

Modeling as Teaching:
Preparing Preservice Teachers to Implement Universal Design for Learning

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The act of writing a dissertation is an act of selflessness. Not on the part of the one whose name is on it; for me, the dissertation means recognition, advancement, and hopefully career fulfillment. The selflessness is in those who are hidden from view, those whose contribution was in the form of encouragement, support, editing, teaching. Behind my name are those like my committee members. Dr. Karee Dunn, I am so thankful for your insights into the theoretical context for this study and being willing to bounce ideas during the fundamental stages. Dr. Yujeong Park, your persistent encouragement and keen intelligence helped me sustain when the challenges mounted. Dr. David Cihak, captain, you brought me in and saw me through, I could never have done it without you. Dr. Sherry Bell, if I could have searched the world for a dissertation advisor, I would never have found any superior to you. Your tremendous efforts in providing me feedback and support from start to finish were immensely helpful, and I am forever grateful.

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Abstract

Increasing diversity and growing achievement gaps among diverse groups in U.S. public schools has resulted in increased pressure on teacher education programs to prepare teachers effectively to meet the needs of contemporary students. Research is needed to establish best practices of teacher education that carry forward into future practice. Universal Design for Learning (UDL) has been proposed as a framework to help address the need for more flexible learning environments, but limited research has been conducted to determine best practices for supporting preservice teachers in learning this complex framework. In this dissertation study, I examine the notion that education research develops in ecological context before presenting a case for the current period of education research being one of “innovation.”

After recognizing the barriers to researching UDL and faculty modeling, solutions are presented and tested through the study. In the study, itself, I present the results of a group, time series design in which participants were exposed to an intervention in which UDL is explicitly modeled in contrast to a control condition which focused on traditional methods of lecture and textbook reading. Effect on efficacy in practicing UDL and attitudes toward inclusion are reported. A two-way repeated measures ANOVA suggested no statistically significant difference ($p > .05$) in preservice teacher attitudes toward inclusion as assessed by the Multidimensional Attitudes toward Inclusion Scale (Mahat, 2008). Likewise, a two-way repeated measures ANOVA suggested no statistically significant difference ($p > .05$) in preservice teacher sense efficacy in practicing Universal Design for Learning, as assessed by an adapted version of the Teacher Sense of Efficacy Scale (Tschannen-Moran & Hoy, 2001). Discussion, implications, and calls for further research follow.

Table of Contents

Chapter 1 Introduction and General Information	1
Chapter 2 Review of the Literature	19
Chapter 3 Method	65
Chapter 4 Results.....	88
Chapter 5 Discussion, Conclusion, and Recommendations	96
References.....	111
Appendices.....	140
Appendix A Tables and Figures	147
Appendix B: UDL Brief Lesson Design Template and Sample	163
Appendix C: Treatment and Control Implementation Form and Checklists.....	172
Appendix D: Instruments.....	178
Vita	183

List of Tables

Table 1. <i>Reauthorizations of Public Law 94-142</i>	147
Table 2. <i>Key Reauthorizations of the Elementary and Secondary Schools Act(1965).</i> .	148
Table 3. <i>Principles of Universal Design.</i>	149
Table 4. <i>Principles Associated with Universal Design Models</i>	150
Table 5. <i>Dependent Variables and Respective Measures.</i>	151
Table 6. <i>Overview of Content Taught by Group and Condition.</i>	151
Table 7. <i>Comparison of Activities/Aspects in Treatment and Control Conditions.</i> . . .	152
Table 8. <i>Correlation Matrix: Multidimensional Attitudes Toward Inclusion Scale and Teacher Sense of Efficacy in Universal Design for Learning Scale - Parsed by Time.</i> .	153
Table 9. <i>Descriptive Statistics by Group and Time (Teacher Sense of Efficacy in Universal Design for Learning Scale).</i>	155
Table 10. <i>Descriptive Statistics by Group and Time (Multidimensional Attitudes Toward Inclusion Scale).</i>	156

List of Figures

- Figure 1.* A model showing process from macrosystematic context to education research intended to address these perceived deficiencies.157
- Figure 2.* A model showing process from new education research disseminated through teacher education and professional development with intent to improve student and societal outcomes. 158
- Figure 3.* A representation of the focus of access-based research across time from the 1960s to contemporary lines of research. 159
- Figure 4.* Simplified model of teacher behavioral intention adapted from “The Theory of Planned Behavior,” by Ajzen, 1991. *Organizational Behavior and Human Decision Processes*, 50(2), p. 181. 159
- Figure 5.* Adapted from The “Universal Design for Learning Guidelines version 2.0” by the Center for Applied Special Technology (CAST), 2014.160
- Figure 6.* A quasi-experimental, repeated measures time series design whereby two groups are measured three times, and each experience the control condition or treatment condition once.161
- Figure 7.* Operationalizing UDL as a “Territory,” definition adapted from Meyer, Rose and Gordon (2014) and Edyburn (2010); boundary items adapted from “Would You Recognize Universal Design for Learning If You Saw It? Ten Propositions for New Directions for the Second Decade of UDL” by Edyburn, D. L., 2010. *Learning Disability Quarterly*, 33(1), 33–41. 162

Chapter 1

Introduction and General Information

Background

Quality education is a critical foundation of any democratic society, including that of the United States. It is appropriate and unsurprising, then, that education is a domain that receives intense scrutiny in the U.S. from the spheres of politics, media, and research. Indeed, the relation between the broader social and societal context in which education occurs and the practice of education is a close and bilateral bond. This relation reflects the concepts defined by Bronfenbrenner's (1979) Ecological Systems Theory. Though Bronfenbrenner focused on application of his theory to development of individuals in context, I posit that his theory may also be applied to communities, groups, and fields of study. Accordingly, the field of education and the practice of teacher education have not emerged in isolation, but in an ecological context.

For example, education theorists and practitioners interact mesosystematically with schools of psychology, sociology, anthropology, philosophy, and other fields. Likewise, practitioners and researchers in education are influenced by systems such as those occupied by political authorities that are as distinct from education researchers as such researchers are from them, even as we continue to influence one another indirectly as exosystematic relations. Still broader powerful and dynamic macrosystematic social forces and cultural identities give drive to our politics, our education, and all else that defines our civilization.

Interactions among these different contexts is complex, and some (e.g., Neal & Neal, 2013) argue is better described in terms of networks rather than the classic “nested” model that Bronfenbrenner suggested. To this discussion, I add that contextual factors (e.g., major economic and social events) not only affect classroom teaching and learning directly, but also indirectly by way of affecting the agenda for education research and teacher preparation; this effect is linear and bilateral (Figures 1 and 2 Appendix A).

The logic that gives rise to the phenomena modeled in Figures 1 and 2 is quite simply that of an associative property: if good teacher preparation programs develop good teachers (Darling-Hammond, 2000), good teachers develop good students (Hanushek, 2002), and good students develop strong society (Jamison, Jamison, & Hanushek, 2006), then good teacher preparation programs indirectly have the immense—if indirect—responsibility of strengthening societies as a whole. With this understanding, educational research is the overarching means by which each level of the explicit education system (teacher preparation, K-12 teaching, K-12 student learning) is improved as research-based practices are taught via teacher preparation and/or through professional development to in-service teachers. In this sense, attempting to rectify social problems and challenges by way of education and the professionals therein makes great sense. In recognition of this bilateral process, teacher preparation and the research that guides it gain substantial importance and relevance in our societies. Recognition of this model of contextual drivers is also salient for articulating relevance of education research in the context of macrosystematic ecological factors.

Therefore, though this dissertation study is focused on one level in the education system (teacher preparation), in it I nevertheless seek to contribute toward addressing broader issues in contemporary education, particularly the need to prepare our relatively homogenous teacher force to better meet the needs of an increasingly diverse K-12 school population (Darling-Hammond, 2005; Horne & Timmons, 2009; Jung, 2007; Sosu, Mtika, & Colucci-Gray, 2010).

Increasing diversity. Since the mid-20th century, there has been a gradual, but persistent, growth in diversity in U.S. K-12 classrooms, including increasing inclusion for students with disabilities; however, this access has not necessarily translated into access to learning (Jiménez, Graf, & Rose, 2007; McGuire-Schwartz & Arndt, 2007; Rioux & Pinto, 2010; Rose, 2000). Following the U.S. Supreme Court decision, *Brown vs. the Board of Education* (1954), five decades worth of education research has continued to show persistent achievement gaps for diverse students, including those from racially, economically, or linguistically diverse homes and those with disabilities; this achievement gap grows progressively by year in school (Darensbourg & Blake, 2013; Edyburn, 2010). In other words, it has become resoundingly clear that physical access to the classroom is not enough to ensure fair and equal access to learning for diverse populations, but it has become clear that providing access to materials in isolation is also a shortcoming (see Figure 3). For example, students learning to read who are given the opportunity to routinely access texts via text to speech technology may have access to the content of the reading, but this access may hinder their learning to be text readers. The

time has come for education researchers to find solutions that go beyond paying lip service to inclusion and to find genuine solutions that enable all children and youth to access to their fundamental right to *learn* (Rioux & Pinto, 2010).

Policy response. Litigation (e.g., *Brown v. the Board of Education*, 1954) and legislation (e.g., the Civil Rights Act of 1964, P.L. 88-352) in the 1950s and 60s pushed the agenda for the inclusion of individuals of diverse races, linguistic experience, cultures, and (dis)abilities. The Civil Rights Act (1964), for example, sought to protect United States citizens from discrimination based on race, color, religion, sex, or national origin; it intended to “protect constitutional rights in public facilities and public education” and further “prevent discrimination in federally assisted programs” (p. 241). Nearly a decade later, the Civil Rights Act was extended to also apply to individuals with disabilities in Section 504 of the Rehabilitation Act (1973; P.L. 93-112), and this was shortly followed by the passage of the Education for All Handicapped Children Act (P.L. 94-142) in 1975. With the advent of this latter, “for the first time children and youth with disabilities [were] afforded the right to a free and appropriate public education, individualized programming, parental participation in the decision making process, nondiscriminatory identification and evaluation, and instruction in the least restrictive environment, while ensuring families due process rights and responsibilities” (Jiménez et al., 2007, p. 41).

These early legislative keystones have had tremendous influence on U.S. public schools and society, and provided opportunity for inclusion to populations that had

previously been disbarred.

However, in education practice, these mandates may have enabled physical access to the public-school classroom for diverse individuals, but social and academic access are far more complex and demanding of education systems and environments than physical access. Systematic discrimination (intentionally or not) continued and continues to be an issue facing U.S. public schools for both teachers and students (e.g., Abramo, 2012; Adair, 2015; Bellmore, Nishina, You, & Ma, 2012; Brown & Chu, 2012; Ogbu, 1994; Smith, 2014). The effect of this systematic discrimination is apparent in the aforementioned achievement gap for diverse populations (Edyburn, 2010) as well as high school dropout rates that are disproportionally high for students in at-risk groups (Murnane, 2013).

In recognition of the persistence of these continued inequities through the decades since the passage of initial anti-discrimination laws, several additional legal interventions have unfurled. Jiménez and others (2007) propose two related legislative lines: that which, beginning with P.L. 94-142 in 1975 focused on inclusion and anti-discrimination, and that which began with the Elementary and Secondary Education Act (P.L. 89-10) in 1965, which focused on federal funding, narrowing achievement gaps, and calls for explicit accountability measures. Each of these evolved over the decades and have had an immense influence on which, how and where children and youths are educated and schools are evaluated in the United States (Tables 1 and 2).

Education research response. In response to social and/or economic and/or political pressure, education research began to turn in earnest to expand the access that children and youth had to curriculum and to true learning in the 1990s and early 2000s in K-12 settings and extending to postsecondary (Bos & Fletcher, 1997; Fisher & Sax, 1999; Gilmore, Schuster, Zafft, & Hart, 2001; Gundara, 2000; Hafner, 2008; Hart, 2006; Hines, 2001; Odom, 2000; Powell, Hyde, & Punch, 2013; Rojewski, Lee, & Gregg, 2013; Simpson, 2004; Williams, Berger, & McClendon, 2005; Wlodkowski & Ginsberg, 1995). However, because inclusion practice to this time arguably was ineffective (Edyburn, 2010), the time had come for the articulation and application of a method or framework that would allow diverse students, including those with disabilities, to truly learn and thus meet the accountability standards that had been implemented from federal mandates. One focus that emerged at that time was Universal Design (UD), and more specifically Universal Design for Learning (UDL). Indeed, it was in this social context that Howard (2003) wrote “UDL is an idea whose time has come” (p. 113).

Universal Design for Learning (UDL) now appears in critical federal policy and legislation including the Every Student Succeeds Act (ESSA, 2015), the National Educational Technology Plan (2010) and the National Instructional Materials Accessibility Standards (NIMAS, 2006) and appears in several state and local initiatives. In spite of this, educational preparation faculty awareness of UDL remains low, and even those who are aware of UDL do not necessarily understand what it is or teach it in their courses (Vitelli, 2015). There is opportunity, therefore, to promote means of teaching

UDL to preservice teachers, and to begin examining methods of doing so effectively. The latter is what this study is designed to contribute.

Conceptual Underpinnings for the Study

In addition to social context and addressing a practical need in U.S. public education, this study is also couched in theoretical context. In this study, I explore the effect of modeling on the development of preservice teachers' attitudes and efficacy. Selection of modeling as an independent variable, as with all researched variables, stems from a theoretical position: in this case, social cognitive theory (1977, 1978, 1986). Meanwhile, the research model is further supported by the theory of planned behavior (Ajzen, 1985, 1991b).

Social cognitive theory. Bandura's (1977, 1978, 1986) theory articulates the idea that learning occurs, in part, through behavioral experience and in part through observation of others. On the one hand, Bandura's (1978) model of reciprocal determinism suggests that learning is affected by the reciprocal interrelations among personal cognitive factors (e.g., self-efficacy, will, attitudes and beliefs), behavior (i.e., what one actually does), and environment (e.g., the circumstances of a situation and the reinforcement that emerges from the environment in response to one's behavior and cognitive perspectives). Bandura thus seems to promote the importance of learning by doing. In context of teacher preparation, this may be taken to imply that teachers learn most about teaching *by teaching* (behavior), which is both influenced by– and reciprocally influences– their teaching environment and their cognitive positions in

relation to aspects of teaching. Such an application of Bandura's theory could be taken to further imply a limitation of the effect that university-based teacher education may have on preparing future teachers given that such preparation tends to occur largely before extensive teaching experience occurs.

However, inasmuch as Bandura's (1978) model of reciprocal determination provides emphasis also on the effect of personal cognitive positions on one's environment and behavior, this theory may still be taken to suggest that attempts to develop desired personal cognitive positions in teacher preparation is worthwhile and can have instrumental effect on both individual teachers' practice and in shaping schools in which teachers will later be employed. Indeed, I posit that through the lens of social cognitive theory, the development of preservice teachers' cognitive positions may be a central aspect of teacher preparation.

Moreover, even as Bandura (1978) stresses the utility of one's own actions as a source of knowledge, he also recognizes that, as is generally the case with preservice teachers, "Results of one's own actions are not the sole source of knowledge" (p. 347). He goes on to say, "Information about the nature of things is frequently extracted from vicarious experience... [through the] observation of the effects produced by somebody else's actions" (pp. 347-348). Elsewhere, Bandura (1971) emphasizes that learning by doing can be both dangerous and laborious, and thus underscores the significance and value of learning by watching *others* perform behaviors and observing or experiencing consequences therefrom. In fact, he goes as far as suggesting that "some complex

behaviors... can be produced only through the influence of models” (p. 5). Given that teachers are expected to perform as professionals from their first week of teaching, I believe that learning from observation is an important aspect of teacher preparation.

In the context of teacher education, application of Bandura’s (1971) comments on the value of observing others may be taken to suggest that while preservice teachers are not yet teaching, they are nevertheless being taught by someone who *is* teaching and thus have the opportunity to learn from the vicarious experience of being pupils. Thus, social cognitive theory (SCT) is useful for this study in providing a theoretical justification for the significance of some of the dependent variables herein explored (i.e., teacher’s sense of efficacy and attitudes regarding inclusion), which may well affect teacher behavior. More directly, however, SCT is useful for guiding the independent variable of faculty modeling given that modeling, when done intentionally and explicitly (Lunenburg, Korthagen, & Swennen, 2007), may provide the vicarious experience necessary to affect preservice teacher development in cognitive and behavioral domains. Below I briefly detail modeling and self-efficacy as two constructs of SCT that are of great relevance to this study.

Modeling. In social cognitive theory (Formerly “Social Learning Theory”; Bandura, 1971), modeling is fundamentally different than the modeling construct in operant conditioning (Skinner, 1954) and Miller and Dollard’s (1941) classic “Social Learning and Imitation,” in both of which modeling requires immediate reciprocal action from the learner. Such modeling would be impractical for teacher preparation whereby

preservice teachers do not have the opportunity to apply practices professionally for months or years after learning. In contrast, Bandura's (1971) construct of modeling moves beyond the temporal and physical to being potentially symbolic; that is, such modeling does not represent what the learner should do specifically and immediately, but informs a conceptual means of doing something that can be later applied in different and similar situations. In this way, Bandura's concept of modeling is far more relevant and useful for teacher preparation than that of Skinner's.

In the context of this study, and more broadly of teacher preparation, modeling may be taken to involve a teacher demonstrating instructional methods either as a means of teaching other content (e.g., modeling cooperative groups to teach about education law) or may be taught more directly by modeling an education method explicitly for its own sake (e.g., modeling literature circles to helping students understand literature circles). In other words, the modeled pedagogical method may be the vehicle to deliver content, or both the vehicle and the content itself. In the case of modeling a method to teach unrelated content, being explicit about what is being modeled may allow for a dual learning experience for preservice teachers; they may learn the target content but also have opportunity to reflect on the vicarious experience of how they were taught.

Regardless of the strategy employed, Bandura's (1977, 1978, 1986) model calls for modeling to reflect four interrelated sub-processes:

1. Attention: the observer selectively attends to the behavior being modeled.

2. Retention: the observer recognizes the cause and effects of a behavior and generalizes these cause/effects to apply them to future, similar behavior.
3. Production: the observer applies the behavior, himself or herself, in an appropriate context.
4. Motivational process: the observer's behavior is reinforced or weakened based on the feedback received from attempting to replicate the behavior observed.

The entirety of the process and its relative success for learning is contingent upon contextual factors (e.g., self-efficacy, cognitive ability, environmental supports or barriers). Per social cognitive theory, being able to observe behavior in others, particularly social behaviors, is a central means of learning to act in certain ways.

In this study, the entirety of the modeling process was not carried out. As aforementioned, preservice teachers in the university setting are not in the context or in a professional position to implement best practices in their (nonexistent) classrooms. While it is certainly possible to practice making lesson plans or demonstrating methods to peers acting as pseudo K-12 students, preservice teachers, these are no more than proxies to true practice, and feedback—while constructive—cannot be equivalent to the natural feedback experience in the K-12 classroom. As such, the focus was on the first two aspects: supporting students in attending to and retaining a pedagogical framework such that they may later practice it in the context of a genuine classroom setting and experience the natural feedback of student response and achievement. This method of applying SCT without immediate performance is an accepted form of practice in the

literature, including in studies by Bandura himself (Bandura, 1969; Flanders, 1968).

While the final two steps, including the power of reinforcements, are vital to complete the process, the nature of teacher preparation may require that true completion of learning may only occur after teachers are placed, and thus the role of teacher preparation in this sense is to develop the *potential* for skilled practice (Bandura, 1978) in preservice teachers.

Self-efficacy. The second aspect, self-efficacy, has emerged in education and teacher preparation literature as a substantial topic such that the construct of teacher efficacy has been developed as a specific manifestation of self-efficacy particularly related to teachers (Gibson & Dembo, 1984); more about teacher efficacy follows in Chapter 2. In his work, Bandura (1981; 1982; 1986; 1989) explored self-efficacy as one's perceptions about his or her own capability to successfully perform a given action or task. If one does not believe that he or she *can* personally perform a behavior, he or she is far less likely to try it. Self-efficacy, per Bandura (1989), can be impacted by physiological arousal, by vicarious experience of observing others succeed or fail in each behavior (i.e., modeling), by encouragement and social pressure, and by personal experience of relative success or failure in performing an attempted behavior (i.e., practice); in the context of learning to teach, the latter three are perhaps the most significant.

Effectively, one's belief that one can complete a given action affects the effort and persistence in trying, which in turn affect his or her success, which itself impacts his or her efficacy in a cyclical pattern. In application, social cognitive theory would suggest

that in preparing teachers to perform the action of complex planning and instruction, providing successful modeling, encouragement, and opportunity to practice are all critical. As Blume (1971) stated, “teachers teach the way they have been taught – not how they have been taught to teach” (p. 412). Using this theoretical basis, this study is designed to examine how modeling (or not) affects the development of preservice teacher attitudes, efficacy and behaviors related to UDL.

Theory of planned behavior. The theory of planned behavior, like Bandura’s social cognitive theory, draws attention to the importance of beliefs and feelings of self-efficacy in conducting behavior. This model, however, adapts these constructs to focus particularly on teachers and includes a proxy for performed behavior in the form of *intention* to perform a behavior (Ajzen, 1985). This component is important, because whereas social cognitive theory helps us understand methods for preparing teachers with the skills, attitudes, and efficacy needed to potentially perform behavior, it is ultimately a theory based on individual receptivity or learning, with behavior functioning as part of learning rather than an end unto itself (Bandura, 1978). However, the importance of my study hinges both on preservice teacher learning and on future performance of their learning. One may have the knowledge and skill to conduct a behavior, but still not do so (Bandura, 1978). Thus, in teacher preparation, it is critical that preservice teachers learn and intend to perform what they have learned. Moreover, as my study is not longitudinal and therefore does not involve following teachers into placement settings, a more immediate proxy for classroom behavior is necessary.

The theory of planned behavior basically suggests that when teachers are motivated (attitudes and belief) to perform a behavior and feel empowered to control their own behavior and bring about the desired results (teacher efficacy), they then *intend* to undergo such behavior, which is the nearest proxy to actually performing such behavior (e.g., Ajzen, 1991; Armitage & Conner, 2001; MacFarlane & Woolfson, 2013; Pang & Watkins, 2000; see Figure 4).

Statement of the Problem

In this study, I address two different, but interrelated problems. First, researchers and practitioners have noted the increased complexity of the contemporary classroom and the demands that this places on high quality teacher preparation (e.g., Cochran-Smith & Zeichner, 2005; Darling-Hammond, 2000, 2012), but there is little consensus as to best practices for preparing teachers to implement quality teaching once they begin their careers (Korthagen, Loughran, & Russel, 2006). Faculty modeling of best practices for K-12 education to preservice teachers has long been proposed as a potential best practice (Aleccia, 2011; Darling-Hammond, 2005; Korthagen et al., 2006; Loughran & Berry, 2005; Putnam & Borko, 2000), but has little empirical support (Cochran-Smith & Zeichner, 2005a; Korthagen et al., 2006; Merseth, 1996). Empirical research is needed to provide justification for the notion that modeling best practices may result in heightened learning and practice among preservice teachers when compared to non-modeled methods (e.g., lecture/textbook reading).

Second, as aforementioned, though UDL has been emphasized in federal policy including eight times in the Every Student Succeeds Act (ESSA, 2015), and has appeared as an independent variable in a wealth of contemporary research (Rao, Ok, & Bryant, 2014), there remain serious challenges in terms of clearly operationalizing UDL (Edyburn, 2010), being consistent in what is meant by UDL in research and practice (Edyburn, 2010; Rao et al., 2014), and in consistency of education faculty knowledge and dissemination of knowledge related to UDL to preservice teachers (Vitelli, 2015). Given the complexity of UDL as a framework for teaching, and the difficulty in clearly *stating* what UDL is (Edyburn, 2010), it may be fairly suggested that UDL would be best *shown* to preservice teachers, and thus lends itself to modeling, as proposed in this study.

