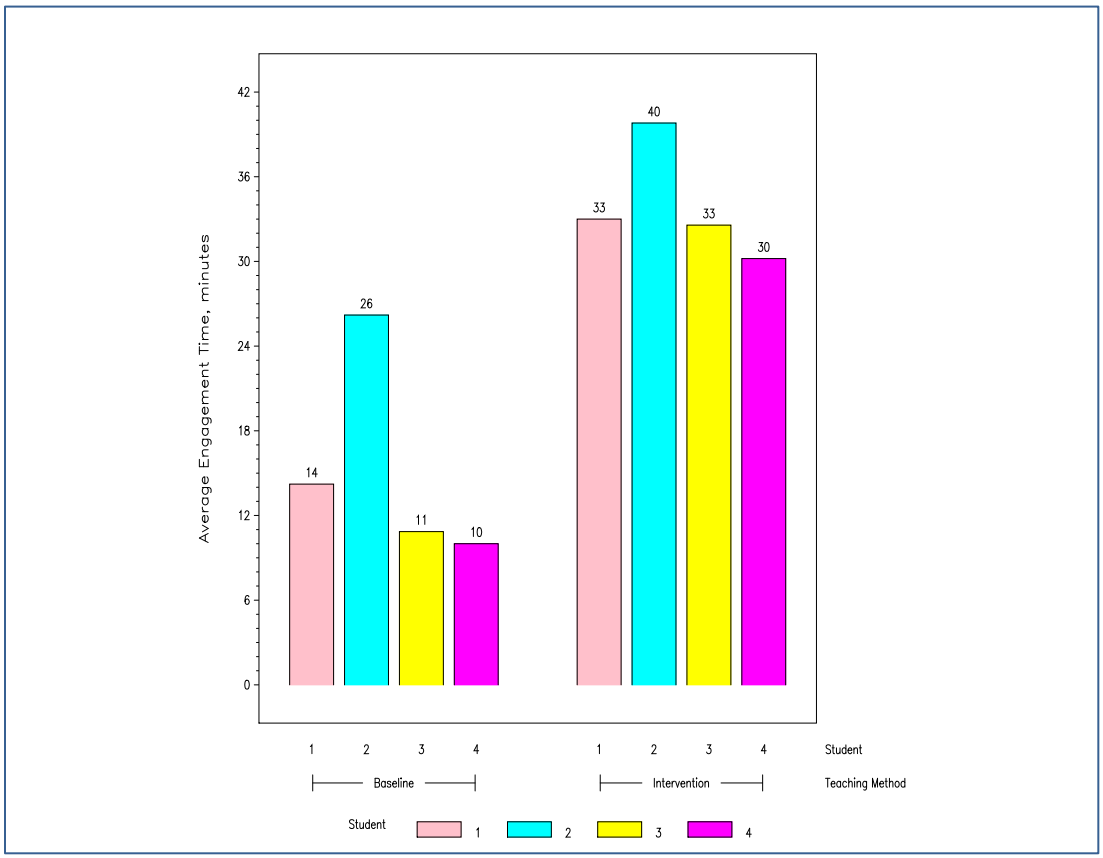


Table 4: Student Engagement Time Statistical Summary

Summary Statistic	Student 1		Student 2		Student 3		Student 4	
	Baseline (n=9)	Intervention (n=10)	Baseline (n=10)	Intervention (n=10)	Baseline (n=7)	Intervention (n=7)	Baseline (n=6)	Intervention (n=10)
Average Engagement Time minutes (% Total Class Time)	14.2 (33.8%)	33.0 (78.5%)	26.2 (62.3%)	39.8 (94.7%)	10.8 (25.8%)	32.5 (77.5%)	10.0 (23.8%)	30.2 (71.9%)
Engagement Time Standard Deviation minutes (% Total Class Time)	5.4 (12.9%)	4.1 (9.8%)	7.3 (17.4%)	3.1 (7.5%)	3.4 (8.1%)	6.6 (15.7%)	4.7 (11.2%)	8.1 (19.4%)
95% Confidence Interval on Average Engagement Time minutes (% Total Class Time)	10.0 to 18.3 (23.9 to 43.7%)	30.0 to 35.9 (71.5 to 85.6%)	20.9 to 31.4 (49.8 to 74.8%)	37.5 42.0 (89.3 to 100.0%)	7.6 to 14.0 (18.2 to 33.4%)	26.4 to 38.6 (63.0 to 92.0%)	5.0 to 14.9 (11.9 to 35.6%)	24.3 to 36.0 (57.9 to 85.8%)
Observed Minimum and Maximum Baseline Engagement Time minutes (% Total Class Time)	6.0 to 26.0 (14.2 to 61.9%)	28.0 to 40.0 (66.6 to 95.2%)	10.0 to 36.0 (23.8 to 85.7%)	34.0 to 42.0 (80.9 to 100.0%)	8.0 to 18.0 (19.0 to 42.8%)	20.0 to 40.0 (47.6 to 95.2%)	4.0 to 16.0 (9.5 to 38.0%)	14.0 to 38.0 (33.3 to 90.4%)
Difference Between Baseline and Intervention Average Engagement Time minutes (% Total Class Time)	18.7 (44.7%)		13.6 (32.3%)		21.7 (51.7%)		20.2 (48.0%)	
95% CI on Difference Between Baseline and Intervention Average Engagement Times minutes (% Total Class Time)	14.1 to 23.4 (33.6 to 55.7%)		8.2 to 18.9 (19.7 to 45.0%)		15.5 to 27.8 37.1 to 66.2		12.2 to28.1 29.2 to 66.9%	

Chapter 5: Conclusions and Discussion

This research studied the effects of students' with significant cognitive disabilities access to the general curriculum using the Universal Design for Learning strategy of representation through the use of graphics supports. Zascavage (2009) stated that appropriate application of UDL principles to instructional planning would allow for students with significant cognitive disabilities to have fuller access to the general education classroom. Wehmeyer (2006) discussed the importance of having students with significant disabilities move from access to progress which is found in the general education classroom.

Conclusions

