# The Effects of Training in Universal Design for Learning

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Ting-Wen Chen

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# DEDICATION

I dedicate my dissertation work to my family, especially…

to my husband, Andy Peng, and my parents, Lin-Fa Chen and Mei-Ching Liu,

for your ***unconditional love, support, and understanding.***

# ABSTRACT

Adaptation is a vital component to effective inclusion across students with mild to severe disabilities. The purpose of this study was to examine the effects of a one-hour Universal Design for Learning (UDL) intervention in preparing preservice general educators to make adaptations to lesson plans when including students with mild academic disabilities in the classrooms. An experimental group design was used to investigate the effects of the UDL training on both quantity and quality of adaptations made by participants. Participants were 41 preservice general educators and randomly assigned to the experimental condition (UDL training) or the control condition. Data was analyzed using a Mann-Whitney U test and a Wilcoxon Matched-Pairs Signed-Rank T Test. Results from the posttest indicated the experiment group made statistically fewer number of adaptations ($p$ =.018) with better quality ($p$ =.009) than the control group after the intervention. Moreover, there was no statistically significant difference (quantity: $p$ =.341; quality: $p$ =.397) between the posttest and the follow-up test scores for the treatment group, meaning the treatment effects were able to last overtime.

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# CHAPTER I

# INTRODUCTION

## Problem Statement

Prior to the passage of the Education for All Handicapped Children Act (EAHCA) of 1975, more than 1.75 million students with disabilities did not receive educational services, and more than 3 million students with disabilities did not receive an education that was appropriate to their needs (Yell, 2006). With EAHCA, the rights of students with disabilities to access a free, appropriate public education in the least restrictive environment were mandated. The concept of a free, appropriate public education was first introduced in Section 504 of the Vocational Rehabilitation Act of 1973 (reauthorized as the Carl D. Perkins Career and Technical Education Act of 2006), which is a civil rights law that prohibited discrimination against individuals with disabilities in programs and activities that received federal funds. In addition, Section 504 required these programs to offer reasonable accommodations to provide a nondiscriminatory and free, appropriate education for individuals with disabilities (Friend & Bursuck, 2011; Mastropieri & Scruggs, 2010; Yell, 2006).

EAHCA specified the categories of disabilities that enabled students to be eligible for special education, the procedures to identify students with disabilities, and the related services to which students may be entitled. In addition, EAHCA required each student with disabilities to have an individualized education plan (IEP), outlined the rights of students with disabilities and their parents, and mandated students with disabilities

between the ages of three and 21 to receive a free, appropriate education in the least restrictive environment (Yell, 2006).

EAHCA was renamed as the Individuals with Disabilities Education Act (IDEA) in 1990. Significant changes established person first language, extended special education services for children from birth to age two, and required the inclusion of individualized transition planning in IEPs. IDEA was amended in 1997 and further specified that general educators should serve as members of IEP teams to assist with writing the educational plan for students with disabilities. Moreover, students with disabilities should be included in district and state assessments through the same assessment instruments or some types of alternative instruments (Friend & Bursuck, 2011; Yell, 2006).

This legislation was strengthened by the No Child Left Behind Act of 2001(NCLB 2001), which stresses that all students need to make adequate yearly progress (AYP) and which holds districts, schools, and educators accountable for improving student achievement (Santoli, Sachs, Romey, & McClurg, 2008), as documented by students' performance on standardized tests. To better improve the quality of education, educators are required to use evidence-based practices that have been proven effective scientifically (Odom et al., 2005).

Following passage of NCLB, the Individuals with Disabilities Education Improvement Act of 2004 (IDEIA 2004) was passed as a reauthorization of IDEA 1990. This reauthorization requires educators to be highly qualified, to be held accountable for their students' learning, and to use scientific-based instructional strategies and methods.

Moreover, IDEIA 2004 reemphasizes that students with disabilities should be instructed in the least restrictive environment. That is, students with disabilities should be educated alongside peers without disabilities to the maximum extent appropriate, with supplementary aids and services provided and documented in students' IEPs. Typically, the general education environment is considered as the least restrictive setting because it provides the greatest proximity for students with disabilities to access the general education curriculum and their peers without disabilities (Cummings, Atkins, Allison, & Cole, 2008; Friend & Bursuck, 2011, Lewis & Doorlag, 2011; Yell, 2006).

Under the two legislations, NCLB 2001 and IDEIA 2004, inclusion is specified as the goal of placement in the least restrictive environment, greatly increasing the number of learners with disabilities in general education classrooms. According to the Twenty-Eighth Annual Report to Congress on Children with Disabilities from the US Department of Education in 2009, approximately 96% of students with disabilities are educated in regular schools, and about 50% of the students with disabilities are placed in general education classrooms for more than 60% of their days (Lewis & Doorlag, 2011). As a result, it has become an inevitable responsibility for general educators to ensure all students, both students with and without disabilities, successfully and meaningfully have access to general education curriculum with the provision of reasonable accommodations and modifications (Kavale, 2002; Murawski & Lochner, 2011).

**Adaptation as a Vital Component to Effective Inclusion**

Over the years, potential benefits of inclusion for students with disabilities have been documented inconsistently (Fryxell & Kennedy, 1997; Mcleskey & Waldron, 1998;

Salend & Duhancy, 1999; Walther-Thomas, 1997). Some studies demonstrated effectiveness of inclusive programs in improving students' academic performance, while other studies indicated that students with disabilities experienced academic failure in inclusive settings because these students did not receive specially-designed instruction to meet their needs. Moreover, researchers have further examined factors that contributed to successful inclusion and identified "adaptation" as a vital component to effective inclusion across students with mild to severe disabilities (Cross, Traub, Hutter-Pishgahi, & Shelton, 2004; Dingle, Falvey, Givner & Hagger, 2004; Hunt & Goetz, 1997; Manset & Semmel, 1997).

According to Cross et al. (2004, p.179), *adaptation* is defined as "any change made to support a specific child's ability to develop, learn, and participate in the daily routines and activities of the setting. An adaptation may be a change to an object, environment, instruction, communication, process, or product. Adaptations include both modifications and accommodations." The difference between accommodations and modifications is further described, with accommodations not changing the content objectives or the difficulty level of the curriculum and with modifications changing the rigor of the curriculum (Dee, 2008; Polloway, Epstein, & Bursuck, 2003, Ysseldyke et al., 2001). Other than accommodations and modifications, Dee (2008, p.56) described *differentiation* as "changes to content, how students are taught, and the way in which they demonstrate learning," which is similar to the definition of adaptation. For the purpose of this study, the term adaptation will be used, incorporating accommodations, modifications, and differentiation, to mean any changes made to the instructional process,

from planning and delivering instruction to evaluating student performance in order to promote achievement among students with disabilities in inclusive settings.

In general, the goal of making adaptations is for general educators to adjust instruction in the areas where students with disabilities have difficulties, to maximize their participation, and to enhance their success in inclusive settings (Boulton, 2008; Fuchs, Fuchs, & Bishop, 1992; Kargin, Güldenoglu, & Sahin, 2010; Kuyini & Desai, 2008; Scott, Vitale, & Masten, 1998). With respect to using adaptations to promote student achievement among students with disabilities, research has demonstrated effectiveness of various kinds of adaptations that can be made to different instructional elements, such as curriculum content, instruction strategies, and assessments (Cole et al., 2000). These adaptations may include: curriculum objectives priorities (Mastropieri & Scruggs, 2010); readability of the content (Salend, 1998), graphic organizers (Friend & Bursuck, 2011; Mestropieri & Scruggs, 2010), study guides (Horton & Lovitt, 1989; Horton, Lovitt, & Bergerud, 1990), Peer-Assisted Learning Strategies (PALS) (Fuchs, Fuchs, & Kazdan, 1999); direct instruction (Marston, Deno, Dongil, Diment, & Rogers, 1995), cooperative learning (Johnson & Johnson, 1981), presentation of test format (Johnson, 2000), and curriculum-based measurement (Fuchs, Fuchs, Hamlett, & Stecker, 1991).

**Research on Teacher Preparation**

Several research teams have investigated general educators' use of adaptations to meet the needs of students with disabilities. Some researchers examined general educators' overall readiness, while other researchers focused on types of adaptations that

general educators typically made in inclusive classrooms. For overall readiness, researchers found that the necessary attitude, accommodations, and adaptations were still not yet in place in general education (Kavale, 2002). Although teachers perceived that making adaptations can be beneficial to promote student learning, they often felt that they lacked knowledge, skills, and confidence to plan and make instructional adaptations, and were in need of more training to prepare them to meet the needs of students with disabilities (Norman, Caseau, & Stefanich, 1998; Schumm & Vaughn, 1995).

To study the adaptations that general educators reported being willing to make, Munson (1986-87) found that teachers reported making more classwide rather than individualized adaptations for students with disabilities. Similar findings were also reported in Bacon and Schulz' (1991) and Kuyini and Desai's (2004) studies, in which teachers were more accepting of making adaptations that required little time and change in their usual teaching practices, rather than making individualized adaptations. When further examining preservice general educators' sample lesson plans developed with a consideration of including students with disabilities in the classrooms, Dee (2011) identified six themes: no evidence of purposeful planning for students with IEPs, accommodations centering around partner or group work; an undeveloped or inaccurate understanding of special education and its terminology, preference for using multiple intelligences and manipulatives for adaptations, reflections focusing on teachers' actions rather than students' learning, little evidence of meaningful planning for students with disabilities.

In summary, these studies found that many general educators lack or believe they lack knowledge, skills, and confidence to meet the needs of students with disabilities through making adaptations. Even when adaptations were made, they often were not purposeful and meaningful. Thus, there is an urgent need to identify effective teacher training that can better prepare general education teacher to make quality adaptations to meet the needs of students with disabilities.

## Significance

Students with disabilities are being served with increasing numbers in general education classrooms, and educators are held accountable to ensure all students successfully and meaningfully have access to the general education curriculum (Kavale, 2002; Lewis & Doorlag, 2011; Murawski & Lochner, 2011). Although adaptation is identified as a critical factor of successful inclusion, research has indicated that educators are in need of effective training to better prepare them making quality adaptations to meet the needs of students with disabilities (Cross et al., 2004; Dingle et al., 2004; Hunt & Goetz, 1997; Manset & Semmel, 1997; Norman, Caseau, & Stefanich, 1998; Schumm & Vaughn, 1995). Through reviewing studies that identified training-related variables of general educators' use of adaptations, one study by Spooner, Baker, Ahlgrim-Delzell, Browder, and Harris (2007) proposed using Universal Design for Training (UDL) to increase the quantity of adaptations that preservice general educators made to a lesson plan when including students with disabilities in the classrooms. However, the adaptations were not examined to determine whether they purposefully addressed specific learner needs, reflecting the quality of the adaptations. Thus, there is a need to further

investigate the effects of UDL training on quality of adaptations, as well as exploring an assessment tool to measure the quality.

The current study extended Spooner et al.'s study to examine the effects of a one-hour UDL intervention in preparing preservice general educators to make adaptations to lesson plans when including students with mild academic disabilities in the classrooms. The UDL intervention incorporated the concept of a modified Bloom's Taxonomy developed by Seifert, Hupp, Chen, and Wilson (2011) as an approach to promote and assess preservice educators using higher-order thinking skills to make adaptations. With a specific focus to examine the growth of the quality, both the quantity and quality of the adaptations that participants made to lesson plans were assessed.

## Definitions of Key Terms

*Developmental cognitive disabilities:* "Developmental Cognitive Disability is defined as a condition that results in intellectual functioning significantly below average and is associated with concurrent deficits in adaptive behavior that require special education and related services" (MN Dept of Ed., 2004, p.13). Other terms that are used to describe the condition may include: intellectual disability, cognitive disability, mental deficiency, mental subnormality, mentally handicapped, mental retardation, or intellectually challenged (Mastropieri & Scruggs, 2010).

*Inclusion:* "The process of integrating students with disabilities into general education setting in order to address the requirement of "least restrictive environment" mandated by the Individuals with Disabilities Education Act" (Scruggs & Mastropieri, 1996, p.59).

*Learning disabilities:* "Specific learning disability means disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in the imperfect ability to listen, think, speak, read, write, spell or to do mathematical calculations, including conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia and developmental aphasia" (MN Dept of Ed., 2008, p.1-3). Moreover, individuals with learning disabilities typically experience difficulties in academic areas that may include reading (referred to dyslexia), math (referred to dyscalculia), and writing (referred to dysgraphia) (Swanson, Harris, & Graham, 2003).

*Least restrictive environment:* "To the maximum extent appropriate, children with disabilities, including children in public or private institutions or other care facilities, are educated with children who are not disabled, and special classes, separate schooling, or other removal of children with disabilities from the regular educational environment occurs only when the nature or severity of the disability of a child is such that education in regular classes with the use of supplementary aids and services cannot be achieved satisfactorily" (Department of Education, 2006, p.46541).

*Quality of adaptations*: In the current study, this term refers to the degree to which an adaptation is purposefully planned to address specific learner characteristics, to demonstrate implementation procedures, and to combine with other adaptations as a unified adaptation (Dee, 2011, Seifert et al., 2011).

*Students with disabilities:* This term refer to those who are eligible for special education services or accommodations according to federal and state guidelines.

Typically, researchers use students with special needs or exceptional learners as synonyms to describe students with disabilities (Friend & Bursuck, 2011; Hallahan, Kauffman, & Pullen, 2011; Lewis & Doorlag, 2011; Mastropieri & Scruggs, 2010).

*Students with mild academic disabilities:* This term is used to describe those students with disabilities who are primarily placed in general education classrooms and only require minimal extra support from special education services (Mastropieri & Scruggs, 2010, Zhang, 2006). For the purpose of this study, students with mild disabilities focused on students with learning disabilities and students with developmental cognitive disabilities.

## Purpose and Research Questions

The purpose of this study was to examine the effects of training in UDL developed through an incorporation of a modified Bloom's Taxonomy (Seifert et al., 2011) on adaptations of lesson plans made by preservice general educators in a university classroom setting. This study focused on academic instruction for students with mild academic disabilities, including students with learning disabilities and students with developmental cognitive disabilities.

The primary research questions were: (1) Do preservice general educators who have the UDL training make more number of adaptations than those who do not have the training? (2) Do preservice general educators who have the UDL training make adaptations with better quality than those who do not have the training?

A secondary research question was related to examining the validity of the newly developed coding system (Seifert et al., 2011) used to assess the quality of adaptations

that preservice educators made to their lesson plans in the current study. Validity is defined as "an overall evaluative judgment of the degree to which empirical evidence and theoretical rationales support the adequacy and appropriateness of interpretations and actions based on test scores or other modes of assessment" (King, Goodson, & Rohani, 1998, p.65). The specific research question was: What is the extent to which the assessment tool aligns with the concept of Bloom's Taxonomy from preservice general educators' perspective?

# CHAPTER II

## LITERATURE REVIEW

Inclusion benefits have been documented inconsistently among student with disabilities (Fryxell & Kennedy, 1997; Mcleskey & Waldron, 1998; Salend & Duhancy, 1999; Walther-Thomas, 1997). Adaptation is identified as a critical factor of successful inclusion (Cross et al., 2004; Dingle et al., 2004; Hunt & Goetz, 1997; Manset & Semmel, 1997). However, research has indicated that many general educators neither feel prepared to meet the needs of students with disabilities through making adaptations, nor able to make adaptations that can purposefully address individual needs (Dee, 2011; Kargin, Güldenoglu, & Sahin, 2010; Kavale, 2002; Munson, 1986-87; Norman, Caseau, & Stefanich, 1998; Schumm and Vaughn, 1995). Thus, it is important to investigate training-related variables that predict general educators' use of adaptations for students with mild academic disabilities, so that researchers can empirically examine how these variables impact teachers' use of adaptations in inclusive settings and provide recommendations for teacher preparation programs. Moreover, Spooner et al. (2007) demonstrated the effects of UDL in increasing the quantity of adaptations that preservice general educators made to a lesson plan when including students with disabilities in the classrooms, but they did not further assess whether UDL also enhanced the quality of the adaptations. It is necessary to examine what other research has been done in relation to the effects of UDL and explore components that can be incorporated with UDL to promote and assess the quality of adaptations.

This chapter begins with a review of training-related variables of general educators' use of adaptations for students with mild academic disabilities. Next, it presents the research with respect to the effects of UDL in student achievement and teacher preparation. Finally, it provides a rationale for incorporating the concept of a modified Bloom's Taxonomy (Seifert et al., 2011) with UDL as an approach to promote general educators using higher-order thinking skills to make quality adaptations.

## A Review of Training-Related Variables Regarding Teachers' Use of Adaptations

The purpose of this literature review is two-fold: (1) to identify training-related variables of general educators' use of adaptations for students with mild academic disabilities, primarily targeting students with learning disabilities and students with cognitive disabilities; (2) to examine the relationship between the training-related variables and general educators' use of adaptations for students with mild academic disabilities. First, I describe methods, including literature search procedures and inclusion/exclusion criteria, used to select studies in this review. Second, I present training-related variables identified from the selected studies and reported their relationships with general educators' use of adaptations. Finally, I discuss implications for further practice and research.