However, very little research has been conducted on preparing teachers to utilize the framework of UDL. What few manuscripts currently provide research perspectives include case studies, surveys of perspective or practice, and other qualitative research (Allday, Neilsen-Gatti, & Hudson, 2013; Berquist, 2013; Cavendish & Espinosa, 2013; Kurtts, 2006; Lang, 2014; McGuire-Schwartz & Arndt, 2007), and a very few empirically designed quantitative studies (Aronin, 2009; Courey, Tappe, Siker, & LePage, 2013; Killoran, Woronko, & Zaretsky, 2014; Spooner, Baker, Harris, Delzell, & Browder, 2007a), which tend to focus on how short UDL interventions (e.g., video or live modeling UDL, explicit training in UDL) lead to reported change in attitudes toward inclusion (Killoran et al., 2014) or performance on universally designed lesson plans (Aronin, 2009; Courey et al., 2013; Spooner et al., 2007a). The only research available that

examines the effect of modeling UDL on preservice teachers is Aronin's (2009) dissertation in which she explored the effect of contextually relevant video modeling of UDL on elementary preservice teachers knowledge and understanding of UDL, their confidence in teaching UDL and their ability to construct UDL lesson plans. More work is needed to provide practical solutions for– and empirical evidence to support– the preparation of preservice teachers to practice UDL.

Purpose of the Study

The purpose of this study is to empirically test the effect of modeling UDL on preservice teacher intention to include diverse students in their early career as measured in proxy by sense of efficacy and attitudes toward including diverse students, including those with disabilities.

Research Question

Does faculty modeling of universal design for learning improve preservice teacher attitudes and sense of efficacy regarding inclusion?

Hypotheses

There is a statistically significant ($p < .05$) difference between the two groups (i.e., those who are taught using explicit modeling (Lunenberg et al., 2007) of UDL and those who are taught using textbook and lecture format only) in terms of sense of efficacy in utilizing UDL, and attitudes regarding inclusion of diverse students and students with disabilities.

Summary

Quality K-12 education is of central importance to democratic societies such as the United States. It is appropriate and expected that emphasis would be placed on ensuring high quality output therein. However, K-12 education does not occur in isolation, but in social, economic, and political context. The field of education is also systematic, resulting in linear or semi-linear networking of schools, teachers, teacher preparation programs, and researchers. Thus, perceived deficiencies in K-12 put pressure on K-12 teachers and then teacher preparation programs, which results in the development of new lines of research to address these perceived deficiencies.

One contemporary perception of deficiency may be seen in the continuing achievement gap that exists between majority-group students and students who identify as belonging to one or more minority and/or disadvantaged groups (e.g., race, ethnicity low socio-economic status, culturally/linguistically diverse, disability, giftedness). It has been noted that teachers need to be better equipped with efficacy, attitudes, and ability to provide for the diverse needs of all learners, which implies that teacher preparation programs need to take responsibility for equipping teachers as such. However, there is little consensus as to how to do so.

Any attempt to address methodological solutions in education ought to be grounded in educational theory. Closest in concept to the nature of the issue of preparing teachers with constructive attitudes and efficacy may be social cognitive theory (Bandura, 1986) and the theory of planned behavior (Ajzen, 1991a). Each of these

theories focuses on how attitudes, beliefs, and efficacy interrelate and affect learning (especially social cognitive theory) and planned performance (especially theory of planned behavior) of teaching strategies.

Similarly, meeting the needs of diverse students may be couched in the theory and practice of Universal Design for Learning (UDL). However, it is worth recognizing that there remain significant limitations in practice for the degree to which UDL is taught in teacher preparation programs (Vitelli, 2015) as well as clarity as to what exactly UDL looks like in research or practice (Edyburn, 2010; Rao et al., 2014), and there is a significant paucity of empirical research that explores how UDL may be taught to preservice teachers in such a way that they apply the framework, themselves, in future classrooms.

One method that is frequently mentioned in discussions of preparing teachers to utilize UDL among UDL scholars is that of faculty modeling. Faculty modeling itself is the subject of numerous position papers and qualitative accounts, but there is limited empirical research available to support significant shifts in policy and practice. Faculty modeling of UDL, specifically, is nearly completely absent from present literature.

Therefore, I designed this study to provide empirical exploration of how using faculty modeling to teach UDL to preservice teachers may be more, less, or equally effective as more traditional methods of instruction (e.g., lecture and textbook reading) across comparable periods of time.

Chapter 2

Review of the Literature

The Chapter 1 introduction to this study served to overview the research and briefly couch it in social and theoretical context. I provided evidence to suggest that the policy support for UDL is not yet matched by practical implementation in teacher preparation. That is, relatively few education faculty accurately know what UDL is and even fewer intentionally teach it in their courses (Vitelli, 2015). Part of the difficulty in teaching UDL is that it is a framework, rather than a method (Meyer, Rose, & Gordon, 2014), and thus is challenging because the implementation of such a framework requires complex cognitive consideration rather than just methodological behavior.

I proposed that such complex teaching tasks may be best taught using advanced modeling techniques (e.g., Korthagen et al., 2006; Lunenberg et al., 2007). However, a paucity of empirical research regarding the effect of faculty modeling has resulted in opportunity for new lines of research in this area. In this study, I intended to combine these two issues to determine if there is empirical evidence to support the use of faculty modeling to prepare preservice teachers to implement UDL in future classrooms.

In this chapter, I overview relevant research by exploring current issues related to the independent variables (i.e., faculty modeling and UDL) and then addressing the literature as relates to the dependent variables (i.e., preservice teacher efficacy and attitudes regarding inclusion).

Independent Variable(s)

Faculty modeling. There are issues and unique challenges to teaching well at the university level. Quality teaching is sometimes difficult to achieve among the many other roles that university faculty must fulfill as researchers and leaders. Exacerbating this point is the notion that quality teaching may not be a key factor in determining tenure and raises in the university setting (Kelsky, 2015; Koster, Brekelmans, Korthagen, & Wubbels, 2005).

If more focus can and should be placed on the quality of teaching among teacher educators, as Koster and others (2005) propose, then there needs to be clear understanding of best practices at the university level and there is a need to explicitly examine the degree to which such practices, when implemented in university-level courses, impact the quality of preservice teachers' teaching after becoming professionals.

Blume (1971) asserted that "teachers teach as they have been taught – not the way they have been taught to teach" (p. 412), an assertion that may be presently expanded to suggest that faculty modeling of best practices with preservice teachers may be among the most significant factors in determining the extent to which preservice teachers actualize the migration from theory to practice and demonstrate the use of skills and practices in the classroom that are most relevant to quality instruction. Korthagen and colleagues (2006) articulate a central irony in this domain whereby "student teachers report their disappointment when they experience a class in which a lecture is used to present alternatives to the lecture method" (p. 1036). To this end, the purpose of this

section of the literature review is to examine previously published findings regarding the effectiveness of faculty modeling of teaching practices for preservice teachers and the effects of modeling on the preservice teachers' own practice.

Faculty modeling has been highlighted in the literature as a practice with great potential (e.g., Aleccia, 2011; Darling-Hammond, 2005; Korthagen et al., 2006; Loughran & Berry, 2005; Putnam & Borko, 2000); however, there is not yet enough published evidence to justify this notion. What literature exists on the topic often notes this limitation (e.g., Cochran-Smith & Zeichner, 2005; Korthagen et al., 2006; Merseth, 1996). To date, there does not appear to be a unified collection of literature on the topic, but rather a somewhat eclectic mix of position papers, self-reflections by faculty, secondary sources, and calls for research. Perhaps one of the issues causing this lack of coordinated and empirical research is explicated in the American Education Research Association (AERA) Panel on Research and Teacher Education (Cochran-Smith & Zeichner, 2005) the editors of which suggests that the complexity of methodological issues involved with teacher education may often prevent experimental design. I explore several papers that have worked to provide a theoretical framework for faculty modeling as a means of improving outcomes in teacher education programs in this section. None of these studies contribute new experimental or quasi-experimental data, but are useful in demonstrating the value of such experimental studies going forward.

An early exploration of the concept and importance of faculty modeling appears in Putnam and Borko's (2000) literature review/conceptual framework regarding the

social constructivist notion of situative learning. In this review, the authors draw attention to research that stresses the importance of authentic learning activities for cognitive development. They note the struggle of teacher educators to provide “learning experiences powerful enough to transform teachers’ classroom practice” (pp. 5-6) and examine different ways of providing vicarious learning experiences for preservice teachers. To this end, the authors examine the use of field experiences as well as modeling via case-based experiences where the preservice teachers, in the context of the university classroom, discuss and role play cases to attempt multiple approaches in a semi-controlled environment. Though the authors do not address faculty modeling explicitly in their paper, inasmuch as faculty modeling is designed to provide a vicarious experience for conceptual development, faculty modeling could be considered a sub-set of “situative learning” akin to case-based experiences. As such, Putnam and Borko’s study is an appropriate place to begin in examining theoretical underpinnings for faculty modeling.

In a more explicit attempt to address the limited available research and respond to the AERA’s (Cochran-Smith & Zeichner, 2005) emphasis on researching teacher education, Korthagen and colleagues (2006) used published self-studies in a form of qualitative review designed to tease out principles that have shown consistent positive effects for training preservice teachers. Each of the principles presented is accompanied by anecdotal evidence from multiple primary sources that support and exemplify the practice. Korthagen and colleagues’ principles have proven seminal in a new wave of

research, and several more recent studies have cited Korthagen and colleagues' manuscript while expanding on one or more of the seven principles. Though description of all seven principles is beyond the scope of this review, principle seven is immediately relevant. In the authors' words, principle seven is: "Learning about teaching is enhanced when the teaching and learning approaches advocated in the program are *modeled by the teacher educators in their own practice*" (p. 1036, emphasis added). The nature of this research as a review again provides excellent basis for further experimentation, though the data presented therein are not conclusive enough to be considered as evidence toward recognizing faculty modeling as a best practice in teacher education.

Korthagen and colleagues' (2006) call for modeling was expanded in Lunenberg, and colleagues' (2007) study in which the authors review and articulate constructs relevant to the exploration of faculty modeling. These include: "(1) implicit modeling, which seems to have a low impact; (2) explicit modeling (which is used in this study); (3) explicit modeling and facilitating the translation into the student teachers' own practice; and (4) connecting exemplary behavior to theory" (p. 597). The authors suggest that modeling good practice (implicitly or explicitly) does not itself ensure that students can apply such practice in their own teaching, and thus explicit discussion and guidance in such application is necessary (i.e., type 3); additionally, they articulate the constructivist notion that personal growth must be connected to public discourse in order to not waste time reinventing the wheel of best practices, and thus suggest that modeling should be clearly connected to theory in order to model not only the practice itself, but the process

of using theory to guide practices (i.e., type 4). This articulation of different forms of modeling is extremely useful for further analysis of the literature base and would be a critical component of any experimental design, given that different types of modeling may have substantially different outcomes. If the type of modeling used is not articulated, there is a danger of critical misunderstanding when the word “modeling” is used.

Korthagen and colleagues’ (2006) conclusions support another study conducted by Koster, Brekelmans, Korthagen and Wubbels (2005) in which the authors also explored the question of what teacher education faculty believe to be best practices from their own experience, but approached this through a different research design. Koster and others used a Delphi-method survey to elicit responses from large groups (different numbers for each wave of the study) of teacher education faculty, administrators, and leaders from all regions of the Netherlands regarding what competencies and practices are most important for teacher educators to possess. Scores on a seven-point Likert-type scale were averaged and rated in terms of being considered “very necessary,” “necessary,” “necessary to some extent” and others being filtered out as not being considered substantially necessary. Among a few competencies considered to be “very necessary” was “being able to be a model with regard to pedagogical and communicative competencies” (p. 167).

A more recent review, similar to Korthagen and colleagues’ (2006) outline of seven qualities of effective teacher education was published with a focus on qualities of effective teacher education faculty for teaching preservice teachers to use technology

(Tondeur et al., 2012). Tondeur and others used a “meta-ethnography” to provide new interpretation across multiple qualitative studies related to teaching preservice teachers to use educational technology. The authors identified seven key themes related to best practices for the preparation of preservice teachers. While the focus on technology influences some of the themes to be technology-specific, many of the themes relate generally to developing preservice teachers and fit with other research on the topic of modeling. For example, Tondeur and others highlighted the themes of aligning theory and practice, using teacher educators as role models, and scaffolding authentic experiences. Each of these themes is highly relevant to the discussion of faculty modeling.

Thus, the reports by Korthagen and colleagues (2006) and Koster and colleagues (2005), and Tondeur and colleagues (2012) collectively suggest that there is a body of education faculty who believe that faculty modeling is necessary and useful. The next step may be providing evidence that this practice is statistically and practically significant and examining if faculty *are* actually practicing modeling techniques. Unfortunately, there is almost no literature examining the first question in a quantitative form to date, though there are reports examining the effectiveness of this approach in qualitative means. In the next section, I explore the degree to which faculty modeling is practiced and examine some of the reports regarding its effectiveness.

Faculty modeling in teacher education. In addition to offering an articulation of four types of faculty modeling, Lunenberg, and colleagues’s (2007) study was designed

to determine whether teacher education faculty were using modeling and, if so, which types were being used. In their study, 10 faculty members from three universities in Australia, the Netherlands, and Canada were observed for two sessions each (for a total of 20 teaching sessions). During these observed sessions, six out of 10 faculty showed explicit modeling (type 2), of which four out of six connected to the students' actual practice (type 3), and zero out of six connected to theory (type 4). There was no evidence of correlation between years of faculty experience and the degree to which the practice of modeling was utilized. The limited application of the higher forms of modeling is tempered yet further by the note that the data may have been overly favorable given that participants were informed in advance about the purpose of the observation, and many "reported that by participating they had become aware of their own pedagogical choices and the degree to which they acted in accordance with their views of learning and teaching" (p. 598).

These results are similar to findings in a United States setting by Watanabe (1997). Watanabe surveyed the practice of 10 teacher education faculty members and their students' response to the instruction. Watanabe reports that the faculty claimed to model good instruction frequently, though the type of modeling being used is what could be categorized as type 1 and 2 in Lunenberg and colleagues' (2007) stratification. That is, faculty implicitly modeled good instruction, or explicitly modeled (reflecting on the fact that they were modeling), but fell short of connecting these models to the preservice teachers' future classrooms and/or connecting explicitly to theory. Nonetheless, faculty

participants believed that their students had more successful learning experiences as a result of this approach, a notion that was largely supported by qualitative content reported from the preservice teachers themselves. These findings suggest that even if “higher” forms of modeling (i.e., explicit modeling with reflection, explicit modeling with connection to theory) are theoretically superior, any form of modeling may be superior to the absence of modeling.

Loughran and Berry (2005) reflect on a practice that they refer to as “pedagogic interventions,” which is a process in which a faculty member (1) provides an intentional context in which a vicarious meta-learning (i.e., learning about learning) experience will occur (i.e., briefing the students), (2) provides teaching experiences whereby the intent is to critically consider methods and outcomes as opposed to rote acceptance, (3) provides an explicit model of a concept in a modeled context (e.g., demonstrated inquiry-based learning, pretending that the preservice teachers are 9th grade science students), (4) explicitly reflects on what was done and connects this to relevant theory through dialogue with students. Loughran and Berry provide reflective evidence of the positive outcomes of this approach for their students, and also are clear about identifying issues and challenges that they have faced and/or foresee others facing in the pursuit of this discipline.

Though Loughran and Berry’s (2005) study predates Lunenberg and colleagues’ (2007) articulation of four types of faculty modeling, Lunenberg’s articulation can be retroactively applied. Loughran and Berry’s approach demonstrates modeling types 3 and

4, whereby the faculty's practice included explicit modeling, reflection on the preservice teacher's own future practice, and discussion about how the practice relates to education theory. In this way, though the articles are not chronologically presented, it can be argued that Loughran and Berry's study offers practical support for Lunenberg and colleagues' promotion of faculty modeling types 3 and 4.

In another self-study, Russell (2005) explores the question of whether reflective practice (as a discipline of educators) can be taught. In his own reflection, Russell comes to recognize that reflection was best taught and learned through a modeling approach. Through gradual improvements based on student performance and response, Russell developed methods for teaching reflection that involved structured provisions, open dialogue, and ongoing modeling of reflection in his classes. Again, this may be considered a positive example of Lunenberg and others (2007) "type 3." Russell notes, "fostering reflective practice requires far more than telling people to reflect and then simply hoping for the best. I now believe that reflective practice can and should be taught... using personal reflection-in-action to interpret and improve one's teaching of reflective practice to others" (pp. 203-204). Given that reflection is an example of an implicit discipline (e.g., a practice that usually occurs privately in one's mind or one's own private notes), and thus similar to the cognitive process of making pedagogical decisions, Russell's report offers further qualitative evidence to suggest that making the implicit explicit through types 2-4 faculty modeling may prove effective.

Other, more recent studies have built on the Korthagen and colleagues' (2006)

and Lunenburg and colleagues' (2007) manuscripts (intentionally or not). For example, in a self-study designed to examine the effects of modeling and reflection (Lunenburg's type 3) on the development of preservice teachers, Kindle and Schmidt (2013) found that implicit modeling of professional language (type 1) resulted in a faster and more thorough uptake of the professional jargon among preservice teachers and that reflective prompting to model professional introspection led to higher degrees of self-awareness among student participants. This is a unique example in the literature of type 1 (implicit) modeling proving effective, a phenomenon that may have as much to do with the nature of language acquisition (e.g., Krashen, 1989) as it does faculty modeling.

In another study, Casey (2011) explicates the role of live modeling and video modeling for coaching best practices for in-service teachers. Casey suggests a process whereby faculty create a clear purpose for the modeling experience, engage in the model, and thinking aloud/reflecting explicitly and communally; this approach is consistent with Lunenburg's type 3 modeling (e.g., explicit modeling and connection to the teacher's own practice). Casey's application of this model to in-service teachers expands the literature base, and demonstrates the effectiveness of intentional and reflective modeling in her own experience as a pedagogy coach in K-12 schools.

Lu and Lei (2012) also refer to the components of Lunenburg's type 3 modeling, which they refer to as "dual modeling," itself a hybrid of behavior modeling (e.g., demonstrating the behavior/teacher action) and cognitive modeling (e.g., explicating the thought process driving the behavior/action). The authors apply this type of explicit

modeling to training early-stage preservice teachers in the craft of combining technological skills, content knowledge, and pedagogical knowledge (collectively referred to as TPACK), a highly complex synthesis. In their experience, explicit and reflective modeling (types 2 and 3) was highly effective in facilitating early development in this complex enterprise. Gains were especially noted in the development and bridging of content knowledge and pedagogical knowledge. Students reported on the benefit of being able to see the faculty's thought process in determining what and how to teach, instead of simply being "corrected" after their own trials.

Only one quantitative, group study manuscript was identified as focusing explicitly on faculty modeling for preservice teachers in this literature search. Spooner, Baker, Harris, Delzell, and Browder (2007) set out to examine whether modeling of concepts and practices related to UDL would have more effect on the knowledge, understanding, and application of UDL for preservice teachers compared to a control group with no instruction. A pretest-posttest design was utilized to examine both within- and between-group differences in the experiment, and data were collected via preservice teacher planning for hypothetical student(s) with diverse learning needs in their future classrooms. Statistically and practically significant results ($p < .001$) were noted for all three areas assessed (providing multiple means of representation, engagement, and expression). Given that this was a one-hour intervention, the gains are very significant from a practical perspective, if the learning was maintained (a factor that was not examined in Spooner and colleagues' study).

Collectively, the studies reviewed in this section offer (mostly qualitative) support for the theoretical evidence presented in the prior section. Three themes that emerged from this review are: (1) faculty modeling is believed important and effective (Aleccia, 2011; Blume, 1971b; Darling-Hammond, 2005; Korthagen et al., 2006; Koster et al., 2005; Lunenberg et al., 2007; Putnam & Borko, 2000; Tondeur et al., 2012); (2) not many faculty are actually practicing explicit modeling (Lunenberg et al., 2007; Watanabe et al., 1997); and (3) when it is used, there is qualitative (and limited quantitative) evidence as to its effectiveness (Casey, 2011; Kindle & Schmidt, 2013; Korthagen et al., 2006; Loughran & Berry, 2005; Lu & Lei, 2012; Russell, 2005; Spooner et al., 2007). In some ways, these themes raise more questions than answers. For example: if there is theoretical and practical evidence supporting faculty modeling (points 1 and 3), then why does such modeling, and especially types 3 and 4 appear to be practiced only rarely? This question is the focus of the next section.

Roadblocks to modeling. Based on the limited body of research available, one may form an interim conclusion that it has been strongly suggested that modeling best practices of education to preservice teachers is being called for, but this call is not being fulfilled. Loughran and Berry (2005) present some possible reasons for this lack of explicit modeling. The authors suggest that modeling entails not only demonstration but also added components of evaluation and reflection involving the preservice teachers; the vulnerability that this necessitates may indeed be very uncomfortable for the faculty member who is not used to having his or her pedagogical decisions questioned.

Furthermore, effective modeling is anything but straightforward. Faculty must make difficult, thoughtful decisions in terms of what aspects of practice to model explicitly, as well as how and when to do so to maximize effectiveness and minimize confusion among preservice teachers (Loughran & Berry, 2005). In many cases, the time necessary to construct such high quality instruction is beyond reason for faculty for whom teaching is only one responsibility among many such as publishing, taking leadership roles, attending and presenting at conferences, etc.; moreover, these other duties are far more likely to impact the faculty member's career in terms of earning promotion or becoming tenured, which may result in a demotion of focus on quality teaching in some settings (Koster et al., 2005). Lunenburg and others (2007) also suggested that lack of knowledge and skill related to either the concepts to be modeled or in terms of how such concepts could be explicitly tied to theory may impede faculty modeling. This may not be as surprising as it may first appear after one considers the fact that education faculty are often removed from the K-12 classroom for some time before—and during—their tenure as faculty. As best practices change and emerge, it is one thing to understand them conceptually and another to have actively practiced them. If anything, these inhibitions only underscore the initial issue of vulnerability.

Another issue related to faculty modeling for preservice teachers might be a lack of authenticity. Faculty modeling often takes two broad forms in the teacher education classroom: the faculty member may model best practices (for university students) while teaching the natural content of the course or the faculty member may enlist the students

to role play situations from a hypothetical K-12 setting. Either option has questions regarding the authenticity of the situation. While modeling and reflecting on best practices that emerge in the university classroom may well be authentic to the university setting, that particular tool, approach, or situation may be very unlike what the preservice teachers will actually encounter in a K-12 setting (Putnam & Borko, 2000).

On the other hand, seeking to model a situation that could be expected in a K-12 setting is still only a simulation. Schrader, Leu, and Kinzer (2003) note that “[Preservice teachers] do not usually see the identified practices actually used in context-rich or complex situations; rather, the materials often present imagined scenarios or... under pristine conditions” (p. 318). Preservice teachers who responded in the literature have sometimes expressed negativity toward such simulations, which they may see as fake or manipulated (Lunenberg et al., 2007).

