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"The Course Fit Us": Differentiated Instruction in the College Classroom

Mary Volesky Dosch

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he course fit us": Differentiated instruction in the college classroom

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**"THE COURSE FIT US": DIFFERENTIATED INSTRUCTION IN THE COLLEGE
CLASSROOM**

by

Mary Volesky Dosch

Bachelor of Arts, Minnesota State University Moorhead, 1993

Master of Science, Minnesota State University Moorhead, 1998

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A Dissertation

Submitted to the Graduate Faculty

of the

University of North Dakota

in partial fulfillment of the requirements

for the degree of

Doctor of Philosophy

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This dissertation meets the standards for appearance, conforms to the style and format requirements of the Graduate School of the University of North Dakota, and is hereby approved.

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Dean of the Graduate School

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ABSTRACT

Differentiated instruction is a learner-centered philosophy of teaching based on Tomlinson's research, but stems from a constructivist belief espoused by Dewey, Piaget, and Vygotsky. Through consideration of three diagnostic areas: readiness, interests, and learning profiles, a teacher differentiates how diverse students access the material (content), how students make sense of the material (process), and how students demonstrate their learning (product).

Differentiated instruction has been used successfully at the elementary, middle, and high school levels showing quantitative improvements for diverse students. A limited number of qualitative studies on differentiated instruction exist at the college level, with even fewer quantitative studies.

The purpose of the current study was to further explore implementing differentiated instruction in higher education to more thoroughly understand if quantitative improvements were noted in a differentiated (DI) classroom compared to a nondifferentiated (NDI) classroom in two different sections of the same Educational Psychology course taught by the same instructor. In addition, the researcher investigated perceptions of DI students toward the use of differentiated instruction.

The DI and NDI sections had enrollments of 39 and 38 undergraduate students, respectively. The majority of the students were preservice teachers attending a Midwestern University of about 7000 students. Six assignments that provided choices for the DI group, but not for the NDI group and three exams were utilized to measure

quantitative differences in achievement between the groups. The DI group significantly outperformed the NDI group on the aggregate of the assignments and the aggregate of the exams. However, only two of the assignments and one exam showed significantly higher scores for the DI group when examined individually. In addition, the DI group perceived differentiated methods as beneficial to their learning as noted by the ratings on the course evaluation survey and their responses to open-ended survey questions.

These findings suggest that differentiated instruction can have a significant impact on diverse undergraduate students' achievement and perceptions of learning. In addition, modeling of differentiated instruction by college professors may positively impact preservice teachers' knowledge and use of differentiated instruction for the diverse population of K-12 students.

CHAPTER 1

INTRODUCTION

In the field of education, teachers need to expose students to a variety of curricula, learning strategies, teaching styles, environments, and methods of learning to help students meet their individual learning potential. For the K-12 student population, diversity among learners is anticipated and teachers are expected to consider this in their instructional planning (National Board for Professional Teaching Standards, 2002). At the higher education level, students are perhaps even more diverse due to their varied educational and life experiences, yet less consideration for diversity in instructional planning occurs (Merriam, Caffarella, & Baumgartner, 2007). Planning instruction to meet the needs of the adult population, however, becomes no less imperative considering the changing demographics of this population and the increasing numbers of adult learners today (Merriam et al., 2007).

Wormeli (2007) stated, “Students are more diverse than ever—culturally, emotionally, economically, physically, and intellectually” (p. 3). Several researchers (Aud et al., 2011; Merriam et al., 2007; Santangelo & Tomlinson, 2009) concur that the diversity of adult learners is ever increasing. Merriam et al. (2007) explained, “For the first time in our society, adults outnumber youth, there are more older adults, the population is better educated than ever before, and there is more cultural and ethnic diversity” (p. 7). One of the major concerns regarding the increased diversity in higher

education is whether educators are adequately meeting the needs of our diverse students (Pliner & Johnson, 2004; Santangelo & Tomlinson, 2009). Aud et al. (2011) in a report on remediation uncovered the following:

In 2007-2008, approximately 36 percent of first-year undergraduate students reported that they had ever taken a remedial course, and 20 percent of first-year students undergraduates reported that they had taken at least one remedial course in the 2007-08 academic year. (p. 70)

In addition, the National Center for Educational Statistics report revealed, "...the percentage of White first-year undergraduates (31 percent) who reported that they had ever taken a remedial course in college was smaller than the percentages of all other racial/ethnic groups..." (Aud et al., 2011, p. 70). Also, more females are taking remedial courses than males (Aud et al., 2011). With almost one third of White freshman students taking remedial courses and an even higher percentage in each of the other racial groups (45% Black, 43% Hispanic and 38% Asian students), it could be said that the educational system is failing many students. This academic failure is pervasive for students of all racial groups, both genders, and several types of disabilities. Students of color and those with disabilities face some of the most extreme challenges. Pliner and Johnson (2004) share the plights of diverse students:

...they experience significant cultural, curricular, and pedagogical barriers; and they are often asked continually to serve as educational "diversity" agents for mainstream students. Because these structural barriers are in place, colleges and universities deny students of color equal access to educational opportunity. Students with disabilities face similar challenges to those faced by students of

color. They have to fight for access, whether it is physical access or curricular and pedagogical access. (p. 109)

The high percentage of students repeating an academic course indicates a mismatch between college and students' academic needs. More specifically, instructors are not meeting the challenge of successfully preparing diverse students. The traditional model of lecture-style teaching and teacher-driven education continues to dominate in college classrooms (Hansen & Stephens, 2000). This model fails to consider students' interests, learning profiles, and readiness levels. Hansen and Stephens (2000) state that providing all students with a learner-centered education should be an ethical obligation for educators.

The lack of attention to learner-centered education may be partly responsible for students repeating courses and dropping out of college. The current educational system works hard to keep these traditional ideals and methods in place instead of making education more learner-centered. For example, Fassett and Warren (2004) found when interviewing teachers and students, that both use strategic rhetoric and behaviors to keep systemic power in place, so that the current educational system can be justified. The three types of rhetoric that Fassett and Warren state are most often used are: individualism, victimization, and authenticity. Individualism is blaming the student for failure or success without considering the institutional or social context.

Such a rhetorical framing that denies contextual matters and further insists that any failure is due to no factor other than one's direct inability to do the work. It ignores economic or cultural factors that might undermine one's chances in school. (Fassett & Warren, 2004, p. 28)

In other words, there is nothing wrong with the system or the current hegemonic ideal; if the student cannot make it in the current system, then it is his own fault.

The second type of rhetoric is called victimization which is in direct opposition to the individualism strategic rhetoric. Victimization strategic rhetoric holds that the student is a victim of the context: societal rules, or institutional rules. "Thus, students are again positioned as fulfilling obligations that are beyond their control, obligations imposed in these cases by the specific rules of normalized classroom practice" (Fassett & Warren, 2004, p. 31). The use of rhetoric here takes any form of control over success or failure from the student. The student simply needs to survive the current system because there is no hope for change in the institution.

Finally, the strategy of authenticity is the third type of rhetoric. Fassett and Warren (2004) state that the rhetoric of authenticity falls under three forms of power: "(1) a failure to measure up to standards, (2) mythical other's success, and (3) popular culture as a model" (p. 33). Again the student is blamed for not meeting deadlines or other norms of education. Second, the student is compared to others such as peers or the teacher herself and these superior (hegemonic) measures are used to judge the student. Third, expectations of the classroom in the movies or other media are used as gauges for how teachers and the educational experience should be. Students are said to expect, for example, that all teachers should be like the inspirational ones seen in specific films, an unrealistic goal because movies are made for entertainment and fail to capture the day-to-day demands of a classroom.