### Method

**Literature search procedures.** An initial literature search was conducted by using two databases: ERIC and PsycINFO. The search included the following keyword sets: adaptations and inclusion; adaptations, disabilities, and general education; adaptations and teacher training/teacher preparation; disabilities, teacher training/teacher

preparation, and general education. During the search process, several keywords were substituted with other terms in the keyword sets in order to expand the areas of search. For example, the keyword "adaptations" was replaced by "accommodations", "modifications", and "differentiation" due to the similarities of the definitions among these terms (Cross et al., 2004; Dee, 2008; Polloway, Epstein, & Bursuck, 2003, Ysseldyke et al., 2001). The keyword "disabilities" was replaced by other terms that typically describe the conditions of disabilities, learning disabilities, and developmental cognitive disabilities (Friend & Bursuck, 2011; Hallahan, Kauffman, & Pullen, 2011; Lewis & Doorlag, 2011; Mastropieri & Scruggs, 2010; Swanson, Harris, & Graham, 2003). These terms included exceptional learners, special needs, learning disabilities, dyslexia, dyscalculia, dysgraphia, developmental disability, cognitive disability, intellectual disability, mental deficiency, mental subnormality, mentally handicapped, intellectually challenged, mental retardation, and developmental cognitive disability. After the initial search, an ancestral search was conducted by searching studies that used the selected studies as cited references. Finally, an extended search was conducted by searching studies in the references of collected reports (Schumm & Vaughn, 1995; Scott, Vitale, & Masten, 1998).

**Inclusion/exclusion criteria.** To determine the appropriateness of each article included in this review, studies were evaluated by using the following criteria. First, studies had to be published in peer-reviewed journals or published as doctoral dissertations or master's theses. Second, studies had to examine training-related variables of general educators' use of adaptations for students with mild academic disabilities, including either students

with learning disabilities or students with developmental disabilities. Studies that specified adaptations were made for other than students with learning disabilities or students with developmental cognitive disabilities were excluded. Moreover, studies that only identified training-unrelated variables of general educators' use of adaptations were also excluded. Third, studies had to investigate the relationship between training-related variables and general educators' use of adaptations for students with mild academic disabilities. Studies that identified training-related variables of general educators' use of adaptations but did not further examine their relationships were excluded. Fourth, studies had to focus on academic or behavioral adaptations made to the core academic subject areas. Studies that investigated adaptations made in music, physical education, or other non-academic settings were excluded. Fifth, studies were included if they used experimental group, quasi-experimental group, or single subject design. Studies that used case study or qualitative design were excluded because the results of these types of studies tend to be exploratory and therefore limit their generalizability.

**Training-Related Variables**

A training-related variable is defined as a variable that can be potentially affected through teacher training. A total of 11 studies met the above criteria and identified six training-related variables that predicted general educators' use of adaptations for students with mild academic disabilities. These six training-related variables include: teacher training, teaching efficacy, teachers' perceptions of adaptations, teachers' attitudes toward inclusion, teachers' perceptions of time, and teachers' knowledge about handling

disruptions. A discussion of the relationships between these variables and general educators' use of adaptations follows.

**Teacher training.** Multiple research teams explored teacher training as a variable related to general educators' use of adaptations for students with mild academic disabilities. Some researchers examined the predictive relationship between teacher training and general educators' use of adaptations. Other researchers investigated the extent to which teacher training increased general educators' use of adaptations.

Three studies examined the predictive relationship between teacher training and teachers' use of adaptations by using correlational designs. Bender and Ukeje (1989) identified teacher training as a variable related to general educators' reported use of 40 instructional adaptations. Participants (N=50) were mainstreamed teachers in Grade 3-12 in New Jersey. The Bender Classroom Structure Questionnaire (BCSQ) was used as the dependent measure to investigate 40 instructional adaptations used by the participants. BCSQ is a 40-item, Likert-type scale device, which includes research-proven instructional adaptations in the areas of tutoring strategies, cooperative instructional strategies, precision teaching, effective teaching behaviors, and cognitive strategies planning. The reliability of the BCSQ was not provided by the researchers (however, this reliability was reported in a study by Bender, Vail, and Scott (1995) and is presented on page 21). The total BCSQ was correlated with the eight independent variables related to teacher and class variance and teacher attitude. Results indicated that the total BCSQ correlated positively with the number of special education classes taken ($r=.33$, $p<.05$).

The 40 instructional adaptations were reported being used more often by general educators who had had more special education courses.

Zhang (2006) examined general educators' perceptions of inclusion and the adaptations they made for students with disabilities through correlational research. A total of 157 regular teachers participated in the study. A survey instrument was developed that contained five sections to gather participants' demographic information, perceptions toward inclusion and adaptations, and use of common practice to meet the needs of students with disabilities in inclusive settings. Significant differences were observed between groups of teachers with different numbers of trainings (e.g. inservices, workshops, conferences, etc.) on teaching in inclusive settings and their use of adaptations. Teachers with one to five trainings used instructional, material, classroom management, and grading adaptations significantly more than did teachers with no trainings ($p<.05$). Teachers with six or more trainings used material adaptations significantly more often than teachers with one to five trainings ($p<.05$).

Maccini and Gagnon (2006) also used a correlational design to investigate whether general educators' use of empirically validated instructional practices and assessment adaptations for students with learning disabilities and emotional/behavioral disorders would be predicted by years of experience, knowledge in math, and/or total number of methods courses focusing on teaching math to these students. A nationwide random sample of 78 secondary general education teachers participated in the survey study. The survey was composed of three parts. The first part collected the demographic information of the participants, the second part focused on participants' perceived

knowledge of secondary math topics, and the third part required participants to report their use of 14 instructional practices (e.g., individualized instruction, additional practice, extended time on assignments) and 8 assessment adaptations (e.g., reduced problems on tests, extended time on tests, color coding). Results indicated that the number of methods courses taken by participants significantly predicted their use of instructional practices ($r=.368$, $p<.05$) and assessment adaptations ($r=.368$, $p<.05$). In brief, when general educators took more methods courses that focused on teaching math to students with learning disabilities and emotional/behavioral disorders, they reported using more instructional practices and assessment adaptations.

Four studies investigated the extent to which teacher training increased general educators' use of adaptations for students with mild academic disabilities. Fuchs, Fuchs, Hamlett, Phillips, and Karns (1995) examined 20 Grade 2-4 general educators' use of specialized adaptations for students with learning disabilities in their math instruction through a true-experimental design. Participants were randomly assigned to two conditions, the "noADAPT" and the "ADAPT" groups. Teachers in both conditions received training in making routine adaptations (curriculum-based measurement [CBM] and peer-mediated instruction) and then administered CBM and peer-mediated instruction in a whole-class format. In addition, teachers in the "ADAPT" condition received training in making specialized adaptations (decision rules to identify students whose progress was inadequate and specific support to implement adjustments in response to individual learning needs), and administered such adaptations on target students. Both ADAPT and noADAPT teachers completed the Teacher Planning

Questionnaire, which asked questions regarding their use of specialized adaptations. Results indicated that the ADAPT teachers retaught lessons to their students with learning disabilities significantly more than did the noADAPT teachers ($F=4.27$, $p<.05$). Moreover, the ADAPT teachers deviated from the teacher's manual significantly more than did the noADAPT teachers when planning instruction for students with learning disabilities ($F=5.89$, $p<.05$). That is, training in specialized adaptations increased general educators making more individualized adaptations for students with learning disabilities. However, when further comparing the performance of students with learning disabilities in the two conditions, nonsignificant results were found, meaning that specialized adaptations were not associated with student learning. The researchers explained that the nonsignificant findings may suggest the routine adaptations (CBM and peer-mediated instruction) have exerted an initial effect on student achievement.

Andrews (2002) used a nonexperimental design to evaluate the effects of training in web-enhanced case-based instruction on lesson plan development of 40 general preservice teachers enrolled in a special education foundation course. Intervention was implemented without including a comparison condition. A case study was developed for participants to design an adapted lesson plan. The collaborating teacher, a classroom teacher with 15 years of fifth grade experience, provided feedback regarding the adapted lesson plan through using WebCT. The participants, in 10 cooperative learning groups, revised the lesson after feedback. Adapted lessons were analyzed using the Adapted Lesson Analysis Guide, which categorized adaptations as surface, intense, or intense with elaborations. Surface adaptations referred to changing materials or rule, but not adapting

teaching to meet individual needs. Examples of these adaptations were changing the seating plan or having students doing an easier assignment. Intense adaptations were adaptations that facilitated actual student participation and learning. These adaptations included using cooperative learning or designing tiered assignments for more than one learning level. Intense adaptations with elaboration referred to adaptations that were described in depth and demonstrated participants' increased reflection and effort.

Results indicated that all 10 groups contained surface adaptations on their original lesson plans and on the lesson plans resubmitted after the feedback was given. The total number of surface adaptations remained constant before and after feedback. Moreover, all 10 groups included intense adaptations in their resubmitted lesson plans, compared to only four groups in their original lesson plans. The total number of intense adaptations increased from five to 23 after feedback. Finally, three groups elaborated extensively about their intense adaptations in the resubmitted lesson plans. The total number of intense adaptations with elaborations increased from zero to 11 after feedback. The participants completed a survey to evaluate their perceptions regarding learning outcomes and attitudes after intervention. Results reflected increased confidence of working with students with disabilities, as well as positive attitudes of collaboration in general, both with the classroom teacher and the cooperative learning groups.

Spooner et al. (2007) used a true-experimental design to investigate the effects of training in UDL on lesson plan development of special and general preservice teachers enrolled in four education courses. During the pretest and posttest, special preservice educators were given a case study of a student with a severe disability, while general

preservice educators were given a case study that focused on a student with a mild cognitive disability (e.g. a learning disability). After the pretest, participants (N=72) were randomly assigned to the treatment group or the control group. The intervention was a one-hour lecture on how to modify lesson plans for students with severe and mild disabilities by using three components (representation, expression, and engagement) of UDL. Representation referred to modifications that can make classroom materials more accessible to students with disabilities. Expression referred to alternative methods of communication for students with disabilities to express their understanding or points of views. Engagement referred to strategies that involve students with disabilities in the learning process. The control group received the UDL lesson after the posttest. Case studies of students with disabilities were developed for participants to utilize UDL to create lesson plans that met the needs of the students.

After pretest and posttest, participants' lesson plans were evaluated using a scoring rubric to assess the extent to which participants utilized the three components of UDL to design the adaptations. The maximum number that a participant could receive from the rubric was 6 points. Results indicated a significant intervention effects, $F$ (1,68)= 52.027, $p$<.001, $\eta^2$=.433. Moreover, the effects were observed across the three components: representation, $F$ (1,68)= 31.416, $p$<.001, $\eta^2$=.316; expression, $F$ (1,68)= 46.069, $p$<.001, $\eta^2$=.404; and engagement, $F$ (1,68)= 6.830, $p$<.011, $\eta^2$=.091. In brief, the one-hour intervention on UDL enabled both the special and general preservice teachers in the experimental group making more adaptations to a lesson plan to meet the needs of students with disabilities.

Brown, Welsh, Hill, and Cipko (2008) evaluated the effects of embedding special education instruction into a preservice general education assessment course through a quasi-experimental design. Participants (N=208) were teacher education candidates enrolled in one of the six sections of a required evaluation and measurement course. A pretest-posttest, control group design was used to examine the effects of the intervention. Three sections served as a control group and were taught using a traditional approach. The other three sections served as the experimental group and received the treatment embedded within the course content areas throughout the semester. The treatment included information related to the nature of learning disabilities and adaptations that were appropriate for instructing and assessing students with learning disabilities. A self-report survey was developed to evaluate the treatment effects.

Significant differences were observed between the control and treatment groups in defining the term "learning disability" on the posttest data ($t(102)=7.8$, $p<.000$). For adaptations, no differences were found between the control and treatment groups on the pretest data. When the posttest data were compared, significant differences were observed, favoring the treatment group ($t(113.5)=12.2$, $p<.000$) in describing more adaptations for students with learning disabilities. Moreover, participants in the treatment group also reported increased confidence in meeting the needs of students with learning disabilities after intervention than the participants in the control group.

The seven studies above showed that teacher training both predicted and increased general educators' use of adaptations for students with mild academic disabilities. Moreover, these effects were particularly demonstrated in making

instructional and assessment adaptations to lesson plans to meet the needs of students with mild academic disabilities.

**Teaching efficacy.** Three studies found that general educators' self efficacy predicted their use of adaptations for students with disabilities. Self-efficacy is defined by Bandura as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Henson, Kogan, & Vacha-Haase, 2001, p. 405). Teaching efficacy is one of the few teacher characteristics that are related to student achievement. Bandura's theory of self-efficacy suggests efficacy to be malleable, especially at the early learning stage (Hoy, 2005). Therefore, teaching efficacy is considered as a training-related variable.

As reported previously, Bender and Ukeje (1989) used the BCSQ to investigate variables that predicted 50 mainstreamed teachers' reported use of 40 instructional adaptations in New Jersey. The researchers also assessed teachers' teaching efficacy by using the Teacher Effectiveness Scale, which contains two subscales: the Personal Teaching Efficacy (Cronbach's $\alpha$=.78) and the Limited Teaching Efficacy (Cronbach's $\alpha$=.75). A high score on Personal Teaching Efficacy indicated that a teacher believed that his or her teaching effectiveness can make a difference in students' lives. A high score on Limited Teaching Efficacy indicated that a teacher believed that his or her teaching effectiveness will be limited by environmental factors. Results indicated that the total BCSQ score was positively correlated with personal teaching efficacy ($r$=.59, $p$<.05) and negatively correlated with limited teaching efficacy ($r$= -.28, $p$<.05). When teachers had higher personal self-efficacy, they reported using these 40 instructional adaptations more

often. When teachers had higher limited teaching efficacy, they reported using these 40 instructional adaptations less frequently.

Bender et al. (1995) replicated Bender and Ukeje's study (1989) in different geographic areas and found similar results by conducting a correlational research. Participants were 127 general educators in Grade 1-8 from 11 schools in Georgia. The BCSQ was used to assess participants' use of 40 instructional adaptations, the Mainstreaming Attitudes instrument was used to assess teachers attitudes toward mainstreaming, and the Teacher Effectiveness Scale was used to assess teachers' personal teaching efficacy and limited teaching efficacy. The researchers reported internal-consistency reliabilities of the total BCSQ (.88) and the two subscales of BCSQ, individualized instruction (.84) and cognitive strategy instruction (.74). The internal-consistency reliabilities of the two subscales of the Teacher Effectiveness scale were: the Personal Teaching Efficacy (.78) and the Limited Teaching Efficacy (.75). The total test-retest reliability correlation of the Mainstreaming Effectiveness Scale was .81.

According to participants' self-reporting, they used numerous adaptations in their classrooms such as individualized instruction, alternative test options, and differentiated instruction. However, participants also reported that they used less frequently a number of adaptations that were known to facilitate academic achievement for students with disabilities such as self-monitoring, behavioral contracts, advance organizers, or token economies. Moreover, teachers' utilization of the instructional adaptations was significantly correlated with teachers' personal teaching efficacy ($r=.24$, $p<.01$).

Specifically, teachers with higher personal teaching efficacy reported more utilization of instructional adaptations.

Boulton (2003) also used a correlational approach to identify that teaching efficacy was related to teachers' reported use of adaptations. Participants (N=187) were randomly selected from teachers of Grade 1-5 in the State of Louisiana. The Teacher Acceptability and Use Scale was used to assess teachers' acceptability and utilization of 28 common classroom adaptations designed to support students with disabilities in inclusive settings. Cronbach's alpha coefficients of the six acceptability subscales (assignment adaptations, instruction adaptations, adaptations to increase student focus, visual adaptations, peer learning, and assessment adaptations) ranged from .44 to .67. Cronbach's alpha coefficients of the four use subscales (adaptations to assignment and assessment, instruction adaptations, peer and adaptive learning, and visual adaptations) ranged from .66 to .76. The Teacher Sense of Efficacy Scale (TSES) was used to measure teachers' efficacy. Cronbach's alpha coefficients of the two efficacy subscales were: instruction and student engagement (.44) and classroom and behavior management (.67). Results from canonical correlation analyses indicated that when teachers had higher self-efficacy of their teaching, they reported using adaptations for students with disabilities ($r=.4$, $p<.05$).

The findings from the three studies above suggested that when teachers had higher beliefs that the effectiveness of their teaching would positively change students' life, they reported more use of adaptations for students with disabilities. However, when

they believed that teaching effectiveness would be limited by external factors, they reported using fewer adaptations.

**Perceptions of adaptations.** Teacher perceptions, such as their beliefs and attitudes, can be actively controlled by teachers (Scheerens, 2010). Moreover, teacher beliefs are more malleable during the training years compared to once individuals start their teaching career (Decker & Rimm-Kaufman, 2008). Therefore, perception is regarded as a training-related variable.