These limitations and roadblocks to modeling were considered for this current study. No attempt was made to model UDL in the context of P-12; instead, the practice of UDL was modeled in age- and context-appropriate means for the university classroom using explicit modeling techniques with reflection (type 2). Preservice teachers were then asked to take their learning and experience of UDL and apply it themselves to P-12 classrooms by way of designing lesson plans (type 3). In this context, whereby teaching was my primary focus, I did not lack for time or motivation. Likewise, my position and purpose allowed me to circumvent the issue of vulnerability, which I intentionally accepted as part of this research agenda. As such, I was able to address the barriers to

faculty modeling for the sake of this study, even if my solutions may not be generalized to faculty on the whole.

Universal design (for learning). While faculty modeling forms the focal independent variable for this study, modeling is a construct that must always co-exist with a second construct: the content being modeled. From a social cognitive perspective, modeling direct instruction, for example, may have different cognitive outcomes than modeling UDL. As such, it is worthwhile to explore UDL as a supporting or co-construct independent variable for this study.

As aforementioned, the United States public school classroom has become increasingly diverse, and thus there is a persistent call to actively and intentionally prepare preservice teachers to meet the challenges that come with teaching truly heterogeneous student groups (e.g., Darling-Hammond, 2005; Horne & Timmons, 2009; Jung, 2007; Sosu, Mtika, & Colucci-Gray, 2010). Despite the fact that diverse individuals, including those with disabilities, now have access to the general education classroom, such physical access has not necessarily translated into access to learning (Jiménez et al., 2007; McGuire-Schwartz & Arndt, 2007; Rioux & Pinto, 2010; Rose, 2000). There is a long-established achievement gap that increases by age among students who identify as belonging to minority and/or traditionally disadvantaged groups (e.g., those from minority racial, ethnic, linguistic backgrounds, low socio-economic status, with disabilities) when compared to their less diverse or more economically advantaged peers (Darensbourg & Blake, 2013; Edyburn, 2010).

Universal Design for Learning (UDL) was developed as a way to utilize neurological and educational research to address achievement gaps, including those noted for students with disabilities (Meyer et al., 2014). To do so it borrowed more broadly from Universal Design (UD), a concept used to guide architectural accessibility. In 1999, Kame'enui and Simmons wrote about “the architecture of instruction” (p. 2) and used parallels to architectural ramps designed for individuals in wheelchairs to point out that “cognitive ramps” (p. 14) for “students with learning disabilities, like physical ramps for persons with physical disabilities, should be designed from the outset to go with the architecture” (Howard 2001, p. 113). This reference was an early one of many that sought to borrow from the seven principles of Universal Design (Pisha & Coyne, 2001; Story, Mueller, & Mace, 1998) for building educational environments in which accessibility was a thoughtful and proactive element, rather than a retrofitted aspect of education (e.g., reactive accommodations, modifications for individual students with disabilities). While the seven principles of UD have been argued to be inconsistent with what we now practice in UDL, and thus called a “distraction” (Edyburn, 2010, p. 36), they are included here for the purpose of historical roots in literary reference and to articulate what UD (not UDL) is (see Table 3).

UD was adapted in different ways in relation to application in the classroom by different groups. The Center for Applied Special Technology (CAST) developed the framework of Universal Design for Learning (UDL) with three overarching principles (and nine guidelines, three for each principle; Meyer et al., 2014), while the National

Center to Improve Tools of Education (NCITE) at the University of Oregon developed their own framework of six principles (Kame'enui & Simmons, 1999). Additionally, Universal Instruction Design (UID; Higbee & Goff, 2008) formulated at the University of Minnesota has its own eight principles, and Universal Design for Instruction (UDI; Burgstahler, 2009) from the University of Washington, has eight as well (see Table 4).

These frameworks share points of similarity as well as divergence. Conceptually, all the models draw from aspects of universal design and apply these aspects to a classroom environment and to the pedagogical relation. Structurally, each of the models is a framework, intentionally networking different research-based practices, even as the framework itself is not scientifically validated, as Edyburn (2010) argues is the case for UDL.

Each of these models, and particularly UDL, UID, and UDI continue to find success and application in research and practice (Rao et al., 2014). And while UDL has overshadowed the other models, appearing in college coursework throughout the country as well as in state and federal legislation (UDL Center, 2015), including being prominently mentioned in the Every Student Succeeds Act (2015), Rao and others remind their readers that “there is no consensus on how UD principles should be applied, nor is there agreement as to how much or in what combination the principles or guidelines of any model need to be present for an educational intervention to be considered universally designed” (p. 154).

In their review of nearly 200 peer-reviewed manuscripts that purported to use empirical methodology to apply universal design frameworks (i.e., UDL, UID, UDI) to education settings (i.e., PK-12 or higher education), Rao and others (2014) discovered a “scarcity of empirical examinations exploring the efficacy of UD models” with most of the literature consisting of “descriptive studies about the importance of using UD in education and descriptions of how researchers applied the principles” (p. 164). They further appeared to concur with Edyburn’s (2010) call for an operationalization of UDL if claims are to be made for scientific validity. They suggest that, though there was abundant evidence of positive outcomes for students and educators who utilized UD models, “because the studies used a range of research designs, most of which did not establish causality of effectiveness, the evidence should be interpreted with caution as a set of preliminary positive results based on varied methods of analysis” (162).

Universal design for learning. UDL has emerged as the most prolific model of UD in education, appearing liberally in federal policy and mandates including the National Instructional Materials Standards (2006), the Higher Education Opportunity Act (2008), the Common Core State Standards Initiative (2010), the National Educational Technology Plan (2010), and the Every Student Succeeds Act (2015). Additionally, beginning in 2013, six states (Michigan, Maine, Maryland, Rhode Island, Kentucky, and Louisiana) had statewide UDL initiatives and every state in the union had one or more state-sanctioned activity supporting the principles of UDL in public education (National Center on Universal Design for Learning, 2013).

Per CAST (2015), UDL may be broadly defined as, “a framework to improve and optimize teaching and learning for all people based on scientific insights into how humans learn” (para. 1). A parallel definition is presented at CAST’s udlcenter.org (2014), which notes that UDL is “a set of principles for curriculum development that give all individuals equal opportunities to learn” (p. 1). Per the website, “UDL provides a blueprint for creating instructional goals, methods, materials, and assessments that work for everyone — not a single, one-size-fits-all solution but rather flexible approaches that can be customized and adjusted for individual needs” (p. 1).

The “blueprint” mentioned refers to a set of three principles, which are subdivided into nine guidelines (three per principle), and the guidelines themselves are further subdivided into a total of 31 checkpoints (see Figure 5). Not all guidelines or checkpoints need to be utilized in any given lesson or unit or even classroom setting for UDL to be applied; the focus of UDL application is one of *designing* lessons with an eye toward barriers that may exist for students to access the learning, and an intentional attempt to remove or reduce these barriers (or rather, equip and enable the students to do so) using the UDL framework (Israel, Ribuffo, & Smith, 2014). Further, some developers of UDL suggest a process for practicing UDL whereby instructors (1) determine clear learning objectives, (2) identify barriers students may face in learning and achieving the objectives, and (3) utilize the principles, guidelines, and checkpoints to design learning experiences that are flexible enough that the significant majority of students would be

able to access the learning effectively (National Center on Universal Design for Learning, 2012).

In contrast to the claims from Edyburn (2010) and Rao and others (2014) that UDL lacks a clear research base, the CAST UDLCenter website (2012), counters that UDL has an extensive research base. The research page of the website references manifold empirical peer-reviewed research publications supporting the foundational constructs that have been synthesized in the UDL framework as well as empirical research supporting each of the 31 checkpoints that are included in the UDL guidelines (e.g., Assor, Kaplan, & Roth, 2002; Atkinson, 2002; Bottge, Rueda, Serlin, Hung, & Kwon, 2007; Celinska, 2004; Cleary & Zimmerman, 2004; Fuchs et al., 2000; Gersten & Baker, 2001; Graham & Perin, 2007; Norris, Sullivan, Poirot, & Soloway, 2003; Orsmond, Merry, & Reiling, 2002).

In personal conversation with Edyburn (personal communication, March 16, 2016), it became clear that the rift between CAST's claims that UDL is research-based and Edyburn's conclusion that it is not is that while CAST underscores the research base for the *components* of UDL, which are empirically validated, Edyburn believes that the complexity of UDL is such that component research itself is not enough to support claims of effectiveness for the framework as a whole. He believes that there is no way to determine, with existing literature, if UDL is any more than the sum of its best-practice parts. Though CAST does also refer to holistic research, as do Rao and others (2014) in their review of the literature, Rao and colleagues' commentary on the different

interpretations and manifestations of UDL in research and practice also raises awareness of how a lack of consistent interpretation of UDL may preclude holistic research from being meaningfully synthesized. Rao and others state, “most of the literature consists of descriptive studies about the importance of using UD in education and descriptions of how researchers applied the principles” (p. 164).

Rao and colleagues’ recognition of qualitative and descriptive bias in the UDL literature is consistent with my own review of the literature as I found that most of the research published regarding the holistic implementation of UDL are variations of position papers (e.g., Benton-Borghi, 2013; Cochran-Smith & Dudley-Marling, 2012; Edyburn, 2010; Gradel & Edson, 2009; Howard, 2003; Jiménez et al., 2007; Lopes-Murphy, 2012; Martin, 2006; Nelson, 2006), methods for implementation (e.g., Katz, 2014), or qualitative case studies with results that are difficult to generalize (e.g., Abell, Jung, & Taylor, 2011; Smith, 2012). Several of these are helpful in articulating key issues and potential ways forward in the field, but the limitation of empirically designed research measuring student outcomes is startling for a framework that is described in the Assistive Technology Act (29 U.S.C. 3002) as being “scientifically validated.”

Therefore, it may be the lack of clear operationalization that has precluded quantitative empirical study of the framework in its entirety. In this study, I present a potential solution to the challenge of operationalizing UDL and provide quantitative, empirical evidence to measure the effectiveness of UDL for improving preservice teacher

outcomes. In this way, I both acknowledge the barrier that exists in the field of UDL research today and contribute toward addressing this barrier.

Research on UDL and teacher education. Extending the broader trend of UDL research noted in the preceding section, very little empirical research has been conducted indicating the efficacy of such instruction for preservice teachers themselves and less still on the future outcomes of such preservice teachers' students. What few manuscripts currently provide research perspectives include case studies, surveys of perspective or practice, and other qualitative research (Allday et al., 2013; Berquist, 2013; Cavendish & Espinosa, 2013; Kurtts, 2006; Lang, 2014; McGuire-Schwartz & Arndt, 2007; Vitelli, 2015), and a very few empirically designed quantitative studies (Aronin, 2009; Courey et al., 2013; Killoran et al., 2014; Spooner et al., 2007). These studies tend to focus on how short UDL interventions (e.g., video or live modeling UDL, explicit training in UDL) lead to reported change in attitudes toward inclusion (Killoran et al., 2014) or performance on universally designed lesson plans (Aronin, 2009; Courey et al., 2013; Spooner et al., 2007).

Thus, in reviewing the literature it has become clear that the acceptance and promotion of UDL has in many ways superseded the research base, which supports the individual checkpoints far better than it does the framework as a whole. This issue is present in the literature related to UDL implementation in general (Rao et al., 2014), and particularly in research related to teacher education. It has been articulated that before further progress can be made in researching the framework of UDL as a discrete entity,

UDL must be operationalized (Edyburn, 2010; Rao et al., 2014). Next, I articulate a method of operationalizing UDL that may encompass both the frameworks' inherent and vital flexibility and the necessity of having clarity in defining what UDL is and is not.

Operationalizing UDL. I included this section to provide clarity as to how UDL was operationalized in this study. Given Edyburn's (2010) call for UDL operationalization and Rao and colleagues' (2014) related literature review, a concise, objective definition of what constitutes UDL is was not yet available and agreed upon at the time of this writing. Any attempt at operationalizing UDL needs to take into account both the holistic aspects (e.g., design, barrier removal, flexibility, goal setting; Meyer et al., 2014) and the details (e.g., principles, guidelines, and checkpoints) that guide the practice of UDL. To assess this, the procedures for the treatment condition of this study called for using intentional design, barrier removal, and clear goal setting for each lesson as well as identifying specific principles, guidelines, and checkpoints to use to address the said barriers and support students in accomplishing the articulated goal(s). The specific checkpoints utilized varied by lesson; as a result, more emphasis was placed on the framework itself than any specific checkpoint or combination of checkpoints (please see the Procedures section in Chapter 3 for more details).

One broad concept guiding UDL in practice has been underscored by Israel, Ribuffo, and Smith (2014) who argue that for a lesson to be considered in alignment with UDL, it must go beyond providing physical or even content-based access to students. Israel and others express the significance of this point, saying "the traditional classroom

accessibility efforts via automatic doors, automatic classroom lights, and wider entryways to accommodate wheelchairs; these solutions offer entry into the classroom but do not alter the content or instruction once students are there” (p. 24). In this sense, developing and executing a UDL lesson must involve the *intentional dissolution of barriers* such that a student may access the room, the content, and the learning. This exceedingly broad conceptualization is insufficient as an operationalization of UDL, but nevertheless begins to hack away at what UDL is not (but is often confused to be; Edyburn, 2010).

A second broad concept worth articulating may be to suggest that how we operationalize UDL is inherently connected to how we believe UDL ought to be taught to (preservice) teachers, and—by extension—how UDL ought to be used in P-12 and higher education classrooms. For example, if we believe that for UDL to be used to teach ninth graders about World War II, we must draw from all three principles (i.e., multiple means of representation, action and expression, and engagement), then operationalizing UDL as a constructed framework in general or in application to developing preservice teachers must also insist on drawing from all three. Conversely, if researchers recognize that arbitrary rules such as “one must use at least two checkpoints from at least three guidelines in at each principle” is too rigid and impractical for dynamic classroom application, then UDL ought not to be so sharply operationalized at the conceptual level for research.

Further, operationalizing UDL requires a subjectivity that is reflective of the fact that UDL is a framework, not a method. Any attempt to operationalize must recognize

that the application of UDL is a complex, skill-based, subjective, decision-oriented form of pedagogy, the guiding principles for which will manifest uniquely depending on the context in which it is utilized. Seeking to objectively operationalize UDL would thus be limiting for practice and arbitrary for research. What we need in research is a qualitative description of the design process that teachers, researchers, or instructional designers used to implement the UDL framework in the specific context in which it was done; such description must be rich enough to demonstrate the core aspect of UDL: design (Israel, Ribuffo, & Smith 2014).

Edyburn's (2010) commentary entitled "Would You Recognize Universal Design for Learning if you Saw It?" provides 10 propositions regarding what UDL is and is not, argues that "without an adequate base of primary research, an analysis of research evidence establishing UDL as a scientifically validated intervention is not possible" (p. 34). In title and content, this groundbreaking commentary expresses Edyburn's concern that the profession cannot "implement a construct that it cannot define" (p. 33). Rao and others (2010) echo this call for operationalization, arguing that a "clear definition" (p. 154) of UDL is needed, where currently there is divergence.

Edyburn's call for "scientific validation" is one that begs objective operationalization of the construct of UDL. Likewise, the fact that Rao, and others call for a "clear definition" despite very official and widely disseminated definitions that exist, indicates that 'clear' here may be synonymous to 'objective,' which the official definition of UDL (i.e., that published by the Center for Applied Special Technology) is

not. In both cases, this desire to structure UDL as an objective intervention reflects a modernist, positivist perspective that may be at odds with the dynamic nature of UDL. The issue may not be that UDL has not been well constructed and defined, but rather that we have not sufficiently undergone the necessary paradigm shift, as a field, to embrace the implications of researching a dynamic framework that calls for perpetual innovation rather than what we are long accustomed to: methods that can be learned and applied with a degree of operationalized objectivity.

The desire for such objectivity is not surprising given that the academic field of Education has grown up and gained what significance it has in the context of empiricism. It is our heritage to resemble the so-called hard sciences as closely as possible. However, in this period of innovation, clear top-down objectivity and structure may need to give way to bottom-up, post-positivist and postmodernist constructs. What is UDL and what is not must be shaped by qualitative, intentional, creative, and contextual adherence to the framework. Unlike the field that is striving to study it, UDL's heritage is in the recognition and celebration of subjectivity. Just as UDL calls for us to recognize that it is not a student who is disabled, but a learning environment that is disabling, so we must recognize that the definition of UDL is not limited, but rather it is our attempt to define UDL in conventional means that is limiting its potential.

In this light, Edyburn's 10 propositions are exactly what we need: broad exploration of where the tentative boundary lines are for implementing the UDL framework; however, I would suggest that this is not "definitional" in the traditional

sense. Explicitly or implicitly, the majority of Edyburn's propositions state what UDL is *not*. Here is a paraphrase of 7 of the 10: It is *not* parallel to UD architecture (proposition #1); it is *not* just good teaching or what we have always done, but rather about dynamic design (proposition #4); it is *not* "natural" (proposition #5); it is *not* low tech/no tech (proposition #6); it is *not* assistive technology (proposition #7); it is *not* simply about primary impact/primary target (proposition #8); it is *not* simple (proposition #10). The remaining three, affirmative-natured propositions are either intentionally broad in concept (i.e., proposition #2: "UDL is fundamentally about proactively valuing diversity"; proposition #3: "UDL is ultimately about design") or about evaluation of the construct, which is not definitional (i.e., proposition #9: "Claims of UDL must be evaluated on the basis of enhanced student performance."). Focusing on what UDL is *not* may be the correct idea. Doing so does not lead to a definition, but a territory (see Figure 7) in which UDL and its practice may move and grow in relation to the complex task that it seeks to achieve. In this study, UDL is operationalized according to this territorial operationalization, with specific articulation as to which principles and checkpoints were utilized in lessons, and some qualitative explanation provided to demonstrate the design elements of these choices in context.

Dependent Variables

In this section, attention is given to the dependent variables under consideration in this study. Given that education is discipline that is grounded in action, and given that action, according to the theory of planned behavior (Ajzen, 1991b) is borne—at least in

part—of both cognitive attitudes (e.g., Fang, 1996; MacFarlane & Woolfson, 2013) and efficacy (e.g., Armitage & Conner, 2001; Dixon, Yssel, McConnell, & Hardin, 2014; E. D. Evans & Tribble, 1986; Sass, Seal, & Martin, 2011; Soodak & Podell, 1993; Woolfolk, Rosoff, & Hoy, 1990), this study includes measures of both domains. To this end, the following variables are utilized as dependent measures of this study. Italicized words represent the core construct being assessed.

1. Preservice teacher *sense of efficacy* in using UDL to teach students with disabilities and other diversities and
2. *Attitudes* regarding inclusion of students with disabilities.

As aforementioned, the ultimate goal of teacher preparation is preparation for the very active practical duties for which preservice teachers will later be responsible. To support preservice teacher development for practical duties, I chose to include measures of both efficacy and attitudes to bolster confidence that the display of such qualities in unison in the context of teacher preparation may transfer to professional context (Ajzen, 1991b).

On the one hand, that preservice teachers may be trained to behave in a certain way when explicitly taught, shortly after being taught, has long been established in the literature of preservice teacher preparation (Cochran-Smith & Fries, 2005). A study that demonstrates this phenomenon may add little to our current knowledge base. On the other hand, the fact that preservice teachers may demonstrate the ability to complete a task (e.g., lesson plan) in a desired way in the context of a preparation setting does not itself

necessarily indicate transfer to a professional setting (Cochran-Smith & Fries, 2005, Sharp, 2009). One of the reasons for why this transfer cannot be assumed is that learning to apply behaviors in a given context is a lower-order skill than transferring such behavior to other, especially more complex, contexts. Furthermore, given that a focal point of UDL is the concept of *designing* lessons that meet the needs of one's students in context, it cannot be sourced from chance, mimicry, or ignorant aptitude (i.e., unintentional skill).

As such, a more robust dependent variable (or collection of variables) is necessary to provide confidence that skills learned in the preparation setting may transfer. Others have contributed evidence that teachers may be taught how to develop UDL lesson plans and may be explicitly taught concepts related to UDL (e.g., Coyne, Pisha, Dalton, Zeph, & Smith, 2012; Spooner, Baker, Harris, Delzell, & Browder, 2007); this study adds to the literature by exploring the effects of a UDL intervention on psychological domains related to inclusion of diverse students. This has value given that attitudes serve as proxies to applied behavior, as it has been well established that teacher attitudes have a significant effect on their actions, including regarding inclusive practices (Hargreaves, 1977; Power & Tisher, 1973; Rath, 2015).

More specifically, knowledge and skill must be accompanied by teacher intention to result in actual teacher practices (e.g., Ajzen, 1991; MacFarlane & Woolfson, 2013). Furthermore, building on existing literature that focuses on practical (behaviorist) domains by adding attitudinal and efficacy (cognitivist) domains may allow for greater

confidence that short-term outcomes among preservice teachers will transfer to applied settings. In the following sub-sections, I report on the critical aspects of efficacy and attitudes and how they have been addressed in the literature. This study intends to build on studies that focus on short-term preservice teacher knowledge and skill, which and overlaps in some capacities with attitudes and efficacy. As such, I also include a brief review of the literature regarding (preservice) teacher knowledge.

Preservice teacher intention to include. As mentioned earlier, there is evidence to support the notion that teacher practice is mutually informed by capacity (e.g., knowledge, skill) and intention (e.g., will, attitude, beliefs; Fang, 1996; MacFarlane & Woolfson, 2013). In this section, I focus on the cognitive domain of teacher intention, and specifically intention to include diverse students. The importance of intention is articulated by Ajzen (1984) who demonstrated that, “intentions to perform behaviors of different kinds... together with perceptions of behavioral control, account for considerable variance in actual [teacher] behavior” (p. 179). The construct of intention to perform a particular behavior is assumed to represent motivation; that is, how hard one would be willing to work to perform a behavior (Ajzen, 1985, 1991a). This variable itself is seen to largely correlate with actual behavior (Ajzen & Madden, 1986), but is moderated in part by a second factor: the degree to which individuals feel that they are able or enabled in a specific situation to bring about the outcomes they intend (Ajzen, 1991). This latter construct is referred to in psychological literature as “perceived behavioral control” (Ajzen, p. 183) and has been argued to be parallel to teacher efficacy (Ajzen, 1991; Eagly

& Chaiken, 1993; MacFarlane & Woolfson, 2013). For example, a teacher may believe very strongly that a child with disabilities should be socially included in her classroom, and may be willing to work very hard to make this happen (motivation, intention), but if the teacher feels that she is disempowered (possibly because she thinks teachers cannot truly influence social relations among peers), her low perceived behavioral control may mitigate the effect of her strong attitude/beliefs.

Conversely, feeling that one can do something without the attitude or beliefs that motivate such action is not a recipe for behavior either. For example, if a teacher feels adequately prepared to help a student with a learning disability in reading, but believes that such students should receive support outside the general classroom, he is not likely to expend the effort necessary to help this student achieve, and thus contributes to a sort of confirmation bias when the student fails to succeed in his general classroom setting. A simplified version of Ajzen's (1991) model, therefore, may be: when teachers are motivated (attitudes and belief) to perform a behavior and feel empowered to achieve the target results of the behavior (perceived behavioral control), they then intend to undergo such behavior and then do in fact perform such behavior (see Figure 2). Because the actual behavior that is sought of preservice teachers must be performed in the future and in the school-setting context, intention to perform behavior (in this case, intention to include) may be the most relevant proxy available.

It is worth noting that the construct of perceived behavioral control emerged in psychology literature (e.g., Ajzen 1985, 1991) and is broadly used in health. However, it

bears striking similarity to the education literature notion of teacher efficacy. For example, both relate to the degree to which individuals (or individual teachers) believe they can commit behavior that affects desired change and both recognize the subjectivity of this belief based on circumstances and context. Because this study is couched in education rather than general psychology or health (where the terminology “perceived behavioral control” is more commonly used), I focus more specifically on the construct and terminology of “teacher efficacy,” recognizing the strong overlap of the two concepts (e.g., Eagly & Chaiken, 1993; MacFarlane & Woolfson, 2013).