Each of these types of strategic rhetoric promotes the educational norms, or the "one-size fits all" teaching method, to remain the same instead of changing to create

learner-centered environments. Kolb and Kolb (2005) state, “To improve learning in higher education, the primary focus should be on engaging students in a process that best enhances their learning...” (p. 194). Students learn in unique ways. (Gardner, 1993; Sternberg & Spear-Swerling, 1996; Tomlinson & Imbeau, 2010; Wormeli, 2007). As Gardner in his interview with *Edutopia* (1997), states:

If we all had exactly the same kind of mind and there was only one kind of intelligence, then we could teach everybody the same thing in the same way and assess them in the same way and that would be fair. But once we realize that people have very different kinds of minds, different kinds of strengths -- some people are good in thinking spatially, some in thinking language, others are very logical, other people need to be hands on and explore actively and try things out -- then education, which treats everybody the same way, is actually the most unfair education. (Gardner in *Edutopia*, 1997, para. 2)

Just as each person has his individual medical growth chart that is dissimilar to any other person, each person learns and develops cognitively in a unique manner (Tomlinson & Imbeau, 2010). With the knowledge that students’ learning is unique (Pliner & Johnson, 2004; Santangelo & Tomlinson, 2009; Tomlinson, 2000), instructors need to adopt new and varied teaching mindsets that meet the needs of the all learners. One way that this has been done with kindergarten through 12th grade students is through differentiated instruction.

Carol Ann Tomlinson (1999), a forerunner in research and use of differentiated instructional methods explains differentiated instruction in this way:

Differentiated instruction is not an instructional strategy or a teaching model. It's a way of thinking about teaching and learning that advocates beginning where individuals are rather than with a prescribed plan of action, which ignores student readiness, interest, and learning profile. It is a way of thinking that challenges how educators typically envision assessment, teaching, learning, classroom roles, use of time, and curriculum. (p. 108)

Differentiated instruction is a learner-centered approach that takes into consideration multiple aspects of the learner to best meet her educational needs. Three diagnostic preassessment components are utilized to best understand personal characteristics of students and their academic skills: readiness, interest, and learning profile (Tomlinson, 2001). Each component is briefly explained in the following paragraphs.

Student readiness refers to a student's proximity to the desired educational outcome based on background foundational knowledge, past experiences, opportunities for learning, and skill level. Readiness is based on a constructivist model meaning that teachers know their students' current levels of performance and that they differentiate lessons in order to build upon students' past knowledge and experiences. Dewey (1938), Piaget (1971), and Vygotsky (1997) advocated for teaching students using constructivist-based methods. In the following quote, Fosnot (1996) summarized the three educational theorists' ideas of constructivism-based learning. "Rather than behaviors or skills as the goal of instruction, concept development and deep understanding are the foci; rather than stages being the result of maturation, they are understood as constructions of active learner reorganization" (p. 10). As new or conflicting information is presented to an individual, the individual must choose to reorganize one's previous knowledge of the

subject. Learning is understood as continually adjusting one's knowledge, either adding onto a concept or developing a brand-new concept as new information is processed in the brain (Piaget, 1971). Due to these continuous adjustments, instruction then is based on the learner's development.

In a constructivist model of education, the student is always kept in his zone of proximal development, a position where with guidance the student can successfully learn new material (Vygotsky, 1997). To ensure that a student remains within this challenging range, teachers differentiate for all learners and scaffold novel concepts onto the preexisting knowledge of the students. "Scaffolding is a temporary framework that assists the child's growth. As the child develops, the scaffolding changes" (Fosnot, 1996, p. 96). Scaffolding stretches the child's learning a bit further. The effectiveness of scaffolding methods utilized in differentiated instruction is well-supported by research (Brooks & Brooks, 2004; Molenaar, van Boxtel, & Slegers, 2010; Palinscar & Brown, 1984). For example, Palinscar and Brown (1984), through the use of reciprocal teaching that involved expert scaffolding, were able to help students who struggled with comprehension to significantly increase their skills as measured from pretest to posttest when compared with their peers who did not receive the treatment. Through the use of scaffolding techniques, Molenaar et al. (2010) significantly increased the use of metacognitive activities employed by triads of students as they interacted with a computer program.

The idea of tapping into students' interests in differentiated instruction is significant, because studies have shown that when students are interested, intrinsic motivation is awakened (Deci & Ryan, 1985; Vansteenkiste, Lens, & Deci, 2006). When

students are interested, they are motivated to learn and keep learning. Intrinsic motivation is integral for persistent, lifelong learners. To maintain intrinsic motivation, Jensen (2005) suggests allowing students choices, activating their background knowledge, increasing feedback, and providing a safe environment to explore. Through understanding our students' learning profiles, educators can help students preserve their intrinsic motivation.

A student's learning profile is defined as "a preference for taking in, exploring, or expressing content" (Tomlinson & Imbeau, 2010, p. 17). A learning profile consists of a student's preferred contextual environment, one's intelligences, one's gender, and one's culture (Tomlinson & Imbeau, 2010). Each of these preferences contributes to how a student learns most proficiently and efficiently. Contextual environment pertains to ways of learning such as alone or in a group and issues such as how information is presented. Intelligences refer to different ways students think such as practically, analytically, or creatively (Sternberg & Spear-Swerling, 1996) or through multiple intelligences as suggested by Gardner (1993). One's gender also affects how one learns for a variety of reasons including social, cultural, and physiological differences (Jensen, 2005). Finally, one's culture can distinguish what information is considered worth learning (Vygotsky, 1978).

Instructors differentiate their courses through considering four distinct areas: *content, process, product, and affect* (Tomlinson & Imbeau, 2010). Instructors first decide the most important content knowledge that students need to learn through the course. Then the instructor looks at the process or "making-sense" methods of instruction needed to meet the variety of learners, deciding the teaching methods that should be

utilized so that every student is able to learn the material. The product is how the students show the teacher their learning of the content. The instructor decides and suggests ways the students can demonstrate what they have learned. Affect addresses attitudes and feelings toward school and school-related activities or how the students perceive the classroom environment. Grasping an understanding of each of these areas for every student requires that the teacher has knowledge of each student, which in differentiated classrooms is gathered through assessment methods.

Differentiated instruction is rooted in assessment: diagnostic, formative, and summative (Tomlinson & Imbeau, 2010). Assessment is the driving force of differentiated instruction, utilized, not in the traditional manner, such as giving a student a midterm exam and final exam as a measure to conclude whether the student understood the material. Instead of one summative assessment at the midterm and one at the end of the semester, teachers do formative assessments on a regular basis. Initially the instructor uses diagnostic assessments to understand individuals' present level of performance for the particular unit, allowing the teacher to know the foundation to build upon. These pre-assessments may include gathering knowledge about students through questionnaires regarding how they learn best and their interests. Formative assessments are ongoing throughout a unit to understand the progress students are making as they learn and if reteaching is necessary. Summative assessments are typically used at the end of a unit to verify learning and to ascertain whether students have met the appropriate objectives.

Differentiated instruction methods have been successfully implemented in elementary schools where students showed significant improvements in academic core areas and behavior (Baumgartner, Lipowski, & Rush, 2003; Beecher & Sweeny, 2008;

Grimes & Stevens, 2009; Tieso, 2005). Utilization of differentiated instructional methods has been less frequent at the middle and high school levels than at the elementary level, but academic improvement and learning enjoyment was demonstrated in several studies (Avcı, Yüksel, Soyer, & Balıkcıoğlu, 2009; Baumgartner et al., 2003; Graham, 2009; Mastropieri et al., 2006). At the higher education level, even fewer studies relating to the use of differentiated instructional methods have been completed. The investigations that have been completed were generally qualitative and explored the affective aspects of differentiated instruction. Overall, students at the college level perceived differentiated instruction as conducive for learning (Ernst & Ernst, 2005; Livingston, 2006; Santangelo & Tomlinson, 2009).