Two research teams suggested teachers' perceptions of adaptations were related to general educators' use of adaptations for students with disabilities. Schumm, Vaughn, Gordon, and Rothlein (1994) conducted a correlational research to examine the relationship between teachers' beliefs of the importance of 10 adaptations, teachers' perceptions of their skills in using the 10 adaptations, and teachers' use of the 10 adaptations among 60 participants (20 elementary, 20 middle school, and 20 high school general educators). Results indicated that teachers' use of adaptations for students with disabilities was significantly and positively correlated with their beliefs of the importance of adaptations ($p<.05$) and their perceptions of their skills ($p<.05$). When teachers had higher beliefs in the importance of a particular adaptation and perceived themselves as skilled implementers of that adaptation, they used that adaptation more frequently for students with disabilities. Boulton (2003) also demonstrated a positive relationship between teachers' perceptions of adaptations and their use of adaptations. As already reported previously, participants were 187 general educators in Grade 1-5. Results indicated that teachers' acceptability of adaptations ($r=.4$, $p<.05$) was correlated with

teachers' use of adaptations. Specifically, when a teacher reported that a particular adaptation was more acceptable, they reported using that adaptation more often.

The two studies above suggested that teachers reported more utilization of adaptations for students with disabilities when they perceived adaptations as important and acceptable and when they perceived themselves as skilled implementers of the adaptations.

**Attitude toward inclusion.** Attitude toward inclusion was identified as a variable related to general educators' use of adaptations for students with disabilities. As reported above, Bender et al. (1995) investigated the relationship between teacher background factors and adaptations that teachers used in mainstreamed classrooms. Participants were 127 mainstream teachers in Grade 1-8. Results indicated that teachers' utilization of the instructional adaptations was correlated with teachers' attitudes toward mainstreaming ($r=.33$, $p<.01$). That is, teachers demonstrated more utilization of instructional adaptations when they had a more positive attitude toward mainstreaming.

**Other variables.** Fuchs, Fuchs, and Bishop (1992) conducted a correlational study to examine how characteristics of students, teachers, and organizations predicted general educators' use of two types of adaptations: routine and specialized. Routine adaptations referred to instructional adaptations anticipated by teachers on a regular basis because of differences among students. Specialized adaptations referred to special, unanticipated instructional adaptations introduced by teachers when students with learning disabilities respond poorly to planned instruction. Participants ($N_{ALL}=110$) were regular elementary and middle school teachers in grade 1-6. Each participant delivered

either reading ($N_R$=53) or math ($N_M$=57) instruction to at least one student with learning disabilities in their classroom on a daily basis.

The researchers assessed students' performance in reading and math, surveyed participants' perceptions of educating students with disabilities and use of routine adaptations by using a series of questionnaires, and interviewed participants about the specialized adaptations they made on lesson plans over six weeks. Results indicated that teachers made more routine adaptations, when they had more knowledge about handling student disruptions ($F=8.29$, $p<.001$). Moreover, teachers made more specialized adaptations when they were willing to devote more time to LD students ($F=7.33$, $p<.01$).

**General Discussion**

The purpose of this literature review included: (1) identifying training-related variables that predict general educators' use of adaptations for students with mild academic disabilities, and (2) examining the relationships between the training-related variables and general educators' use of adaptations for students with mild academic disabilities. A total of 11 studies met the inclusion/exclusion criteria and identified six training-related variables: teacher training, teaching efficacy, teachers' perceptions of adaptations, teachers' attitudes toward inclusion, teachers' perceptions of time, and teachers' knowledge about handling student disruptions.

When further examining the relationships between these predictive variables and general educators' use of adaptations for students with mild academic disabilities, most variables were identified as having a positive relationship with general educators' use of adaptations. Specifically, teachers made more adaptations for students with mild

academic disabilities when the teachers were willing to devote more time to them, received more teacher training, had more knowledge about handling student disruptions, had more acceptance and higher beliefs in the importance of adaptations, perceived them as skilled implementers of adaptations, possessed more positive attitudes towards inclusion, and had higher personal teaching efficacy. Only one variable, teachers' limited teaching efficacy, was identified as having a negative relationship with educators' use of adaptations. When teachers perceived teaching effectiveness being limited by external factors, they made fewer adaptations for students with mild academic disabilities.

**Limitations**

There were several limitations in this review of literature. First, studies included in this literature review were primarily located in two databases: Eric and PsychInfo. Although an ancestral search of selected studies and an extended search of references in the collected reports were also conducted, the number of studies reviewed was small. As a result, this review may not include all of the studies that addressed training-related variables that predict general educators' use of adaptations for students with mild academic disabilities. In addition, the scope of this review was limited to adaptations made for students with mild academic disabilities in the core subject areas. Studies that specified adaptations were made for other than students with mild academic disabilities or adaptations were made in music, physical education, or other non-academic settings were both excluded. Consequently, the conclusions drawn from this review may only generalize to general educators making adaptations for students with mild academic disabilities in the core subject areas.

**What do we know from research?**

Six training-related variables that predicted general educators' use of adaptations were identified in this review. Among all of these variables, teacher training seems to be the most influential. According to the current review, teacher training predicted and increased general educators' use of adaptations for students with mild academic disabilities. Teacher training also may have potentially enhanced the quality of the adaptations that educators made from general to more individualized (Andrews, 2002; Fuchs, et al, 1995). Moreover, when teachers had taken more special education classes, they had more positive attitudes of teaching students with mild academic disabilities. In Andrews (2002) and Brown et al.'s (2008) studies, after being trained in making instruction and assessment adaptations, participants demonstrated more positive attitudes toward making adaptations for students with mild academic disabilities and increased confidence in meeting their needs. Therefore, the extent to which educators receive training in teaching students with mild academic disabilities may be a strong indicator of educators who can make more appropriate adaptations for them. Other than teacher training, teachers who demonstrate more use of adaptations for students with mild academic disabilities may possess characteristics such as having more confidence in their teaching effectiveness, more positive attitudes toward inclusion and making adaptations, more knowledge in handling student disruptions, and being willing to devote more time to students with disabilities.

**What do we still need to learn from research?**

NCLB 2001 requires teachers to be accountable for students' performance (Yell, 2006). IDEIA 2004 mandated that students with disabilities are required to be educated in the least restrictive environment, which is usually considered as close as possible to general education settings, while still having these students' needs met (Cummings, Atkins, Allison, & Cole, 2008; Friend & Bursuck, 2011, Lewis & Doorlag, 2011; Yell, 2006). Meeting the needs of students with disabilities in inclusive settings has become an inevitable responsibility of general educators. Making specific and appropriate adaptations is recommended by researchers as a critical factor to promote successful inclusion (Cross et al., 2004; Dingle et al., 2004; Hunt & Goetz, 1997; Manset & Semmel, 1997).

The current review identified six training-related variables that predicted general educators' use of adaptations for students with mild academic disabilities from 11 studies. Most studies used correlational designs to examine the relationships. Therefore, it remains unclear the extent to which these variables, except for teacher training, may affect the quantity or quality of adaptations that general educators make for students with mild academic disabilities. Future researchers need to further investigate how we can increase general educators' use of quality adaptations by manipulating those variables. Although some studies (Brown et al., 2008; Spooner et al., 2007) demonstrated that certain teacher trainings increased the quantity of adaptations that general educators made to lesson plans for students with mild academic disabilities, these researchers did not further assess whether the quality of these adaptations were also improved. For studies

that examined the quality of adaptations, Fuchs et al. (1995) found training in specialized adaptations increased general educators making more individualized adaptations for students with learning disabilities, but they also reported these specialized adaptations were not associated with student achievement. Andrews (2002) claimed that intense and elaborated adaptations were developed as a result of teacher training. However, the researcher used a nonexperimental design to conduct the study and merely presented the increased number of intense and elaborated adaptations that participants made to lesson plans from pretest to posttest without providing any statistical significance to support his findings. This limits our understanding of whether there was a true difference in increasing the quality of adaptations after teacher training. Future researchers need to explore other teacher trainings that can promote general educators making quality adaptations for students with mild academic disabilities and examine the effects of these quality adaptations on student achievement.

## Research on Universal Design for Learning (UDL)

To prepare general educators to make quality adaptations, UDL may be one solution. UDL, developed by the Center for Applied Special Technology (CAST) in early 1990s, is a theoretical framework to guide development of different elements in curricula (e.g. goals, materials, instructional methods, and assessments) that are flexible, equitable, and accessible to all students (Garguilo & Metcalf, 2010; Rose & Meyer, 2006). The concept of UDL is derived from an architectural movement called "Universal Design (UD)," which advocates the importance of planning individual accessibility to buildings at the design stage rather than adapting existing structures so that a variety of

users can participate in everyday activities more easily and actively (Hall, Meyer, Rose, 2012; Spooner et al., 2007). UDL extends and adapts the concept of UD to the educational field, and emphasizes a preventative approach for teachers to consider varied needs and interests when designing instruction so that all students can have more equal opportunities to access the curriculum and demonstrate their level of understanding while keeping them engaged throughout the learning process.

In the Higher Education Opportunity Act (HEOA; Public Law 110-315, August 14, 2008), Congress defines UDL as:

> 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.''.

UDL shifts the focus from viewing individual difference as a problem to "fix" to removal of barriers embedded in the curriculum that are irrelevant to the learning goals for the students (Hall, Meyer, & Rose, 2012). These barriers can result from disabilities, educational experiences, language, and cultural background. Moreover, UDL systematically guides educators to overcome these barriers through considering three principles: 1) provide multiple means of representation; 2) provide multiple means of

expression; and 3) provide multiple means of engagement (Rose & Meyer, 2002; Rose & Meyer, 2006).

Multiple means of representation refers to the "what" of learning and considers offering students a variety of ways to receive and interpret information (e.g. lecturing, watching video clips, taking a field trip) (Garguilo & Metcalf, 2010; Rose & Meyer, 2006). Multiple means of expression refers to the "how" of learning and suggests allowing students to have choices of action and expression to demonstrate how they learn and what they have learned (e.g. oral report, written report, demonstration through an experiment, role play). Multiple means of engagement refers to the "why" of learning and emphasizes using different ways to motivate students while keeping them engaged and challenged in learning (e.g. discussing, using a game format, providing feedback, using positive behavior support). These principles not only can be used to guide educators to design curriculum that can adapt individual differences at the start, but also can be used to assist teachers rethinking the potential barriers and adaptations to be made after a lesson is delivered (Hall, Meyer, & Rose, 2012).

When reviewing UDL literature, many of the studies (Brand & Dalton, 2012; Darrow, 2010; King-Sears, 2009; Rose, 2001; Stockall, Dennis, & Miller, 2012) focused on explaining the basic concepts and principles of UDL and providing suggestions of implementing UDL in classroom settings. Some researchers have demonstrated the effects of UDL in improving academic performance among students with disabilities in the areas of literacy and social studies (Coyne, Pisha, Dalton, Zeph, & Smith, 2010; Dolan, Hall, Bannerjee, Chun, & Strangman, 2005). Other researchers were interested in

knowing how implementation of UDL affected teachers' or students' perceptions of instructional adaptations and inclusion (Kortering, McClannon, & Braziel, 2008; Izzo, Murray,& Novak, 2008; Schelly, Davies, & Spooner, 2011).

However, very few studies examined the effects of teacher training that aimed to prepare educators to make adaptations through using UDL principles to meet the needs of students with disabilities. Roberts, Park, Brown, and Cook (2011) reviewed empirical studies related to UDL at the postsecondary settings published in peer-reviewed journals between 2000 and 2009. Only one study by Spooner et al. (2007) used an experimental design to investigate the effects of a one-hour UDL intervention in increasing the number of adaptations that preservice general educators made to lesson plans for students with disabilities. The other seven studies included in the review primarily focused on examining faculty's and students' perceptions about the use of UDL through qualitative or mix methods.

When reviewing more recent studies about UDL teacher training, Yang, Tzuo, and Komara (2011) surveyed 41 preservice special educators to determine if training about the use of WebQuest as an approach for promoting UDL enhanced their understanding of accommodating the needs of students with disabilities. Even though the results showed that 40 out of 41 participants found WebQuest helpful and supported training educators to use WebQuest as a UDL tool, again, this study only informed us of educators' perceptions of training in UDL, rather than actually examining whether the UDL teacher training better prepared participants to make adaptations for students with disabilities.

## Bloom's Taxonomy and High-Order Thinking Skills

In 1956, Benjamin Bloom, along with a group of educational psychologists, developed the "Bloom's Taxonomy," for classifying educational objectives using six levels of thinking skills: knowledge, comprehension, application, analysis, synthesis, and evaluation (Bloom, Krathwohl, & Masia, 1956; Sultana, 2010). Though these levels are not necessarily sequential, the first two levels, knowledge and comprehension, typically represent lower-order cognitive skills, and the remaining four levels demand higher-order cognitive skills (Crowe, Dirks, & Wenderoth, 2008; Neal, 2011; Szabo & Schwartz, 2011). This taxonomy has been widely-used by educators as a framework to guide their students through the learning process.

Higher-order thinking can be viewed as "an ability to compare, explain, contrast, analyze, theorize, generalize, hypothesize and reflect" (Yang, Tzuo, and Komara, 2011, p.23). Higher-order thinking skills include critical, logical, reflective, metacognitive, and creative thinking (King, Goodson, & Rohani, 1998). These skills are considered as indications of the depth of understanding and may be considered an essential part of teacher preparation programs so that preservice educators can develop ability to analyze and apply learned information to novel situations, provide evidence to support and evaluate their decisions, and become reflective practitioners (Wickersham, & Dooley, 2006).

Multiple research teams have used Bloom's Taxonomy or modified Bloom's Taxonomy as an approach to promote and assess higher-order thinking skills across age groups and in various kinds of discipline areas. Szabo and Schwartz (2011) assessed the

effects of online discussion forums as an instructional tool in a face-to-face course to increase preservice educators' higher-order thinking skills. Participants were 93 undergraduate students (82% were preservice teachers) registered in four sections of an Educational Psychology course at a Midwestern university. The four sections were assigned to either the traditional or technology conditions. With other components being identical, the only difference between the two conditions was that students in the technology group were required to post reflections and respond to other students' reflections on the Blackboard discussion forums. The course instructor monitored and occasionally posted explanatory messages on the forums throughout the semester. To compensate the workload, students in the traditional group were asked to complete short reflections as part of the homework assignments. The researchers developed a rubric based on the Bloom's revised taxonomy by Anderson and Krathwohl (2001) to examine the growth of participants' higher order thinking skills. Results indicated that the online Blackboard discussion forums significantly increased participants' use of higher-order thinking skills reflecting on four areas: factual ($F=4.94$, $p<.01$), conceptual ($F=6.02$, $p<.01$), procedural ($F=11.41$, $p<.01$), and metacognitive ($F=7.06$, $p<.01$).

Crowe, Dirks, and Wenderoth (2008) reported that the Blooming Biology Tool (BBT), an assessment tool based on Bloom's Taxonomy, enhanced students using high-order thinking skills to write biology proposals. BBT is a rubric, which provides descriptions or examples of different levels in Bloom's Taxonomy in relation to scientific-specific skills inherent to Biology. Participants were 46 students registered in two consecutive quarters (1st quarter, n=22; 2nd quarter, n=24) of a biology laboratory

class at a research-one institution. The course instructor used the BBT to evaluate performance of students from the first quarter in writing a biology proposal. In general, these students performed the best in the areas that required only a knowledge- or a comprehension-level of thinking and demonstrated weakness in the areas that required higher-order thinking skills, including synthesizing new ideas or evaluating a technique. Then, the instructor designed two new course activities to provide students opportunities to practice the higher-order thinking skills in the subsequent quarter. The first activity involved clearly introducing the BBT to students at the beginning of the quarter, and the second activity required students using BBT to evaluate a sample proposal as an approach to ensure their understanding of the scoring rubric and to promote their higher-order thinking skills. Without reporting the significance, researchers claimed students in the second quarter outperformed students in the first quarter in using higher-order thinking skills to write a biology proposal. Moreover, these researchers emphasized the importance of aligning course activities with assessment to motivate students developing and practicing higher-order skills, recommending that course instructors design activities that require students to use higher-order thinking skills and assess students' performance on these skills accordingly.

Seifert, Hupp, Chen, and Wilson (2011) developed and demonstrated reliable use (interrater reliability of 89%) of a modified Bloom's Taxonomy to code adaptations designed by preservice general education teacher candidates. This coding system uses five levels to demonstrate and assess educators' depth of thinking in planning adaptations for students with disabilities. The definitions and corresponding examples of each level

are presented in Table 1. The current study incorporated the concept of the modified Bloom's Taxonomy (Seifert et al., 2011) with UDL to develop training materials and a coding system to promote and assess preservice general educators' using high-order thinking skills to make adaptations for students with mild academic disabilities. Moreover, the growth of the quantity and quality of the adaptations that participants make to lesson plans were both assessed.