Effectively, recognition of this model allows for a more thorough and meaningful way to measure influence of cognitive effects on behavior than could have been achieved by just looking at the effects of attitudes, which have been demonstrated to be inconsistent in predicting behavior by themselves. Nevertheless, it is worth examining each of the two constructs independently before merging them to generate the meta-construct of teacher intention. In the following sections I set out to accomplish this independent examination.

Teacher efficacy. The construct of teacher efficacy stems from two sources: the RAND organization (Armor et al. 1976) and Bandura’s (1977) manuscript “Self-Efficacy: Toward a Unifying Theory of Behavioral Change.” The RAND study focused on just two Likert-type scale questions that dealt with the degree to which teachers felt they had control over their students’ achievement in the face of external factors. The wording of these questions also varies in terms of generalized or personal subject (i.e.,

“When it comes right down to it, *a teacher* really can't... vs. “If *I* really try hard, *I* can...”). When parsed, responses to these questions can be assigned to the categories of General Teacher Efficacy (GTE; Ashton, 1984) or Personal Teacher Efficacy (PTE; e.g., Tschannen-Moran, Hoy, & Hoy, 1998), a distinction which has proven fruitful in the literature.

Building on the initial RAND construct for teacher efficacy, several instruments have been developed to either sharpen focus or expand the broadness of the construct including, for example, Teacher Locus of Control (Rose & Medway, 1981), Responsibility for Student Achievement (Guskey, 1981), and The Webb Efficacy Scale (Ashton et al., 1982) among others.

Bandura (1977), however, had a different definition of self-efficacy (of which he saw teacher efficacy to be an extension). He was dissatisfied with the generalized nature of teacher efficacy in the RAND construct, arguing that teacher efficacy could and did change with contexts. For example, a teacher may have high efficacy in teaching high school chemistry, but a much lower efficacy in teaching middle school biology. Or a teacher with high efficacy in a mono-cultural setting may have much lower efficacy in a diverse setting. In their summary of Bandura's view, Tschannen-Moran and others (1998) suggest,

“Self-efficacy is a future-oriented belief about the level of competence a person expects he or she will display in a *given situation*. Self-efficacy beliefs influence thought patterns and emotions that enable actions in which people expend

substantial effort in pursuit of goals, persist in the face of adversity, rebound from temporary setbacks, and exercise some control over events that affect their lives” (p. 207, 210; emphasis added).

When applied to teachers (i.e., teacher efficacy), self-efficacy requires the teacher to believe that (1) their behavior may have direct impact on student performance (implying a strong internal locus of control), and (2) that they have the capacity to identify and utilize the behaviors that will be successful to this end in specific contexts.

This further implies that teachers believe in their ability to bring about positive student outcomes *in spite of* other relevant factors affecting such outcomes including socio-economic status, home life, IQ scores, etc. (Moeller & Ishii-Jordan, 1996). As Moeller and Ishii-Jordan suggest, important to this construct is the idea that teachers believe that all students can learn, despite initial entering skills and abilities.

Despite the variety of ways teacher efficacy has been measured, there is overwhelming consensus in the literature as to its importance. High scores in teacher efficacy measures have been used to accurately predict more active interaction with students (Gibson & Dembo, 1984), professional commitment (Coladarci, 1992; Evans & Tribble, 1986); progressive instructional experimentation (Allinder, 1994); organization, planning and fairness (Allinder, 1994); a greater sense of willingness to keep students with diverse learning needs in the general classroom (Meijer & Foster, 1988; Podell & Soodak, 1993; Soodak & Podell, 1993); overall student academic outcomes (e.g., Moore & Esselman, 1994; Ross, 1992; Watson, 1991) and students’ own attitudes (e.g.,

Woolfolk, Rosoff, & Hoy, 1990). The importance of this construct, therefore, makes it a useful and significant dependent variable to measure in this study. Further discussion of measurement of this construct, including the measures used in this study, appears in Chapter 3.

Teacher attitude. Teacher attitude is a compound construct, as it may be recognized to have both cognitive (e.g., belief) and affective (e.g., feeling) aspects, both of which are relevant in driving behavior. Interest in teacher attitudes may date back to at least Phillip Jackson's (1968) *Life in the Classroom* in which Jackson attempted to frame the means by which teacher thought processes were the implicit processes that underlie the behavior that was the focal point of research at his time of writing. However, being a subdomain of cognitivism, serious collective research on the topic of teacher attitudes did not take off until the early 1980s, during what Cochran-Smith and Fries (2005) refer to as the period in which teacher preparation was framed as a "learning problem," a period that closely corresponds with the rise of cognitive models of education research.

The rise of research interest in teacher attitudes was useful in establishing justification of an indirect connection from teacher cognition to teacher behavior and ultimately to student learning (e.g., Anders & Evans, 1994; Clark, Peterson, & Wittrock, 1986; Fang, 1996; Hollingsworth, 1989; Niederhauser & Stoddart, 1994; Schommer, 1994; Wigfield & Eccles, 2000). Collectively, this body of early research goes beyond demonstrating the connection from teacher cognition to student performance to attempting to formulate theories about the nature of the process (Fang, 1996). For

example, Putnam and Duffy (1984) argued that teacher cognition dictates pre-planned outcomes, as behaviors are unconsciously perpetuated to help bring these outcomes to bear; similarly, Shavelson and Stern (1981) suggested teacher cognition serves as a filter through which decisions are sifted and made, resulting in behavior. Fang summarized the body of research from this period saying, “teachers' thinking about their roles and the beliefs and values they hold help shape their pedagogy. Specifically, it indicates that teachers teach in accordance with their theoretical beliefs” (p. 53).

However, this unilateral model whereby teacher beliefs determine teacher actions, which affect student performance has also been challenged as too linear and as failing to recognize the complex environmental and social interactions that reciprocally affect teacher action and that mediate teacher action and student performance (Fang, 1996). Other factors including school, instructional and classroom life (e.g., Duffy & Anderson, 1984), associative impact of administrator and collegial attitudes (Kilgore, Ross, & Zbikowski, 1990), teacher evaluation policies and their stated values (Sapon-Shevin, 1990), and difficulty for early career teachers to bridge the gap from the idealism (often generated in preparation environments) to the realities of classroom life (e.g., Pinnegar & Carter, 1990). In light of these factors, Fang (1996) suggested, “teachers' theoretical beliefs are situational and are transferred into instructional practices only in relation to the complexities of the classroom” (p. 55).

In reflection, two findings from the early literature together present an important conundrum for education faculty: (1) teacher cognition can have serious implications for

student achievement and (2) teacher cognition may be affected by a large number of complex factors that occur after leaving preparation programming. How can education faculty meaningfully contribute to developing constructive attitudes in preservice teachers and ensure that these fledgling beliefs survive the complex battery of (potentially less constructive) early career influences? Speaking of in-service teachers, Duffy and Anderson (1984) summarize this issue in a way that easily and vitally translates to the preparation process:

The issue is not whether teachers should possess theoretical knowledge ... They should. Instead, the issue is how teachers can apply theoretical knowledge in real classrooms where the relation between theory and practice is complex and where numerous constraints and pressures influence teacher thinking (p. 103).

It must, therefore, become a rallying point for teacher educators to consider how to not only develop constructive cognitive attitudes among preservice teachers with whom they have influence, but to do so in a way that prepares such preservice teachers for the complex settings in which such attitudes are to be applied, and to develop them in such a way as to be resilient against the impact of less constructive views with which teachers are likely to come in contact in their careers.

However, following attitudinal effects from undergraduate intervention to professional practice is excessively complicated. Longitudinal studies are not only resource intensive, but also difficult to ensure validity given the multitude of variables that intercede between coursework and practice. To be convincing, therefore, such data

would need to be collected not only longitudinally, but also large scale and requiring of an (also large) control group. Such a study would be extremely resource intensive.

In absence of the resources (time, program control, funding) for such a large-scale endeavor, this study examines a smaller portion of the process: specifically, the impact that a single course of study may demonstrate on the immediate or short-term attitudes of teachers. Though this type of short-term research already has been developed in theoretical and some practical terms in much older research (e.g., Anders & Evans, 1994; Clark & Peterson, 1986; Duffy & Anderson, 1984; Eccles & Wigfield, 1985; Fang, 1996; Hollingsworth, 1989), it still has value for this study for two reasons. (1) From a theoretical perspective, this study extends the literature that examines attitudes in isolation by using teacher attitudes as one of a set of interdependent variables. The hypothesized expectation of significant growth in more than one domain may allow for greater certitude of continuation than any one in isolation. That is, beliefs without related knowledge and skill may be more likely to be lost than those that are supported by the same. (2) From a practical perspective, the presence of attitudinal measures may provide me with heightened sensitivity necessary for the multiple measures design utilized in this study. Further discussion of the design utilized for this study can be found in Chapter 3.

(Preservice) Teacher Knowledge

Though this study does not explicitly measure preservice teacher knowledge, it builds upon and extends research that has already done so. In this sense, it is valuable to reflect on the nature of the construct of (preservice) teacher knowledge. The literature

base demonstrates broad agreement that teacher knowledge is an important variable in establishing what it means to be a quality teacher (Darling-Hammond & Bransford, 2005; Grossman & McDonald, 2008; Munby, Russell, & Martin, 2001; Voss, Kunter, Baumert, 2011; Woolfolk Hoy et al., 2006). Indeed many recent studies have shown that teacher knowledge is associated with higher student outcomes (e.g., Metzler & Woessmann, 2012; Olszewski, 2010; Sadler, 1989; Tchoshanov, 2011; Walshaw, 2012). Additionally, König, (2013) has demonstrated that early teacher preparation in developing teacher knowledge, before practice, can help prepare teachers for creative application of such knowledge.

However, teacher knowledge is not a unitary construct in the literature. For example, in his seminal work on the topic Shulman (1986, 1987) parsed the construct of teacher knowledge into *content* knowledge (CK), *pedagogical* knowledge (PK; sometimes referred to as *general pedagogical knowledge*, GPK), and the hybrid *pedagogical content* knowledge (PCK). Most relevant to framing this study is general pedagogical knowledge (GPK). GPK has been defined by Shulman (1987) as “broad principles and strategies of classroom management and organization that appear to transcend subject matter” (p. 8); Grossman and Richert (1988) alternatively suggest that GPK “includes knowledge of theories of learning and general principles of instruction, an understanding of the various philosophies of education, general knowledge about learners, and knowledge of the principles and techniques of classroom management” (p. 54).

Much emphasis in the literature has been on PCK over GPK as a construct that lends itself better to focusing on skills that are specifically relevant to teaching content, and for good reason. Methods for teaching math, for example, may be different than those employed for literature. That said, increasing interest in dynamic frameworks may allow for resurgence of interest in GPK as teachers are taught principles for education which they may plug in the various methodologies they learn via PCK coursework, professional development, and experience. This suggestion is reflected in the relatively recent re-emergence of GPK in the literature (e.g., Baer et al., 2007; König et al., 2011; Oser & Oelkers, 2001; Schulte, 2007).

In reflection of this trend, I found a handful of studies that demonstrate how short, direct instructional interventions can improve practical teacher knowledge as measured by UDL lesson plan development (Courey, Tappe, Siker, & LePage, 2013; Spooner, Baker, Harris, Delzell, & Browder, 2007; Van Laarhoven, Kraus, Karpman, Nizzi, & Valentino, 2011). For example, in their study, Spooner, and others (2007) explore the effect of a one-hour direct instruction intervention on the ability of preservice teachers to design lesson plans (in 20 minutes) that reflected the three guiding principles of UDL (multiple means of representation, action/expression, and engagement). In this study, which was a pretest/posttest experimental group study, the authors showed strong and statistically significant growth for the group receiving the one-hour intervention compared to those who did not receive such intervention.

Similarly, Courey, and others (2013) involved participants who were preparing for inclusive settings in which students with disabilities will be present alongside those without disabilities. These participants were tasked with designing lesson plans to be used for simultaneously teaching a whole class (rather than individual students, as was the case in Spooner and others). Courey and others expand explicit UDL training from Spooner and colleagues' one hour to three hours. The authors also matched Spooner and others in the provision of a pretest and immediate posttest, but then also added a maintenance posttest at the end of the semester. The results on this maintenance posttest are again positive, demonstrating significant growth in the performance of participants from pretest to first posttest and a high degree of maintenance (and often further improvement) between the first posttest and the maintenance posttest. This study thus expands the notion of direct instruction of UDL to be a module-based learning experience over three hours (compared to direct lecture for one hour in Spooner and colleagues' study) and demonstrate how the lesson plan analysis can be utilized as a repeated measure to obtain a degree of maintenance data at the end of the term.

Together with other studies involving more intensive and programmatic UDL interventions (Evans, Williams, King, & Metcalf, 2010; Frey, Andres, McKeeman, & Lane, 2012), there are grounds to suggest that there are ways to quickly and effectively (and/or thoroughly and systematically) develop preservice teacher *knowledge* of UDL. However, knowledge alone, without related positive attitudes and efficacy is unlikely to result in pragmatic change in teacher behavior (e.g., Ajzen, 1991; Armitage & Conner,

2001; MacFarlane & Woolfson, 2013; Pang & Watkins, 2000). Thus, in this study, I assume that UDL can be efficiently taught in terms of knowledge, and focus on the variables of gains in attitude and efficacy measures.

Summary

In this chapter, I examined existing literature regarding each of the independent and dependent variables. First, I conducted a review of the literature regarding the independent variable of faculty modeling. While faculty modeling is stressed in position papers and qualitative reports, there is little by way of empirical studies that support the effect of such modeling. However, the literature base has well prepared for new lines of research in this domain by clearly articulating and parsing what faculty modeling is and different forms it may take (Korthagen et al., 2006; Loughran & Berry, 2005), which is useful for this present study, in that it is intended to contribute toward providing empirical evidence for the practice of faculty modeling for the development of preservice teachers' capacity to utilize complex frameworks in their early careers.

Next, I provided an analysis of UDL and how it is represented in the literature, particularly in relevance to teacher education. One of the most pertinent discoveries was that though UDL is well established in policy, it is less entrenched in teacher preparation programs (Vitelli, 2015). There are a number of barriers related to teaching and researching UDL including a lack of consensus as to how UDL may be operationalized (Edyburn, 2010; Rao et al., 2014). I presented a case for operationalizing UDL as a territory, focusing on broad definitions provided by the Center for Applied Special

Technology (CAST) and using negative renditions of Edyburn's (2010) 10 propositions to form boundaries for what is not UDL.

I next turned the literature review to the dependent variables examined in this study: (preservice) teacher intention to include via efficacy and attitudes regarding inclusion. In terms of teacher knowledge general pedagogical knowledge (GPK; König et al., 2011; Shulman, 1986) is the most relevant manifestation of teacher knowledge for broad frameworks such as UDL. Two short intervention studies (Spooner et al., 2007; Courey et al., 2012) were used to demonstrate that one key point already has been established: preservice teacher knowledge of UDL may be developed quickly. However, knowledge alone is not enough to justify confidence in future classroom behavior. A better proxy for future behavior is intent to perform the said behavior, which relates to the theory of planned behavior, the framework for the approach used in this study.

The review of literature related to preservice teacher intention to include diverse students borrowed significantly from the theory of planned behavior (Ajzen, 1985, 1991a; Ajzen & Madden, 1986). According to this theory, intention is an immediate proxy to behavior (e.g., inclusive behavior; Ajzen, 1991; Armitage & Conner, 2001; MacFarlane & Woolfson, 2013; Pang & Watkins, 2000) and intention itself is predicated by two factors: (1) teacher attitudes and beliefs and (2) perception of behavioral control (cf. self-efficacy, teacher efficacy). This literature review also included measures of intention to include, which informed the instrumentation for this present study.

Teacher efficacy (Gibson & Dembo, 1984) is a more specific form of Bandura's (Bandura, 1977) construct of self-efficacy, and measures the degree to which teachers believe they have potential to positively impact their students above and beyond other factors (e.g., socio-economics, school policies, homelife). In addition to being a construct related to intention to include, teacher efficacy itself is a variable that has been linked to numerous outcomes in the classroom (e.g., Allinder, 1994; Coladarci, 1992; Gibson & Dembo, 1984), including student academic achievement (e.g., Moore & Esselman, 1994; Ross, 1992).

Likewise, teacher attitudes are relevant for supporting intention to include (Ajzen, 1991a), but also relevant in their own right, as attitudes, themselves, have been shown to influence teacher behavior and pedagogy (Putnam & Duffy, 1984; Shavelson & Stern, 1981). Though it is difficult to trace attitudes from undergraduate classroom to professional practice, this draws from literature that has examined attitudinal gains based on short-term interventions (e.g., Anders & Evans, 1994; Clark & Peterson, 1986; Duffy & Anderson, 1984; Eccles & Wigfield, 1985; Fang, 1996; Hollingsworth, 1989), but extends the existing literature by examining this variable as one half of the construct of "intention to perform a behavior" (Ajzen, 1985), which forms a more holistic picture of preservice teacher intention.

This review of the literature thus demonstrates how both independent variables are worth studying because of significant existing holes in the research. Barriers associated with researching each of these variables were noted and addressed except the

need to operationalize UDL, which is addressed in Chapter 3. This review provides a pragmatic foundation onto which this study can build and provides clarity as to how this study may contribute to the current needs and opportunities of our time and field-of-education context.

Chapter 3

Method

This chapter is dedicated to presenting the methods and materials used for data collection in this study. Herein, I rearticulate the problem I address in this study, which provides guidance for the research questions and hypothesis. I then move into an articulation of the population and sample participants in this study, an overview of the experimental design utilized, provide information regarding the instrumentation and measurement employed for data collection, and conclude with an examination of data analysis procedures to be utilized in this study.

Problem and purpose review. In prior chapters, I articulated two different, but interrelated problems. First, researchers and practitioners have noted the increased complexity of the contemporary classroom and the demands that this places on high quality teacher preparation (e.g., Cochran-Smith & Zeichner, 2005; Darling-Hammond, 2000; 2012), but there is little consensus as to best practices for preparing teachers to implement quality teaching once they begin their careers (Korthagen et al., 2006). While faculty modeling has been proposed as a potential best practice (Aleccia, 2011; Darling-Hammond, 2005; Korthagen et al., 2006; Loughran & Berry, 2005; Putnam & Borko, 2000), there remains little empirical support (Cochran-Smith & Zeichner, 2005a; Korthagen et al., 2006; Merseth, 1996). Thus, empirical research is needed to provide justification for the notion that modeling best practices may actually result in heightened

learning and practice among preservice teachers when compared to non-modeled methods (e.g., lecture/textbook reading).

Second, though UDL has been emphasized in federal policy including repeated mentions in the Every Student Succeeds Act (ESSA, 2015), and has appeared as an independent variable in a wealth of contemporary research (Rao et al., 2014), there remain serious challenges in terms of clearly operationalizing UDL (Edyburn, 2010), being consistent in what is meant by UDL in research and practice (Edyburn, 2010; Rao et al., 2014), and related to the consistency of Education faculty knowledge and dissemination of knowledge related to UDL to preservice teachers (e.g., Allday, Neilsen-Gatti, & Hudson, 2013; Berquist, 2013; Cavendish & Espinosa, 2013; Kurtts, 2006; Lang, 2014; McGuire-Schwartz & Arndt, 2007; Vitelli, 2015).

These two under-researched areas lend themselves to a joint study in that faculty modeling has a theoretical basis for being a useful means of teaching complex and dynamic frameworks such as UDL (Ajzen, 1991a; Bandura, 1986). As such, this study may be able to contribute both empirical evidence for the benefit of faculty modeling and provide evidence as to an effective solution for preparing preservice teachers to implement UDL in their future classrooms.

Research question. Does faculty modeling of UDL improve preservice teacher sense of efficacy and attitudes regarding inclusion? To address this two-part question, each dependent variable is matched with a single instrument as depicted in Table 5.

Hypotheses. There is a statistically significant difference between the two groups (i.e., those who are taught using explicit modeling (Lunenberg et al., 2007) of UDL and those who are taught using textbook and lecture format only) in terms of sense of efficacy in utilizing UDL and attitudes regarding inclusion of diverse students and students with disabilities.

Participants, Assignment, and Setting

Participants are preservice teachers attending a large traditional university in the Southeast United States. Fifty-one participants were involved in this study with groups being $N=25$ and $N=26$ participants, respectively. Of the 51 participants, 43 identified as female and five as male. Three identified as African-American/Black, and 48 as European-American/non-Hispanic white. Thirteen were third-year undergraduates, 27 were fourth-year undergraduates, seven were fifth-year undergraduates, and four were Master's-level students. Thirty-five participants were seeking an initial teaching license in a field other than special education (e.g., music education, English education, agricultural education, etc.), 15 were seeking initial licensure in special education, and two were taking the class in pursuit of an additional endorsement in special education to supplement existing education licenses.

All participants were enrolled in the university's teacher education program, which requires having accrued a minimum of 45 - 75 semester credits (depending on major area within Education) and having maintained a GPA above 2.7. Further, all participants were enrolled in the course in which this study was conducted, which itself is

a mandatory course for all education initial licensure candidates, and focuses on preparing general and special education teachers with the requisite knowledge for teaching students with disabilities and diverse learners.

Participants were briefly introduced to the study, provided an informed consent and invited to participate in the study. Those who opted in were assigned a random participant ID which they were asked to write down and use for participant identification in each of the instruments used throughout the study. Participants were assigned a group number based on the class section of which they were part. All participants in the class section meeting on Monday evenings were assigned to group 1 while all participants in the section meeting on Tuesday and Thursday mornings were assigned to group 2. Though the class schedule differed in the number of meetings per week, the amount of instructional time was held constant each week across the two class sections.

This sample may be considered a convenience sample (Gall, Gall, & Borg, 2007), but it nevertheless reflects similar dispersion of gender and race compared to national trends in education (NCES, 2013), and typical age range for undergraduate attendance (NCES, 2016). In this sense, though this sample was a convenience sample it may be reasonable to cautiously generalize the results of this study to other traditional university-based teacher preparation programs nationally.

Design

This study was conducted with a within-subjects, repeated measures design (Charness, Gneezy, & Kuhn, 2012). This design is a modified version of the time series

design (Campbell & Stanley, 2015; Ostrom, 1990), which is described as involving “a single group of research participants... measured at periodic intervals, with the experimental treatment administered between two of these intervals” (Gall, Gall, & Borg, 2007, p. 404). The within-subjects time series design is frequently used successfully for research related to behavior changes (Gall et al.), and has been adapted to examine the effects of intervention on student behavior in education (e.g., Duda, Dunlap, Fox, Lentini, & Clarke, 2004; Patrick, Hisley, Kempler, & College, 2000). In this modified version of the time series design, participants in two groups underwent the time series alternating intervention and control settings (see Figure 6); this approach allowed for the within-subjects design to be combined with a between-subject design. Such a combination of within and between subject designs has been recognized as a way to utilize the advantages and mitigate the drawbacks of each design type while also increasing the amount of data collected from a set of participants (Charness et al.).

Data collection. Data were collected at three points in time (pretest, posttest 1, posttest 2). The pretest occurred in the second and third class meeting respectively for the Monday section and the Tuesday/Thursday section, prior to any core instruction. The posttest 1 data collection occurred after participants in group 1 experienced the control condition (lecture) and those in group 2 experienced the treatment condition (modeling). Between posttest 1 data collection and posttest 2 data collection, the conditions were reversed such that participants in group 1 experienced the experimental (modeling)

condition and those in group 2 experienced the control (lecture) condition (see Figure 6 for further clarification if desired).