This study not only demonstrated that UDL representation strategies provided the students with significant cognitive disabilities access to the general curriculum, it promoted success in the general curriculum by providing the students with multiple means of representation through graphic supports. The access and progress the students made throughout the study can be attributed to the teacher's better understanding of the principles of UDL and implementation of the UDL principles into her instruction. Appropriate application of the UDL principle of representation implemented effectively by the teacher resulted in an increase in student engagement. The following sections (pre- and post-assessment, task analysis, and student engagement) discuss the conclusions of the study and how results are reflected in the data.

Pre- and Post-Assessment

The quantitative section assessed general knowledge on UDL, inclusion, accommodations and modifications and the participant's score of 40% on the pre-assessment. The qualitative section assessed the participant's understanding of how the principles of UDL are

manifested in her classroom and teaching practices through open-ended questions. The qualitative questions of the pre assessment were scored using a coding rubric with the following range: 1=never, 2=rarely, 3=sometimes, 4=always. The teacher scored a 62.5% on the qualitative sections which assessed her application of UDL in her classroom. The teacher participant was given 3 points on question 1 of the qualitative section on the pre assessment said she only used a Smartboard. When the teacher was given the post assessment, she scored 4 points because she discussed the different types of technology that she was using her in classroom. She now uses AAC systems such as iTalk2's, Bigmacks, and picture cards daily throughout her instruction. The teacher was given 2 points out of 4 for question 2 on the pre assessment because her answer was vague stating that she tried to include her students' with disabilities when she could. She did not given specific UDL application answers. The teacher participant did score 4 points out of 4 on the post assessment for question 2 because she gave very specific answers on how she sees UDL reflected in her instructional block. For the last qualitative question, the teacher participant received 2.5 out of 4 points on the both the pre- and post- assessment because she gave the same answer for determining student engagement. In comparison to the pre assessment scores of 40% on the quantitative section, the teacher scored a 100% indicating an increase of 60%. Her pre assessment on qualitative section was 62.5% and an 87.5% on the post assessment giving her an improvement score of 20%.