**Table 1**

*Modified Bloom's Taxonomy (Seifert et al., 2011)*

| Levels | Definitions | Examples |
|---|---|---|
| Level 1 | Naming an adaptation that does not match with the instructions. | e.g. Proposing a representation adaptation when asked for an expression adaptation. |
| Level 2<br>Knowledge | Naming an adaptation that matches with the instructions. | e.g. Graphic organizer (when asked for a representation adaptation). |
| Level 3<br>Application | Naming an adaptation and linking it to a specific type of disability. | e.g. Graphic organizer can be helpful for students with learning disabilities, who have difficulties organizing learned information. |
| Level 4<br>Comprehension<br>Analysis<br>Synthesis | Naming and combining multiple adaptations, or describing definitions or procedures of one or more adaptations. | e.g. Use graphic organizers and highlight important content in texts. (Naming and combining multiple adaptations.)<br>e.g. I will teach students the purpose and basic concepts of graphic organizers, and model how to use them to organize information. (Describing procedures of implementing an adaptation.) |

| | | |
|---|---|---|
| Level 5<br>Synthesis | Describing multiple adaptations and linking these adaptations to specific learner characteristics. | e.g. I will use graphic organizers when presenting information to students and highlight the important concepts on textbooks because students with learning disabilities often lack of strategies to organize information. |

## Summary

This chapter presented the literature related to training-related variables of general educators' use of adaptations for student with mild academic disabilities, current research findings on the effects of UDL, and a rationale of incorporating a modified Bloom's taxonomy with UDL as an approach to promote general educators using higher-order thinking skills to make adaptations for students with mild academic disabilities. Next chapter will discuss the methodologies used in this study.

# CHAPTER III

# METHOD

## Setting and Participants

This study was conducted in two sections of a teacher education course titled, Foundations of Special Education I, which is required for general education teacher licensure in a Midwest university. The course was chosen based on the following criteria: (a) course objectives, (b) course topics, (c) course requirements, and (d) number of students enrolled in the class. First, the purpose of the intervention aligned with one of the primary course objectives, using data to adapt and modify curriculum, instruction, and learning environments to meet individual learner needs. Second, the course topics were considered appropriate because students met regularly in class to discuss instructional adaptations. Third, one course assignment required students to make adaptations to lesson plans. Participants can use UDL as a means to accomplish this assignment. Fourth, the number of students enrolled in the class was considered adequate to provide statistical power to this study.

Forty-six preservice general educators pursuing an undergraduate degree with a major in elementary education were enrolled in this course and invited to participate in the study. A frequently-asked question sheet for advertising this study was made and posted on course website at the beginning of the semester. Additionally, one week prior to the intervention, the primary investigator visited participants in both sections to explain the purpose of the study and answer any questions. The course instructors conducted the consent process and collected consent forms from the participants. All of

the preservice general educators gave their consent to participate in the UDL intervention. However, five of the 46 were either absent during the intervention or only attended part of the intervention. As a result, 41 participants were included in this study, and 15 of them gave consent to participate in the individual interviews after the UDL intervention. Each participant received a five-dollar gift card from a local retail store for participating in the UDL intervention. Participants who consented and were selected to participate in the individual interviews received an additional five-dollar gift card.

Among the 41 participants, 36 (88%) were female, and five (12%) were male. Forty (98%) participants' ages ranged from 18 to 24 years old, and one (2%) was in the range from 30 to 40 years old. Thirty-seven (90%) participants identified themselves as European American, two (5%) as Hispanic American, and two (5%) as Asian American. Thirty-two (78%) of the participants had heard about UDL in a college course and/or from classroom teachers prior to the intervention, and nine (22%) had never heard of the term "UDL." Forty (98%) of the participants had the experience of writing a lesson plan, but only one (2%) has designed a lesson plan based on UDL.

For the 15 participants consenting to the individual interviews, 14 (93%) were female and one (7%) was male, with all ages ranging from 18 to 24 years old. Fourteen (93%) participants were European American, and one (7%) was Hispanic American. Thirteen (87%) of the participants had heard about UDL in a college course and/or from classroom teachers prior to the intervention, and two (13%) had never heard of the term "UDL." All (100%) of the participants had the experience of writing a lesson plan, but only one (7%) has designed a lesson plan based on UDL. Demographic information for

participants consenting to participate in the UDL intervention and the individual interviews is summarized in Table 2.

**Table 2**

*Participant Demographics*

| | UDL intervention (n=41) | | Interview (n=15) | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| Age | | | | |
| 18-24 | 4 | 36 | 1 | 14 |
| 25-29 | 0 | 0 | 0 | 0 |
| 30-40 | 1 | 0 | 0 | 0 |
| 40+ | 0 | 0 | 0 | 0 |
| Ethnicity | | | | |
| European | 4 | 33 | 1 | 13 |
| Hispanic | 0 | 2 | 0 | 1 |
| Asian | 1 | 1 | 0 | 0 |
| Has heard of the term “UDL” | | | | |
| Yes, in a college course | 1 | 22 | 0 | 10 |
| Yes, from classroom teachers | 3 | 7 | 1 | 2 |
| No | 1 | 8 | 0 | 2 |
| Has experience of writing a lesson plan | | | | |
| Yes | 5 | 35 | 1 | 14 |
| No | 0 | 1 | 0 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| Has written a lesson plan based on UDL | | | | | |
| | Yes | 0 | 1 | 0 | 1 |
| | No | 5 | 35 | 1 | 13 |

## Research Questions and Variables

The main purpose of this study was to examine the effects of teacher training in UDL developed through an incorporation of the modified Bloom's Taxonomy (Seifert et al., 2011) on adaptations of lesson plans made by preservice general educators in a university classroom setting. Primary research questions included the following: (1) Do preservice general educators who have the UDL training make more number of adaptations than those who do not have the training? (2) Do preservice general educators who have the UDL training make adaptations with better quality than those who do not have the training? The independent variable was the one-hour UDL intervention. Two conditions, experimental (UDL training) and control (no training), were compared. Two dependent variables (Total Quantitative Score and Total Qualitative Score) were examined through two measures respectively to assess whether the UDL intervention increased the quantity and quality of adaptations that participants made to lesson plans for students with mild academic disabilities.

A secondary research question was to examine the validity of the newly developed coding system (Seifert et al., 2011) used to assess the quality of adaptations that preservice educators made to their lesson plans in the current study. The specific research question was: what is the extent to which the assessment tool aligns with the

concept of Bloom's Taxonomy from preservice educators' perspective? Four 15-minute individual interviews were conducted to examine whether the levels of thinking that participants perceived themselves using to design the adaptations to the lesson plans aligned with the levels of thinking reflected from the assessment tool.

## Procedures

To address the primary and secondary research questions, this study was divided into two phases, the UDL intervention and the individual interviews. Specific procedures of each phase are presented in the following sections.

### Phase 1: UDL Intervention

The UDL intervention was implemented across three consecutive instructional days. On the first instructional day, all of the participants were given a 10-minute mini-lecture about the operational definitions of three principles (representation, expression, and engagement) of UDL. After the mini-lecture, the participants were randomly assigned to either the experimental or control conditions. On the second instructional day, participants in the experimental condition received a one-hour intervention on UDL and an application of a modified Bloom's Taxonomy conducted by the primary investigator of this study. Participants in the control condition received 50 minutes of regular instruction from the course instructors and took the posttest (see the entirety of the posttest in Appendix B) for 20 minutes. The posttest required participants to adapt a lesson plan for students with mild academic disabilities by using three principles of UDL with an incorporation of the modified Bloom's Taxonomy.

The intervention was a one-hour classroom lecture on how to adapt lesson plans for students with mild academic disabilities. The lecture consisted of three parts. The first part was a 20-minute introductory power point presentation on UDL, including development, basic concepts, and principles (representation, expression, and engagement) that comprise UDL according to CAST. Specific examples regarding how to make adaptations to lesson plans based on the three principles of UDL were presented to the participants. The second part was a 20-minute power point presentation regarding how to incorporate the modified Bloom's Taxonomy with UDL to make adaptations to lesson plans for students with mild academic disabilities. Participants were presented with the basic concept of the modified Bloom's taxonomy and examples of how to use it to develop quality adaptations of each UDL principle for students with mild academic disabilities. Moreover, participants were given an opportunity to practice application of the modified Blooms' Taxonomy framework by matching sample adaptations to each level in the modified Bloom's Taxonomy. The third part was a 20-minute practice session. A predesigned lesson plan (see Appendix A) was given to participants. Participants were first presented with examples of incorporating UDL with the concept of the modified Bloom's Taxonomy for designing adaptations to the lesson plan. Participants were then randomly assigned to small groups (3 to 4 people in a group) to develop their own ideas for adapting the lesson plan for students with mild academic disabilities by using one of the UDL principles through the concept of the modified Bloom's Taxonomy. By the end of the practice session, each group presented the

adaptations they made to the lesson plan to the whole class and received immediate feedback from the primary investigator and other classmates.

On the third instructional day, participants in the experimental group received 50 minutes of regular instruction from the course instructors and took 20 minutes to complete the posttest, while participants in the control group received the one-hour UDL lecture from the primary investigator. One month after the UDL intervention, all of the participants took the follow-up test (see the entirety of the follow-up test in Appendix C) for 20 minutes during the regular instructional time. As with the posttest, the follow-up test required participants to adapt a novel and comparable lesson plan for students with mild academic disabilities by using three principles of UDL with an incorporation of the modified Bloom's Taxonomy.

**Phase II: Individual Interviews**

After the one-hour UDL intervention was completed with both the experimental and control groups, participants' posttests were immediately scored using the quantitative and qualitative scoring rubrics. An invitation email for the individual interviews was sent to all participants who used higher levels of thinking (e.g. application, analysis, or synthesis) to design adaptations in the posttest and who previously gave their consent to be contacted for the individual interview. The first four participants who replied to the invitation email were selected to participate in the interviews. Each individual interview was conducted for about 15 minutes outside of the regular instructional time within two weeks after the one-hour UDL intervention and was tape-recorded. During the interview, participants' original responses were typed on a sheet and presented to them. The

participants were then probed to recall their thinking process as they designed those adaptations (see the entirety of the probing question sheet in Appendix D). When participants used the same level of thinking to make more than one adaptation, only one adaptation was randomly chosen and probed to investigate participants' underlying thinking process. In addition, participants were asked to decide which level of thinking in the Bloom's Taxonomy they perceived themselves using to develop those adaptations, as well as to provide explanations why they made such choice.

## Instrumentation

### Phase I: UDL Intervention

In the posttest, participants were given a predesigned lesson plan along with a list of different types of adaptations and asked to adapt the lesson plan for 20 minutes by incorporating the three principles of UDL with the modified Bloom's Taxonomy for students with mild academic disabilities. The list of adaptations was from the Minnesota State Recommended Due Process Forms and Directions, and served the purpose of providing the typical resource that participants may have in a real-world setting. A comparable and novel lesson plan was created for the follow-up test administered one month later. In the follow-up test, participants were also provided with the list of adaptations and had 20 minutes to adapt the lesson plan by incorporating the three principles of UDL with the modified Bloom's Taxonomy as a means to include students with mild academic disabilities in general education classrooms.

Participants' lesson plans were scored after the posttest and follow-up test by using two scoring rubrics respectively to examine the quantity and quality of adaptations

that participants made to the lesson plans. The scoring rubric that examined the quantity of participants' responses reflected the exact number of adaptations that participants made to the lesson plans. A sub-quantitative score was assigned to each adaptation made by a participant. The Total Quantitative Score was the sum up of all the sub-quantitative scores. There was no upper ceiling for the Total Quantitative Score. The criteria of the scoring rubric are presented as follows:

- 0 points if there is no adaptation discussed,
- 1 point if one adaptation is discussed,
- 2 points if two adaptations are discussed,
- And so forth…

The scoring rubric that examined the quality of adaptations that participants made to the lesson plans was an adapted version of the modified Bloom's Taxonomy (Seifert et al., 2011) in order to better reflect the tasks assigned to the participants and their performance in the current study. The definitions and corresponding examples of each level in the modified Bloom's Taxonomy are presented in Table 3.

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**Table 3**

*Adapted Version of the Modified Bloom's Taxonomy (Seifert et al., 2011)*

| Levels of Thinking | Definitions | Examples |
|---|---|---|
| Level 1 | Naming an adaptation that does not match with the instructions. | e.g. Proposing a representation adaptation when asked for an expression adaptation.<br>e.g. Proposing an adaptation for students with disabilities other than mild academic disabilities. |
| Level 2<br>Knowledge<br>Comprehension | Naming an adaptation that matches with the instructions.<br>Describing (definition or purpose of) one adaptation. | e.g. Graphic organizer (when asked for a representation adaptation).<br>e.g. Graphic organizer-visual representation of knowledge, concepts (definition)<br>e.g. Graphic organizer- to provide a visual framework for organizing conceptual information (purpose). |
| Level 3<br>Application | Naming an adaptation and linking it to a specific type of disability. | e.g. Graphic organizer can be helpful for students with learning disabilities, who have difficulties organizing learned information. |
| Level 4<br>Analysis | Describing procedures of implementing one adaptation with or without link to learner characteristics. | e.g. I will teach students the purpose and basic concepts of graphic organizers, and model how to use them to organize information. |
| Level 5<br>Synthesis | Combining multiple adaptations. | e.g. Use graphic organizers and highlight important content in texts. |
| Level 6<br>Synthesis | Describing multiple adaptations and linking these | e.g. I will use graphic organizers when presenting information to students and highlight the |

| | | |
|---|---|---|
| | adaptations to specific learner characteristics. | important concepts on textbooks because students with learning disabilities often lack of strategies to organize information. |

The qualitative scoring rubric consisted of a 7-point scale and evaluated participants' use of each principle of UDL to make adaptations. Participants received an individual sub-qualitative score for each adaptation made to the lesson plans. The Total Qualitative Score was the median of the sub-qualitative scores. The median was selected as the measure of central tendency because it can prevent participants' scores from being affected by extreme values (Howell, 2007). The maximum number of the Total Qualitative Score that a lesson plan could receive was 6 points. The criteria of the scoring rubric are presented as follows:

- 0 points if there is no adaptation discussed,
- 1 point if an adaptation is named but does not match with the instructions.
- 2 points if an adaptation is named or described with its definition or purpose,
- 3 points if an adaptation is named along with a link to a specific type of disability,
- 4 points if one adaptation is described with procedures of implementing the adaptation,
- 5 points if multiple adaptations are combined,
- 6 points if multiple adaptations are described along with a link to specific characteristics of a learner with mild academic disabilities.

Content validity of the lesson plans used in this study was examined by two quality indicators: the content and the presentation of the lesson plans. The content of the lesson plans addressed Minnesota State Standards. The presentation of the lesson plans included four major curricula elements: objectives, materials, procedures, and assessment as recommended by the National Center on Curriculum Access (Castellani, Mason, & Orkwis, 2005). Procedural fidelity was measured using an observer checklist to ensure each component of the intervention was addressed. The primary investigator marked the procedural fidelity checklist to reflect what was actually delivered to the participants during the UDL intervention. The checklist is presented in Figure 1.

Mini-lecture (10 minutes): Operational definitions of three components of UDL.

_____ Representation

_____ Expression

_____ Engagement

UDL lecture (60 minutes):

Introduction to UDL (20 minutes)

_____ Development: Universal Design versus Universal Design for Learning

_____ Three principles of UDL

_____ Adaptation ideas by using each UDL principle

Modified Bloom's Taxonomy (20 minutes)

_____ Basic concept of the Modified Bloom's Taxonomy

_____ Adaptation ideas by incorporating UDL with the modified Bloom's Taxonomy

_____ A quick practice to enhance participants' understanding of the modified Bloom's Taxonomy

Practice Session (20 minutes)

_____ A quick review and more examples of incorporating UDL and Bloom's

Taxonomy to come up with adaptations to a lesson plan

_____ Practice Time: Small group discussion

_____ Whole class discussion

Figure 1: Procedural Fidelity Checklist

Raters in this study were blind to the conditions, experimental or control. To check the interrater reliability of the scoring of the posttest and follow-up test lesson plans, 25% of the lesson plans in the posttest and 20% of the lesson plans in the follow-up test were randomly selected and scored by a second rater. The percentage agreement was calculated by dividing the number of agreements over the total number of measure.

**Phase II: Individual Interview**

Four participants whose adaptations reflected the use of higher order thinking (i.e., application, analysis, synthesis) were interviewed within two weeks following the one-hour UDL intervention to probe their recall of the thinking processes they used to design those adaptations. Each participated in a 15-minute individual interview conducted by the primary investigator of this study. A set of probing questions was designed prior to the interviews to elicit participants' responses. During the individual interviews, participants were first presented with their original responses on the posttest that reflected higher-order thinking, and probed to recall the thinking process they used to design those adaptations. Participants were then presented with a set of three index cards that described three different levels of thinking respectively, including the level of thinking that an adaptation was scored based on the qualitative scoring rubric, as well as one level of thinking below and one level of thinking above according to the Bloom's

Taxonomy. For examples, if the level of thinking of the adaptation was scored as *analysis* based on the qualitative scoring rubric, the participants would be presented the index cards of *analysis, application* (one level below), and *synthesis* (one level above). After being allowed sufficient time to read the descriptions on the index cards (See Figure 2), participants were asked to choose which level of thinking that they perceived they had used to design the adaptation and explain why they made such choices.