Data were collected in the form of survey response and testing via two instruments: The TSE-UDLS and the MATIES (Mahat, 2008). The TSE-UDLS was created as an adaptation of the Teacher's Sense of Efficacy Scale (TSES; Tschannen-Moran & Hoy, 2001). Like the original scale, this measure was designed to examine participants' sense of efficacy in teaching and classroom management related areas, but the adapted instrument focused specifically on efficacy in practicing UDL and UDL-related aspects of teaching and classroom management. The TSE-UDLS includes 28 items for which participants scored themselves on a five-point Likert-type scale; mean scores were calculated for each participant at each time point. The MATIES (Mahat, 2008) was designed to measure participant's attitudes toward including diverse students including those with disabilities in the general classroom. The MATIES includes 18 items for which participants scored themselves on a five-point Likert-type scale; mean scores were calculated for each participant at each time point.

Data collection occurred three times in the form of pretest, posttest 1 (at the halfway point), and posttest 2 at the conclusion of the intervention study. Figure 6 presents the study design wherein group 1 and group 2 refer to two sections of the course in which this study was conducted. "Lecture" refers to the control groups wherein there was business as usual; that is, the instructor lectured and assigned textbook reading related to the topic being studied. "Model" refers to the experimental group wherein there

was active modeling of the principles of UDL under the guidelines articulated in Chapter 2. The measures were administered during regular class time, at the beginning of a class. Students were given a link to a Qualtrics form and allotted 20 minutes to complete both surveys.

The same content was being taught during the same types of teaching (i.e., participants in group 1 and group 2 learned the same course material while in lecture phase and model phase, respectively; however, they learned such content in opposite chronological order; see Figure 6). Any growth that occurred between the pretest and posttest 1 would be labeled as “treatment (modeling)” or “control” for groups 1 and 2 respectively and growth between posttest 1 and posttest 2 would be labeled as “control” and “treatment (modeling)” for groups 1 and 2 respectively. Parsing these out allowed for comparison of gain both between the groups and across time.

Whereas 1.1 represents group 1, time 1 (pretest) and 1.2 represents group 1 time 2 (posttest 1), and so forth, the null hypotheses for this design were:

- $H_{01}: \text{Gain } 1.1 \geq \text{Gain } 1.2$
- $H_{02}: \text{Gain } 2.1 \leq \text{Gain } 2.2$
- $H_{03}: \text{Gain } 1.1 \geq \text{Gain } 2.1$
- $H_{04}: \text{Gain } 1.2 \leq \text{Gain } 2.2$
- $H_{05}: \text{Gain } 1.1 + \text{Gain } 1.2 \neq \text{Gain } 2.1 + 2.2$

Each teaching period, whether lecture or model, lasted three weeks during which three discreet topics were taught using the respective method based on whether a class was in test or control condition. Thus, the entirety of the study involves six weeks of instruction covering six topics of study; none of these topics deals explicitly with Universal Design for Learning. The intention of presenting three discreet topics of study during each teaching period was to reduce the likelihood that a given topic was over- or under-stimulating to students compared to those taught in the other setting (i.e., control or intervention). The topics of study assigned to modeling and lecturing conditions, respectively, in the first period remain for the second; that is, the topics taught to the test group in gain period 2.1 were taught to the test group likewise in gain period 1.2. See Table 6 for a tabular summary of these aspects of the design.

There was no way to randomize the participants in the two groups, and thus this research was quasi-experimental in nature. However, the collection of descriptive data and the use of a pretest helped account for minor differences between groups that existed in relation to the dependent variables at the outset of research intervention. The use of the hybrid within- and between- subject repeated measures design allowed for greater confidence in interpreting results with a relatively small sample size (Campbell & Stanley, 2015; Charness et al., 2012; Cook & Campbell, 1979).

Procedure and “Local” Operationalization

The nature of this group study design was such that participants in each group experienced the treatment and control conditions at different times. The same content was

taught in the corresponding conditions (see *Figure 6* and Table 6). These procedures correspond with the condition design in Table 7 and the procedural integrity checklist provided in Appendix C. The conditions differed only in what occurred during in class lessons; outside of class, students were assigned textbook reading to be introduced to relevant content that would be further explicated and developed in class. Each lesson also was followed by relevant homework to extend the learning and/or demonstrate content mastery.

Control condition. The control condition was “business as usual” for the instruction of this course. During each control condition lesson the instructor:

1. Textually and orally shared the learning objective(s) for the lesson with the students on the second slide of a PowerPoint presentation (the first slide was the lesson title).
 - a. For example, one of the “Special Education Procedures” included a (second) PowerPoint slide that stated the objectives: “students will be able to... (1) compare the RTI model to the outmoded IQ discrepancy model and (2) apply the RTI model to a hypothetical classroom case.”
2. At the beginning of the lesson, verbally and visually encouraged/prompted students to take notes.
 - a. For example, the lesson included a slide after the objectives that stated “Please be encouraged to take notes. You may also audio record.”
3. Orally lectured and displayed (mostly textual) PowerPoint slides.

- a. For example, the lesson included 33 slides that were mostly text, with occasional necessary graphs or images to support content. As the instructor orally lectured, he advanced the slides corresponding to the points being made.
4. Verbally prompted students to ask any questions or offer any comments that they have at appropriate intervals during the lesson (at least two times per hour per lesson).
 - a. For example, in the lesson, the instructor paused after covering the content associated with the first objective and asked the students if they had any questions. If questions were asked, they were answered. If no questions were raised after 5 seconds, the lecture continued. This procedure was repeated after the content corresponding with the second objective was covered by the lecturer.
5. Verbally summarized the lesson during the last 5 minutes of the class.
 - a. For example, in the lesson the instructor reflected on each of the objectives in turn, providing a succinct reflection of the main points (this summary was also displayed in text on the PowerPoint).

Treatment (modeling UDL) condition. The treatment condition operationalization thus blends aspects of explicit faculty modeling (Lunenborg, et al., 2007; Bandura, 1986) and my own application of UDL to this context. In the treatment (modeling UDL) condition, the instructor designed and delivered a lesson by the following procedures:

Lesson design. Given the territorial operationalization of UDL (presented in Chapter 2), the primary focus of UDL instruction is in explicit instructional design. Operationalizing modeling of UDL for this study required an additional element of modeling the design of lessons. For lesson design, the instructor (1) explicated a learning goal for a lesson by identifying what specifically students would be able to know or be able to do by the end of the lesson in measurable terms, (2) identified predictable barriers corresponding with the learning goals that the students enrolled in the course may face (and provided rationale), and (3) intentionally and explicitly drew from the UDL guidelines (Figure 5) to address such barriers. The template and one example of such a lesson plan including these features is presented in Appendix B.

Lesson delivery. The instructor utilized the UDL lesson plan aforementioned. The instructor then followed all steps included in the control condition and added the following procedures for lesson delivery. The procedures here include a form of explicit modeling (i.e., type 2; Lunenburg, et al., 2007) referred to in the literature as ‘meta-commentary’ (Lunenburg, et al., 2007, Wood & Geddis, 1999); that is, the practice of making one’s teaching choices explicit and giving reason. Where others (e.g., Loughran, 1996) present meta-commentary as ongoing throughout the lesson, the method for application herein focused on presenting meta-cognition after the lesson in a reflective format; this is comparable to the approach taken by Lu and Lei (2014).

1. Uniquely to the treatment condition, the instructor distributed a hard copy of the lesson plan to the students, which included the goals, barriers, and checkpoints for

the lesson. It was also shared through the course Learning Management System in digital form.

- a. An example of one such lesson plan is presented after the blank template in Appendix B.
2. Uniquely to the treatment condition, the instructor gave students 5 minutes at the start of class to review the instructor's lesson plan and then the instructor verbally expressed justification for the UDL checkpoints selected for the present lesson (an aspect of meta-commentary).
 - a. For example, after distributing the lesson plan presented in appendix B (hard and digital copies), the instructor gave five minutes for students to skim over all aspects. The instructor then explained why specific checkpoints were chosen to address pre-identified barriers.
3. As in the treatment condition, the instructor verbally encouraged students to take notes, stating "please remember that you are always encouraged to take notes by hand or using your laptop or tablet during class. You may also feel free to audio record the lesson."
4. Uniquely to the treatment condition, the instructor paused to explicitly state (verbally) when a prescribed checkpoint was used. This was done for each checkpoint prescribed in the lesson plan.
 - a. For example, after introducing relevant new terminology for the lesson, the instructor paused and explicitly reflected "Please note that I just took a

minute to clarify some new vocabulary. This reflects checkpoint 2.1 in the UDL framework, which I had prescribed to address the barrier that I predicted whereby some students may not have had requisite vocabulary for the lesson.”

5. Uniquely to the treatment condition, for each explicitly stated checkpoint (as in “4”, above), the instructor provided opportunity for the students to reflect on the effectiveness of the checkpoint to address the predicted barrier and respond with a physical gesture chorale response (thumbs up/down).
 - a. For example, following the scenario in “4” above, the instructor asked, “did the explicit instruction of new vocabulary for this lesson ensure common understanding of key terms?” The instructor solicited student chorale response (thumbs up/down).
6. As in the control condition, the instructor verbally prompted students to ask any questions or offer any comments that they have at appropriate intervals during the lesson (at least two times per lesson).

Procedural integrity. Procedural integrity was based on third party observation of the class in 20% of all lessons (Gall, Gall & Borg, 2007). Based on the above procedures and my proposed territorial operationalization of UDL, procedural integrity in modeling UDL for this study was evaluated based on a procedural checklist (see Appendix C). Consistent with Gall and colleagues’ guidelines, procedural integrity was recorded by a trained observer, and integrity was indexed as a percentage of items

implemented (observed divided by the sum of observed, not observed, or not applicable). Observers were trained by being taught the operationalization of the two conditions and given several examples and non-examples until agreement was reached among the research and the observers prior to live observations.

The primary observer attended 20% of all lessons and integrity was 97%. A second observer was present for 25% of all observed cases; inter-observer agreement. Inter-observer agreement was calculated by taking the total number of agreements divided by the total number of agreements plus disagreements. The coefficient was then multiplied by 100 to compute the percentage (%) of agreement. Inter-observer agreement in these cases was 100%.

Instruments

Given the dependent variables in this study of preservice teacher sense of efficacy related to practicing UDL and attitudes regarding inclusion of diverse students, including those with disabilities, two instruments were chosen (one each) to measure progress in these variables. Respectively, these are the Teacher's Sense of Efficacy using UDL Scale (TSE-UDLS), and the Multidimensional Attitudes toward Inclusive Education Scale (MATIES). I include details and psychometric qualities for each. The instruments in entirety may be found in Appendix D.

Reliability. The most common measure of instrument reliability is that of Cronbach's alpha (Gall et al., 2007). For internal consistency, Cronbach alpha scores above .70 are considered "good" (Terwee et al., 2007). Basically, Cronbach's alpha is

used to measure how well a set of items measures a single, unidimensional latent aspect of participants. Indeed, that the instrument being measured for Cronbach's alpha measures a unidimensional construct is an assumption of the tool, however one that is often arbitrarily overlooked (Armor, 1973; Gerbing & Anderson, 1988; Widhiarso & Ravand, 2014). Drolet and Morrison (2001) suggest that many psychological measures examine constructs that are multidimensional in nature. For example, the construct of intelligence (and measures thereof) would be difficult to justify as being unidimensional. The literature has shown that using Cronbach's alpha to estimate reliability of multidimensional instruments generally underestimates reliability and introduces bias (Gerbing & Anderson, 1988). Conceptually, this makes good sense; if Cronbach's alpha determines the degree to which items holistically measure a construct, then the extent to which the construct is not monolithic will likely proportionally and negatively affect alpha scores.

For this reason, several alternative measures for estimating reliability of multidimensional measures have been developed. For example, the stratified alpha coefficient (Cronbach, Schönemann, & McKie, 1965), Mosier's coefficient (Mosier, 1943) and the Omega coefficient (McDonald, 1999) each use different conditional approaches to more accurately estimate reliability of multidimensional measures.

The Multidimensional Attitudes toward Inclusive Education Scale (MATIES) is, as the name suggests, explicitly multidimensional. In Mahat's (2008) original reliability measures, therefore, Mahat correctly used stratified alpha scores to measure the reliability

of each factor previously identified through factor analysis. It is entirely possible and reasonable that the TSE-UDLS measures multiple dimensions of teacher efficacy; however, this measure – more than the MATIES – is conceptually unidimensional. Therefore, the need for factor analysis and multidimensional reliability analysis may be justifiably reduced.

In this study, there were not enough participants to reach reasonable thresholds for conducting factor analyses of the MATIES (Tabachnick & Fidell, 2013). As such, the only way to conduct multidimensional measures of reliability was to utilize the original, published subdomains for the MATIES. More details on psychometrics for each measure are presented below.

Teacher Sense of Efficacy using UDL Scale. This scale is a modification of the Teacher Sense of Efficacy Scale (TSES; Tschannen-Moran & Hoy, 2001), which is a well-established, validated and field-tested instrument to measure teacher efficacy. After obtaining permission from the authors to modify their instrument, I carefully reviewed the original instrument and made revisions in order to heighten the salience of the modified instrument to measure not just teacher efficacy, but particularly efficacy as it relates to utilizing UDL in the classroom. To do so, I carefully examined each item in the original TSES and selected those to keep, modify (extending the core concept of the original question), or remove, and then added several questions of my own. All additions were reworded phrases from Meyer, Rose and Gordon's (2014) *UDL Theory and Practice* textbook, which was used after obtaining written permission.

Questions that were maintained were kept because they relate to UDL concepts and/or relate to including diverse students. For example, “How much can you do to motivate students who show low interest in school work?” was maintained, because diversity in how students are engaged is addressed by the UDL principle “provide multiple means of engagement.” Questions that were modified were modified because a core component was still useful, but the question needed to be re-tasked to fit well with the purpose of the new instrument. For example, “How much can you do to improve the understanding of a student who is failing?” was modified to read, “How much can you do to design lessons that prevent diverse students from failing?” This latter construction reflects the importance of lesson design in UDL and shifts from reactivity (“a student who is failing”) to proactivity (“*prevent* diverse students from failing”), which is also important for UDL implementation. Questions such as “How much can you do to get children to follow classroom rules?” which didn’t have immediate relation to learning were removed. Finally, new additions such as “To what extent can you design learning activities that provide options for all learners to physically respond?” are re-worded UDL principles or guidelines framed as questions that reflect the nature of TSES questions. The full instrument is presented in Appendix D.

Psychometrics. Original construct validity for the TSES (Tschannen-Moran & Hoy, 2001) was established by conducting correlation analysis with previously existing measures (e.g., the RAND items, the Teacher Efficacy Scale, the General Teacher Efficacy scale). Correlations were significant at the $p < .001$ level for all measure

comparisons. Additional factor analysis was conducted to refine the construct. The final instrument was narrowed from 24 to 18 items as a result of this factor analysis; there were strong factor loadings (from .61 to .83) for each item.

The overall Cronbach's alpha score for the original 18-item TSES was an excellent (Nunnally & Bernstein, 1994) .95; likewise, the overall Cronbach's alpha for the 28-item TSE-UDL was also excellent at .97.

For the current study, I focused only on the holistic alpha score because I made significant modifications to the instrument, and thus the factor analysis utilized for the initial study could not transfer and, as aforementioned, too few participants were involved to conduct a new factor analysis. To increase sensitivity and detail in test-retest reliability reporting, I collected alpha scores for each data time data were collected (pretest, posttest 1, posttest 2). Reliability scores were $\alpha = 0.95$ for the pretest, $\alpha = 0.97$ for posttest 1 and $\alpha = 0.98$ for posttest 2. Overall and each time-based reliability score for the TSE-UDLS can be considered excellent (Nunnally & Bernstein, 1994).

Multidimensional Attitudes toward Inclusive Education Scale. There are several instruments for measuring the construct of teacher attitudes. A large number of these attitudinal instruments (e.g., Berryman & Robinson, 1980; Larrivee, 1986; Moberg, Zumberg, & Reinmaa, 1997; Reynolds & Greco, 1980; Schmelkin, 1981; Semmel, Abernathy, Butera, & Lesar, 1991; Sideridis & Chandler, 1995; Villa, Thousand, Meyers, & Nevin, 1996; Wilczenski, 1992) focus narrowly on specific dimensions of attitude, such as cognitive aspects, and many such instruments are narrowly developed for a

particular study and thus do not readily lend themselves to more general use (Mahat, 2008).

However, Mahat's (2008) Multidimensional Attitudes toward Inclusive Education Scale (MATIES) is designed for broad use and intended to collect data regarding affective, cognitive *and* behavioral aspects of teacher attitudes, as pertain to inclusion of diverse and exceptional students. In addition to the focus specifically on teacher efficacy as it relates to inclusion, the instruments' multidimensional approach, offering data collection on affective, cognitive and behavior domains parallel the complex attitudinal and behavioral approach that is being utilized for both intervention and data collection in this study, making it an excellent match.

The MATIES (Mahat, 2008) includes 18 questions: six questions for each sub-scale: affective, cognitive, and behavioral. Collectively, these questions ask participants to indicate the degree to which they agree or disagree with statements related to interaction and instruction of diverse learners. The instrument uses a six-point Likert-type rating scale anchored at five points with: strongly disagree, disagree, neither agree nor disagree, agree, strongly agree (see Appendix D for the full instrument).

Psychometrics. Original content validity for the MATIES (Mahat, 2008) was established by a panel of experts during development phase. Construct validity and criterion validity and reliability were also reported as being excellent using measures of item separation (Wright & Masters, 1982) and teacher separation (Mahat, 2008). Consistent with my analysis regarding reliability measures for multidimensional

measures, the original reliability scores are presented in terms of stratified alpha coefficients; that is, Cronbach's alpha scores provided separately for each of the three subscales: affective, cognitive, behavioral. These scores were reported as being $\alpha = 0.77$ (cognitive) $\alpha = 0.78$ (affective) and $\alpha = 0.91$ (behavioral). These scores qualitatively range from acceptable to excellent a. In the current study, alpha scores were calculated as $\alpha = 0.65$ (cognitive), $\alpha = 0.73$ (affective) and $\alpha = 0.82$ (behavioral). These scores are considered acceptable (Nunnally & Bernstein, 1994).

For the current study, I also collected alpha scores for each data time data were collected (pretest, posttest 1, posttest 2). Scores for the cognitive domain were $\alpha = .45$ (pretest), $\alpha = 0.66$ (posttest 1) and $\alpha = 0.76$ (posttest 2). Scores for the affective domain were $\alpha = .69$ (pretest), $\alpha = 0.70$ (posttest 1) and $\alpha = 0.78$ (posttest 2). Scores for the behavioral domain were $\alpha = .79$ (pretest), $\alpha = 0.79$ (posttest 1) and $\alpha = 0.90$ (posttest 2). Reliability scores increased in all three subdomains from pretest through posttest 2, possibly indicating an increased cogence in response as participants advanced through the course and/or an accumulation of scores near the top of the measure. With the exception of the cognitive subdomain of the pretest, all scores were considered acceptable or better (Nunnally & Bernstein, 1994). The small number of participants may have been a relevant factor in the relatively low reliability scores. Further, because the cognitive alpha score was acceptable at posttest 1 and 2 and because the overall alpha score was acceptable, I chose to ignore the sub-optimal alpha for the cognitive-pretest cell.

Data Analysis

Given the repeated measures group design of the study, a two-way repeated measures ANOVA with one between-groups factor (group belonging) and two within-group factors (the intervention as the focal variable and time as the moderator variable) was most appropriate (Bowlin, 2012; Gall et al., 2007; Gravetter & Wallnau, 2013).

It is worth noting that two *a priori* assumptions need to be met for the two-way repeated ANOVA to be used: (1) the dependent variable (for each measure) must be continuous (i.e., interval or ratio scaled, not ordinal or nominal) and (2) there must be at least one within-subjects factors measured at two or more categorical levels (Laerd, 2015). In this study, each of the dependent variables (preservice teacher knowledge regarding structures and applied principles of UDL, and attitudes and teacher efficacy regarding inclusion of students with disabilities) was measured using an instrument that collects interval data. Further, the within-subjects factor was time, measured at three levels (i.e., pretest to posttest 1 and posttest 1 to posttest 2) which implicitly involves condition, also at three levels (i.e., pretest, control, intervention).

Posthoc analysis. Because this statistical test is omnibus in nature, post-hoc analysis was used to identify growth for each variable between each measurement period (Gravetter & Wallnau, 2013).

Summary

In this chapter, I explicated the participants and sample for this study, the design utilized, how modeling UDL was operationalized in this study, the methods of data

collection including instrumentation, and how data are analyzed. Here I provide a brief summary of these elements.

The participants involved in this study represent a convenience sample of preservice teachers attending a large southeastern traditional university. Fifty-one participants were involved in this study with groups being $N=25$ and $N=26$, respectively. This sample demonstrated a range of demographic characteristics (see pp. 60-61) that parallel national trends in education. Therefore, though this was a convenience sample, the results may cautiously be generalized to other traditional U.S. university-based teacher preparation programs.

In this study, I use a within-subjects with repeated measures group design (Charness, Gneezy, & Kuhn, 2012); that is, the study utilizes aspects of both within-group repeated measures and between group designs in hybrid approach. So doing allows me to draw from the strengths of each of these data collection methods while mitigating related limitations of each (Charness et al.). This type of design lends itself to a two-way repeated measures ANOVA with posthoc analysis.

Two instruments are utilized for this study: the Teachers Sense of Efficacy using UDL Scale (TSE-UDLS) and the Multidimensional Attitudes toward Inclusive Education Scale (MATIES; Mahat, 2008). The TSE-UDLS was developed based on the Teacher's Sense of Efficacy Scale (TSES; Tschannen-Moran & Hoy, 2001), extending and modifying the original TSES with an explicit focus on teachers efficacy as relates to practicing UDL. The MATIES was used as originally published with no modifications.

These two measures combine to inform the construct of “planned behavior” (Ajzen, 1985) as articulated in Chapter 2.

Chapter 4

Results

The purpose of this study was to empirically test the effect of modeling UDL on preservice teacher intention to include diverse students in their early career as measured in proxy by sense of efficacy and attitudes in including diverse students, including those with disabilities. To this end the research question I examined in this study was: “Does faculty modeling of universal design for learning improve preservice teacher sense of efficacy and attitudes regarding inclusion?”

Partial Attrition

In accordance with IRB stipulations, identifying data were destroyed. Because of this provision, I explicitly requested that the participants ensure that they wrote their ID number down in a safe place at the time it was assigned. However, several participants forgot and lost their identification numbers, and thus the number of usable participants for the within-subjects aspects of the study were less than the total number of individuals who opted in as participants in the study (43%). Between-group aspects of the study did not require participant IDs; and thus, all participants were included in between-group analyses. Note this method did not violate other IRB stipulations as those who did not opt in did not need to complete the surveys or, if they did, did not include a group number. Those without group numbers were excluded from the ANOVA calculations; additional posthoc tests using independent samples *t*-tests were conducted to address the full set of participants, as discussed in Chapter 5.

Assumption Testing

The two-way repeated measures ANOVA has three main assumptions in addition to the two *a priori* assumptions covered in Chapter 3: (1) there should be no significant outliers in any cell of the design (e.g., in time x group cells), (2) the dependent variable should be approximately normally distributed for each cell of the design, and (3) the variance of the differences between levels should be equal. In this section, I will present the results of each assumption test and my related decisions.

Outliers. Outliers on any of the instruments could be caused by participants inputting a response set (e.g., all fives or all ones) or could indicate a data entry error. Given how small the sample size was for this study, it was important to identify and appropriately deal with outliers, as warranted (Laerd, 2015).