The studies that I have found conducted at the college level thus far have all been primarily qualitative. I have searched numerous databases such as EBSCO, Wilson Web, Google, ProQuest, and ERIC, and have read numerous books, dissertations and articles, without finding quantitative data at the college level. Santangelo & Tomlinson (2009) did state that the students in their study all met the course objectives, but specific quantitative data was not given. It seemed clear that further investigation needed to be conducted on the quantitative aspects of differentiated instruction and that such a study clearly was needed at the college level.

Purpose of Study

The purpose of the current study is to further explore implementing differentiated methods in higher education to more thoroughly understand if quantitative improvements are noted in a differentiated (DI) classroom compared to a nondifferentiated (NDI) classroom in two different sections of the same course taught by

the same instructor. In addition, I was curious as to whether the DI students would perceive differentiated methods as beneficial to their learning.

Research Questions

Two research questions guided this study: (1) Did the incorporation of differentiated methods in an undergraduate course of Educational Psychology result in higher achievement scores on assignments and exams for the DI students when compared to the NDI students' scores who were in a different section of the same course with the same teacher? (2) Did undergraduate DI students perceive the differentiated philosophy and methods in the course to be beneficial to their overall learning?

The hypothesis was that the DI students would receive higher scores on assignments and exams because of the implementation of differentiated instructional methods. In other words, the DI group of students would show a stronger level of mastery of the material than the NDI group. In addition, it was hypothesized that students in the DI group would perceive differentiated instruction as beneficial to their learning as measured by course evaluations.

The rationale for the hypothesis that the DI students would attain higher academic scores when differentiated instruction methods were utilized by the instructor was that the students were given a degree of control over how they learned the material and how they expressed their learning. They were provided with opportunities to explore their interests and make choices as to how they would demonstrate their learning. Exploring interests, making choices, and feeling in control of one's learning increases motivation to learn (Brederson, 2009; Deci, 1985; Ernst & Ernst, 2005; Santangelo & Tomlinson, 2009; Tomlinson, 2001; Tomlinson, 2008). Due to differentiation of the content, exposure to

multiple ways of processing information and having choices in the products they created, it was surmised that the students would perceive differentiated instruction positively.

Assumptions and Delimitations

As a university instructor, I have implemented some differentiated activities in my courses because I have witnessed academic improvements in K-12 schools with the use of differentiated instruction. At the higher education level, I believed that through differentiating instruction the needs of the increasingly diverse population will and can be met. However, I also felt that it was important not to simply operate from a potentially biased belief that differentiation works, but instead to conduct research and investigate whether a measurable difference would be found in academic gains and whether students would perceive qualitative differences because of the use of differentiated instruction.

This study included students in two sections of an Educational Psychology course at a moderate size university of about 7500 students located in the upper Midwest. The instructional methods were limited to a constructivist model of teaching for the DI group, employing differentiated methods based on learning profiles, readiness, and student interests versus a more traditional lecture style of teaching for the NDI group. The diagnostic and formative assessments were teacher-made for the DI group and were used to guide my instruction for the DI section. I also created the summative assessments, the assignments and exams, which were used for grades. The assignments for the DI group allowed for choices that I surmised would be appealing to the students. Rubrics for the assignments and for scoring essay questions on the exams were also teacher-made. The rubrics held the same requirements and scoring for all students.

Definitions

Constructivism: a self-regulatory process of struggling with the conflict between existing personal models of the world and discrepant new insights, constructing new representations and models of reality as a human meaning-making venture with culturally developed tools and symbols, and further negotiating such meaning through cooperative social activity, discourse, and debate (Fosnot, 1996, p. ix)

Differentiated Instruction: an instructional mindset of responding to the needs of learners through consideration of their readiness, interests, and learning profile (Tomlinson, 2001)

Intrinsic Motivation: a variety of behaviors that do not require reinforcements for their maintenance (Deci & Ryan, 1985, p. 5)

Learning Profile: a preference for taking in, exploring, or expressing content (Tomlinson & Imbeau, 2010, p. 17)

Preservice Teachers: undergraduate students that have been accepted into the teaching program and are working towards a degree in education

Students: for the purpose of this study, students will refer to college students, unless otherwise specified.

Triarchic Theory of Intelligence: a theory of intelligence proposed by Robert J. Sternberg stating that intelligence can be categorized into three types of learners: practical, analytical, and creative (Sternberg, 1985)

Understanding by Design: (also called backward design) curriculum planning based on three factors: desired student results of learning, assessments of evidence of

learning, and instructional planning based on student experiences and educational standards (Wiggins & McTighe, 1998)

Zone of Proximal Development: the ideal learning gap between the knowledge already mastered and the novel knowledge yet to be learned (Vygotsky, 1978)

CHAPTER II
REVIEW OF LITERATURE
Differentiated Instruction

The purpose of the current study is to explore implementing differentiated methods in higher education to more thoroughly understand if quantitative improvements are noted in a differentiated (DI) classroom compared to a nondifferentiated (NDI) classroom in two different sections of the same course taught by the same instructor. In addition, I was curious as to whether the DI students would perceive differentiated methods as beneficial to their learning. More specifically, did the incorporation of differentiated methods in an undergraduate course of Educational Psychology result in higher achievement scores on assignments and exams for the DI students when compared to the NDI students' scores who were in a different section of the same course with the same teacher; and did undergraduate DI students perceive the differentiated philosophy and methods in the course to be beneficial to their overall learning?

This chapter begins with a definition of differentiated instruction and the reasoning for why this research on differentiated instruction is critical. A review of educational theories that support differentiation based on readiness, interest, and learning profile follows. Next, the crucial relationship between differentiated instruction and assessment is examined. A description of the four curricular-related components of differentiated instruction precedes a delineation of what differentiation is and is not.

Finally, a review of the findings in recent research regarding the implementation of differentiated instruction at the elementary, middle/high school, and college levels is provided.

A greater understanding of what differentiated instruction entails is important to grasp before delving into the topic any further. Tomlinson (2008) stated:

Differentiated instruction is teaching with student variance in mind. It means starting where the students are, rather than adopting a standardized approach to teaching that seems to presume that all learners of a given age or grade are essentially alike. Thus differentiated instruction is 'responsive' teaching rather than 'one-size-fits-all' teaching (Tomlinson symposium, November 19, 2008).

The critical ideas behind differentiated instruction are that students are unique due to their own life experiences and that they require deliberate educational guidance according to their needs.

The traditional or standardized approach to education at the university level has been predominately geared toward a specific type of student (Pliner & Johnson, 2004). Invariably when educators teach toward the so-called "typical" student, anyone not meeting the pre-set criteria is not considered when planning the instructional methods. Pliner & Johnson (2004) elaborated, "...higher education in the United States has been primarily available to a professional class that was white, able-bodied, heterosexual, Christian, and male" (p. 106). In recent years, as a result of civil rights legislation, higher education has become more inclusive; however, the curriculum and teaching methods have not been altered sufficiently in response to incorporating the diverse students and meeting their unique educational aspirations. The one-size-fits-all method of teaching for

the “typical” student is still prevalent among college educators. Pliner & Johnson (2004) shared:

Although higher education became more available to historically underrepresented groups, educational practices and culture did not shift significantly to address the experiences and learning needs of the students newly enrolled. So, although legislation opened the door to diverse student populations, the absence of efforts to change the culture or the educational practices in higher education (such as the curriculum, physical layout, and teaching and testing methods) have created significant barriers to access, retention, and graduation for many students...(p. 106)

Without changes to educational practices, diverse students are set up for failure. Striving to match instruction to students’ needs is both respectful and important. Continual responsiveness to students’ diverse educational needs while keeping them engaged in their learning infers that the education of one student does not stop to wait for others.

Responsive teaching entails altering instructional methods in multiple ways to best help each and every student master the material. In other words, the teacher differentiates his instruction to meet the needs of all learners. Tomlinson (2001) wrote, “In a differentiated classroom, the teacher proactively plans and carries out varied approaches to content, process, and product in anticipation of and in response to student differences in readiness, interest, and learning needs” (p. 7).