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**Knowledge: Ability to recall facts, concepts or principles.**
Skills Demonstrated:
- observation and recall of information
- knowledge of dates, events, places
- knowledge of major ideas
- mastery of subject matter

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**Comprehension: Ability to translate or interpret information. A grasp of meaning, intent relationship is demonstrated in oral, written, or non-verbal communication.**
Skills Demonstrated:
- understanding information
- grasp meaning
- interpret facts, compare, contrast
- order, group, infer causes

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**Application: Ability to apply previously acquired knowledge of information to a new or concrete situation.**
Skills Demonstrated:
- use information
- use methods, concepts, theories in new situations
- solve problems using required skills or knowledge

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**Analysis: Ability to break material down into its components so that organizational structure may be understood.**
Skills Demonstrated:
- seeing patterns
- organization of parts
- recognition of hidden meanings
- identification of components

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**Synthesis: Ability to analyze the parts and put them together to form a whole.**
Skills Demonstrated:
- use old ideas to create new ones
- generalize from given facts
- relate knowledge from several areas
- predict, draw conclusions

**Evaluation: Ability to make judgments based on evidence and determine the value of material based on definite criteria.**
Skills Demonstrated:
- assess value of theories, presentations
- make choices based on reasoned argument
- verify value of evidence
- recognize subjectivity

Figure 2: Index Cards for Individual Interviews

## Research Design

A control group design was used to examine the effects of the UDL teacher training. Participants were randomly assigned to experimental (UDL training) or control (no training) conditions. Sample size was estimated by using G*Power, a program that estimates required sample size based on specified power, alpha level, and effect size (Faul, Erdfelder, Lang, & Buchner, 2007; Prajapati, Dunne, & Armstrong, 2010). A power analysis based on Mann-Whitney U Test was conducted and indicated that a sample size (n=48) was necessary to show adequate power (1- *β error probability*= 0.8) to detect an effect size of d = .8 when the significance level (α rate) was set to be 0.05, and parent distribution was set as unknown (minimal A.R.E.). A power analysis based on Wilcoxon Matched-Pairs Signed-Rank T Test was also conducted and indicated that a sample size (n=22) was necessary to show adequate power (1- *β error probability*= 0.8)

to detect an effect size of d = .8 when the significance level (α rate) was set to be 0.05, and parent distribution was set as unknown (minimal A.R.E.).

Four 15-minute individual interviews were conducted to examine the extent to which the qualitative scoring rubric aligned with the concept of Bloom's Taxonomy from preservice educators' perspective. The format of the interview was semi-structured and entailed asking a series of predesigned questions and then probing more open-ended questions to obtain clarifications (Folkestad, 2008; Gall, Gall, & Borg, 2007; Wills, 2005).

## Data Analysis

### Phase I: UDL Intervention

There were two dependent variables (Total Quantitative Score and Total Qualitative Score) in this study. The Total Quantitative Score was interval, and the Total Qualitative Score was ordinal. According to Serlin and Harwell (2004), ordinal data tend to violate the assumption of normality and nonparametric tests are preferred because they frequently show better control of Type I error rates and good statistical power. Moreover, Mann-Whitney U test is suggested when comparing the difference between two independent samples, and Wilcoxon Matched-Pairs Signed-Ranks T Test is appropriate for comparing the difference between two paired samples (Spatz, 2010). Therefore, data from the posttest were analyzed by using a Mann-Whitney U Test to examine whether a difference was observed on the distributions of scores between the experimental and the control conditions for two dependent variables. Data from the follow-up test were also analyzed by using a Mann-Whitney U Test to examine whether

the control group performed equivalently to the experimental group after both groups received the UDL training. Furthermore, data from the posttest and the follow-up test were analyzed by a Wilcoxon Matched-Pairs Signed-Ranks T Test to examine whether the treatment effects of the experimental group endured over time. An exploratory analysis was conducted for three subtotal scores (representation, expression, and engagement scores) of each measure in the posttest to tentatively investigate if the treatment affected all categories or only some categories.

**Phase II: Individual Interviews**

Data collected from the individual interviews were transcribed verbatim and then analyzed to determine the extent to which the qualitative scoring rubric aligned with the concept of Bloom's Taxonomy from preservice educators' perspectives. Data were first summarized within a table to present the levels of thinking that participants perceived themselves using to make adaptations as compared to the levels of thinking scored by the qualitative scoring rubric. Additionally, data were analyzed by using the following steps: (a) reading entire transcripts several times to become familiar with the overall data; (b) distinguishing responses to each probe question; (c) separating data into different categories according to both participants' agreements and levels of thinking being used to come up with an adaptation; (d) generating themes by identifying patterns and connections (Gall, Gall, & Borg, 2007; Leatherman, 2007; Ryan & Bernard, 2003; Taylor-Powell & Renner, 2003).

# CHAPTER IV

# RESULTS

The main purpose of this study was to investigate the effects of a one-hour UDL teacher training in increasing the quantity and quality of adaptations made by preservice general educators to predesigned lesson plans in a university classroom setting. The specific research questions included: (1) Do preservice general educators who have the UDL training make more number of adaptations than those who do not have the training? (2) Do preservice general educators who have the UDL training make adaptations with better quality than those who do not have the training? The independent variable was the one-hour UDL intervention, and the two dependent variables were Total Quantitative Score and Total Qualitative Score. A follow-up test was conducted one month after both the experimental and control groups received the UDL training.

## Quantity of Preservice General Educators' Adaptations Making

A Mann-Whitney U test was used to determine if there was difference on the distributions of the scores between the control and experimental groups. The mean rank for the control group ($n$=19) was 25.18 and the mean rank for the experimental group ($n$=22) was 17.39 in the posttest (See Table 4). Results indicate that the difference between the two groups was statistically significant (U=129.5, $p$=.018), with the control group making significantly more adaptations than the experimental group (see ratings and ranks of Total Quantitative Score assigned to each participant in Appendix E). The Mann-Whitney U test was also performed to determine if there was a difference on the distributions of the scores between the control and experimental groups in the follow-up

test. The mean rank for the control group was 23.32 and the mean rank for the experimental group was 19.00 (See Table 4). Results show that there was no statistically significant difference (U=165, *p*=.127) in the number of adaptations made between the experimental and control groups one month after both groups received the UDL training. (see ratings and ranks of Total Quantitative Score assigned to each participant in Appendix F). A Wilcoxon Matched-Pairs Signed-Ranks T Test was conducted to determine if the treatment effects endured over time. A nonsignificant result (*p*=.341) was found between the posttest and the follow-up test scores of the experimental group, meaning that the number of adaptations made by the experimental group did not differ significantly between the posttest and the follow-up test.

**Table 4**

*Mean Ranks of the Quantity and Quality Measures*

| | Quantity | | Quality | |
|---|---|---|---|---|
| | Control (*n*=19) | Experimental (*n*=22) | Control (*n*=19) | Experimental (*n*=22) |
| *Posttest* | 25.18 | 17.39 | 16.55 | 24.84 |
| Representation | 24.29 | 18.16 | 16.21 | 25.14 |
| Expression | 26.13 | 16.57 | 16.47 | 24.91 |
| Engagement | 22.74 | 19.50 | 16.95 | 24.50 |
| *Follow-up Test* | 23.32 | 19.00 | 19.05 | 22.68 |

The treatment effects found in the posttest were further examined by an exploratory analysis to determine if the control group made significantly more

adaptations than the experimental group when using each UDL principle separately. Results from the Mann-Whitney U Test suggest that the control group made significantly more adaptations than the experimental group when using the principles of Representation (U=146.5, *p*=.048) and Expression (U=111.5, *p*=.004) (See ratings and ranks of Sub Quantitative Score assigned to each participant in Appendix G).

**Quality of Preservice General Educators' Adaptations Making**

The mean rank for the control group was 16.55 and the mean rank for the experimental group was 24.84 in the posttest (See Table 4). Results from the Mann-Whitney U Test indicate that the difference between the two groups was statistically significant (U=124.5, *p* =.009), with the experimental group outperforming the control group in making adaptations with higher quality (see ratings and ranks of Total Qualitative Score assigned to each participant in Appendix H). The mean rank for the control group was 19.05 and the mean rank for the experimental group was 22.68 in the follow-up test. Results show that there was no statistically significant difference (U=172, *p* =.129) in the quality of adaptations made between the experimental and control groups one month after both groups received the UDL training (see ratings and ranks of Total Qualitative Score assigned to each participant in Appendix I). A Wilcoxon Matched-Pairs Signed-Ranks T Test was used to determine if the treatment effects endured over time. A nonsignificant result indicated that there was no statistically significant difference (*p* =.397) in the quality of adaptations made by the experimental group between the posttest and the follow-up test.

An exploratory analysis was conducted to analyze each UDL principle separately. Results from the Mann-Whitney U Test suggest that the experimental group outperformed the control group in making higher quality adaptations when using all three UDL principles in the posttest (Representation, U=118, $p$ =.006; Expression, U= 123, $p$ =.005; Engagement, U= 132, $p$ =.015) (See ratings and ranks of Sub Qualitative Score assigned to each participant in Appendix J).

## Treatment Fidelity and Interrater Agreement

Procedural fidelity of the one-hour UDL intervention was measured by the primary investigator through using an observer checklist to ensure each of the 12 components of the intervention was addressed. To determine the fidelity, the total number of correctly-implemented components was divided by the total number of components. Procedural fidelity revealed 100% accuracy. To check the interrater reliability of the scoring, 25% of the lesson plans in the posttest and 20% of the lesson plans in the follow-up test were randomly selected and scored by a second rater. Both raters in the current study were blind to the conditions. The percentage of interrater reliability agreement were 90% for the quantity of adaptations and 100% for the quality of adaptations in the posttest; 87.5% for the quantity of adaptations and 87.5% for the quality of adaptations in the follow-up test.

## Preservice General Educators' Perceptions of the Coding System

Four preservice general educators participated in the individual interviews with at least one of the adaptations they made to the posttest being scored as using higher levels of thinking (e.g. application, analysis, or synthesis) according to the qualitative scoring

rubric. When a participant made more than one adaptation by using a particular higher level of thinking, only one adaptation was randomly chosen to investigate her underlying thinking process. A total of seven adaptations were investigated in the four individual interviews. Table 5 presents a comparison between the levels of thinking that participants perceived themselves using and the levels of thinking as scored by the qualitative scoring rubric. Among the seven adaptations, two were perceived by the participants and scored by the qualitative scoring rubric as based on analysis. Two adaptations were perceived by the participants and scored by the qualitative scoring rubric as based on synthesis. Two adaptations were scored by the qualitative scoring rubric as based on analysis, while the participants perceived themselves using both application and analysis. One adaptation was scored by the qualitative scoring rubric as based on synthesis, while the participant perceived herself using both application and synthesis.

Table 5

*Comparison of Levels of Thinking: Participants' Perceptions Versus Qualitative Scoring Rubric*

| Qualitative Scoring Rubric | Participants' Perceptions | | | | |
|---|---|---|---|---|---|
| | Application | Analysis | Synthesis | Application and Analysis | Application and Synthesis |
| Application | 0 | 0 | 0 | 0 | 0 |
| Analysis | 0 | 2 | 0 | 2 | 0 |
| Synthesis | 0 | 0 | 2 | 0 | 1 |

The following themes were identified: (a) identifying components as the level of analysis; (b) putting ideas together to create a whole as the level of synthesis; (c) using previous knowledge as the level of application. For each theme, participants' statements in their words were presented to illustrate the patterns and connections being identified from the transcripts.

**Identifying Components as the Level of Analysis**

According to the qualitative scoring rubric, all of these four participants used analysis to make at least one adaptation to the posttest, and they all agreed that their thinking process involved analysis. One of the participants proposed providing "visual aids" when teaching vocabulary in the lesson, and described how she perceived herself using analysis to identify components of the adaptation. "I think this is [analysis], the one I would agree… because like when you are creating the visual aids, you kind of want to have all the components of the definitions. It can't be just a basic picture, so students will not be able to comprehend that's the definition, or they won't understand all of the parts of the definition."

Some of the participants viewed themselves using analysis to make the adaptations because they specified components on the lesson plan to be adapted. A different participant also proposed providing "visual aids" to teach the vocabulary in the lesson. She explained her thinking process as: "I think they said they would go over different words and definitions, so I think including visual aids might help some students in case they don't just benefit from only hearing it… Yah, I agree with that [analysis]… I was like thinking about the different parts of the lesson plan, like what they had, how

they can be more, or how I could think of the different parts of the lesson to come up with adaptations." Another participant proposed increasing time for an activity and described her thoughts as: "Yah, I agree [analysis]. I agree especially with breaking down the materials down into its components, helping people like through each part… like looking at the lesson plan, I was trying to fix each piece on the lesson plan."

Overall, these participants' perceptions aligned with how analysis was interpreted on the qualitative scoring rubric as it requires participants to either specify the steps of implementing an adaptation or specify the components on the lesson plan to which an adaptation relates.

**Putting Ideas Together to Create a Whole as the Level of Synthesis**

Three participants used synthesis to make at least one adaptation to the posttest based on the qualitative scoring rubric, and all of them agreed their thinking process involved synthesis. One participant proposed allowing students to choose their own partners and to take breaks. She explained how synthesis was used: "I think I used synthesis because I thought of different parts that, like different knowledge that I already have and I kind of put that together to form like the whole adaptation. So like the part that from my experience, that part that students sometimes like to pick their own partners but also they might get stressed out in situation. I kind of put that together to create the whole adaptation. I think that's where the synthesis."

A different participant proposed offering a hard copy and reading out loud to students rather than only displaying information on the board. "So I was thinking like, instead of just explaining them on the board, like reading them aloud, because that really

helps me when people read things aloud, and then I was also thinking if you gave them their own copy, then they can go back to read it later… Yah, I think you're right. It was synthesis because I was like thinking about what you taught us in that one day and then like creating new ideas based on that like with this exact lesson and that part, what can I do that will help multiple students, so I was using the knowledge that I have learned about different ways that we can adapt the lesson and apply it to this lesson."

Another participant also proposed offering a hard copy and reading out loud to students instead of only displaying information. She described her thinking process as: "I agree [synthesis]. I agree because like to put parts together to form the whole. I think that's definitely kind of what I was using is taking all the pieces. I am like making up a different whole from each piece. So, the end, like I said I am using all the ideas to create a new one… It's like a new use of the materials given, or a new way to look at the using materials given rather than just a carriage."

In brief, these participants' perceptions aligned with how synthesis was interpreted on the qualitative scoring rubric as it requires participants to combine multiple adaptations together as a unified adaptation.

**Using Previous Knowledge as the Level of Application**

Two participants perceived themselves using both application and analysis to make the adaptations while analysis was scored as being used for coming up with the adaptations based on the qualitative scoring rubric. One participant proposed allowing students to make a video as an option to express their understanding, and explained how she perceived herself using both levels to design the adaptation. "I think it's kind of both

[application and analysis] because I was using what I learned from what you taught us and applying it to the situation. But I was also like breaking down this lesson plan and then reorganizing it... Yah… so I was analyzing it and I was like applying things. So I was doing both." The other participant proposed providing visual aids to vocabulary and further described her thinking process as: "I think it was just like looking and thinking different parts of the lesson, and seeing how different parts like this presentation of information, just how that could, how that specific part could benefit the students. I think I was also using application, because just like what I've seen in the past, like knowing that, like what benefit some students. So I think I applied it to the situation."

One participant perceived that she used both application and synthesis to make the adaptation while synthesis was scored on the qualitative scoring rubric. This participant proposed allowing students to pick their own partners and take breaks, and she further described her thoughts as: "Yah, that's what I am thinking is synthesis because I feel like my answer started with, maybe I would, like regardless what this specific lesson was, I felt like this adaptation would be helpful in like variety of different situations. I think like in general, it would work, not to just one specific situation. So I think I used… like some of the stuff in here, but also things that I have learned and things that I have witnessed, kind of put it all together and decide that will be a good adaptation…" This participant was asked to further clarify the difference between applying previous experience (application) and putting ideas together (synthesis). Her answer was: "I kind of think I started with application, like to actually use my previous knowledge to apply it

to the situation, but I think like it is included in the process of synthesizing it. I think as a whole, I used synthesis, but the application is just one part of that."

In summary, these participants' perceptions aligned with how application was interpreted on the qualitative scoring rubric as it requires participants to apply their knowledge in designing an adaptation to specific learner characteristics.