The results from the pre- and post-assessments indicates that with UDL training and consultation with the special education teacher, the teacher's knowledge and implementation of UDL increased, which resulted in an increase of student engagement as demonstrated by an statistically significant increase in student engagement time. The teacher's ability to plan lessons that allowed the students' with significant cognitive disabilities to access the general curriculum

improved as a result of this research. From the beginning of the study, the teacher's attitude appeared to be positive and that positive attitude was more evident of as the study progressed by comments that the teacher would say to the researcher. Some of the comments that she made included "Wow, I am so impressed with how much they are responding to questions that I have asked them", "I'm so glad that they are a part of my class" and " I can use these strategies to teach my regular education students too."

Task Analysis

The researcher used a 15-step task analysis to measure the graphic supports the teacher used during her lessons. The researcher collected baseline data and intervention data. During baseline, the teacher participant was only completing 3 to 4 tasks. The tasks that she was completing were each student had a copy of the book (task 14), vocabulary displayed on whiteboard or Smartboard (task 9), attention getter (task 1), and pictures to represent vocabulary (task 12). The teacher did not modify any of her lessons during baseline. She was already using pictures to represent the vocabulary because the students were asked to complete a vocabulary chart that had a picture associated with the vocabulary word. The vocabulary words were not story or lesson specific. The students had a copy of the seventh grade literature book with no modifications or adaptations to the book. The teacher's use of graphic supports throughout her lessons primarily consisted of the pictures in the seventh grade literature book. During baseline observation, the students did have a group project where they were divided into groups with their regular education peers and were asked to complete a chart. The teacher did include the special education students when she could by asking them questions but the students' who were non-verbal did not have a way to communicate with the teacher. The teacher's attitude towards having the special education students in her classroom appeared to be very positive and she

wanted them to be a part of her class. The teacher completed an average of 27% of the task as outlined on the task analysis chart.

Once baseline data were collected and teacher training was complete, the intervention began. The teacher and the researcher met to discuss how she could modify and incorporate graphic supports into her lessons. The teacher discussed her lesson plans with the special education teacher (the researcher) and asked for ideas on how to incorporate graphic supports. The special education teacher assisted the teacher in creating in the materials that the teacher needed to incorporate graphics. The teacher used a variety of picture cards along with real objects. The teacher primarily used picture cards to represent the different concepts or key points and characters of the story. When applicable, the teacher would use real objects. The teacher incorporated AAC devices into her lessons. The teacher incorporated both general AAC devices used by the students and the students own personal AAC devices (specific AAC devices are noted for each student in the student engagement section). She used Bigmacks to have the students say the title and author of the book and have the students tell her the topic or reading strategy being used. The iTalk2's were also used for the students who were unable to give a physical response to answer yes and no questions. During intervention, the students used their AAC devices to communicate and participate in the lesson. The teacher was able to complete all of the steps when given the opportunity. On two class days, the teacher did not address vocabulary because the students were working on a group project. The students completed a group project during intervention as well. They were to complete a group project on a particular theme. The students had just heard a story on the theme of friendship to go along with a story that had been taught. The students worked in groups with their regular education peers to complete a story flow map. Each group had a selection of pictures that went along with the story

as well as some that did not. The teacher's reasoning behind having pictures that did not go along with the story was to assess their understanding of the story through integration of distracters. The groups performed well completing the project using pictures to represent the rising action, climax, falling action, and setting in the story. In order to complete the story flow map, the students had to work together to complete the map by having group discussions on what was the rising action, setting, climax, and falling action. The students with significant disabilities were included in the discussion through the use of picture cards, generic AAC devices, and their personal AAC devices. The teacher would walk around the room to make sure that the groups were staying on task and including the students with significant disabilities. As a group, they decided what was to go in each section and they were to have a picture to represent each section in addition to what was written for the students with significant cognitive disabilities.