Theoretical Framework

Differentiated instruction is based on Tomlinson’s (2001) research regarding these three diagnostic areas: readiness, interest, and learning profile. However,

differentiated instruction stems from a constructivist belief that was espoused first by Dewey and Piaget, then later by Vygotsky. Each of their impressions regarding learning will be explored in this section laying the foundation for differentiated instruction.

Readiness

Readiness refers to “a student’s current proximity to specified knowledge, understanding, and skills” (Tomlinson & Imbeau, 2010, p. 16). Understanding the student’s readiness is imperative to know where to begin teaching. A teacher must take into consideration the student’s past experiences, the depth of the student’s knowledge about a topic area, and the next instructional building block needed to move the student to a more in-depth understanding. Readiness in differentiated instruction is predominantly based on constructivism. The prefix “con” means “with” and “struct,” a Latin root word, literally means “to build.” Teachers with the students build into and onto cognitive foundations; teachers “instruct.” Some of the most influential teachers and learning theorists in educational history are Dewey, Piaget, and Vygotsky. Each of these individuals discussed construction of knowledge emphasizing both cognitive influences and environmental/social influences. Dewey gave each aspect, cognitive and social, significant weight in his learning theory. As Greene (1996) reported, “John Dewey and other philosophers have asserted repeatedly that there is no “inner world” somehow set off against the social and the natural” (p. 126). In other words, one does not learn anything in isolation. Vygotsky’s model of constructivism is primarily based on sociocultural interaction (Fosnot, 1996). According to Vygotsky (1997), each new tidbit of information is understood within the sociocultural context of the individual. Within

each of the theorists' philosophies of teaching and learning, one can find numerous references to both cognitive and social constructivism.

Dewey shared the constructivist perspective relating the importance of a teacher understanding the foundation of the student's knowledge and then building on novel information. Dewey (1938) wrote:

It is a cardinal precept of the newer school of education that the beginning of instruction shall be made with the experience learners already have; that this experience and the capacities that have been developed during its course provide the starting point for all further learning. (p. 74)

Not only the teacher's responsibility of understanding the student's current levels of functioning, but also arranging the environment and materials to best match the students' needs is accentuated repeatedly in Dewey's (1938) writings: "He [the teacher] must be aware of the potentialities for leading students into new fields which belong to experiences already had, and must use this knowledge as his criterion for selection and arrangement of the conditions that influence their present experience" (p. 76) and again, "The immediate and direct concern of an educator is then with the situations in which interaction takes place... to create a worth-while experience" (p. 45).

Piaget's cognitive view of constructivism states that the organism will adapt to novel stimuli through assimilation (reorganizes to incorporate new cognitive information) or accommodation (creates a new schema) in order to maintain or attain cognitive homeostasis or equilibrium (Piaget, 1967). For example, a young child might call every animal with four legs a dog (assimilation); however, through maturation and experience, the child realizes that although a cat and a dog have four legs, the cat has other

distinguishing features and is a unique animal (accommodation). In Piaget's words, "The result is that developmental theory necessarily calls upon the concept of equilibrium, since all behavior tends toward assuring equilibrium between internal and external factors or, speaking more generally, between assimilation and accommodation" (Piaget, 1967, p. 103). Constructivism of knowledge is based on the lifelong journey to attain equilibrium through assimilation and accommodation. When novel information is presented, learners choose to assimilate or accommodate the information extending their store of knowledge, reorganizing their previous knowledge, or creating a new, separate bank of knowledge. So, if a student is lacking the background knowledge or readiness to learn a new concept, the concept may not be encoded at all via assimilation or accommodation, or it may be misperceived and be incorrectly encoded.

Perhaps no theorist so clearly explained and framed the importance of readiness as did Vygotsky by considering the social influences that also affect knowledge growth. He concurred with the view of beginning with the student's present levels of functioning and building knowledge onto these constructs. Vygotsky (1997) stated:

This is why familiarity with the student's available store of experience is a necessary condition of pedagogical work. It is always necessary to know the soil and the material which we intend to build on, else we run the risk of putting up a flimsy structure on shifting sands. Therefore, the task of determining how to convey new material that is not part of the student's past experience in the language of his own experience becomes a matter of the greatest concern for the teacher. (p. 151)

As Vygotsky shared, educators need to build onto the previous knowledge of the students, but at the same time, must ensure that the foundation is solid before introducing further novel material. Moreover, Vygotsky (1997) viewed learning not as just an intracognitive effort, but as a social construction based on collaboration between the teacher and the student. “Education is a process of mutual and continuous adaptation of both camps, where sometimes it is guide or leader which represents the most active and the most original effective side, and sometimes those who are being led. A pedagogical process of this sort comes to be a real social world...” (Vygotsky, 1997, p. 349). So, together the teacher and the student construct new knowledge. Social learning is not exclusive to the teacher/student dyad. Social learning most often occurs amongst a community of learners trying to “make-sense” of new information (Fosnot, 1996).

Students in the classroom, through interaction and sharing of their experiences with one another, enhance and deepen learning for all. Vygotsky (1997) stated:

... the child would place a high value on the satisfaction or dissatisfaction of his classmates. With these social structures in place, the environment becomes a powerful mechanism that is forever conveying to the child the reflected impression of his own actions. (p. 237)

As the child is learning in a collaborative group, she immediately is given feedback from her peers regarding her contributions whether verbal or nonverbal.

Initially, the constructivist instructor’s role is to pre-assess the student’s interests, readiness, and background knowledge, so that the teacher can plan how to engage the student in the learning process. Next, it is the instructor’s job to guide the learning of the student through appropriate and challenging tasks (Tomlinson, 2001). Vygotsky’s idea of

the zone of proximal development (Vygotsky, 1978) helped establish criteria for an appropriate task. The zone of proximal development is the ideal learning gap between the knowledge already mastered and the novel knowledge yet to be learned. Effective educators continually adjust the amount of guidance given keeping students in this zone of just the right amount of challenge. In this zone, the material is too difficult for the student to do alone; but with guidance from the teacher, the student can master the information. The ultimate goal is for the student to become an independent, self-guided learner. Vygotsky (1978) further explained:

The zone of proximal development furnishes psychologists and educators with a tool through which the internal course of development can be understood. By using this method we can take account of not only the cycles and maturation processes that have already been completed but also those processes that are currently in a state of formation, that are just beginning to mature and develop. Thus, the zone of proximal development permits us to delineate the child's immediate future and his dynamic developmental state, allowing not only for what already has been achieved developmentally but also for what is in the course of maturing. (p. 87)

Building or scaffolding onto one's knowledge is the crux of Vygotsky's constructivist theory of learning. Therefore, knowing when to teach and scaffold on the next concept (determining readiness) or guide a student in learning a new strategy is the challenge of teaching. The effectiveness of scaffolding methods utilized in differentiated instruction is well-supported by research studies (Brooks & Brooks, 2004; Molenaar et al., 2010; Palincsar & Brown, 1984). As von Glaserfeld (1996) stated, "...the task of the educator

is not to dispense knowledge but to provide students with opportunities and incentives to build it up [at the appropriate time]" (p. 7).

In summary, understanding a student's readiness is the foundation for helping students to construct knowledge. Constructivism begins with understanding the learner's current background knowledge, experiences, and interests and using those aspects for scaffolding new learning. Constructivism is driven by the student's curiosity and desire to learn. Therefore, the student must choose to participate in the learning process and teacher's can assist them to participate by tapping their interest.