# CHAPTER V

# DISCUSSION

The purpose of this study was to examine whether a one-hour UDL teacher training increased the quantity and quality of adaptations made by preservice general educators for students with mild academic disabilities and to examine whether participants perceived themselves to be using the same levels of thinking in the Bloom's Taxonomy to make adaptations as the levels of thinking reflected from the qualitative scoring rubric. Primary research questions were as following: (1) Do preservice general educators who have the UDL training make more number of adaptations than those who do not have the training? (2) Do preservice general educators who have the UDL training make adaptations with better quality than those who do not have the training? A secondary research question asked: What is the extent to which the assessment tool aligns with the concept of Bloom's Taxonomy from preservice general educators' perspective? This chapter begins with a summary of overall findings and its comparison with previous literature. It is followed by the sections including limitations to study design and interpretation of the results, implications for practice, implications for research, and conclusion.

## Summary of Findings

To examine the quality of adaptations, results from the posttest support that the one-hour UDL intervention increased the quality of adaptations made by preservice general educators to predesigned lesson plans for students with mild academic disabilities. Moreover, a comparison of the performance between the posttest and the

follow-up test for the experimental group indicates that the treatment effects endured over time. Lastly, results from the exploratory analysis suggest that such increase of the quality of adaptations was observed across the three UDL principles.

A review of the literature indicated that many general educators believed that they lacked of knowledge, skills, and confidence to address individual needs of students with disabilities through making adaptations. Teacher training was identified as an important variable that predicted and increased general educators' use of adaptations for students with mild academic disabilities, as well as enhancing educators' confidence and positive attitudes towards teaching these students. Demonstration of increased quality of adaptations by the experimental group in this study is innovative and encouraging in that most of the previous investigations primarily focused on increasing quantity and overlooked the quality of adaptations (Brown et al., 2008; Spooner et al., 2007), focused on increased individualization without assessing higher-order thinking (Andrew, 2002; Fuchs et al., 1995), or examined the quality of adaptations through weak study designs (Andrews, 2002). Moreover, many researchers paid attention to explaining the principles and implementation of UDL, rather than examining the effects of UDL to prepare educators to make adaptations for students. Only the study by Spooner et al. (2007) claimed that UDL increased the quantity of adaptations made by preservice general educators based on an experimental design, but again, these researchers did not examine the quality of the adaptations. Furthermore, Crowe et al. (2008) recommended designing activities that require students to use higher-order thinking skills and assess students' performance on these skills accordingly. The current study adopted a true-experimental

study design and specifically incorporated the modified Bloom's Taxonomy with UDL as a way to promote and assess participants using higher-order thinking skills to make adaptations. Results show that preservice general educators were capable of making adaptations with significantly better quality for all of the UDL principles after the intervention.

In contrast to the finding of the quality of adaptations, the analysis showed a different direction of effect with the quantity of the adaptations. Results from the posttest indicate that the experimental group made significantly fewer adaptations than the control group. Exploratory analysis further suggest such significant difference was particularly demonstrated when participants used the principles of Representation and Expression to make adaptations. For the principle of Engagement, the results also showed the same direction arithmetically. These findings are inconsistent with the findings in Spooner et al.'s study (2007), in which the UDL training increased the quantity of adaptations made by preservice general educators.

One possible explanation for the inconsistent findings is that the intervention content and the measurement tools used in the two studies were different. The focus of the intervention in Spooner et al.'s study (2007) was purely on UDL, while the intervention in the current study incorporated UDL with the concept from the modified Bloom's Taxonomy. The purpose of the additional component (the modified Bloom's Taxonomy) was to guide preservice general educators' use of higher-order thinking skills to purposefully design adaptations to address individual needs of students with mild academic disabilities. This concept was also reflected on the measurement tool as the

participants in the current study were asked to incorporate UDL with the modified Bloom's Taxonomy (higher-order thinking skills) to make adaptations to pre-designed lesson plans, while participants in Spooner et al.'s study (2007) were primarily asked to use UDL principles to make adaptations. Moreover, all of the participants in the current study received a mini-lecture about the operational definitions of the three UDL principles before randomly assigned to the control and experimental groups, and were provided with a list of adaptations during the posttest. Through examining the quality of adaptations, many of the participants in the control group proposed adaptations by simply listing and describing individual adaptations without further analysis, versus more participants in the experimental group who demonstrated synthesis by linking a set of adaptations. When the assessment responses are more complex, participants may need a longer time to answer because more thinking and processing time is required (Stobaugh, 2013). The experimental group may have made fewer adaptations than the control group as the assessment time was fixed at 20 minutes.

To answer the secondary research question, four individual interviews were conducted to examine whether the levels of thinking in the Bloom's Taxonomy that participants perceived themselves using aligned with the qualitative scoring rubric. A total of seven adaptations were investigated in the four individual interviews. Even though some participants indicated that they used more than one level of thinking to create an adaptation, results show that the highest level of thinking perceived by the participants for making each adaptation aligned with the level of thinking specified by the qualitative scoring rubric. When accomplishing a task, lower levels of thinking may

serve as a base for higher levels of thinking, which may have explained why some of the participants perceived themselves using more than one level of thinking when devising adaptations (King, Goodson, & Rohani, 1998). However, this should not be viewed as a conflict with the qualitative scoring rubric as its purpose is to identify the highest level of thinking that a participant uses when making an adaptation. Along with the acceptable interrater reliability (87.5% and above), the qualitative scoring rubric appears to yield reliable and valid scores for the quality of adaptations made by preservice general educators to predesigned lesson plans for students with mild academic disabilities.

## Limitations

There are a few limitations to this study. First, this study used a convenience sample of preservice general educators and had a small sample size. Moreover, the participants were primarily Caucasian women aged 18-24. Representativeness of the overall population is limited and generalization of the results needs to be made with caution. Additionally, this study focused on examining adaptations for students with mild academic disabilities; therefore, generalization to other disability types or levels of severity may not be supported.

A second limitation relates to the implementation of the UDL intervention across three consecutive instructional days, a limitation imposed by the course duration. As a result, the experimental group took the posttest one instructional day later than the control group. It is possible that the control group may have shared information regarding testing questions with the experimental group and allowed the experimental group to have more

advantage on testing performance. In the future, it would be better to have both groups take the tests at the same time.

Finally, this study shows initial support for the qualitative scoring rubric as a reliable and valid measurement tool to assess the quality of adaptations made by preservice general educators. However, only four individual interviews were conducted to examine the validity, with a total of seven adaptations investigated. To strengthen the validity, future studies should consider interviewing a larger sample to allow further investigation of potential problems on the measurement tool.

## Implications for Practice

This study has a few implications for practice. First, results indicate that the one-hour UDL intervention with an incorporation of the modified Bloom's Taxonomy was effective in increasing the quality of adaptations made by preservice general educators to predesigned lesson plans. This finding supports the idea that preservice general educators are capable of designing adaptations that can purposefully and meaningfully address individual needs of students with mild academic disabilities through adequate and appropriate training. Being able to consider varied needs and interests through adapting lesson plans before implementation may save educators extensive instructional time as opposed to making changes after the fact (Spooner et al., 2007). College level instructors should highly consider including the topic of UDL with an incorporation of the modified Bloom's Taxonomy into the curriculum in order to better prepare preservice general educator making quality adaptations for students with mild academic disabilities. Moreover, the finding from the current study also supports the use of the Bloom's

Taxonomy in promoting preservice general educators' use of higher-order thinking skills to design quality adaptations. This indicates the concept of the Bloom's Taxonomy can be applied to other areas where researchers are interested in quality improvement of a particular skill or increase in learners' use of higher-order thinking skills to apply their learned knowledge to novel situations and eventually become reflective practitioners (Wickersham, & Dooley, 2006). Finally, given the results from the interrater reliability and individual interviews, the qualitative scoring rubric appears to provide a reliable and valid score for the quality of adaptations made by preservice general educators. College level instructors may use the qualitative scoring rubric to assess whether the quality of adaptations is enhanced by training.

## Implications for Research

Several implications for research also emerged from this study. First, results from the posttest indicate that the experimental group made significantly fewer adaptations than the control group. In addition, the experimental group also made more adaptations that required higher-order thinking skills, which demonstrate more complexity in assessment responses and therefore may have required longer processing time. When learners demonstrate mastery of a specific skill, they can retrieve and apply their knowledge more efficiently to new situation (Bransford, Brown, & Cocking, 2000). According to King, Goodson, and Rohani (1998), development of higher-order thinking skills can be enhanced by learning strategies such as scaffolding and small group activities (e.g. cooperative learning). Future studies may incorporate learning strategies within the intervention and examine if the additional components will increase the

efficiency of preservice general educators' use of higher-order thinking skills to make adaptations, in terms of an increase in the quantity of adaptations.

Second, the current study identified an effective intervention to better prepare preservice general educators to make quality adaptations for students with mild academic disabilities. Even though results from a follow-up test indicate that the intervention effects endured one month after the intervention was terminated, future studies may conduct an additional follow-up after a longer interval to enhance the evidence of treatment duration. Furthermore, since adaptation is a critical factor of successful inclusion across students with mild to severe disabilities (Cross et al., 2004; Dingle, Falvey, Givner & Hagger, 2004; Hunt & Goetz, 1997; Manset & Semmel, 1997), researchers can examine if such intervention effects will be demonstrated when preservice general educators make adaptations for students with different disability types or with different severity level of a disability. Similarly, replication of such intervention can be implemented with inservice general educators who have difficulties addressing individual needs of students with disabilities through making adaptations.

Third, and perhaps the most important, positive effects have been found in increasing the quality of adaptations made by preservice general educators to predesigned lesson plans for students with mild academic disabilities. However, these effects did not address implementation of instruction or student outcomes. Future studies could directly examine whether the improved quality of adaptations through the UDL intervention leads to an increase in student achievement. If this relationship can be identified, it will greatly

support the necessity and urgency to include the UDL intervention within preservice teacher preparation programs and inservice teacher trainings.

## Conclusions

Adaptation is one of the determining factors whether students with disabilities can be successful in inclusive environments (Cross et al., 2004). Many general educators found themselves lacking of knowledge, skills, and confidence to make appropriate adaptation for students with disabilities (Dee, 2011; Kargin, Güldenoglu, & Sahin, 2010; Kavale, 2002; Munson, 1986-87; Norman, Caseau, & Stefanich, 1998; Schumm and Vaughn, 1995). The current study supports that preservice general educators were capable of making quality adaptations to address the needs of students with mild academic disabilities after the one-hour UDL intervention with an incorporation of the modified Bloom's Taxonomy. Acquisition of this skill will not only facilitate development of a lesson, but also can serve as a guideline for adjusting instruction based on student performance.

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# APPENDICES

Appendix A

**Lesson Plan (Practice)**

**Title:** No Choice!
**Subject:** Language Arts
**Grade Level(s):** 4

**Purpose:**

Students get a first-hand experience of not having a choice. They relate this experience to how the Pilgrims and other immigrants feel when they choose to come to the United States for democratic freedom.

**Objectives:**

*The learner will:*

- respond to the experience of losing freedom to choose.
- respond to the text and others' interpretation of the text.
- write in a journal from the point of view of a Mayflower passenger or a person who chose to stay in England.
- recognize that having freedom is important.
- recognize that human rights and freedom to choose are the foundation of the forming of democracy.

**Materials:**

- *Across the Wide Dark Sea: The Mayflower Journey* by Jean Van Leeuwen (see **Bibliographical References** )
- *How Many Days to America?* by Eve Bunting (see **Bibliographical References** )
- Journals and pencils

**Instructional Procedure(s):**

**Anticipatory Set:**

*At recess time, tell the students that today you will be telling them with whom they must play and what they must play. Assign students to specific parts of the playground, give them specific toys or activities and tell them with whom they must play.*

- When the students return from recess, ask them to talk about how it felt to be told where to play, what to play and with whom to play. Write some of

their key words on the board (not fair, didn't like it, wanted to do _____, you can't tell me what to do).

- Ask the students what they would think if the government started telling them where to live, where to go to school and where or how they may worship? Allow them to articulate their responses/feelings.

- Tell them that you are going to read two stories about families who wanted freedom from a government that told them where and how they should worship.

- Read *Across the Wide Dark Sea* (see **Bibliographical References** ). Talk about where the events of this book fit on a timeline. Talk about why the boy's family left their home to seek a new home in a strange new place. Lead the students to understand that they were taking a great risk, causing themselves much discomfort, and facing uncertainty. Does having freedom seem that important? Why?

- Read *How Many Days to America?* (see **Bibliographical References** ). Talk about why the family left their home to seek a new home in America. Talk about the risks and uncertainties they faced. What did they have when they came? What was the most important thing to the family about America? Discuss the **opportunity costs** of leaving their home. Talk about how this story could be today or any time or place as many families from many countries are coming to America to escape oppressive governments. Discuss the importance of respect and sensitivity (and tolerance) toward others.

- Talk about the people who chose to stay behind in their home countries in both books. What life did they face? Why did they stay?

- Talk about the similarities and differences between the two books. Pass out a blank Venn diagram. Have students write the names of the books at the top of the circles in the diagram. Tell them to write about these similarities and differences in the Venn diagram.

**Assessment:**

- Pair up the students. In each pair, one student takes the point of view of a person leaving home to come to America, while the other student takes the point of view of someone who decides to stay. Allow the students time to talk about who they are, where they live and why one of them has decided to come to America. Then, they write in their journals as if they are writing letters to each other, giving their perspective about their different situations.

- Assess their journals using the following 5-point scoring guide:

***5 points***
Journal entries clearly demonstrate an understanding of the lesson and use five or more adjectives and/or comments discussed in class.

***4 points***
Journal entries demonstrate an understanding of the lesson and use three or four adjectives and/or comments discussed in class.

***3 points***
Journal entries somewhat demonstrate an understanding of the lesson and use at least two adjectives and/or comments discussed in class.

***2 points***
Journal entries demonstrate a lack of understanding of the lesson but use at least one adjective and/or comment discussed in class.

***1 point***
Journal entry shows no understanding, but an attempt has been made to make a journal entry.

Appendix B

# Universal Design for Learning Training Session Posttest

## Demographic Information

**Age:** 18-24 25-29 30-40 40+

**Gender:** M F

**Ethnicity:** White Hispanic African American Native American Asian

**Have you heard of the term "Universal Design for Learning (UDL)"?**

Yes No

**If yes, where did you hear about UDL?**

in a college course | classroom teacher | internet | research article | book | Other

**Have you written a lesson plan before?**

Yes No

**Have you ever designed a lesson plan based on UDL?**

Yes No

Minnesota 8/99

# Adaptations

This list includes some of the adaptations that may available to this student through team recommendations based on individual student need. This list is not exhaustive and can be modified regularly by the IEP team. The adaptations to be provided will be stated in the Adaptations section of the IEP or attached to the IEP. The person(s) responsible should also be stated.

| **Instructional Adaptations:** | | **Materials Adaptations:** | |
|---|---|---|---|
| Small group instruction | | Materials +/or lectures on tape | |
| Guided to unguided instruction | | Highlighted, color coded materials | |
| Leave class for resource room assistance | | Large print materials | |
| Study buddy, peer partner, peer note-taker | | Braille materials | |
| Visual aids | | ESL materials | |
| Auditory aids | | Materials, books in alternative format | |
| Instructional aids | | Study buddy, peer partner, peer note-taker | |
| Extra time for oral response | | Manipulatives, study aids | |
| Extra time for written response | | Outline grid | |
| Dictate responses to person or tape | | Flow charts, arrays, webs, etc. | |
| Study carrel | | Copy of teacher notes | |
| Minimize visual distractions | | Study guides related to test content | |
| Minimize auditory distractions | | Two sets of books, materials | |
| Additional feedback | | Other: | |
| Assignment notebook | | | |
| Oral and printed instructions | | **Class Test Adaptations:** | |
| Shortened instructions; in segments | | Extra time for completion | |
| Number and sequence task steps | | Shortened tests | |
| Provide a model of end product | | Rearrange or segment tests | |
| Opportunity to verbalize instructions | | Highlighted or otherwise altered tests | |
| Opportunity to write instructions | | Alternate test | |
| Preferential seating | | Short answer tests | |
| Prompts for participation & transitions | | Multiple test sessions | |
| Repeated review, drill | | Tests read to the student | |
| Concrete, positive reinforcers | | Dictate responses to person or tape | |
| Other: | | Take home or open book tests | |
| | | Project or other activity | |
| **Grading Adaptations:** | | Use of manipulatives, other aids | |
| Adapt % of work for passing grade | | Recognition instead of essay response | |
| Partial grade based on individual efforts | | Minimize distractions; study carrel | |
| Frequent grading averaged in | | Opportunity to take tests in resource room | |

| | | | |
|---|---|---|---|
| Daily work weighted higher than tests | | Alternate grading | |
| Opportunity to rework for better grade | | Opportunity to retake until passing grade | |
| Grade on corrected work | | Other: | |
| Alternate grading, e.g., pass/fail | | | |
| Modify class participation expectations | | | |
| Others: | | | |
| **Assignment Adaptations:** | | **Assistive Technology and Other Services:** | |
| Extra time for completion | | Interpreter | |
| Reduced assignments using key concepts | | Augmentative Communication Device | |
| Modified assignments using key concepts | | Instruction in Braille, use of Braille | |
| Alternate assignment | | Books, materials on tape | |
| Project or other activity (e.g., not written) | | Word Processor | |
| Other format, such as on tape | | Note taker | |
| Other response, such as oral or taped | | Decoders for TV, film | |
| Study buddy, peer partner, peer note-taker | | Magnification | |
| Task analyze, sequence assignments | | Amplification | |
| Overview of long term assignments | | Large print materials | |
| Frequent checkpoints for long term work | | 1-1 paraprofessional support | |
| Reinforce appropriate work completion | | Training/technical assistance for student | |
| Alternate grading | | Training/technical assistance for family | |
| Other: | | Training/technical assistance for staff | |
| | | Job coach | |
| **Behavior Management:** | | Counseling | |
| Positive reinforcement | | Other: | |
| Modify expectations | | | |
| Code to identify inappropriate behavior | | **Transportations:** | |
| Pair with role model peer for group work | | Special bus/van | |
| Modified expectations | | Special route | |
| Amended consequences | | Special seating | |
| Preferential seating | | Seating harness | |
| Individualized behavior contract | | Car seat | |
| Check-in time(s) | | Lift | |
| Clearly defined limits | | Bus assistant | |
| Frequent reminders | | Behavior contract | |
| Frequent breaks | | Change in discipline policy | |
| Proximity control | | Other: | |
| Designated safe place for times of stress | | | |

| | | | |
|---|---|---|---|
| In-class time-out | | | |
| Private discussion about behavior | | | |
| Opportunity to be teacher assistant | | | |
| Supervised transitions | | | |
| Other: | | | |

For additional academic adaptation suggestions, refer to the "Testing Guidelines for Students with IEP or 504 Plans" materials, including the lists of possible accommodations and modifications.