To assess for outliers, I utilized studentized residuals, looking for values greater than ± 3 (Osborne, 2012). Residuals (e_i) are calculated as being the difference between observed and predicted response (i.e., distance of any given data point from the expectation line); this can be expressed mathematically as $e_i = y_i - \hat{y}_i$ where “ y_i ” represents a participant’s observed response and “ $\hat{y}_i$ ” represents the expected response. Studentized residuals (r_i) are calculated by dividing residuals by an estimate of their standard deviations (i.e., $r_i = e_i / S(e_i)$). Studentized residuals are in standardized units, and thus allow for easy identification of outliers (Tabachnick & Fidell, 2013). There were no outliers for any of the cells in either measure, as assessed by examination of studentized residuals for values greater than ± 3 .

Normality. To test for normality, I utilized a Sharpio-Wilk's test of normality (Gall et al., 2007). MATIES data were normally distributed ($p > .05$) at all three time periods. The TSE-UDLS data were normally distributed ($p > .05$) except at posttest 2 ($p < .05$). The non-normality of the TSE-UDLS posttest 2 data manifested in a similar negative skew for both groups (skewedness = -.970 and -.1048, respectively). This combined with the robustness of the ANOVA test led me to continue regardless of this minor violation (Laerd, 2015).

Variance of differences between levels. To test the variance of differences between levels, I used Mauchly's test for sphericity. Mauchly's tests the null hypothesis that the variances of the differences between the levels of the within-subjectss factor are equal (Tabachnick & Fidell, 2013). Regarding the TSE-UDLS, Mauchly's test of sphericity indicated that the assumption of sphericity was met for the three time levels, $\chi^2(2) = 1.35, p > .05$. Similarly, regarding the MATIES, Mauchly's test of sphericity indicated that the assumption of sphericity was not met for the three time levels, $\chi^2(2) = 13.561, p < .01$.

Thus, assumptions were met for the two-way repeated measures ANOVA for all measures and assumptions except for the test of sphericity for the MATIES. The violation of the sphericity assumption for the MATIES means that there was an increased risk of type 1 error when interpreting F -ratio scores (Laerd, 2015). To address this risk, I calculated epsilon scores using the Greenhouse-Geisser method. This score ($\epsilon = .670$) is $< .75$ and thus Greenhouse-Geisser was the correct interpretation to use to minimize the

risk of type 1 error (Collier, Baker, Mandeville, & Hayes, 1967). With this provision in place, I could continue with the analysis.

Correlations

As a way of introducing the data, I developed correlation matrices to examine the relationships between the two instruments (MATIES, TSE-UDLS) holistically and among different time samples. There was a strong and positive correlation between scores on the MATIES and on the TSE-UDLS $r(22) = .762, p < .001$. Additionally, there were moderate to strong positive correlations between scores on the MATIES and on the TSE-UDLS at time 1 ($r(48) = .407, p < .001$), time 2 ($r(26) = .639, p < .001$), and time 3 ($r(28) = .554, p < .001$); see Table 8).

Analysis of Research Questions

In this section, I present the results for the two-part research question addressed in this study. The research question focuses on the effect of modeling UDL compared to traditional instruction without UDL modeling on the two dependent variables, sense of efficacy related to the practice of UDL and related aspects of teaching and classroom management, and attitudes regarding inclusion of diverse students including those with disabilities. Though this was a single research question, the theory of planned behavior (Ajzen, 1985), which I have utilized to frame this study, is best harnessed by treating both of the sub-components individually in analysis before a holistic analysis can be conducted. This allows me to see the individual effects of the intervention on participant efficacy and attitudes prior to assembling the two factors, constructing the likelihood of

increased “intention to perform” the behavior of inclusive teaching practices. Analysis was conducted per the procedures described in Chapter 3. Results of the analysis are described below and further discussion of the results are presented in Chapter 5.

Analysis of participant teacher efficacy. The first part of the research question can be stated as, “Does faculty modeling of universal design for learning improve preservice teacher sense of efficacy regarding inclusion?” To answer this question, data were drawn from the TSE-UDLS. Descriptive statistics for this instrument are presented in Table 10.

A two-way repeated measures ANOVA was conducted to examine both between- and within-group effects of the intervention. There was no group (condition) by time interaction $F(2, 40)=.029, p > .05$, meaning any differences between conditions was consistent for all groups. There was, however, a significant time main effect $F(2, 40)=9.245, p < .001$, meaning that there was a significant difference between pretest, posttest 1 and/or posttest 2. Posthoc analysis revealed that there was a statistically significant difference from pretest to posttest 1 ($p < .05$) and from pretest to posttest 2 ($p < .01$), but no significant change from posttest 1 to posttest 2 ($p > .05$).

Lastly, there was no group main effect $F(1, 20)=.116, p > .05$, indicating that there were no overall differences between groups (conditions; see Table 9). This is an omnibus statistic, but because this statistic would be significant if there were significant differences at any time point, I must conclude that the groups were never significantly different from one another. Most significantly, participants in group 2 did not score

significantly higher at posttest 1, after experiencing the treatment condition, than participants in group 1. To this end, I fail to reject the null hypothesis for this question; the modeling condition did not result in significantly greater growth in participant sense of teacher efficacy related to inclusive design compared to the lecture condition.

Analysis of participant attitudes toward inclusion. The second part of the research question can be stated as, “does modeling UDL lead to greater improvement in attitudes regarding inclusion of diverse students, including those with disabilities, when compared with traditional instruction?” To answer this question, data were drawn from the MATIES. For descriptive statistics for this instrument, see Table 9.

A two-way repeated measures ANOVA was conducted to examine both between- and within-group effects of the intervention. There was no group (condition) by time interaction $F(2,42)=.565$, $p > .05$, meaning any differences between conditions were consistent for all groups. There was also not a significant time main effect $F(2,42)=.474$, $p > .05$, meaning that there were no significant differences among pretest, posttest 1 and/or posttest 2. Lastly, there was no group main effect $F(1, 21)=.307$, $p > .05$, indicating that there were no overall differences between groups. This is an omnibus statistic, but because this statistic would be significant if there were significant differences at any time point, I must conclude that the groups were never significantly different from one another. Most significantly, participants in group 2 did not score significantly higher at posttest 1, after experiencing the treatment condition, than participants in group 1. To this end, I fail to reject the null hypothesis for this question; the modeling condition did not

result in significantly greater growth in teacher attitudes toward inclusion compared to the lecture condition.

Because the MATIES is separated into three domains (cognitive, affective, and behavioral), additional analyses were run to determine if significant results may manifest in any individual domain. A two-way repeated measures ANOVA was conducted to examine both between- and within-group effects of the intervention on the cognitive domain. There was no group (condition) by time interaction $F(2,55)=3.216, p > .05$, meaning any differences between conditions were consistent for all groups. There was also not a significant time main effect $F(2,55)=.052, p > .05$, meaning that there were no significant differences among pretest, posttest 1 and/or posttest 2. Lastly, there was no group main effect $F(1, 29)=.710, p > .05$, indicating that there were no overall differences between groups.

A two-way repeated measures ANOVA was conducted to examine both between- and within-group effects of the intervention on the affective domain. There was no group (condition) by time interaction $F(2,55)=.380, p > .05$, meaning any differences between conditions were consistent for all groups. There was also not a significant time main effect $F(2,55)=.785, p > .05$, meaning that there were no significant differences among pretest, posttest 1 and/or posttest 2. Lastly, there was no group main effect $F(1, 29)=.707, p > .05$, indicating that there were no overall differences between groups.

A two-way repeated measures ANOVA was conducted to examine both between- and within-group effects of the intervention on the behavioral domain. There was no

group (condition) by time interaction $F(2,55)=1.918$, $p > .05$, meaning any differences between conditions were consistent for all groups. There was also not a significant time main effect $F(2,55)=.714$, $p > .05$, meaning that there were no significant differences among pretest, posttest 1 and/or posttest 2. Lastly, there was no group main effect $F(1, 29)=1.823$, $p > .05$, indicating that there were no overall differences between groups.

Summary

In this chapter, I reported the findings from the data collection in relation to the two-part research question and hypotheses. I failed to reject the most relevant null hypotheses (p. 79). The modeling condition did not have significant effect on participant sense of efficacy or attitudes regarding inclusion of diverse students. However, significant growth in teacher efficacy with UDL was noted across the duration of the investigation, regardless of group belonging/condition. Participant attitudes toward inclusion did not significantly change during the investigation holistically or in any of the three sub-domains. In Chapter 5, I provide further conceptual analysis and discuss the implications of these findings.

Chapter 5

Discussion, Conclusion, and Recommendations

In this study, I address two interrelated problems. First, I recognize that researchers and practitioners have noted the increased complexity of the contemporary classroom and the demands that this places on teacher preparation programs aspiring to be high quality (e.g., Cochran-Smith & Zeichner, 2005; Darling-Hammond, 2000, 2012), and there is also little consensus in the literature as to best practices for preparing teachers to implement quality teaching once they begin their careers (Korthagen et al., 2006). Specifically, there is a paucity of research on faculty modeling as a potential best practice in teacher preparation (Cochran-Smith & Zeichner, 2005; Korthagen et al., 2006; Merseth, 1996). Second, though Universal Design for Learning (UDL) has been emphasized in federal policy in relation to meeting the needs of diverse students in the contemporary classroom (e.g., it is mentioned eight times in the Every Student Succeeds Act of 2015), there remain serious challenges to the implementation of UDL. These include long-standing difficulty in clearly operationalizing UDL (Edyburn, 2010), in consistently establishing what is meant by UDL in research and practice (Edyburn, 2010; Rao et al., 2014), and in the degree to which education faculty demonstrate and disseminate knowledge of UDL to preservice teachers (Vitelli, 2015).

In short, if UDL is to be used to address the growing complexity of the K-12 classroom as proposed in current legislation, I recognize that more work is needed to provide practical solutions for the research of UDL and empirical evidence to identify

effective methods to prepare preservice teachers to practice UDL. My purpose for this study was to contribute toward addressing the need for practical solutions by contributing to the empirical examination of the effects of faculty modeling as a method of teaching UDL.

This study was conducted using a within-subjects with repeated measures design (Charness, Gneezy, & Kuhn, 2012). In this modified version of the time series design, participants in two groups underwent the time series alternating intervention and control settings (see Figure 6). This approach allowed for the within-subjects design to be combined with a between-subject design. Such a combination of within- and between-subject designs has been recognized as a way to utilize the advantages and mitigate the drawbacks of each design type while also increasing the amount of data collected from a set of participants (Charness et al.).

In this final chapter, I present various points of discussion including: interpretation of results, recognition of limitations, and recommendations for further research and finally present the holistic conclusions of my study.

Discussion

The research question used to guide this study was: Does faculty modeling of universal design for learning improve preservice teacher sense of efficacy and attitudes regarding inclusion?

I had hypothesized that there would be a statistically significant ($p < .05$) difference between the two groups (i.e., those who are taught using explicit modeling of

UDL and those who are taught using textbook and lecture format only) in terms of sense of efficacy in utilizing UDL and attitudes regarding inclusion of diverse students.

As presented by the data in Chapter 4, I failed to reject the null hypotheses. There were no statistically significant differences between or within groups on either of the measures utilized. On the one hand, these results are at odds with those presented elsewhere in the (mostly qualitative) literature. For example, Lu and Lei (2014) reported qualitative evidence that students found “live dual modeling” (a variation of type 3: explicit modeling with reflection) was helpful in guiding their own practice. Likewise, Kindle and Schmidt (2013) found that implicit (type 1) language modeling was effective for improving preservice teacher professional vocabulary in their qualitative study. However, the successful results of these studies may have as much to do with the methodology as it does the intervention. That is, the richer, more reflective nature of qualitative interview and observation research may allow for recognition of effects on modeling on efficacy and attitudes to an extent that evades quantitative measures. This is in part, perhaps, explainable by the “naiveté factor” discussed below.

Similarly, both Spooner and others (2007) and Courey and others (2013) found modeling lead to significant improvement in preservice teacher participant outcomes related to lesson plan development according to UDL following short modeled interventions. However, it may be argued that the behavior of creating universally designed lesson plans is at least different and possibly more easily modified dependent variable than the more cognitive variables of attitude and efficacy measured in this study,

and thus significantly different outcomes may not be considered contradictory. To date, this is the first study to explore faculty modeling for teacher education with an explicit focus on the dependent variables of attitude and efficacy (compared to Spooner, et al., Courey et al., for example, who all explore behavioral outcomes). In this capacity, there were several important takeaways and points for discussion as follow.

Limitations

There were some important limitations in this study affecting what conclusions may be drawn.

Ceiling effect. Participant mean scores on the two self-report were very high at the time of the pretest, creating a ceiling effect; thus leaving very little room for participants to improve (statistically). With a possible range of scores from a1 to 5 on the TSE-UDLS, participants across groups 1 and 2 earned a mean score of 4 and a standard deviation of .565 on the pretest. Participant scores on the TSE-UDLS across the three testing times ranged from 2.4 to 5; however, all but four of the 127 data points were 3 or higher. With a possible range of scores from 1 to 6 on the MATIES, participants across groups 1 and 2 earned a mean score of 5.13 and standard deviation of .50 at the pretest. Participant scores on the MATIES across the three testing times ranged from 3.5 to 6; however, all but two of the 129 data points were 4 or higher. Presentation of ranges per group time, and domain are in Tables 9 and 10. Given the restricted range and relatively small sample size of participants involved in this study, there was apparently not enough

sensitivity in the dependent variable measures to determine statistical significance in participant reports of growth (Faul et al., 2007).

Quasi-experimental challenges. Conducting quasi-experimental research in intact classrooms poses significant challenge (Cochran-Smith & Fries, 2005); this study was no exception. There were some variables which were not possible to control. For example, participants in group 1 were in a one-hour-15-minute class that met twice per week, while participants in group 2 were in a two-and-a-half hour blocked class one night per week. Assignment to these sections was not random; the evening class attracted more in-service teachers who were seeking additional licensure or master's degrees than the day class. Time of day, too, may have been influential on focus, energy and attitudes.

Ecological threats. There was also possibility of ecological threats in the study execution. First, one relevant ecological threat may have been the experimenter effect (Gall et al., 2007). That is, because I was the researcher and also the instructor of the course being studied, there was potential for expectations or other characteristics (e.g., being an engaging lecturer) may have influenced the outcome of the study. Second, given that participants knew they were being observed as part of a study and were called upon to reflect on their efficacy and attitudes, the Hawthorne effect (i.e., participant behavior changes because they know they are being observed; Gall et al.) may have influenced self-scores at all points in the study. Third, because the study design included participants undergoing two conditions, it is possible that the multiple treatment effect (Gall et al.)

influenced participant scores, particularly between posttest 1 and posttest 2, when both groups had already experienced and potentially been influenced by treatment or control.

The Naiveté Factor

Though not a limitation, an alternative explanation for the lack of statistical significance in this study may be the naiveté factor, here explored. The instruments utilized in this study (the TSE-UDLS and the MATIES) were self-report surveys that relate to psychological dimensions (self-efficacy and attitudes, respectively). Most participants in the study were not majoring in special education, were learning about the implication of working with students with disabilities for the first time, and were persons for whom no significant degree of experience interacting with persons with disabilities could be assumed. The phenomenon of over-rating oneself, even “grossly overestimating their skills and abilities” on self-report scales (Kruger and Dunning, 1999, p. 1122) has been documented in the literature (Ackerman, Beier, & Bowen, 2002; Alicke, 1985; Kruger & Dunning, 1999; Maki, Jonas, & Kallod, 1994; Shaughnessy, 1979).

There is also a highly relevant precedent in the literature (Cho & DeCastro-Ambrosetti, 2005) to suggest that one’s knowledge and experience (or lack thereof) may affect one’s responses to psychological measures regarding efficacy and attitudes in regards to inclusive education. That is, though the same individuals took the pretest and the posttest, they had changed in awareness and experience with the topic of including diverse students by the time of the posttest. This is particularly relevant given Tschannen-Moran, Hoy, and Hoy’s (1998) interpretation of teacher-efficacy as “a future-oriented

belief about the level of competence a person expects he or she will display in a *given situation*” (p. 208). If one is not clear about what a “given situation” involving meeting the needs of students with disabilities may look like in the future, then one’s self-assessment of teacher-efficacy must be inevitably affected. I here refer to this theoretical phenomenon as “the naiveté factor.” The factor could be argued to be reasonably causative of the UDL

There is evidence of the naiveté factor affecting outcomes in other studies that likewise examine attitudinal and efficacy factors through self-reports. For example, a closely related and similar phenomenon was reported in Cho and DeCastro-Ambrosetti’s (2005) study regarding preservice teachers’ attitudes toward multicultural education. The authors report an “odd phenomenon” occurring during the data analysis which they believed a “cause for some concern” (p. 27). They speak of how there was a negative attitudinal shift (12%) toward the benefits of multicultural education from pretest to posttest *although* participants overwhelmingly reported that the completion of the multicultural education course (the independent variable) had a *positive* impact on their attitudes toward diversity.

Cho and DeCastro-Ambrosetti (2005) offer limited commentary for this finding other than to say that it warrants “further research.” I suggest, however, that their paradoxical finding can be explained by an increased awareness of issues surrounding multicultural education and diversity throughout the course. Self-reported measures of attitudes are reflect one’s self report in context of time and knowledge/understanding.

Thus, I posit that all measures of attitude used for pre/post studies measure not only an individual's growth in attitude, as intended, but the individual's growth *in the contexts* of their awareness of the object of their attitudes at the time of each testing. This is not unlike the concept presented in the work of Rose, Meyer and Gordon (2014) wherein they point out that individual qualities in psychological domains are variable not only compared to others, but within themselves at different times and in different circumstances. I posit that ignorance and naiveté toward the difficulties of a task may have a positive influence on one's attitudes toward it. When awareness grows, self-reports of attitudes may naturally decline in the face of reality. Declining self-report scores in such cases may not tell the whole story, as more realistic (but moderated) attitudes at posttest may be considered superior to idealized (but high) attitudes at pretest. That is, I suggest that ignorance is a covariate of attitudinal measures and failure to account for it may result in misinterpretation of data.

Generalized, this proposition may be: in a study in which the independent variable is one that is likely to enrich awareness and understanding of a challenging task, the absence of change in level of self-reported efficacy or attitudes from pre- to posttest could be interpreted as growth. In application to the current study, I may have more accurately hypothesized that teacher efficacy and attitudes would *decline* when students learned of the challenges, responsibilities, and legalities of serving students with disabilities in the general education classroom; a lack of such predictable, significant decline (as noted similarly in Cho and DeCastro-Ambrosetti, 2005) could be taken to

indicate improvement. To this end, though the results presented in Chapter 4 do not demonstrate statistical improvement, the interpretation of the data may be considered pragmatically positive; however, further research is needed to confirm or challenge this proposition; I suggest two ways to do so in future research, below.

Additional Analyses: Independent Samples *t*-tests

Due to unintended attrition, as noted above additional independent samples test analyses were conducted to utilize all data collected without the data loss imposed by the two-way ANOVA. Findings from these independent samples *t*-tests confirm the results of the two-way ANOVA. With all participants accounted for (in mean scores for each cell), two statistically significant results emerged that were not present in the two-way ANOVA; though neither is sufficient to challenge the results presented in Chapter 4, I briefly discuss both below.

First, there was a statistically significant growth for participants in group 2 between time 1 and time 2 (treatment condition) where there was not significant growth for group 1 during the same period (control condition). While this seems promising, this effect is not consistent during the period from time 2 to time 3 (i.e., when group 1 experienced the treatment condition, they did not show the statistically significant growth that the group 2 did during the treatment condition). Further, the difference in number of participants (25 to 12) for group 2 at the pretest and posttest 1, respectively, is likely to have influenced the validity of interpretation from the data.

Second, the between-subject scores on the MATIES were different at posttest 2 (only). While this is interesting, this difference does not lend itself to contributing to the relevant main hypothesis of this study (i.e., that modeling significantly improves preservice teacher attitudes toward inclusion), given that both groups experienced both the treatment and control condition before the final measurement. Thus, without theory to guide interpretation, the differences must be relegated to random error.

Effectively, conducting the independent samples *t*-test as a post-hoc analysis did not reveal anything that would pose a challenge to the results of the two-way repeated measures ANOVA. To this end, though the limitation of partial attrition was important from a statistical analysis perspective, there is evidence to support the conclusions that I arrived at therefrom: the effect of the modeling condition was no more or less significant on influencing teacher efficacy and attitudes than the lecture condition according to data collected on the included measures.

Future Research

Regarding the naiveté factor, future researchers may wish to reduce the negative effect of this phenomenon by including: (1) a measure of practical knowledge along with attitudinal and efficacy measures and use scores on this other instrument to control or account for the covariate of naiveté or knowledge, (2) a self-report of relative growth in attitude from pre- to posttest in conjunction with—or instead of—the uniform measures of attitude and efficacy. This latter strategy allows for reflection of growth and thus adds a

way to address latent variables of time and increased understanding to the otherwise unidimensional measures.

Future research exploring empirical effects of faculty modeling of UDL should include a greater number of participants, ideally from multiple sections or terms to increase power for statistical analysis. To address the ceiling effect, utilizing wider Likert-style ranges (e.g. *one to nine* instead of *one to five*) may allow for more precise identification for participants and heightened room for improvement. Alternatively, using more objective measures (such as observation checklists related to dependent variables) or measures that account for the latent variable of increased awareness (e.g., “to what extent have you improved in your attitudes toward inclusion because of participation in this class?”) may be fruitful.

Further, I concur with Cochran-Smith and Fries (2005) that if short-term outcomes are noted, it would be valuable to follow participants into the field to determine if outcomes are robust enough to transfer to actual placement settings and early career applications. Studies that combine the utility of the theory of planned behavior (dependent variables of teacher efficacy and attitudes/beliefs) with longitudinal aspects may also help contribute to the confidence of using the theory of planned behavior as a more pragmatic alternative to following preservice teachers longitudinally; this would be a great service to the field.

Conclusions

In Chapter 1 of this work, I noted that the academic field of education is couched in a political, social, and temporal context. In present context, there is increased pressure to prepare teachers that are equipped to meet the needs of diverse learners in the classroom. This is a complex endeavor for research and practice. In this study, I sought to contribute the existing literature regarding best practices of teacher education by fusing two current lines of inquiry: (1) can faculty modeling result in improvements in preservice teacher efficacy with UDL and attitudes toward inclusion?

This two-parted question was couched not only in calls for further research in recent literature, as articulated in Chapter 2, but also in established education theory. Social cognitive theory guided how I framed the independent variable of faculty modeling as I attempted to utilize higher levels of modeling (i.e. explicit modeling) as a means of approximating Bandura's (1978) process of social learning through vicarious experience. Likewise, the dependent variables were informed by Ajzen's (1991) theory of planned behavior, whereby measuring teacher efficacy and attitudes in conjunction would enable me to more accurately project the likelihood of inclusive behaviors in future classroom settings. This was a strong position from which to conduct this dissertation study.

However, ultimately the results of this study were inconclusive. The results of the statistical analysis did not reveal statistically significant difference in growth among

preservice teacher efficacy in practicing UDL or attitudes toward inclusion based on exposure to the modeling condition.