Interest

Interest is driven by curiosity or passion to learn about a topic (Tomlinson, 2001). Educators need to know each student's interests because interests are frequently "linked to a student's strengths, cultural context, personal experiences, questions, or sense of need" (Tomlinson & Imbeau, 2010, p. 17). Vygotsky (1997) underscored that part of the teacher's duties is to help the student discover his own inspirations. He wrote:

It is time that pedagogics, too, followed this road and sought out people who possessed an exact knowledge of laws and the methodology through which the child's own sense of inspiration could be aroused within the confines of his own soul, making use of whatever means were available, by whatever means possible, the child's own inspiration. (p. 344)

Piaget (1970) contended, "...true interest appears when the self identifies itself with ideas or objects, when it finds in them a means of expression and they become a necessary form of fuel for its activity" (p. 158). Interest is driven by what the child identifies with or the child's previous knowledge. Thus, when the connection to this previous knowledge

is made the child becomes motivated to learn more; the interest has been tapped. Now, the child is curious and ready for the next novel information to be scaffolded onto the known material. According to Vygotsky (1997), “Thus, interest would appear to be the natural motive force of the child’s behavior, it is the true expression of instinctive striving, an indication that the child’s activity coincides with his organic needs” (p. 83).

Humans are curious, natural learners (Piaget, 1970; Vygotsky, 1997). Piaget and Vygotsky both purported that learning begins when one reacts instinctively or through reflexes to stimuli and then adapts accordingly. Through the cycle of perceiving, processing and finally reacting to the stimuli, one learns (Vygotsky, 1997). Scientifically speaking, Vygotsky stated, “We have seen that the individual’s own experience is the only teacher capable of forming new reactions in the individual...Ultimately, the child teaches himself” (p. 47). This scientific, experiential way of learning is the basis for constructivist learning and very different from the traditional philosophy of educating a student. Vygotsky (1997) highlighted this in the following excerpt:

The traditional European school system, which always reduced the process of education and instruction to a passive apprehension by the student of a teacher’s lessons and outlines, was the ultimate of psychological nonsense. The educational process must be based on the student’s individual activity, and the art of education should involve nothing more than guiding and monitoring this activity. (p. 48)

In other words, a child’s innate ability to learn progresses when new information is added on to or scaffolded onto one’s preexisting knowledge through experience. To guide a student in her learning, teachers must understand what experiences might spark the natural curiosity of a student and motivate the student to learn.

Edward Deci, one of the most prominent motivation theorists, has explored the underpinnings of motivation. Deci and Ryan (1985) stated, “Curiosity is a basic propensity in human functioning. The desire to explore, discover, understand, and know is intrinsic to people’s nature and is a potentially central motivator of the educational process” (p. 245). Great outcomes can occur when teachers are mindful of students’ interests to drive their learning. Wormeli (2007) purported, “When we feed students’ natural tendencies for dynamic growth, they not only thrive, they become fully committed to learning” (p. 108).

Interest sparks a student’s intrinsic motivation to learn what motivates children to become more engaged in their learning and learn the material to a deeper level (Glynn, Aultman, & Owens, 2005; Tomlinson, 2008). By providing a variety of interesting tasks and a positive learning environment, teachers help students to reach their learning potential. Vansteenkiste et al. (2006) shared:

In other words, if instructors help students see the long-term relevance to themselves in terms of intrinsic goals... the students are likely to become more engaged with the learning activities and in turn to understand the material more fully and to perform better in demonstrating their competence. (p.28)

Regarding motivation and self-determination, Jang, Reeve, and Deci (2010) found that teachers who provided structure and activities that support autonomy increased student engagement and learning in the classroom. Further, Vansteenkiste et al. (2006) wrote, “...teachers would do well to adopt an autonomy-supportive rather than controlling style in relating to the students” (p. 28). Thus, with curiosity or interest as a starting point, students become intrinsically motivated to learn, and to develop autonomy and self-

determination within a supportive, non-controlling environment and therefore, learn to a greater and deeper capacity.

Learning Profile

Learning profile refers to “a preference for taking in, exploring, or expressing content” (Tomlinson & Imbeau, 2010, p. 17). Four different aspects comprise a learning profile: multiple intelligences, learning preferences, gender, and culture (Tomlinson & Imbeau, 2010).

Several theories of multiple intelligences exist, but probably the most preeminent are Howard Gardner’s and Robert Sternberg’s. The basic premises of their theories are that people are intelligent in many different ways, ways that frequently are not measured well or not at all by a standardized intelligence test (Gardner, 1993). Gardner named several different intelligences: linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, intrapersonal, interpersonal, naturalistic, and (possibly) existential (Moran, Kornhaber, & Gardner, 2006). Students may be strong or weak in several intelligences, creating a unique intelligence profile. “Intelligences are not isolated: they can interact with one another in an individual to yield a variety of outcomes” (Moran et al., 2006, p. 23). By considering multiple intelligences, teachers can help students make connections to a particular topic of study via their intelligences. For example, if a student is very athletic or kinesthetically intelligent, but struggles with a particular rhythm in music, the teacher could employ movement to help the individual learn the correct beat. Gardner claims that through the use of a student’s strengths, one can help the student to understand novel concepts. When a student is aware of her own intelligences and employs them to learn new material, the student becomes a more autonomous learner. “In

ideal multiple intelligences instruction, rich experiences and collaboration provide a context for students to become aware of their own intelligence profiles, to develop self-regulation, and to participate more actively in their own learning” (Moran et al., 2006, p. 27).

According to Sternberg and Spear-Swerling (1996), Gardner’s theory of multiple intelligences denotes domains of intelligences, whereas, Sternberg’s theory enumerates how students use their knowledge. The two theories actually are complementary. Sternberg’s Triarchic theory of human intelligence suggests three ways of processing information: analytical, creative, and practical. Analytical thinkers like to evaluate, compare/contrast, analyze, and critique information. Creative thinkers like to invent, imagine, create, and design when processing novel information. Practical thinkers like to apply, implement, show how, demonstrate, and utilize information in real-life ways. Sternberg and Spear-Swerling (1996), when discussing their educational research on human intelligence, stated:

We used to think that large portions of our students just were not very bright when it came to the subjects we teach. When we began diversifying our instruction and assessment via the triarchic model, we discovered that many students who we thought could not do well could, if only we gave them a chance.

(pp. 69-70)

Neither Gardner nor Sternberg suggested teaching to specific intelligences. They suggested providing opportunities to explore novel information by using a balanced variety of intelligences to reach all students’ learning needs (Sternberg & Spear-Swerling, 1996; Moran et al., 2006).

By attending to learning preferences, an instructor takes into consideration the environment and personal factors (Tomlinson, 2001). Some preferences may include socialization aspects: individual, small groups or large groups; working conditions: a quiet, structured environment or a noisier, loosely structured environment; or preferred modes of learning: kinesthetic, visual, or auditory channels (Tomlinson, 2008). The key is to provide choices for students that are conducive to learning and most comfortable for them. For instance, when reading a book for pleasure, many students may not want to sit in their chair by their desk. Bean bags in the corner of the room with a lamp might be a more inviting environment for a child to read. At the college level this is also possible and may include: rearranging the room, allowing students to sit on the floor, bringing snacks, playing music while students work in groups or allowing students to stand, as needed, during class.

A student's gender is also important to consider as several researchers have noted that males and females do learn differently and have differing preferences for learning (Alumran, 2008; Cleveland, 2011; Tomlinson, 1999; Tomlinson, 2001). Much variation does exist, however, among males or among females, too. "Whereas more males than females may prefer competitive learning, for example, some males will prefer collaborative learning and some females will prefer competition" (Tomlinson, 2001, p. 62). In addition, males and females brains are structured differently (Jensen, 2005) and how they process information is different (Baxter Magolda, 2001). Jensen (2005) pointed out some examples from brain research as to how scientists believe that brain structure affects learning, "Females are better at remembering landmarks and people than they are at remembering distances and objects. Males throw and hit targets or objects more

accurately. They do gross-motor tasks better and reason out math problems better” (p. 115). Biological variations exist between males and females which affect learning, but cultural and social variations also affect how males and females learn (Tomlinson, 2001). So, instructors must be sure to look at students holistically.