**Lesson Plan**

**Title:** It looks like Philanthropy!

**Subject:** Language Arts
**Grade Level(s):** 4

**Purpose:**
This lesson will characterize how individuals in everyday life need trust. It will define philanthropy and explain how it works toward the common good within family, school, and neighborhood.

**Objectives:**

*The learner will*

- list three ways that common good occurs in the family, school, and neighborhood.
- illustrate common good within the family, school, and neighborhood.

**Materials:**

- Chart paper or a chalkboard
- Blindfolds (5)
- *Common Good for Everyone* (see **Attachment One**)
- background information about Oseola McCarty, a hardworking woman who donated her significant savings to a university http://learningtogive.org/papers/paper111.html or http://www.usm.edu/pr/oolamain.htm (click on first story under her picture)
- *Uncle Jed's Barbershop* by Margaree King Mitchell
- Word cards (philanthropy, trust, common good, family, school, neighborhood)

Handout 1

Common Good for Everyone

**Instructional Procedure(s):**
*Anticipatory Set:*

*Display this question: Is it possible to blindly trust other people to do what is right? Select five teams of two students. Explain that on each team there will be a follower and a leader. Each leader is to lead the follower around the room through an obstacle course*

*by giving clues and directions. The leader is not to touch the follower at any time. Allow 20 seconds each for this demonstration. Select five new teams. This time, the leader will take the follower by the hand through the obstacle course. Time: 20 seconds each. During the third demonstration, allow the five leaders to give clues, directions, and hold the hand of the followers for the entire 20 seconds.*

- Tell the students to reflect on their experiences by answering:
  - *What did you observe?*
  - *How did it feel to be led by instruction, touch, or clues and touch?*
  - *Would you change anything? Why or why not?*
  - *Did you need to* ***trust*** *the other member of your team in order to be successful?*
  - *Did it make a difference if your partner was a personal friend?*
  - *What would have happened if you did not work together?*

- Display the following words and any definitions on chart paper:
  - ***philanthropy*** (*giving of one's time, talent, or treasure for the sake of another or the common good*)
  - ***trust*** (*confidence or faith in a person or thing*)
  - ***common good*** (*the wealth shared by the whole group of people*)
  - rules
  - ***family*** (*a group of people connected by blood or marriage and sharing common ancestry*)
  - school
  - neighborhood

    The chart paper should be prominently displayed in the classroom for future reference. Solicit meanings of words that do not have definitions along with examples of each from students.

- Explain that ***family, school, and neighborhood*** represent various groups to which we belong. Ask how each group is related to trust, common good, rules, and philanthropy. Solicit examples of how each works interdependently by asking:
  - What do you do for members of your family, school, or neighborhood?
  - How does it help?
  - Do you think others would do the same thing for you?

    Explain that these are acts of philanthropy.

- Explain to the students that, as U.S. citizens, we all have the right to benefit and use resources from the common good, but also have responsibilities. We have the

responsibility to uphold constitutional rights. Ask students to name some of these. (Obey the law by allowing others to practice their religion, assemble peacefully, not deprive others of life, liberty or their property, or discriminate on the basis of race, etc.) We can also contribute to the common good through philanthropy.

- Read *Uncle Jed's Barbershop* to the students. What acts of philanthropy were observed?

- Read about Oseola McCarty (see Materials). Ask, "What act of philanthropy was she know for?" Donating $150,000 to a university. It is remarkable that this woman who earned so little was able to give so generously.

- Review the words trust and common good. Explain that in everyday life, people trust one another to do things that will make life better for them. Tell the class that when something is done to benefit the entire group, it is known as common good. Common good may occur within the family, school, as well as the neighborhood. Distribute Common Good for Everyone (see Attachment One). Tell the students that as they work independently, they should list some of the ways trust in others results in the common good for everyone.

**Assessment:**
The worksheet, Common Good for Everyone, will serve as the assessment for this lesson.

| **Rubric** | | | | |
|---|---|---|---|---|
| **0** | **1** | **2** | **3** | **4** |
| Gives one example for one or two categories | Gives one example for each category | Gives two examples for two categories | Gives two examples for each category | Gives three examples for each category |

**Handout 1**

**Common Good for Everyone**

Directions: Complete the chart by indicating ways that you can contribute to the common good within the groups that are listed.

| Family | School | Neighborhood |
|---|---|---|
| 1. | 1. | 1. |
| 2. | 2. | 2. |
| 3. | 3. | 3. |

This lesson plan is adapted from: http://learningtogive.org/

**Answer Sheet**

As classroom teacher, when including students with mild academic disabilities (LD or DCD), **what** adaptations would you make, **how** would you implement these adaptations, and **why** did you choose them through focusing three major principles (representation, expression, and engagement) of Universal Design for Learning.

**Please write your adaptation ideas by using the principle of Multiple Means of Representation. REPRESENTATION** refers to how you offer students a variety of ways to receive and interpret information.

**Please write your adaptation ideas by using the principle of Multiple Means of Expression. EXPRESSION** refers to how you provide students choices of action and expression to demonstrate how they learn and what they have learned.

**Please write your adaptation ideas by using the principle of Multiple Means of Engagement**. **ENGAGEMENT** refers to how you use different ways to motivate students and keep them engaged throughout the learning.

Appendix C

# Universal Design for Learning Training Session Follow-up Test

Minnesota 8/99

# Adaptations

This list includes some of the adaptations that may available to this student through team recommendations based on individual student need. This list is not exhaustive and can be modified regularly by the IEP team. The adaptations to be provided will be stated in the Adaptations section of the IEP or attached to the IEP. The person(s) responsible should also be stated.

| **Instructional Adaptations:** | | **Materials Adaptations:** | |
|---|---|---|---|
| Small group instruction | | Materials +/or lectures on tape | |
| Guided to unguided instruction | | Highlighted, color coded materials | |
| Leave class for resource room assistance | | Large print materials | |
| Study buddy, peer partner, peer note-taker | | Braille materials | |
| Visual aids | | ESL materials | |
| Auditory aids | | Materials, books in alternative format | |
| Instructional aids | | Study buddy, peer partner, peer note-taker | |
| Extra time for oral response | | Manipulatives, study aids | |
| Extra time for written response | | Outline grid | |
| Dictate responses to person or tape | | Flow charts, arrays, webs, etc. | |
| Study carrel | | Copy of teacher notes | |
| Minimize visual distractions | | Study guides related to test content | |
| Minimize auditory distractions | | Two sets of books, materials | |
| Additional feedback | | Other: | |
| Assignment notebook | | | |
| Oral and printed instructions | | **Class Test Adaptations:** | |
| Shortened instructions; in segments | | Extra time for completion | |
| Number and sequence task steps | | Shortened tests | |
| Provide a model of end product | | Rearrange or segment tests | |
| Opportunity to verbalize instructions | | Highlighted or otherwise altered tests | |
| Opportunity to write instructions | | Alternate test | |
| Preferential seating | | Short answer tests | |
| Prompts for participation & transitions | | Multiple test sessions | |
| Repeated review, drill | | Tests read to the student | |
| Concrete, positive reinforcers | | Dictate responses to person or tape | |
| Other: | | Take home or open book tests | |
| | | Project or other activity | |
| **Grading Adaptations:** | | Use of manipulatives, other aids | |
| Adapt % of work for passing grade | | Recognition instead of essay response | |
| Partial grade based on individual efforts | | Minimize distractions; study carrel | |
| Frequent grading averaged in | | Opportunity to take tests in resource room | |

| | | | |
|---|---|---|---|
| Daily work weighted higher than tests | | Alternate grading | |
| Opportunity to rework for better grade | | Opportunity to retake until passing grade | |
| Grade on corrected work | | Other: | |
| Alternate grading, e.g., pass/fail | | | |
| Modify class participation expectations | | | |
| Others: | | | |
| **Assignment Adaptations:** | | **Assistive Technology and Other Services:** | |
| Extra time for completion | | Interpreter | |
| Reduced assignments using key concepts | | Augmentative Communication Device | |
| Modified assignments using key concepts | | Instruction in Braille, use of Braille | |
| Alternate assignment | | Books, materials on tape | |
| Project or other activity (e.g., not written) | | Word Processor | |
| Other format, such as on tape | | Note taker | |
| Other response, such as oral or taped | | Decoders for TV, film | |
| Study buddy, peer partner, peer note-taker | | Magnification | |
| Task analyze, sequence assignments | | Amplification | |
| Overview of long term assignments | | Large print materials | |
| Frequent checkpoints for long term work | | 1-1 paraprofessional support | |
| Reinforce appropriate work completion | | Training/technical assistance for student | |
| Alternate grading | | Training/technical assistance for family | |
| Other: | | Training/technical assistance for staff | |
| | | Job coach | |
| **Behavior Management:** | | Counseling | |
| Positive reinforcement | | Other: | |
| Modify expectations | | | |
| Code to identify inappropriate behavior | | **Transportations:** | |
| Pair with role model peer for group work | | Special bus/van | |
| Modified expectations | | Special route | |
| Amended consequences | | Special seating | |
| Preferential seating | | Seating harness | |
| Individualized behavior contract | | Car seat | |
| Check-in time(s) | | Lift | |
| Clearly defined limits | | Bus assistant | |
| Frequent reminders | | Behavior contract | |
| Frequent breaks | | Change in discipline policy | |
| Proximity control | | Other: | |
| Designated safe place for times of stress | | | |

| | | | |
|---|---|---|---|
| In-class time-out | | | |
| Private discussion about behavior | | | |
| Opportunity to be teacher assistant | | | |
| Supervised transitions | | | |
| Other: | | | |

For additional academic adaptation suggestions, refer to the "Testing Guidelines for Students with IEP or 504 Plans" materials, including the lists of possible accommodations and modifications.

**Lesson Plan**

**Title:** Discovering the Facts

**Subject:** Language Arts
**Grade Level(s):** 4

**Purpose:**

The students experience and reflect on a literature book written from the view point of a reformed bully, *Confessions of a Former Bully*. They analyze the data collected from their survey to determine how bullying affects their school. The students learn that addressing bullying in their school community is an act for the common good - philanthropy. They form groups and develop skits that illustrate "tools" for dealing with bullies.

**Objectives:**

*The learner will:*

- define and use vocabulary - common good, philanthropy, service
- organize and analyze data from a survey
- listen and respond to a literature book
- work in groups to create skits illustrating "tools" to cope with bullying

**Materials:**

- Journals and pencils *Confessions of a Former Bully* by Trudy Ludwig
- Teacher created Survey Tally Form

**Instructional Procedure(s):**

**Anticipatory Set:**

*Remind the students of the fictional character, Kate, who was the bully in the second story they heard and discussed in the last lesson. Say: The author of My Secret Bully, Trudy Ludwig, wrote the story from the point of view of Monica who was being bullied. In another book, author Trudy Ludwig writes about bullying, but this time from the point of view of Kate, the bully. The book is called "Confessions of a Former Bully."*

- Show the book cover and tell the students that during this lesson you will be reading excerpts from the book. Read sections of the book aloud to the class: the introduction entitled *A Note from Katie* and *My Very Important Book About Bullying,* the first section *Here's What I Didn't Know about Bullying* (9 pages, stopping just after the quote from Mother Teresa). Discuss and reflect as appropriate during the reading.
- Say: There were some interesting facts about bullying in elementary schools in the book. Let's see what facts we can learn about bullying in our school from the surveys you collected.
- Organize the class into groups of 3 or 4 students. Give each group a set of completed surveys and one tally sheet. Assign the groups to work cooperatively to tally the responses using the teacher created tally sheet. The teacher may want to structure how the groups tally their set of surveys or you may want to leave it to each group to decide on their own strategy.
- When the groups are finished, ask the groups to report their findings and place the results on the master tally form. Ask the students to draw conclusions about bullying in their school from the information on the master tally form. As appropriate for the class, have students learn and/or use math skills to determine ratios, percentages and to create graphs using the information.
- Once the students have analyzed the data, ask:
    - How is our school affected by bullying?
    - Is this good for our school?
    - Do you think we should and could do anything about it? Why?
- Explain to the students that when they act in a way that makes things better for all the students in their school they are providing a service to their school and acting as philanthropists, people who give their time, talent or treasure and take action for the common good. Share with them that there are some strategies they can learn and teach others about how to deal with bullies for the good of all in the school and the greater community. By doing the survey and teaching students how to deal with bullies, they are doing something for the common good. They are helping students feel safe and helping to create a bully-free zone at school.
- Tell the students that in the book, Kate has some advice about how to handle a someone who is acting as a bully. Begin reading again with the section *Introducing ... Mrs. Petrowski's Totally Awesome Empower Tools (page 19-30)* discussing as appropriate. After reading, list and review the anti-bully "tools" Kate gave in the book for coping with bullies (Say Stop; Why? Why? Why?; Walk Away; So, Whatever, Huh, Who Cares; Change the Subject; Act Silly or Goofy; Turn an Insult Into a Complement; Agree; Get Away Fast; Print a Cyber Message and Show an Adult; Report to Get Kids Out of Trouble). Ask the students if they have additional ideas for "tools" that a victim or bystander might use when seeing someone else being bullied.
- Ask the students to think about which "tool" they might want to act out as a skit. Allow the students to self-select into skit groups. Instruct the group that their skit should take no

longer than 3 minutes to present an example of their "tool." Each group should designate a narrator. All members of the group should help in formulating one or two sentences for the narrator to read to introduce the "tool" and after the skit to explain its effect on the bully. Allow time for the groups to write the narration, develop and practice their skits.

**Assessment:**

Assess the student discussion participation and ability to work collaboratively with the small groups to organize the data and plan the skit.

This lesson plan is adapted from: http://learningtogive.org/

**Answer Sheet**

As classroom teacher, when including students with mild academic disabilities (LD or DCD), **what** adaptations would you make, **how** would you implement these adaptations, and **why** did you choose them through focusing three major principles (representation, expression, and engagement) of Universal Design for Learning.

**Please write your adaptation ideas by using the principle of Multiple Means of Representation. REPRESENTATION** refers to how you offer students a variety of ways to receive and interpret information.

**Please write your adaptation ideas by using the principle of Multiple Means of Expression. EXPRESSION** refers to how you provide students choices of action and expression to demonstrate how they learn and what they have learned.

**Please write your adaptation ideas by using the principle of Multiple Means of Engagement**. **ENGAGEMENT** refers to how you use different ways to motivate students and keep them engaged throughout the learning.