The lack of statistically significant findings does not mean that the study was not fruitful. Several important conclusions have emerged through the completion of this work. First, operationalizing UDL as a territory and using the conceptual process outlined by UDL (moving from learning goals to the identification of barriers to the utilization of the UDL guidelines to address these barriers) worked. Third-party observers successfully identified the procedures I used to facilitate UDL and had high degrees of inter-observer agreement (see chapter 4). In personal reflection, I also believe that intentionally planning through this process made my teaching better and more accessible for all students. These points suggest that the territorial model for operationalizing UDL (i.e., a definition shaped by semi-general theoretical and pragmatic inclusion and explicit exclusion terms) may prove effective if implemented more broadly. This is an area for further research.

Second, though the results in this study were inconclusive, they nevertheless offer a contribution to the line of research related to faculty modeling. Given how much of the existing literature on the topic consists of position papers and other non-empirical works, contributing an empirical, group-study design on the topic may be of utility. If this study is replicated or similar studies are conducted in other conditions and times with similar results, then we may be able to conclude that modeling is not as effective as the rhetoric in the literature presupposes. If, however, there are positive results in future empirical

studies, then comparison to the results of this study may yield insight into important covariates that are hard to identify without having both successful and unsuccessful cases.

Third, the evidence to support the validity of the TSE-UDLS (see Chapter 3) is encouraging. Given that UDL has gained significant momentum in the past several years, there is an outstanding need for more instruments explicitly related to UDL. Because the TSE-UDLS has shown a high degree of reliability in this study, it would be fruitful to continue to collect data with this instrument and work to refine and validate the instrument for use in research.

Final Thoughts

Though it is disappointing that modeling UDL did not yield statistically significant outcomes in terms of improved preservice teacher efficacy and attitudes related to inclusion of diverse learners, the results are not conclusive and should not be interpreted as such. There is opportunity for more research to explore these questions, building on the limitations and structural successes of this study.

Notably, the effective initial piloting of the TSE-UDLS indicates promise that this tool may be of utility in the field wherein new measures of UDL and UDL outcomes are highly sought. Likewise, the territorial operationalization of UDL is an important contribution as discussions of whether UDL may be operationalized (and if so, how) are current in the field.

In this way, I believe that the contributions of this study are notable and will help facilitate new lines of research that will ultimately support the advancement of UDL and

faculty modeling. Rather than being a clear conclusion, this study – as is often the case with dissertations – is a beginning.

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Appendices

Appendix A Tables and Figures

Tables

Table 1.
(Re)authorizations of Public Law 94-142

Date	(Re)authorizations	Key changes
1975	The Education for All Handicapped Children Act (PL 94-142)	For children and youths with disabilities: Free and public education, individualized programming, parental involvement in decision-making, fair evaluation, least restrictive environment, due process.
1990	Individuals with Disabilities Education Act (IDEA '90)	Introduction language of Free Appropriate Public Education and Individualized Education Programs.
1997	Individuals with Disabilities Education Act (IDEA '97)	Greater access to the curriculum for individuals with disabilities
2004	Individuals with Disabilities Education Improvement Act (IDEIA '04)	More explicit language requiring students with disabilities to be educated in the general classroom as much as possible. Emphasizes use of scientifically based instruction prior to identifying specific learning disabilities.

Table 2.

Key Reauthorizations of the Elementary and Secondary Schools Act (1965)

Key (Re)authorizations	Date	Key changes
Elementary and Secondary Schools Act	1965	Federally funded elementary and secondary schools, emphasized accessibility and closing achievement gaps by way of providing equitable opportunities to learn.
Improving America's Schools Act (IASA)	1994	Title 1 support, reforms for charter schools, increase to bilingual and immigrant education funding, support for educational technology
No Child Left Behind Act (NCLB)	2001	Greater accountability measures (e.g., construct of "annual yearly progress" for Title 1 schools), increase in standardized test scores, provision of school choice to parents, teacher certification standards.
Every Student Succeeds Act (ESSA)	2015	Significant transfer of responsibility and authority to States; Provision of "college and career" standards; innovation incentives; extends to include Pre-K.

Table 3.
Principles of Universal Design

Principle	Brief Description
Equitable Use	The design is useful to people with a wide variety of abilities; it avoids segregating or stigmatizing users.
Flexible Use	The design accommodates a wide range of preferences and abilities; it provides choice in methods of use.
Simple and Intuitive Use	Use of the design is easy to understand; it eliminates unnecessary complexity.
Perceptible Information	The design communicates necessary information effectively; it uses different modes of presentation.
Tolerance for Error	The design minimizes hazards and adverse consequences of unintended actions; it provides failsafe features.
Low Physical Effort	The design can be used efficiently and comfortably and with a minimum of fatigue; it minimizes physical effort.
Size and Space for Approach and Use	Appropriate size and space are provided; it makes reach to all components comfortable for any user.

Table 4.
Principles Associated with Universal Design Models

Model	Principles/guidelines
Universal Design for Learning (Center for Applied Special Technology)	1. Multiple means of representation 2. Multiple means of action and expression 3. Multiple means of engagement
UD in education (National Center to Improve the Tools of Educators)	1. Big ideas 2. Conspicuous strategies 3. Mediated scaffolding 4. Strategic integration 5. Judicious review 6. Primed background knowledge
Universal Instructional Design (University of Minnesota)	1. Create welcoming classrooms 2. Determining course components 3. Communicating clear expectations 4. Providing timely and constructive feedback 5. Exploring use of natural supports for learning including technology 6. Designing methods that consider diverse learning styles, abilities, ways of knowing, experience and background knowledge 7. Creating multiple ways for students to demonstrate their knowledge 8. Promoting interaction among and between faculty and students
Universal Design for Instruction (University of Washington)	1. Class climate 2. Interaction 3. Physical environments and products 4. Delivery methods 5. Resources and technology 6. Feedback 7. Assessment 8. Accommodation

Table 5.
Dependent Variables and Respective Measures

Dependent Variable	Measure/Instrument
Preservice teacher sense of efficacy in using UDL to teach students with disabilities and other diversities	Teachers Sense of Efficacy Using UDL Scale (TSE-UDLS)
Preservice teacher attitudes regarding inclusion of students with disabilities in the general classroom	Multidimensional Attitudes toward Inclusive Education Scale (MATIES)

Table 6.
Overview of Content Taught by Group and Condition

Group	Learning Period/Condition	Topics Covered
Group 1	1.1 (Lecture)	1. Special education procedures 2. Building partnerships through collaboration 3. Assessing students with special needs
	1.2 (Model)	1. Students with low incidence disabilities 2. Students with high incidence disabilities 3. Students with special needs other than disabilities (including an annotated bibliography assignment)
Group 2	2.1 (Model)	1. Students with low incidence disabilities 2. Students with high incidence disabilities 3. Students with special needs other than disabilities (including an annotated bibliography assignment)
	2.2 (Lecture)	1. Special education procedures 2. Building partnerships through collaboration 3. Assessing students with special needs

Table 7.
Comparison of Activities/Aspects in Treatment and Control Conditions

Activity/Aspect	Treatment	Control
Textbook reading prior to class	Assigned at least 72 hours in advance. Course readings as warranted per lesson plan.	(Same)
Identification of learning goal	Instructor reflected on course objectives during planning and identifying a relevant, timely, reasonable “chunk” of learning for a lesson.	(Same)
Sharing of learning goals w/ students	Stated orally and on the PowerPoint at the beginning of class. Also, presented in the distributed lesson plan.	Stated orally and on the PowerPoint at the beginning of class.
Teaching toward learning goal with lecture and PowerPoint presentation	Content shared on the PowerPoint was balanced with other activities as per the lesson plan. All lessons included checkpoints from each of the three UDL principles.	PowerPoint and lecture were primary means of communication. Slides included text and – when appropriate – tables, graphs, figures, or images to support understanding.
Encourage students to take notes	Orally encouraged students to take notes.	(Same)
Provide students with the opportunity to ask questions or comment at appropriate intervals	Students were verbally encouraged to raise questions and comments throughout class.	Explicit pauses to ask “does anyone have any questions” occurred approximately every 30 minutes.

Table 7 (continued).

Activity/Aspect	Treatment	Control
Provide summary of the learning	Summary of the learning was provided (orally and textually) and/or student-produced in closing activities.	Summary of the learning was provided (orally and textually).
Identification of likely barriers	In the lesson plan document (Appendix B), the instructor identified hypothetical, likely barriers to student learning in the lesson.	N/A
Prescription of UDL appropriate checkpoints	In the lesson plan document (Appendix B), the instructor identified checkpoints from the UDL guidelines (Figure 5) to address the predictable barriers and developed respective materials and procedures.	N/A
Teaching toward learning goal with intentionally diversified representation, engagement, and student action	The instructor used the lesson plan to explicitly and intentionally teach using the UDL principles and guidelines chosen to address the predicted barriers (see examples, Appendix B)	N/A
Live explication on UDL practices in use	Prior to teaching, the instructor handed out the UDL lesson plan for the day (digitally or physically) and verbally drew attention to the explicit design process.	N/A
Reflection on efficacy of UDL practices utilized	In addition to ending class by summarizing the content learning, the instructor asked the students to reflect in groups about the effect of the use of the UDL design.	N/A

Table 8.

Correlation Matrix: Multidimensional Attitudes Toward Inclusion Scale and Teacher Sense of Efficacy in Universal Design for Learning Scale - Parsed by Time

	MATIES Time 1	MATIES Time 2	MATIES Time 3	TSE-UDLS Time 1	TSE-UDLS Time 2	TSE-UDLS Time 3
MATIES Time 1	1	.479**	.633**	.407**	.515**	.497**
MATIES Time 2	.479**	1	.909**	.367	.639**	.512*
MATIES Time 3	.633**	.909**	1	.442**	.578**	.554**
TSE-UDLS Time 1	.407**	.367	.442*	1	.604**	.580**
TSE-UDLS Time 2	.515**	.639**	.578**	.604**	1	.651**
TSE-UDLS Time 3	.497**	.512*	.554**	.580**	.651**	1

Note. * $p < .05$, ** $p < .01$

Table 9.

Descriptive Statistics by Group and Time (Teacher Sense of Efficacy in Universal Design for Learning Scale)

Time	Group ID	<i>M</i>	<i>SD</i>	Range	<i>N</i>
Pretest	1	3.925	0.724	2.4 – 5.0	12
	2	4.034	0.407	3.2 – 4.9	10
Posttest 1	1 (control)	4.223	0.624	2.9 – 5.0	12
	2 (treatment)	4.293	0.630	2.9 – 5.0	10
Posttest 2	1 (treatment)	4.378	0.673	3.0 – 5.0	12
	2 (control)	4.441	0.549	3.2 – 5.0	10

Table 10.

Descriptive Statistics by Group and Time (Multidimensional Attitudes Toward Inclusion Scale)

Time	Group ID	Domain	<i>M</i>	<i>SD</i>	Range	<i>N</i>
Pretest	1	(Overall)	5.14	0.50	4.2 – 6.0	13
		Affective	4.62	0.81	3.0 – 6.0	
		Cognitive	5.21	.051	4.2 – 6.0	
		Behavioral	5.33	0.64	4.2 – 6.0	
	2	(Overall)	5.13	0.49	4.3 – 5.9	10
		Affective	4.74	0.74	3.6 – 6.0	
		Cognitive	5.26	0.47	4.3 – 6.0	
		Behavioral	5.30	0.67	3.3 – 6.0	
Posttest 1	1 (control)	(Overall)	5.08	0.63	3.7 – 6.0	13
		Affective	4.85	0.67	4.0 – 6.0	
		Cognitive	5.23	0.68	3.5 – 6.0	
		Behavioral	5.19	0.82	3.5 – 6.0	
	2 (treatment)	(Overall)	5.11	0.48	4.0 – 5.8	10
		Affective	4.81	0.75	3.8 – 5.8	
		Cognitive	5.19	0.55	4.0 – 6.0	
		Behavioral	5.46	0.49	4.3 – 6.0	
Posttest 2	1 (treatment)	(Overall)	4.97	0.70	3.5 – 6.0	13
		Affective	4.90	0.73	3.5 – 6.0	
		Cognitive	4.58	0.84	2.8 – 6.0	
		Behavioral	5.10	0.72	3.8 – 6.0	
	2 (control)	(Overall)	5.27	0.52	4.3 – 5.9	10
		Affective	4.77	0.84	2.8 – 6.0	
		Cognitive	5.38	0.53	4.3 – 6.0	
		Behavioral	5.57	0.40	8.8 – 6.0	

Figures.

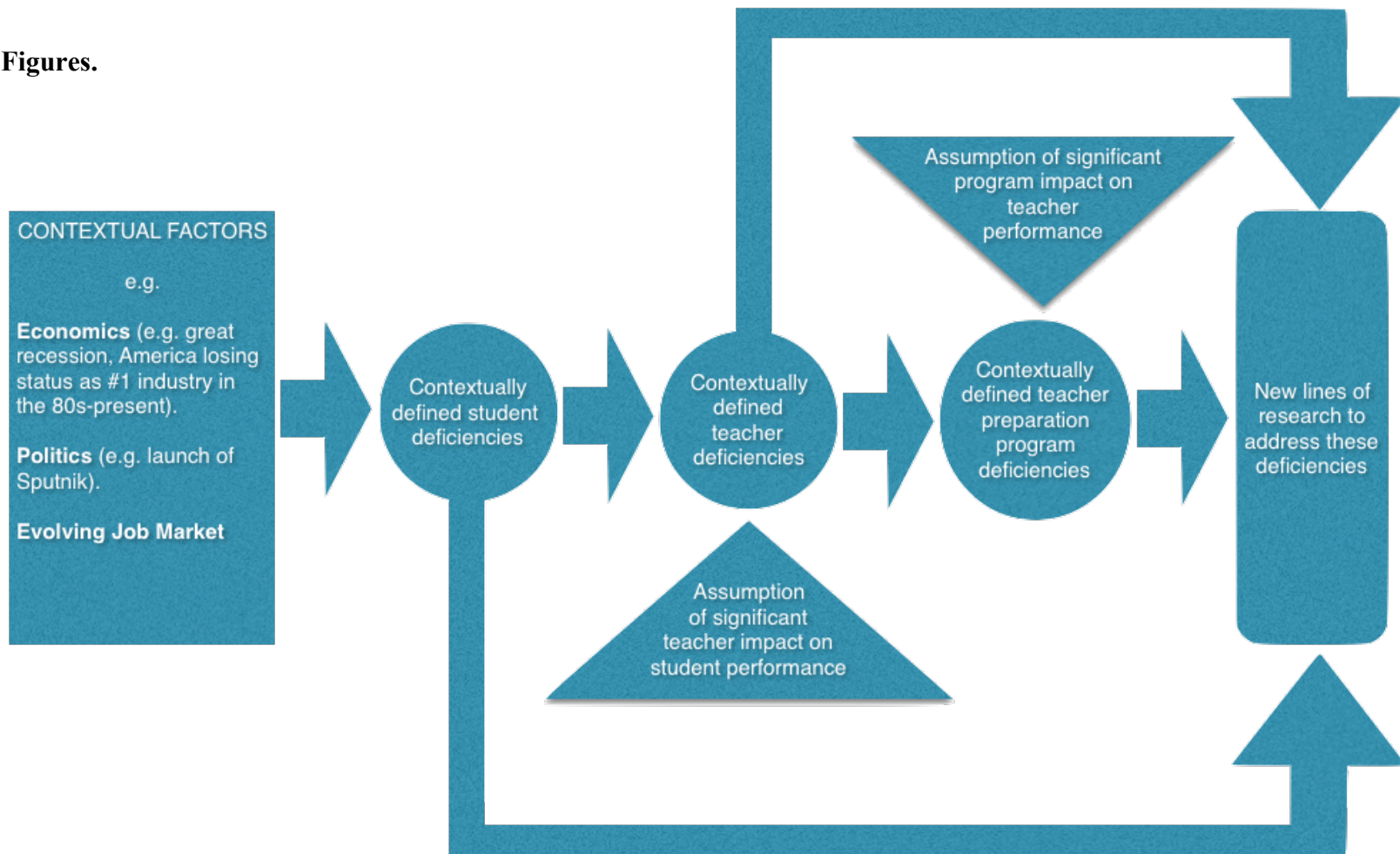


Figure 1. A model showing process from macrosystematic context to education research intended to address these perceived deficiencies.

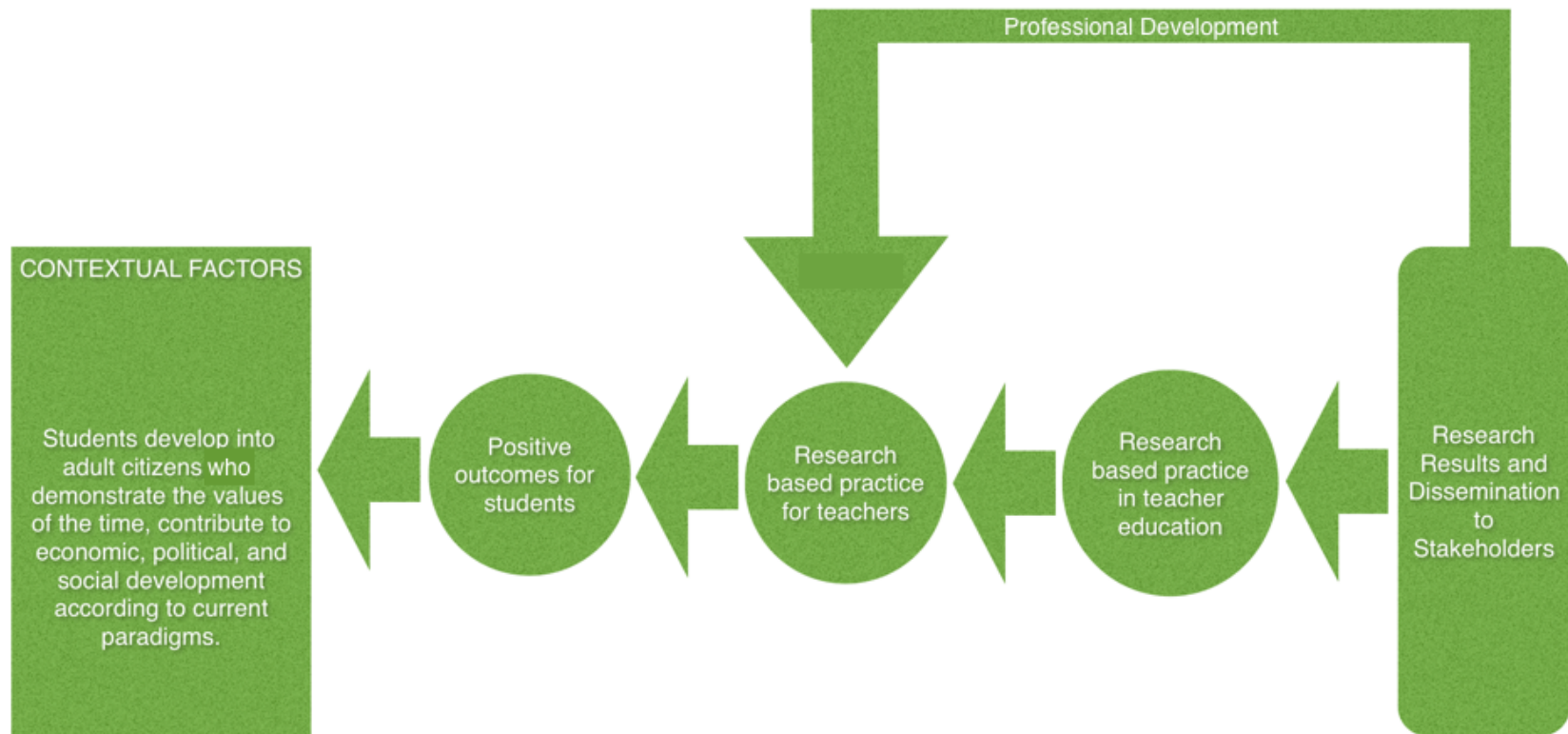


Figure 2. A model showing process from new education research disseminated through teacher education and professional development with intent to improve student and societal outcomes.



Figure 3. A representation of the focus of access-based research across time from the 1960s to contemporary lines of research.

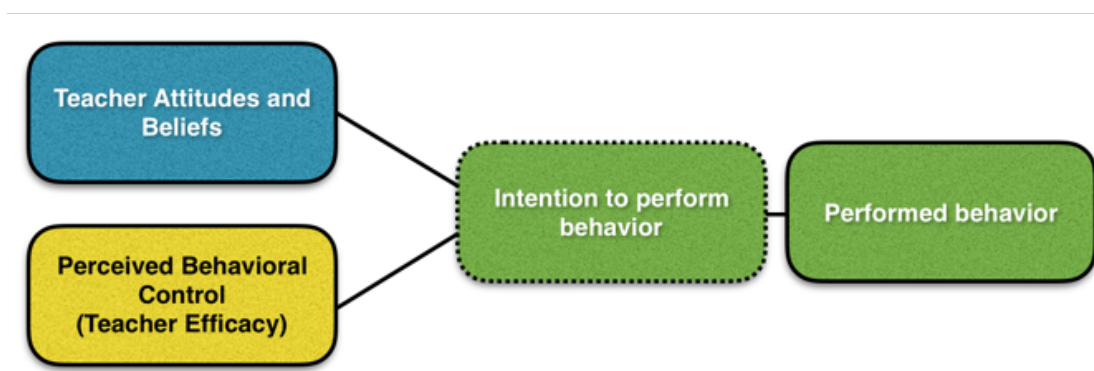


Figure 4. Simplified model of teacher behavioral intention adapted from “The Theory of Planned Behavior,” by Ajzen, 1991. *Organizational Behavior and Human Decision Processes*, 50(2), p. 181.

Universal Design for Learning Guidelines

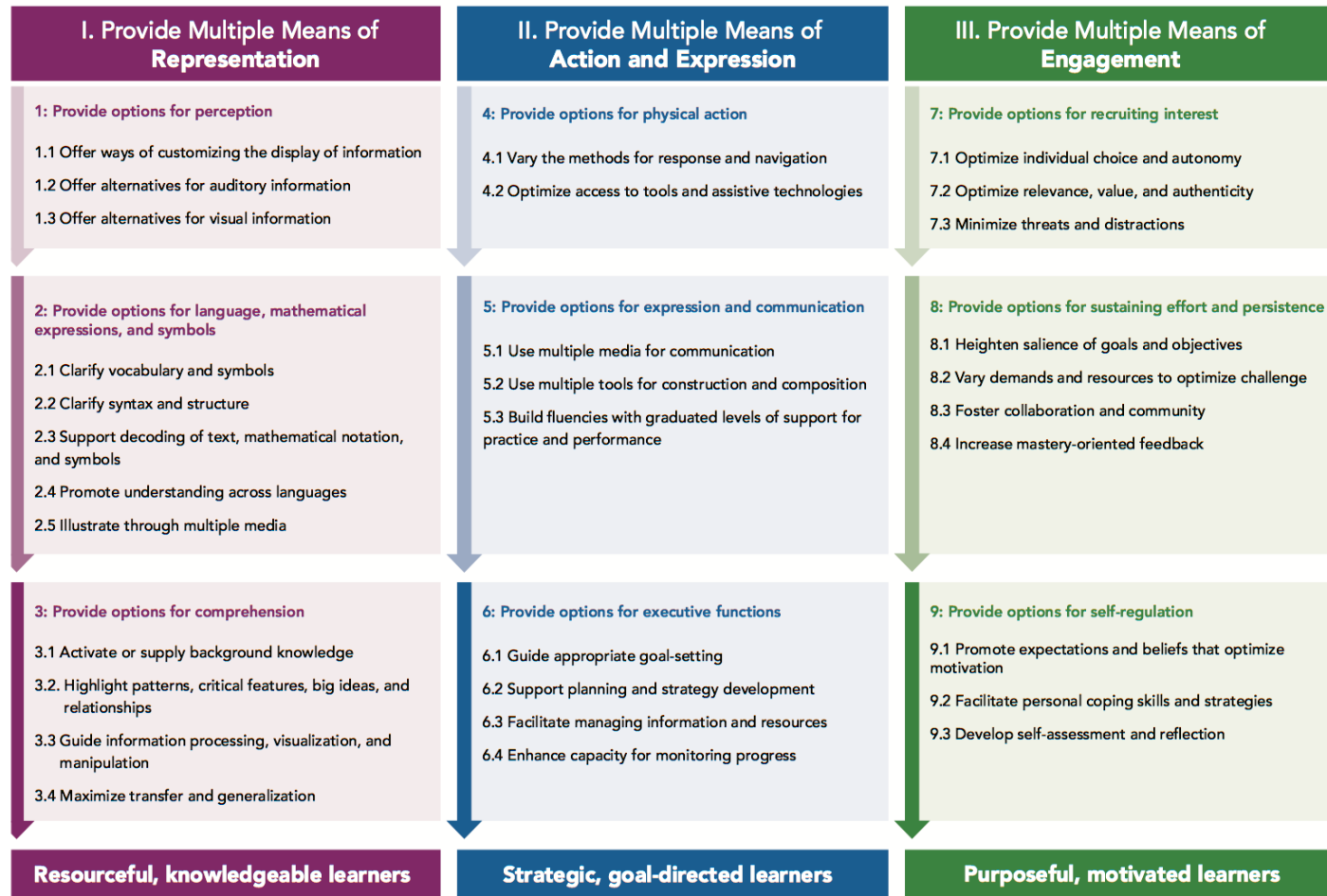


Figure 5. Adapted from The “Universal Design for Learning Guidelines version 2.0” by the Center for Applied Special Technology (CAST), 2014.