A student’s cultural background strongly influences learning (Baxter Magolda, 2001) and preferences for learning. Tomlinson (2001) affirmed:

Culture affects how we learn, as well...whether we learn best in a whole-to-part or a part-to-whole approach, whether we prefer to learn material that’s contextual and personal or discrete and impersonal, whether we prefer to work with a group or individually... (p. 62)

Some cultures enjoy learning collectively, whereas other cultures value independent thinking and learning. Further, what one culture considers important to learn another culture may find insignificant (Baxter Magolda, 2001). Some cultures may place greater emphasis on learning through their community rather than in formal institutions (Deloria & Wildcat, 2001). Teachers need to consider all of these aspects of a student’s culture to help understand how to best guide a child’s learning.

Assessment in Differentiated Instruction

One of the hallmarks of differentiated instruction is continuously being abreast of student knowledge through assessment. Assessment is at the heart of differentiated instruction and is used to inform teachers about their students. In this section, I will define assessment, explain its purpose in the classroom and discuss three different kinds of assessment used in differentiated instruction.

Stiggins and Chappius (2012) defined assessment as “the process of gathering information to inform instructional decisions” (Introduction section, p. xxiii). Depending upon the type of assessment, information can be gained about numerous aspects of a student: culture, preferred ways of learning, interests, feelings about learning, and present levels of academic skills. Each of these aspects can impact how the student learns and therefore each is important. As the definition also stated, assessments are conducted for the purpose of making informed instructional decisions. Stiggins and Chappius (2012) would argue that assessment can be used to drive learning. “We can also use it to build student confidence, motivation, and engagement in their learning... We can promote such learning success with deep student involvement in the classroom assessment, record keeping, and communication process” (Introduction section, p. xxiii). When students understand assessment outcomes and learn to self-assess, they become more autonomous in their learning. For instance, a teacher might supply a student with a checklist of expected criteria for a paper. When the student is finished writing the paper, she can refer back to the checklist to ensure all criteria are met; however, use of assessment by students in a classroom is relatively new as stated by Stiggins and Chappius (2012):

It has not been our (educators) tradition to involve students in self-assessment.

Rather, we have used assessment merely to hold students accountable for learning—to grade them. However, recent research has instructed us that we also can use classroom assessment to advance learning. (Introduction section, p. xxii)

Differentiated instruction is not of the traditional model of assessment. Instead assessment is incorporated before, during, and after instruction. Assessment is a never-

ending process in differentiated instruction. The three categories of assessments utilized before, during, and after instruction are: diagnostic, formative, and summative.

Diagnostic or preassessments are used to gain initial student information regarding the student's proximity to the specific outcomes for a unit (Tomlinson & Imbeau, 2010). Preassessments are typically given several days or a week before a unit is going to be taught. Preassessments help teachers to understand the background knowledge the student possesses before instruction begins. As each school day has a finite amount of time allocated for instruction, teachers do not want to waste time teaching students information the students already know. Preassessments inform teachers of a starting point for their instruction and ensure that the classtime is efficiently used. Surveys and questionnaires, also types of diagnostic or preassessments, help teachers initially become acquainted with their students and understand the students' readiness, interest, and learning profiles. Teachers often will create their own surveys or may use premade surveys as a piece of the puzzle to learn about their students and to guide their instructional decisions.

Formative assessments are conducted during learning or "for learning" (Stiggins & Chappuis, 2012). Formative assessment tools frequently used during instruction include the use of quizzes, question and answer sessions, exit cards, journal entries, thumbs up/down and observations (Tomlinson symposium, November 19, 2008). Typically, formative assessments are not used for grading, but simply to ensure learning along the way (Stiggins & Chappuis, 2012). Formative assessments guide the next steps of the teacher through the instruction of the unit. Adjustments to instruction are made based on the results of the formative assessment. For example, based on the results, a

teacher may need to clarify misunderstandings, reteach a certain section to a small group, or quicken the pace of instruction for some students.

At the end of a unit or chapter, summative assessments are used to verify learning typically in the form of tests, evaluations of products, a performance task, or a portfolio review. According to Stiggins and Chappuis (2012) these are assessments “of learning.” Rubrics or checklists are frequently used for reliable and valid scoring. Most often, summative assessments are used for a grade (Stiggins & Chappuis, 2012). In differentiated instruction, summative assessments may be unique to each learner. Summative assessments are all geared toward meeting the same overall objectives for a unit of study, but one student may demonstrate his learning through a project and another student through an oral exam.

In summary, assessment is an integral part of differentiated instruction. Assessment helps in the planning of instruction, the delivery of instruction, instruction adjustment, and to verify that students are learning. A thorough knowledge of assessment techniques and ability to comprehend the results is essential in a differentiated classroom.

Curriculum-related Components of Differentiated Instruction

Instructional material is adjusted using four curriculum-related components of differentiation: content, process, product, and affect (Tomlinson & Imbeau, 2010). Content consists of what the individual is supposed to learn: knowledge, understandings, and skills. Typically, knowledge of essential facts, understandings of underlying concepts, and skills needed are kept the same for all learners (Tomlinson & Allan, 2000). How students gain access to the material is what is differentiated. For example, all students may learn about buoyancy, but one student may use text, another a computer,

and the third, an experiential activity to gain the same information. Another example of content differentiation would be three texts about the holocaust at three different reading levels that match the students' needs.

Process entails how the student makes sense of the information and learns. Tomlinson and Allan (2000) use "activity" as a synonym to define process. By utilizing a variety of activities, various students can make sense of information. For example, a teacher might guide a student who enjoys storytelling to use this technique as a strategy to understand a unit of study. When working with a sports enthusiast, a teacher might encourage the student to use a baseball field to understand a variety of measurement comparisons. In a differentiated classroom, the teacher typically sets up the activities that assist in the processing of information, but she does so with knowledge of a student's learning profile. However, when an individual learning contract (often used for a student that already mastered the information for a particular unit), for example, is used for a student to learn about a specific topic, then typically a teacher and student meet and decide upon the process together.

The product refers to a medium through which the students shows what they know, understand, and are able to do based on their investigation of a specific topic. An example of product differentiation would be a teacher allowing students to express their knowledge of a topic through a variety of choices such as writing a newspaper article, creating a skit, or drawing a cartoon. Products are frequently used as summative assessments to verify learning and therefore typically used for a grade.

Finally, affect addresses students' feelings and emotions about school-related issues that influence their learning. Tomlinson (2008) shared, "Affect has to do with how

students feel about themselves, their work, and the classroom as a whole. Student affect is the gateway to helping each student become more fully engaged and successful in learning.” (Tomlinson symposium, November 19, 2008). Affect cannot be separated from the learning experience. As humans our initial way to respond to a task is through our emotions (Wormeli, 2007). “In fact, emotion turns out to be one of the most important regulators of learning and memory. The more intense the emotional state, the more likely we are to remember the event” (Jensen, 2005, pp. 55-56). For example, students in my Educational Psychology course who experienced the tragedy of September 11, 2001, know exactly where they were when the event occurred because of the intensity of their emotions. Teachers can create environments that are safe with a strong sense of community, where students are willing to take risks (Tomlinson, 2008; Wormeli, 2007). In addition, by giving students meaningful, respectful, and interesting assignments, students are more likely to participate in the learning experience (Tomlinson, 2008; Wormeli, 2007). Affect is embedded within the content, process, and product; therefore, many studies regarding differentiated instruction do not mention affect with the other three diagnostic components.

A teacher can differentiate all four curriculum-related components in a lesson, just one area or not at all depending on the needs of the students for the particular unit. If all of the students meet an objective with one whole group instruction session, then there is no need to differentiate. Instead, the teacher moves on to the next learning objective.

What Differentiation is Not

Understanding what differentiation really means for a teacher is essential, but so is understanding what differentiation is not. Tomlinson (2001) created a list of what

differentiation is not. First, I will introduce the list and then I will explain each item further. Tomlinson (2001) wrote:

1. Differentiation is NOT the “individualized instruction” of the 1970s.
 2. Differentiated instruction is NOT chaotic.
 3. Differentiated instruction is NOT just another way to provide homogeneous grouping.
 4. Differentiated instruction is NOT just “tailoring the same suit of clothes.”
- (p. 2-3).