Student Engagement

A student engagement recording chart was used to measure the amount of time the four students were engaged throughout the each lesson. The engagement recording chart was used to record the students' engagement every two minutes.

Student One: Bethany

Bethany uses picture cards and an ECO point to communicate. Bethany's ECO point is a voice output eye gaze technology system made by the company PRC. During baseline, Bethany's average engagement time was 14.2 minutes for a total class time engagement of 33.8 %TCT given a total class time of 42 minutes. She had no picture cards or AAC device during baseline and was unable to participate in activities such as the vocabulary chart and journals due to the lack of modifications and adaptations. During baseline, Bethany appeared to enjoy going

to class even though she would just come into the classroom and just sit at her desk the whole class period. This was indicated by her facial expressions and eye contact. Once the intervention began, Bethany's engagement increased drastically from an average of 14.2 minutes of engagement to an average of 33 minutes of engagement, which corresponds to 78.5 %TCT. She was able to participate in classroom discussion through her picture card and ECO Point. She paid more attention to the teacher and the lesson because the teacher was incorporating picture cards, AT, and real objects into her lesson.

Student Two: Tracy

Tracy is verbal and communicates well. She is able to write independently when given a simple logical question to answer and she is able to copy notes from the Smartboard. During baseline, Tracy's average engagement time was 26.2 minutes for a total class time engagement of 62.3 %TCT. Her engagement was much higher during baseline compared to the other three students. The high level of engagement can be attributed to her ability to write, take notes, and speak. However, Tracy struggled with some of the concepts that were being taught during baseline. Tracy was able to participate more during group work because she was able to vocalize her opinions and somewhat complete the activity. Her engagement time increased during intervention from an average of 26.2 minutes of engagement to 39.8 minutes corresponding to 94.7 %TCT. During the UDL intervention phase, Tracy was able to complete all activities. The only time that she struggled with engagement during the intervention was during transition time.

Student Three: Addison

Addison missed two days during baseline and three days during the intervention due to sickness. Addison's engagement time during baseline was an average of 10.8 minutes with a 25.8 %TCT. During baseline he did not use picture cards or AAC device to communicate. He

was easily distracted by his peers in the classroom. He would constantly look around the room at what his peers where doing instead of what the teacher was saying unless the Smartboard or story was being read. When the teacher was explaining an activity, Addison would watch his peers instead of the teacher. He enjoyed the group work even though it was hard for him to actively participate because he did not have modifications or adaptations to the activity. Once the intervention began, Addison's engagement increase from an average of 10.8 minutes to 32.5 minutes which corresponds to going from being engaged 25.8 % of the total class period to 77.5 % of the total class period. Addison used an iTalk4 and picture cards to communicate during class and was able to complete the vocabulary section because he had a modified version of the vocabulary activity on his desk.

Student Four: Marcus

Marcus missed three days during baseline due to medical reasons and one day during the intervention due to vacation. Marcus' average engagement time during baseline was 10 minutes for a total class time engagement of 23.8%. He was harder to engage more than any other student because he responds best to enthusiasm and excitement along with the modifications and adaptations to materials that he is used to in his special education class. During baseline, Marcus spent 75% of the class time with his head on his desk or looking around the room. The teacher would ask him to keep his head up. Once the intervention began, Marcus' engagement began to increase along with his interest in language arts. He enjoyed the use of picture cards, AT, and real objects that the teacher used during her instruction. His engagement time increased from 10 minutes to 30.2 minutes for a total class time engagement of 71.9%. During intervention, Marcus only put his head on his desk to sleep or look around the room 10% of the time.