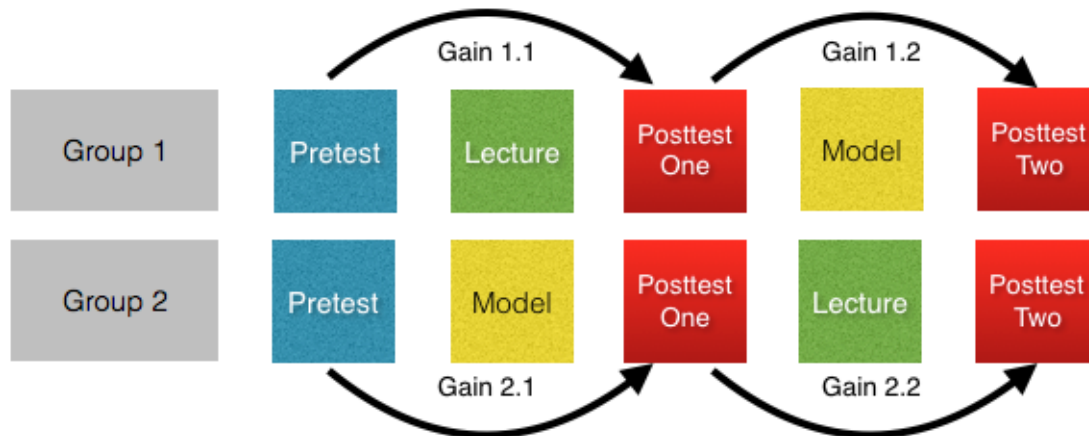
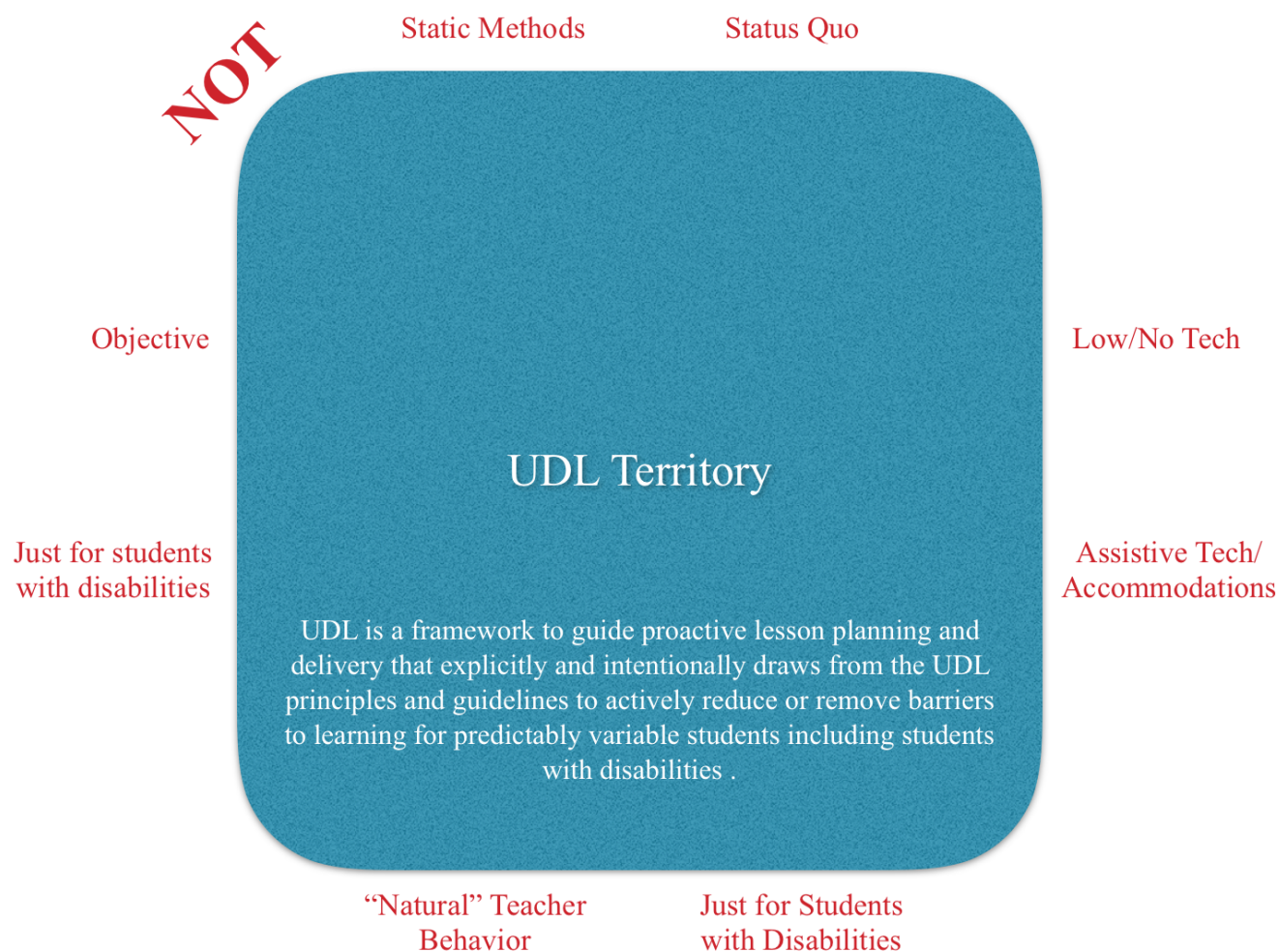
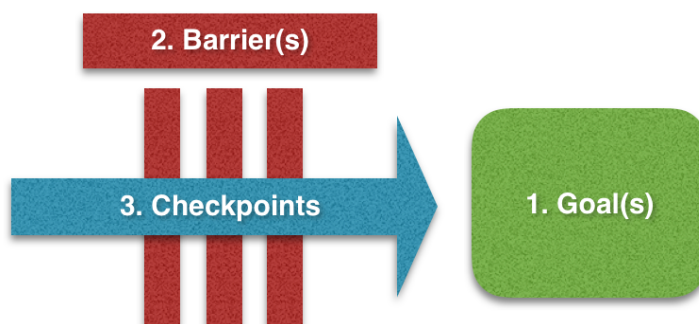


Figure 6. A quasi-experimental, repeated measures time series design whereby two groups are measured three times, and each experience the control condition or treatment condition once.



*Figure 7. Operationalizing UDL as a “Territory,” definition adapted from Meyer, Rose and Gordon (2014) and Edyburn (2010); boundary items adapted from “Would You Recognize Universal Design for Learning If You Saw It? Ten Propositions for New Directions for the Second Decade of UDL” by Edyburn, D. L., 2010. *Learning Disability Quarterly*, 33(1), 33–41.*

Appendix B:
UDL Brief Lesson Design Template and Sample

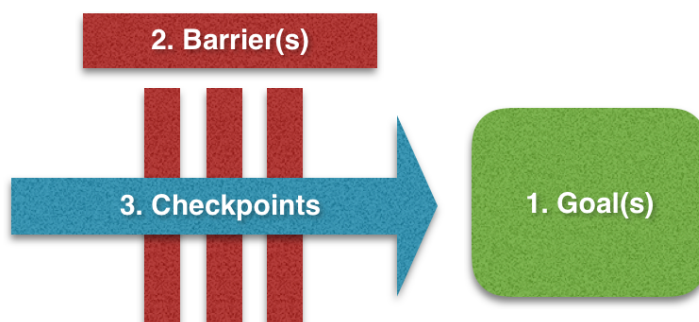


1. Goal(s) of the lesson (State what the students will learn or be able to do in clear, measurable terms. Do not include assessment in the goal unless the assessment (e.g., writing an essay) *is* the goal):

2. Likely barriers to learning and rationale (State one or more barriers that may interfere with students accomplishing the stated goal(s) of the lesson. These may be directly related to the content, the environment, or student-based factors. Barriers here identified should relate to multiple students [not individual needs]). Provide rationale.):

3. Checkpoints and rationale (Identify one or more checkpoint(s) from the UDL Guidelines (see attached) to address the identified barrier(s). Provide rationale.)

UDL Brief Lesson Design Plan (Sample)



Sped 402, Monday, Oct 3

1. Goal(s) of the lesson (State what the students will learn or be able to do in clear, measurable terms. Do not include assessment in the goal unless the assessment (e.g. writing an essay) *is* the goal):

- To prepare for the first assessment (annotated bibliography), teachers will...

- A. **Utilize** the Digital Library and/or Google Scholar to **locate** and **identify** relevant sources for their own research.
- B. **Identify** sources for APA citation and formatting support.

- To provide a conceptual framework to guide the first unit (teaching diverse learners), teachers will...

- C. **Articulate** the likelihood of encountering students with disabilities and other diversities in their future classrooms.
- D. **Consider** how the likelihood of encountering diverse students (including those with disabilities) affects how they prepare to teach.
- E. **Express** why providing access to diverse learners matters in the context of historical and contemporary developments.

- Additionally, though not a learning objective, per se, teachers will formulate cooperative learning groups (CLGs) with whom they will complete the disability presentation (forthcoming).

2. Likely barriers to learning and rationale (State one or more barriers that may interfere with students accomplishing the stated goal(s) of the lesson. These may be directly related to the content, the environment, or student-based factors. Barriers here identified should relate to multiple students [not individual needs]). Provide rationale.):

(Related to Overall Lesson [O])

1. These topics are quite dry. While the function of class is not to be “entertainment” per se, if participants are “zoning out” in boredom, learning cannot occur.
2. Students may have different concepts of what “access” means

(Related to A)

1. In a class of 25 inclusive of both undergraduate and graduate students at different stages of their education in the college, it is probable that there is significant variance in the degree to which individuals know how to use the digital library and/or Google Scholar. Instruction on this topic is therefore likely to be unnecessary, or under-developing for individuals at opposing ends of the range.

(Related to B)

1. (^^ Same for APA Citations, also recognizing that some (e.g. English Education majors) may be more well versed in MLA)

(Related to C)

1. As affirmed through an earlier discussion board, some participants (at least, possibly most) have reservations and concerns about including students with diverse learning needs in their classrooms. Some of the focal points of this lesson (e.g. expanding recognition of the likelihood of having students with disabilities and other diverse learning needs in one’s future classroom) may only exacerbate

these concerns. Thus, the expression of why providing access is important may become superficial or serve only to complicate the participant's feelings.

(Related to D)

1. Some teachers may not yet have enough understanding of course concepts to answer this question, and thus may feel confused or disenfranchised or even ashamed asked to make these considerations.

3. Checkpoints and rationale (Identify one or more checkpoint(s) from the UDL Guidelines (see attached) to address the identified barrier(s). Provide rationale.)

In response to O-1:

- ☐ Checkpoint 7.2 (“Optimize relevance, value, and authenticity.”)
 - Specifically, addressing using the library and APA will be tied to an assignment that students are to begin working on forthwith. I will make this explicit to them so as to increase motivation for learning these skills now.
- ☐ Checkpoint 3.1 (“Activate or supply background knowledge”.)
 - Specifically, in relation to the library and APA goals, I will offer the opportunity to conduct a quick pre-test. This will serve to refresh skills for those who have them or identify missing skills in those who do not. For

those whose missing knowledge can be provided quickly, I can provide it in step with the lesson as we review the results of the pre-assessment. If anyone needs more extensive training, I will offer office hours support to them rather than using class time for the sake of a handful of students or less as beneficiaries. This will help me keep the pace brisk and the whole-group content relevant.

❑ Checkpoint 1.2 (“Offer alternatives for auditory information”).

- While the barrier being addressed at present is an affective one, I feel that auditory-only content can contribute to boredom. Graphic displays (especially exciting ones) may help keep participants engaged in the lesson. **(This will be noted at beginning, but not explicitly reflected on during lesson)**

In response to O-2:

❑ Checkpoint 2.1 (“Clarify vocabulary and symbols.”)

- I will explicitly explore the word “access” as it applies to our course concepts, examining the way that access has evolved in US education via well known history (ties to [checkpoint 3.1](#)) and dialogue with the students about the implications of different forms of access across history.

In response to A-1 and B-1:

❑ Checkpoint 8.1 (“Heighten the salience of goals and objectives”)

- By using a pre-test, I will be able to focus only on the skills shown in deficit, in small groups or 1:1 outside class as necessary.

❑ Checkpoint 4.2 (“Optimize access to tools and assistive technologies”)

- Instead of trying to cover all the rules and such of APA, I will provide access to tools/resources that students may access on their own time to find what they need when they need it (aka “Just in time learning”; ties also to [Checkpoint 9.2](#)).

In response to C-1:

❑ Checkpoint 9.3 (“Develop self-assessment and reflection.”)

- Instead of “silencing” participants by not allowing them the opportunity to express reservations and concerns in the context of my own agenda (to encourage positive attitudes and efficacy), I will facilitate the opportunity to think about and openly share concerns in a safe setting. In this way, we can begin to address (collectively) some of the reservations that participants have regarding inclusion.

In response to D-1:

❑ Checkpoint 9.1 (“promote expectations and beliefs that optimize motivation.”)

- I will explicitly acknowledge that participants may not have the knowledge necessary to respond to this question. I will further stress the relationship between not necessarily knowing how to meet the needs of diverse learners and the sense of discomfort with having such learners in one's class. I will encourage them to thus use their reading, discussion, projects, and lessons in this course to actively seek to shore up their knowledge and skills related to teaching diverse learners.

Appendix C:

Treatment and Control Implementation Form and Checklists

Study: Effects of Modeling on Preservice Teachers

Primary Investigator: Eric Moore

Implementation integrity observer: _____

Date of observation: _____

Time of observation from: _____ to: _____

Did the observation period cover an entire lesson? (circle): **Yes** **No**

1. In which phase of the experiment did the observation occur? (circle)

Modeling UDL -or- **Control**

2. If observing **control condition**, how many of the six checkpoints were met in the lesson you observed? _____ / 7 = _____ % integrity
3. If observing **treatment condition**, how many of the five checkpoints were met in the lesson you observed? _____ / 9 = _____ % integrity
4. If there was a second observer with you, was there 100% inter-observer agreement? That is, did both of you check and not check the same boxes?
Yes No N/A
5. **If no in (4) above**, how many checkpoints were in dispute (i.e., one of you checked and the other did not)? _____

6. **If no in (4) above**, please dialogue about differences and see if you can come to agreement. Were you able to come to common agreement?

Yes No N/A

Any additional comments?

Thank you for your time! Please submit this form to the lead investigator.

Instructions: Check each box that includes something you observed in the lesson (choose the checklist that corresponds with the phase of instruction underway at the time of observation). Feel free to write indicators or notes below each checkbox.

Control Condition: Did the instructor...

- ☐ Assign related textbook reading at least 72 hours in advance of the observed lesson?
- ☐ Identify and explicate (textually and orally) the learning objective(s) for the lesson with the students on the second slide of a PowerPoint presentation (the first slide will be lesson title).
- ☐ Verbally encourage students to take notes, stating “please remember that you are always encouraged to take notes by hand or using your laptop or tablet during class. You may also feel free to audio record the lesson.”
- ☐ Orally lecture and display PowerPoint slides using the PowerPoints?
(PowerPoints should include relevant text and at least one table, graph, figure or image to support understanding during the lesson).

- ☐ Verbally prompt students to ask any questions or offer any comments that they have at appropriate intervals during the lesson (at least two times per hour per lesson).

- ☐ Provide students with the opportunity to ask questions or comment at appropriate intervals, defined as: at least 2x per lesson (T/Th) or 4x per lesson (M) by verbally asking “Does anyone have any questions?” (or equivalent).

- ☐ Verbally summarize the lesson during the last 5 minutes of the class

Modeling UDL Condition: Did the instructor...

- ☐ Create and share with you a lesson plan that identifies for the day: (a) goals, (b) likely barriers, and (c) checkpoints from the UDL Framework that may be appropriate for mitigating or removing these barriers?
- ☐ Assign course textbook and/or related readings/viewings as warranted per lesson plan at least 72 hours in advance?
- ☐ Distribute a hard copy of the same lesson plan (first checkpoint) to students?
- ☐ Verbally express justification of the UDL design process and checkpoints selected for the present lesson?
- ☐ Orally encourage students to take notes?
- ☐ Orally encourage students to raise their hand, interrupt at any time with questions?
- ☐ Provide opportunities to express themselves at least 2x during the lesson?

- ☐ Provide of the learning was provided (orally and textually) and/or request student-produced summary of the learning in closing activities.

- ☐ For at least 3 checkpoints in the UDL lesson plan, did the instructor at appropriate times pause to explicitly state (verbally) when a prescribed checkpoint was used? For example, after introducing relevant new terminology for the lesson, the instructor will pause and explicitly reflect “Please note that I just took a minute to clarify some new vocabulary. This reflects checkpoint 2.1 in the UDL framework, which I had prescribed to address the barrier that I predicted whereby some students may not have had requisite vocabulary for the lesson.” This may also have occurred at the conclusion of the lesson.

_____/9

Additional notes and comments:

Appendix D:

Instruments

Items on the Multidimensional Attitudes Toward Inclusive Education Scale

(MATIES; Mahat, 2008)

Note: Likert-type Scale 1-6: Strongly disagree (1) Disagree (2) Somewhat disagree (3), Somewhat agree (4) Agree (5) Strongly agree (6).

Cognitive

1. I believe that an inclusive school is one that permits academic progression of all students regardless of their ability.
2. I believe that students with a disability should be taught in special education schools.
3. I believe that inclusion facilitates socially appropriate behavior amongst all students.
4. I believe that any student can learn in the regular curriculum of the school if the curriculum is adapted to meet their individual needs.
5. I believe that students with a disability should be segregated because it is too expensive to modify the physical environment of the school.

6. I believe that students with a disability should be in special education schools so that they do not experience rejection in the regular school.

Affective

7. I get frustrated when I have difficulty communicating with students with a disability.
8. I get upset when student with a disability cannot keep up with the day-to-day curriculum in my classroom.
9. I get irritated when I am unable to understand students with a disability.
10. I am uncomfortable including students with a disability in a regular classroom with other students without a disability.
11. I am disconcerted that students with a disability are included in the regular classroom, regardless of the severity of the disability.
12. I get frustrated when I have to adapt the curriculum to meet the individual needs of all students.

Behavioral

13. I am willing to encourage students with a disability to participate in all social activities in the regular classroom.

14. I am willing to adapt the curriculum to meet the individual needs of all students regardless of their disability.
15. I am willing to physically include students with a severe disability in the regular classroom with the necessary support.

Items on the Teacher Sense of Efficacy in Universal Design for Learning Scale (TSE-UDLS; adapted from the Teacher Sense of Efficacy Scale, Tschannen-Moran & Hoy, 2001).

Note: Likert-type Scale 1-5: Nothing (1) Very Little (2) A Moderate Amount (3), Quite a lot (4) A Great Deal (5).

1. How much can you do to get through to the most difficult students?
2. How much can you do to help your students become expert learners (motivated, strategic, and resourceful)?
3. How much can you do to provide options to engage students in the learning such that behavioral issues are reduced or eliminated?
4. How much can you do to motivate students who show low interest in school work?
5. How much can you do to get students to feel that they are empowered to succeed in their schoolwork?
6. How much can you do to help your students value learning?
7. How much can you gauge student comprehension of what you have taught?

8. To what extent can you create engaging, thought-provoking questions appropriate for your students?
9. How much can you do to foster student creativity?
10. How much can you do to design lessons that prevent diverse students from failing?
11. How much can you do to enable a student to regulate his/her own behavior?
12. How much can you do to proactively design flexible lessons such that individual students at different levels may all learn?
13. How much can you provide students options for modes of assessment?
14. How much can you do to provide multiple means of representing a concept to prevent or reduce student confusion?
15. How much can you do to provide flexible options for how your students learn in your classroom?
16. How much can you do to provide appropriate challenges for very capable students?
17. How much can you do to design lessons that provide options for learners to regulate their own learning?
18. How much can you do to design lessons that provide options that help all learners sustain effort and motivation?
19. How much can you do to design lessons that provide options that engage and interest all learners?

20. How much can you do to provide options for learners at different levels to all reach higher levels of comprehension and understanding?
21. How much can you do to design lessons that provide options for all learners to understand requisite symbols or expressions?
22. How much can you do to design lessons that provide options for all learners to perceive what needs to be learned?
23. How much can you do to design learning activities that provide options for all learners to act strategically?
24. How much can you do to design learning activities that provide options for all learners to express themselves fluently?
25. How much can you do to design learning activities that provide options for all learners to physically respond?
26. How much can you do to provide flexible materials that give students options as to how they access the learning?
27. How much can you do to adapt standards and objectives to ensure flexibility in how students approach and demonstrate learning?
28. How much can you do to disentangle means of assessment from lesson and unit objectives?

Vita

Eric Moore was born in the inner city of Chicago, IL to Dr. Rev. Frederick and Lois Moore. As a child, his family moved to Grand Rapids, MI where he considers himself to have grown up. There, he attended Collins Elementary before continuing through Forest Hills Northern middle and high schools. After graduation, he pursued his long-time hope of attending Taylor University where he studied secondary English education. During his time at Taylor, Eric met his wife, Christine, who has been his partner in subsequent adventures and challenges (including parenting!). Eric began his professional teaching career in Kokomo, IN where he taught literature and drama at Northwestern High School. Succumbing to wanderlust, Eric and Christine then traveled to Indonesia where Eric taught middle and high school literature, philosophy and religion for three years before accepting the opportunity to help develop a fledgling international school in South Korea where he served for four years as a teacher and department chair. During his time in Korea, Eric pursued his master's degree in special education as a correspondence student at Grand Valley State University. He graduated with highest honors and earned the Dean's Citation: Outstanding Thesis Award for his work exploring the outcomes of postsecondary programs for young adults with intellectual disabilities. Shortly thereafter, Eric was recruited as a graduate assistant for the University of Tennessee, Knoxville where he earned his PhD in special education under advisors Dr. David Cihak and Dr. Sherry Bell.