Individualized Instruction

In a differentiated instruction classroom, students all still learn the essential and same content; however, differentiated instruction does offer several paths to learning, but does not assume a unique level for each learner. In other words, not all lessons have to be differentiated or necessitate individual instruction. Some topics may be new for all students and whole group instruction is sufficient for meeting the objectives. Teachers vary their instruction from whole class to small groups and at times work with individual students as is needed (Tomlinson, 2001).

Chaotic

The planning involved in a differentiated classroom is extensive. Teachers plan according to what they want all students to know, understand, and be able to do (Tomlinson, 2001) to achieve the learning objective. Lesson plans are used to guide instruction, but plans are also established for movement of students around the room and for behavioral expectations. Plans regarding the layout of the room are also of

importance. Spaces for small group collaboration or individual work must be considered.

Planning in a differentiated classroom is done purposefully.

Grouping

Once a teacher knows the background knowledge of the students regarding the current lesson, specific plans are created to help students master each objective by grouping children according to their readiness, interests, and learning profile.

Differentiated instruction is not tracking. Several configurations of groups are utilized to differentiate instruction; these groups are flexible and are subject to change according to students' strengths and weaknesses (Tomlinson, 2001). For example, a student may have a solid foundation with multiplication math facts, but applying multiplication to real world situations is very challenging for the same individual. If this particular child is the only one struggling to relate the math facts to the real world, the teacher may choose to work with the child individually until she has mastered the application at which point she can be placed into a group.

Tailoring

Differentiation holds all students to the same learning objectives (Tomlinson, 2001). So, if a student has mastered an objective, simply giving that student more work to keep them busy is not differentiation. Instead, the work given should be challenging to the student. Tomlinson (2001) suggests activities that are more complex, create greater independence, or require more abstract thinking to stretch their learning. On the other hand, dumbing down the curriculum for a struggling student and grading that student using lower standards is also not differentiation. Students who are struggling need more

strategies, more examples, and sometimes reteaching in ways that they can connect to the material to master the objective.

What Differentiation Is

Tomlinson also created a list of what differentiation is to better grasp what it entails. I will first share Tomlinson's (2001) list and then explain each item more thoroughly.

1. Differentiated instruction is PROACTIVE.
2. Differentiated instruction is more QUALITATIVE than quantitative.
3. Differentiated Instruction is ROOTED IN ASSESSMENT.
4. Differentiated instruction provides MULTIPLE APPROACHES to content, process, and product.
5. Differentiated instruction is STUDENT CENTERED.
6. Differentiated instruction is A BLEND of whole-class, group, and individual instruction.
7. Differentiated instruction is "ORGANIC." (Tomlinson, 2001, pp. 3-5)

Proactive

A teacher in a differentiated classroom expects students to be diverse and, therefore, plans for and embraces diversity by using the information gathered in preassessments to guide instruction. The activities planned will readily address a variety of learners (Tomlinson, 2001).

Qualitative

In a differentiated classroom, a student who has already mastered an objective is not simply given another worksheet or more problems just to keep him busy. In addition,

the student is not used as a second teacher to tutor all the other students who are struggling. Instead, the nature of the assignment is altered for the student (Tomlinson, 2001). For example, if a student already understands gravitational force, then maybe the next step is actually applying the concept in real life.

Assessment

As stated previously, assessment is integral to differentiated instruction. Assessment occurs before, during, and after instruction through diagnostic, formative, and summative assessments. Just as the child continues to scaffold new learning onto previous knowledge, through assessment a teacher regularly builds on her knowledge of each student (Tomlinson, 2001). Using assessment in this manner strengthens the teacher's ability to guide the student's learning.

Multiple Approaches

Teachers in a differentiated classroom use many avenues to differentiate the content, process, and product to help all students grow in their learning (Tomlinson, 2001). Teachers in differentiated classrooms give students choices as to what content is learned and how they learn it, as well as, how they demonstrate their knowledge. Through choice, students feel more in control of their learning and become more independent learners (Deci & Ryan, 1985; Jensen, 2005).

Student Centered

Differentiated instructional plans are centered around the needs, both academic and personal, of the students in the classroom. The learning experiences need to be relevant, engaging, and interesting and again matched to where the student is currently functioning (Tomlinson, 2001). Work in a differentiated classroom is respectful of the

diversity represented in the classroom. All students receive challenging tasks to complete that take them to the next level of learning. A student's affect about himself as a learner directly impacts his effort and willingness to learn (Tomlinson & Imbeau, 2010).

Providing a caring, positive learning environment and respectful, challenging curriculum are central to a student centered classroom.

A Blend

Several instructional arrangements are used in a differentiated classroom as informed by the results of preassessments and formative assessments (Tomlinson, 2001). Most often at the start of a unit, some whole class teaching will occur simply to introduce the topic. Whole class instruction is most efficient if everyone is succeeding in their learning of the objectives. However, when some students begin to struggle and other students already know the material well, differentiation is needed. Typically small groups are formed after the initial whole group instruction and possibly some one-on-one teaching when necessary. Flexibility is vital.

Organic

Differentiated instruction frequently includes "on the spot" decisions by the teacher according to the needs of his students. Each topic calls for unique ways of teaching and learning as students and teachers vary in their background knowledge regarding the topic. Teachers and students continuously learn together in an ongoing relationship. No day of school is the exact same as another day. Teachers are constantly adapting and doing whatever it takes to ensure student learning.

Review of Research

Differentiated instruction has been applied in grades K-12 with positive academic gains (Beecher & Sweeny, 2008; Grimes & Stevens, 2009; Mastropieri et al., 2006) and affective gains (Avci et al., 2009). The vast majority of books and articles discussing differentiated instruction are “how-to” sources. Research on differentiated instruction has only really been conducted within the last decade and most of the studies have been qualitative with few studies published before 2005. The following studies are explained chronologically in order to show the progression of differentiated instruction research. The greatest amount of quantitative research has been conducted at the elementary level and these findings are explored first. Although more limited in scope, the middle/high school and higher education research will follow.

Elementary Implementation

At the elementary level, differentiated instruction has shown substantial gains in student achievement for diverse groups of students. Tieso (2005) conducted a study of 31 math teachers and their fourth or fifth grade students. Low, mid, and high-ability students in classrooms where the teacher used small, flexible groups and differentiated instruction (FSG) scored significantly higher on the math posttest than low, mid, and high-ability students who were either 1) taught straight from a textbook as a whole group (Comparison), 2) given a revised (more rigorous) curriculum taught as a whole group (Revised), or 3) taught as a group across classrooms of students with similar ability levels (Joplin method). The mean score gains of the low, mid, and high ability groups in the FSG group had effect sizes of .29, .42, and .83, respectively. All of which were well above the other groups' low, mid, and high mean score gains.

Cusumano and Mueller (2007) shared that Holland Elementary School in Fresno, California, had a poverty rate of almost 90%, and 25% of their students were English Language Learners when the school started its differentiated instruction initiative. At the onset of the initiative, the school's statewide ranking was very poor. After six years of schoolwide implementation of differentiated instruction, all students at Holland Elementary met Annual Yearly Progress targets in math and language arts.

Beecher and Sweeney (2008), in a case study of one elementary school, showed that differentiated instructional methods improved achievement in the areas of reading, writing, and math even with a diverse population of students. Asian students and African American students in the remedial band on state assessments dropped from 23% and 21%, respectively, to no students in the remedial band by 2004. In addition, Hispanic and White students in the remedial band dropped from 22% to 7% and 13% to 4%, respectively. "Analyses of student achievement on state tests from 1997 to 2004 showed improvement in all subject areas and in all levels of proficiency" (Beecher & Sweeny, 2008, p. 525).