Appendix D

## Interview Probe

**Main questions:**

1. On the question sheet, one of your answers is "…" Did you remember how you came up with the answer? (recall probe) (repeat this question for each adaptation that were scored as being developed by using higher levels of thinking)
2. (Presenting a set of Bloom's Taxonomy index cards to subjects.) There are a few different kinds of thinking. You have mentioned that you come up with the adaptation because of "… (considering learning needs, describing procedures, or combining adaptations) ". I think being able to consider xxxx tells me that you are using this kind of thinking to come up with adaptations. There are also two other different kinds of thinking. Would you please take a look of these index cards and then tell me if you agree that you're using this kind of thinking to come up with adaptations rather than the other two kinds? Why do you agree or disagree? (specific probe)

**Optional questions:**

1. You have mentioned the term "xxxx." Could you explain more about what you mean? (comprehension/Interpretation probe)

Appendix E

**Total Quantitative Score (Posttest)**

| **Control** | | | **Experimental** | | |
|---|---|---|---|---|---|
| Subject | Rating | Rank | Subject | Rating | Rank |
| 3 | 3 | 1.5 | 30 | 3 | 1.5 |
| 2 | 4 | 4.5 | 17 | 4 | 4.5 |
| 29 | 5 | 9.5 | 35 | 4 | 4.5 |
| 20 | 6 | 15 | 36 | 4 | 4.5 |
| 15 | 7 | 19 | 13 | 5 | 9.5 |
| 19 | 7 | 19 | 16 | 5 | 9.5 |
| 33 | 7 | 19 | 24 | 5 | 9.5 |
| 8 | 8 | 23 | 27 | 5 | 9.5 |
| 22 | 8 | 23 | 37 | 5 | 9.5 |
| 21 | 9 | 26.5 | 12 | 6 | 15 |
| 7 | 10 | 29 | 25 | 6 | 15 |
| 9 | 10 | 29 | 31 | 6 | 15 |
| 1 | 13 | 34.5 | 38 | 6 | 15 |
| 32 | 13 | 34.5 | 4 | 8 | 23 |
| 34 | 13 | 34.5 | 11 | 8 | 23 |
| 26 | 15 | 38 | 39 | 8 | 23 |
| 28 | 15 | 38 | 5 | 9 | 26.5 |
| 14 | 16 | 40 | 10 | 10 | 29 |
| 6 | 19 | 41 | 18 | 12 | 31.5 |
| | | | 40 | 12 | 31.5 |
| | | | 41 | 13 | 34.5 |
| | | | 23 | 15 | 38 |
| Sum of Ranks | | 478.5 | Sum of Ranks | | 382.5 |

Appendix F

**Total Quantitative Score (Follow-up Test)**

| **Control** | | | **Experimental** | | |
|---|---|---|---|---|---|
| Subject | Rating | Rank | Subject | Rating | Rank |
| 2 | 2 | 1 | 25 | 3 | 3.5 |
| 3 | 3 | 3.5 | 37 | 3 | 3.5 |
| 8 | 3 | 3.5 | 17 | 4 | 6.5 |
| 29 | 5 | 10 | 36 | 4 | 6.5 |
| 33 | 6 | 14.5 | 12 | 5 | 10 |
| 20 | 7 | 17.5 | 27 | 5 | 10 |
| 21 | 8 | 21.5 | 30 | 5 | 10 |
| 26 | 8 | 21.5 | 35 | 5 | 10 |
| 6 | 9 | 26 | 10 | 6 | 14.5 |
| 9 | 9 | 26 | 31 | 6 | 14.5 |
| 14 | 9 | 26 | 38 | 6 | 14.5 |
| 32 | 10 | 28.5 | 24 | 7 | 17.5 |
| 7 | 11 | 32 | 5 | 8 | 21.5 |
| 19 | 11 | 32 | 16 | 8 | 21.5 |
| 28 | 11 | 32 | 39 | 8 | 21.5 |
| 15 | 12 | 35 | 40 | 8 | 21.5 |
| 22 | 13 | 36.5 | 11 | 10 | 28.5 |
| 34 | 13 | 36.5 | 18 | 11 | 32 |
| 1 | 16 | 39.5 | 41 | 11 | 32 |
| | | | 13 | 14 | 38 |
| | | | 4 | 16 | 39.5 |
| | | | 23 | 18 | 41 |
| Sum of Ranks | | 443 | Sum of Ranks | | 418 |

Appendix G

**Sub Quantitative Score (Posttest-Representation)**

| **Control** | | | **Experimental** | | |
|---|---|---|---|---|---|
| Subject | Rating | Rank | Subject | Rating | Rank |
| 2 | 1 | 6.5 | 4 | 1 | 6.5 |
| 3 | 1 | 6.5 | 13 | 1 | 6.5 |
| 19 | 1 | 6.5 | 16 | 1 | 6.5 |
| 29 | 1 | 6.5 | 25 | 1 | 6.5 |
| 8 | 2 | 18 | 27 | 1 | 6.5 |
| 15 | 2 | 18 | 30 | 1 | 6.5 |
| 20 | 2 | 18 | 35 | 1 | 6.5 |
| 32 | 2 | 18 | 36 | 1 | 6.5 |
| 7 | 3 | 26.5 | 11 | 2 | 18 |
| 22 | 3 | 26.5 | 12 | 2 | 18 |
| 34 | 3 | 26.5 | 17 | 2 | 18 |
| 14 | 4 | 31 | 24 | 2 | 18 |
| 21 | 4 | 31 | 31 | 2 | 18 |
| 1 | 5 | 34.5 | 37 | 2 | 18 |
| 9 | 5 | 34.5 | 38 | 2 | 18 |
| 33 | 5 | 34.5 | 5 | 3 | 26.5 |
| 26 | 6 | 37.5 | 10 | 3 | 26.5 |
| 6 | 8 | 40.5 | 39 | 3 | 26.5 |
| 28 | 8 | 40.5 | 18 | 4 | 31 |
| | | | 40 | 5 | 34.5 |
| | | | 41 | 6 | 37.5 |
| | | | 23 | 7 | 39 |
| Sum of Ranks | | 461.5 | Sum of Ranks | | 399.5 |

**Sub Quantitative Score (Posttest-Expression)**

| Control | | | Experimental | | |
|---|---|---|---|---|---|
| Subject | Rating | Rank | Subject | Rating | Rank |
| 3 | 1 | 3.5 | 17 | 1 | 3.5 |
| 2 | 2 | 12 | 24 | 1 | 3.5 |
| 33 | 2 | 12 | 30 | 1 | 3.5 |
| 6 | 3 | 24 | 35 | 1 | 3.5 |
| 8 | 3 | 24 | 37 | 1 | 3.5 |
| 9 | 3 | 24 | 4 | 2 | 12 |
| 15 | 3 | 24 | 10 | 2 | 12 |
| 19 | 3 | 24 | 11 | 2 | 12 |
| 20 | 3 | 24 | 12 | 2 | 12 |
| 21 | 3 | 24 | 13 | 2 | 12 |
| 22 | 3 | 24 | 16 | 2 | 12 |
| 29 | 3 | 24 | 25 | 2 | 12 |
| 7 | 4 | 33 | 27 | 2 | 12 |
| 26 | 4 | 33 | 36 | 2 | 12 |
| 28 | 4 | 33 | 23 | 3 | 24 |
| 1 | 5 | 37 | 31 | 3 | 24 |
| 32 | 5 | 37 | 38 | 3 | 24 |
| 14 | 6 | 40 | 39 | 3 | 24 |
| 34 | 6 | 40 | 5 | 4 | 33 |
| | | | 41 | 4 | 33 |
| | | | 40 | 5 | 37 |
| | | | 18 | 6 | 40 |
| Sum of Ranks | | 496.5 | Sum of Ranks | | 364.5 |

**Sub Quantitative Score (Posttest-Engagement)**

| Control | | | Experimental | | |
|---|---|---|---|---|---|
| Subject | Rating | Rank | Subject | Rating | Rank |
| 33 | 0 | 1 | 17 | 1 | 6 |
| 2 | 1 | 6 | 30 | 1 | 6 |
| 3 | 1 | 6 | 31 | 1 | 6 |
| 20 | 1 | 6 | 36 | 1 | 6 |
| 29 | 1 | 6 | 38 | 1 | 6 |
| 9 | 2 | 18 | 5 | 2 | 18 |
| 15 | 2 | 18 | 12 | 2 | 18 |
| 21 | 2 | 18 | 13 | 2 | 18 |
| 22 | 2 | 18 | 16 | 2 | 18 |
| 1 | 3 | 29 | 18 | 2 | 18 |
| 7 | 3 | 29 | 24 | 2 | 18 |
| 8 | 3 | 29 | 27 | 2 | 18 |
| 19 | 3 | 29 | 35 | 2 | 18 |
| 28 | 3 | 29 | 37 | 2 | 18 |
| 34 | 4 | 33.5 | 39 | 2 | 18 |
| 26 | 5 | 36.5 | 40 | 2 | 18 |
| 14 | 6 | 39.5 | 25 | 3 | 29 |
| 32 | 6 | 39.5 | 41 | 3 | 29 |
| 6 | 8 | 41 | 11 | 4 | 33.5 |
| | | | 4 | 5 | 36.5 |
| | | | 10 | 5 | 36.5 |
| | | | 23 | 5 | 36.5 |
| Sum of Ranks | | 432 | Sum of Ranks | | 429 |

Appendix H

**Total Qualitative Score (Posttest)**

| **Control** | | | **Experimental** | | |
|---|---|---|---|---|---|
| Subject | Rating | Rank | Subject | Rating | Rank |
| 1 | 2 | 4 | 11 | 2 | 4 |
| 14 | 2 | 4 | 23 | 2 | 4 |
| 21 | 2 | 4 | 13 | 4 | 19.5 |
| 28 | 2 | 4 | 16 | 4 | 19.5 |
| 34 | 2 | 4 | 17 | 4 | 19.5 |
| 26 | 3 | 8 | 18 | 4 | 19.5 |
| 2 | 4 | 19.5 | 25 | 4 | 19.5 |
| 3 | 4 | 19.5 | 27 | 4 | 19.5 |
| 6 | 4 | 19.5 | 30 | 4 | 19.5 |
| 7 | 4 | 19.5 | 35 | 4 | 19.5 |
| 8 | 4 | 19.5 | 36 | 4 | 19.5 |
| 9 | 4 | 19.5 | 40 | 4 | 19.5 |
| 19 | 4 | 19.5 | 41 | 4 | 19.5 |
| 20 | 4 | 19.5 | 12 | 4.5 | 31 |
| 29 | 4 | 19.5 | 4 | 5 | 36 |
| 32 | 4 | 19.5 | 5 | 5 | 36 |
| 33 | 4 | 19.5 | 10 | 5 | 36 |
| 15 | 5 | 36 | 31 | 5 | 36 |
| 22 | 5 | 36 | 37 | 5 | 36 |
| | | | 38 | 5 | 36 |
| | | | 39 | 5 | 36 |
| | | | 24 | 6 | 41 |
| Sum of Ranks | | 314.5 | Sum of Ranks | | 546.5 |

Appendix I

**Total Qualitative Score (Follow-up Test)**

| **Control** | | | **Experimental** | | |
|---|---|---|---|---|---|
| Subject | Rating | Rank | Subject | Rating | Rank |
| 2 | 0 | 1 | 4 | 4 | 16 |
| 1 | 2 | 2.5 | 11 | 4 | 16 |
| 22 | 2 | 2.5 | 12 | 4 | 16 |
| 3 | 4 | 16 | 13 | 4 | 16 |
| 6 | 4 | 16 | 16 | 4 | 16 |
| 7 | 4 | 16 | 17 | 4 | 16 |
| 8 | 4 | 16 | 18 | 4 | 16 |
| 9 | 4 | 16 | 24 | 4 | 16 |
| 19 | 4 | 16 | 25 | 4 | 16 |
| 26 | 4 | 16 | 35 | 4 | 16 |
| 28 | 4 | 16 | 36 | 4 | 16 |
| 29 | 4 | 16 | 37 | 4 | 16 |
| 32 | 4 | 16 | 39 | 4 | 16 |
| 34 | 4 | 16 | 40 | 4 | 16 |
| 14 | 5 | 36 | 10 | 4.5 | 29.5 |
| 15 | 5 | 36 | 23 | 4.5 | 29.5 |
| 20 | 5 | 36 | 5 | 5 | 36 |
| 21 | 5 | 36 | 27 | 5 | 36 |
| 33 | 5 | 36 | 30 | 5 | 36 |
| | | | 31 | 5 | 36 |
| | | | 38 | 5 | 36 |
| | | | 41 | 5 | 36 |
| Sum of Ranks | | 362 | Sum of Ranks | | 499 |

Appendix J

**Sub Qualitative Score (Posttest-Representation)**

| **Control** | | | **Experimental** | | |
|---|---|---|---|---|---|
| Subject | Rating | Rank | Subject | Rating | Rank |
| 2 | 1 | 2 | 30 | 1 | 2 |
| 14 | 1 | 2 | 11 | 2.5 | 8 |
| 1 | 2 | 5.5 | 23 | 3.5 | 12 |
| 19 | 2 | 5.5 | 4 | 4 | 21 |
| 21 | 2 | 5.5 | 12 | 4 | 21 |
| 34 | 2 | 5.5 | 13 | 4 | 21 |
| 8 | 3 | 10 | 16 | 4 | 21 |
| 26 | 3 | 10 | 18 | 4 | 21 |
| 28 | 3 | 10 | 25 | 4 | 21 |
| 3 | 4 | 21 | 27 | 4 | 21 |
| 6 | 4 | 21 | 35 | 4 | 21 |
| 7 | 4 | 21 | 36 | 4 | 21 |
| 9 | 4 | 21 | 41 | 4 | 21 |
| 20 | 4 | 21 | 40 | 4.5 | 30 |
| 29 | 4 | 21 | 5 | 5 | 35 |
| 32 | 4 | 21 | 10 | 5 | 35 |
| 15 | 5 | 35 | 17 | 5 | 35 |
| 22 | 5 | 35 | 31 | 5 | 35 |
| 33 | 5 | 35 | 38 | 5 | 35 |
| | | | 39 | 5 | 35 |
| | | | 24 | 6 | 40.5 |
| | | | 37 | 6 | 40.5 |
| Sum of Ranks | | 308 | Sum of Ranks | | 553 |

**Sub Qualitative Score (Posttest-Expression)**

| Control | | | Experimental | | |
|---|---|---|---|---|---|
| Subject | Rating | Rank | Subject | Rating | Rank |
| 20 | 2 | 2 | 13 | 2.5 | 4 |
| 21 | 2 | 2 | 11 | 3.5 | 7 |
| 34 | 2 | 2 | 16 | 4 | 19 |
| 26 | 3 | 5.5 | 17 | 4 | 19 |
| 28 | 3 | 5.5 | 18 | 4 | 19 |
| 1 | 4 | 19 | 23 | 4 | 19 |
| 2 | 4 | 19 | 24 | 4 | 19 |
| 3 | 4 | 19 | 25 | 4 | 19 |
| 6 | 4 | 19 | 27 | 4 | 19 |
| 7 | 4 | 19 | 35 | 4 | 19 |
| 8 | 4 | 19 | 37 | 4 | 19 |
| 9 | 4 | 19 | 40 | 4 | 19 |
| 14 | 4 | 19 | 30 | 4 | 19 |
| 19 | 4 | 19 | 4 | 5 | 34 |
| 22 | 4 | 19 | 10 | 5 | 34 |
| 32 | 4 | 19 | 38 | 5 | 34 |
| 33 | 4 | 19 | 39 | 5 | 34 |
| 15 | 5 | 34 | 41 | 5 | 34 |
| 29 | 5 | 34 | 5 | 6 | 39.5 |
| | | | 12 | 6 | 39.5 |
| | | | 31 | 6 | 39.5 |
| | | | 36 | 6 | 39.5 |
| Sum of Ranks | | 313 | Sum of Ranks | | 548 |

**Sub Qualitative Score (Posttest-Engagement)**

| Control | | | Experimental | | |
|---|---|---|---|---|---|
| Subject | Rating | Rank | Subject | Rating | Rank |
| 33 | 0 | 1 | 11 | 2 | 4 |
| 1 | 2 | 4 | 23 | 2 | 4 |
| 14 | 2 | 4 | 5 | 4 | 20 |
| 28 | 2 | 4 | 13 | 4 | 20 |
| 8 | 3 | 8 | 17 | 4 | 20 |
| 21 | 3 | 8 | 18 | 4 | 20 |
| 26 | 3 | 8 | 27 | 4 | 20 |
| 2 | 4 | 20 | 30 | 4 | 20 |
| 3 | 4 | 20 | 31 | 4 | 20 |
| 6 | 4 | 20 | 36 | 4 | 20 |
| 7 | 4 | 20 | 38 | 4 | 20 |
| 9 | 4 | 20 | 39 | 4 | 20 |
| 19 | 4 | 20 | 40 | 4 | 20 |
| 20 | 4 | 20 | 41 | 4 | 20 |
| 29 | 4 | 20 | 4 | 5 | 35 |
| 34 | 4 | 20 | 10 | 5 | 35 |
| 15 | 5 | 35 | 12 | 5 | 35 |
| 22 | 5 | 35 | 16 | 5 | 35 |
| 32 | 5 | 35 | 35 | 5 | 35 |
| | | | 37 | 5 | 35 |
| | | | 24 | 6 | 40.5 |
| | | | 25 | 6 | 40.5 |
| Sum of Ranks | | 322 | Sum of Ranks | | 539 |