Implications for Further Research

This research supports the claim that access to the general curriculum can be met through the implementation of the UDL principle representation through the use of graphic supports. Through participation in this study, the teacher participant was able to increase her knowledge and understanding of UDL as well how to implement UDL into her instruction. Student access to the general curriculum increased significantly through this study. Incorporating the universal design for learning strategy representation through the use of graphics supports increased access to the general curriculum for students with significant cognitive disabilities, most noticeably in the area of student engagement. Using the UDL framework can provide and increase access to the general curriculum for students with significant cognitive disabilities. Further research on the three UDL principles of representation, engagement and expression needs to be completed before results can be generalized. In addition, further research needs to be done on UDL in specific subject areas and other grade levels.

While there is research on UDL for students with mild cognitive disabilities in regard to access the general curriculum, it is considerably less evident for students with significant cognitive disabilities. Inclusion is becoming more than just a place or a setting for students with significant cognitive disabilities; it is becoming a place where students with significant cognitive disabilities can access the same curriculum that their regular education peers are accessing

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Appendix A

Pre- and Post- Assessment for the Teacher

Quantitative Questions

1. Explain the three principles of universal design
2. Name the four components of universal design for learning curricular design.
3. Define inclusion.
4. Describe the six co-teaching styles.
5. Explain the difference between accommodations and modifications.

Qualitative Questions

1. What technology do you currently use in your classroom?
2. Given your current knowledge on UDL, describe how you see that reflected in your instructional block.
3. How do you determine if your students are engaged in the lesson?

*Adapted from Gargiulo and Metcalf's book *Teaching in Today's Inclusive Classroom: A Universal Design for Learning Approach* (2010)

Appendix B

Task Analysis

Instructional Flow – 15 steps **Date**											
1. Attention getter-sensory (a, d)											
2. Teacher points to the title of the book or story (b, c)											
3. Teacher points to author of the book or story (b, c)											
4. Teacher has student say the title and author of the book; using AT* if needed (b, c)											
5. Shows the students the book or story (b, c, d)											
6. Teacher has the students touch the book (b, c, d)											
7. Teacher has objects that represent key points in the story to promote meaning (a)											
8. Teacher has different pictures to represent characters in the book or story (a)											
9. Vocabulary is displayed on Smartboard or whiteboard (a)											
10. Teacher points to text as it is being read aloud (b, c, d)											
11. Teacher has modified books/stories that contain only the main points using simple sentences. (a)											
12. Vocabulary is displayed using word-picture symbols (a)											
13. Teacher has larger print materials for students with visual impairments (a)											
14. Each student has a copy of the book or story (b)											
15. AT is used to help the students say and anticipate the repeated story line and/or response (b, c, d)											

**AT: assistive technology*

Legend: *indicates which step explicitly demonstrates the following components*

- Incorporates graphics (a)
- Following along (b)
- Staying on task (c)
- Watching the teacher (d)

* Adapted from Browder, D.M., Mims, P.J., Spooner, F., Ahlgrim-Delzell, L, & Lee, A. (2009). Teaching elementary students with multiple disabilities to participate in shared stories. *Research & Practice for Persons with Severe Disabilities*, *33*(1-2), 3-12. And Center for Applied Technology (CAST) 2007.

Appendix C

Engagement Recording Chart

Directions: Place an X or a check mark under each specified time that the student is engaged in the lesson.

Engagement= Following along, staying on task, watching the teacher

S1-Student one

S2-Student two

S3-Student three

S4-Student four

Student	1:05	1:07	1:09	1:11	1:13	1:15	1:17	1:19	1:21	1:23	1:25	1:27	1:29	1:31	1:33	1:35	1:37	1:39	1:41	1:43	1:45	1:47	1:49
S1																							
S2																							
S3																							
S4																							

Anecdotal Notes:

_____

_____

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_____

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Appendix D

IRB

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board Office
1L-09 Brody Medical Sciences Building• 600 Moye Boulevard • Greenville, NC 27834
Office 252-744-2914 • Fax 252-744-2284 • www.ecu.edu/irb

TO: Anna Strickland, 1686 Wimbledon Dr., Apt. 3, Greenville, NC 27858

FROM: UMCIRB

DATE: December 10, 2010

RE: Expedited Category Research Study

TITLE: "Universal Design for Learning, Access to General Curriculum for Students with Severe Cognitive Disabilities"

UMCIRB #10-0572

This research study has undergone review and approval using expedited review on 12.10.10. This research study is eligible for review under an expedited category number 6 & 7. The Chairperson (or designee) deemed this **unfunded** study **no more than minimal risk** requiring a continuing review in **12 months**. Changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must submit a continuing review/closure application to the UMCIRB prior to the date of study expiration. The investigator must adhere to all reporting requirements for this study.

The above referenced research study has been given approval for the period of **12.10.10** to **12.9.11**. The approval includes the following items:

- Internal Processing Form (dated 9.8.10)
- Appendix A: Pre & Post Assessment for the Teacher
- Appendix B: Task Analysis
- Appendix C:Engagement Routing Chart
- Appendix D: Survey
- Parental Permission Form (received 11.1.10)
- Letters of Support
- Assent Form for students (received 11.1.10)

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

The UMCIRB applies 45 CFR 46, Subparts A-D, to all research reviewed by the UMCIRB regardless of the funding source. 21 CFR 50 and 21 CFR 56 are applied to all research studies under the Food and Drug Administration regulation. The UMCIRB follows applicable International Conference on Harmonisation Good Clinical Practice guidelines.

October 20, 2010

Dear Parent or Guardian,

My name is Anna Strickland I am currently a Master's student at East Carolina University. I am also a special education teacher at E.B. Aycock Middle School.

I am in the beginning stages of my thesis. I will be conducting research in your student's English Language Arts class for six weeks. My thesis is on the Universal Design for Learning strategy of representation through the use of graphic supports. The purpose of my thesis is to promote access to the general curriculum for students with moderate to severe disabilities.

I would like for your student to participate in my study on Universal Design for Learning. I will be observing your student's academic engagement time during instruction. I will be using an engagement recording chart to track their academic engagement time. I will also be videotaping each lesson so I can go back and make sure I have not missed any academic engagement time. The videos will only be used for my educational purposes and then be destroyed at the completion of the study.

At no time will your student or his/her teacher, and school be identified by name in written reports. The results of this intervention, including scores, will be only used for educational purposes in relation to my thesis. In no way will this study harm or alter your student's educational program.

I am including two copies of this permission letter. Please fill out the bottom portion of both of them. Keep one for your records, and return the other to me at Mary Holloman's class as soon as possible. By doing this, I will know whether or not to include you and your student in this project. At any time you and your student are free to withdraw from the project.

If you have any questions or concerns regarding the study, please contact me at school at 252-756-4181 You may also contact my professor: Dr. Laura King at kinglau@ecu.edu if you have any questions or concerns. Thank you so much for considering this request.

Sincerely,

Anna Strickland

UMCIRB
APPROVED
FROM 12-10-10
TO 12-9-11

____ My student **has** permission to participate in your research on Universal Design for Learning, Access to the General Curriculum for Students with Severe Cognitive Disabilities.

____ My student does not have permission to participate in your research on Universal Design for Learning, Access to the General Curriculum for Students with Severe Cognitive Disabilities.

_____ _____

Parent's Signature Date

____ My student **has** permission to participate in your research on Universal Design for Learning, Access to the General Curriculum for Students with Severe Cognitive Disabilities.

____ My student does not have permission to participate in your research on Universal Design for Learning, Access to the General Curriculum for Students with Severe Cognitive Disabilities.

_____ _____

Parent's Signature Date

UMCIRB
APPROVED
FROM 12-10-10
TO 12-9-11