In another study, Grimes and Stevens (2009) demonstrated that the use of differentiated instruction significantly improved, an increase of 19% on average, mathematics scores for low-achieving elementary students. In addition, through the use of a student survey and analysis of journal responses, students reported greater confidence when working math problems and a stronger yearning to improve in math (Grimes & Stevens, 2009).

Tomlinson (2009) shared the results of an elementary school in St. Louis, Missouri, that decided to implement schoolwide differentiated instruction because of the incredible improvements in achievement outcomes for students. Tomlinson (2009) wrote: The number of students scoring below the 65th percentile on the state test in reading fell from 38 percent to 24 percent in the first three years of differentiation initiative. At the same time, the number of students with scores above the 65th percentile in math rose from 48 percent to 66 percent. (p. 32)

Middle and High School Implementation

Middle schools and high schools, albeit to a lesser degree of implementation than elementary schools, also show academic gains for students when differentiated instructional methods are utilized. In a study employing differentiated instruction in 13 middle school classrooms, students in the experimental group showed significant improvement from pre to posttest (experimental group $M = 23.86$ and control group $M = 21.90$) and on science high stakes test scores (experimental group $M = 458.87$ and control group $M = 438.05$) after a 12-week implementation of peer-assisted learning and differentiated instruction (Mastropieri et al., 2006).

In another study, Graham (2009) analyzed state assessment scores of ninth grade students in a high school that mandated use of differentiated instruction (School A) and an additional school without these mandates (School B). The End-Of-Course-Test (EOCT) for the state of Georgia was utilized to compare the scores of students. Comparing the year previous to the mandate of differentiated instruction and the first year of mandated implementation, Graham found significant differences in the EOCT scores of School A for ninth graders in biology and ninth grade literature, but no

significant difference in American literature, algebra I, geometry, and physical science. No significant differences were found between the EOCT scores for School A (mandated differentiation) and School B (no mandated differentiation). When asked through surveys and focus groups, students in School A showed a preference toward teachers who were more learner-centered and who differentiated instruction, but the academic ratings between students in school A and students in School B were not significant. According to Tomlinson (2008), school-wide implementation of differentiated instruction takes at least five to six years to do proficiently which may account for why more significant scores were not seen within and between schools. In addition, School B was not mandated to use differentiated instruction, but may have chosen to anyway (Graham, 2009).

Tomlinson (2009) shared the success of Colchester High School in Colchester, Vermont. In 2001, the high school began implementing differentiated instruction schoolwide. Within five years of the initiative, standardized test scores went from 25% of students to 52 % of students passing the math problem-solving section, and from 44% to 72% passing the math skills portion. Reading scores improved from 51% to 66% and writing scores increased from 58 % to 75% passage. A decrease in behavior referrals was also noted (Tomlinson, 2009).

Higher Education Implementation

At the college level, differentiation becomes substantially more difficult for several reasons: class sizes are typically quite large; the amount of contact hours with students per week is minimal; designing several ways to assess students is very time consuming and challenging for professors who also have several conflicting obligations; and, finally, ethical issues such as fairness in grading can be controversial (Ernst & Ernst,

2005). Research regarding effectiveness and use of differentiated instruction in post secondary education is scarce. However, a few qualitative studies do exist. Ernst and Ernst (2005) shared their findings using a qualitative survey from teaching an undergraduate political science course, utilizing differentiated instruction. Creating respectful tasks, utilizing flexible groupings, and adjusting according to assessment outcomes shaped the course. The study measured student perspectives of the course, however, did not measure academic gains. The majority of the 35 students in the course rated with some form of agreement that the course helped them to reach their learning potential, that group work was beneficial to their learning, and that they appreciated having choices and exploring topics based on their interests. Overall, the students supported the differentiated methods in comparison to other courses they had taken.

In another study based on qualitative research, Livingston (2006) found success utilizing differentiated instruction in his undergraduate education course wherein 33 preservice teachers learned how to teach using constructivist methods. Overall, Livingston (2006) reported that for the preservice teachers:

...constructivism changed their view about teaching and affected how they would teach in the future. There were also comments about how much behind the scenes work is necessary to teach constructively. Most said that the methods were enjoyable, rigorous strategies that promoted higher order thinking. (p. 14)

Livingston modeled differentiated strategies in his classroom and then asked the students to demonstrate these skills through assignments including: hands-on-learning, project method, reflective writing, reciprocal teaching, discussion, aesthetic experiences, peer-to-peer teaching, peer critique, self assessment, assessment by the professor, and

discovery learning through research. He asked the students to rate individual and group assignments and make comments about each of the strategies they used in their assignments. Students also critiqued their performance and their peers' performances with each of these assignments. Through this process, Livingston suggested that the teacher becomes the facilitator in these situations rather than a lecturer. This coincides with prominent, influential individuals' beliefs about constructivism and differentiated instruction (Dewey, 1938; Piaget, 1950; Vygotsky, 1978; Tomlinson, 1999). The data was qualitatively analyzed. Unanimously, students stated that they appreciated being able to choose how to complete their assignments according to their own learning styles and felt that choice allowed them to better learn the information. The teacher as a facilitator, rather than a lecturer, was also highly approved by students. In conclusion, the majority of students were satisfied with their own learning and the course design.

Santangelo and Tomlinson (2009) conducted a qualitative investigation using Santangelo's graduate course, Education and Psychology of Exceptional Learners, which had 25 enrolled students. The course was open to any graduate student, but was a required course for school psychology, school counseling, and nursing programs. Three research questions served to focus this investigation: (a) How do the principles and practices associated with differentiated instruction influence students' progress towards course objectives?; (b) How do students perceive the use of differentiated instruction?; and (c) What conditions and /or strategies contribute to the outcomes? (Santangelo & Tomlinson, 2009, pp. 309-310)

The students were diverse ethnically, economically, and professionally; some had school-related, professional backgrounds (e.g., administrators, school psychologists, and

teachers), while others were working on their Master's degrees, and some had very little educational field experience. Santangelo used a pre-assessment, rubrics for five key course assignments and classroom activities to measure student mastery of the material. After evaluating the assignments and classroom activities using the rubrics, Santangelo and Tomlinson stated that all students met the course objectives. Further explanation of scoring or grades was not given, but would have been helpful to get a clearer picture of how mastery was measured. Students indicated on the Student Instructional Report II course evaluation survey form that the instructional methods increased their learning of the material. Students perceived differentiation positively as they acknowledged the diversity amongst themselves as individuals. Santangelo also found that having course objectives, using backward design, using formative and summative assessment throughout the semester, and allowing multiple ways of mastering objectives had positive effects on outcomes for students. The strategies shared by Santangelo and Tomlinson (2009) that the students stated were most beneficial were "using a variety of materials and activities... participating in collaborative learning opportunities... having options for expression (of learning)... strategies that were designed to support text comprehension... the provision of choices" (pp. 317-318).

Summary

In this chapter I defined differentiated instruction and explained the necessity of differentiated instruction to help all students meet learning objectives. The four diagnostic areas of differentiated instruction—readiness, interest, learning profiles, and affect—were investigated. Each area was thoroughly explained with educational theories to support their importance. The essential linkage between differentiated instruction and

assessment was explained, followed by the curriculum-related components—content, process, and product—that lend themselves to differentiation. A more in-depth explanation of what is and is not considered differentiation practices was shared. Finally, research that has been conducted at the elementary, middle/high school, and college levels was examined.

At the elementary level, Beecher and Sweeney (2008), Cusumano and Mueller (2007), Grimes and Stevens (2009), Tomlinson (2009), and Tieso (2005) found quantitative gains for diverse students with the use of differentiated instructional techniques. At the middle and high school level, Graham (2009) shared significant quantitative gains when teachers were mandated to use differentiated instruction in two of six courses for ninth grade students. Mastropieri et al. (2006) showed significant quantitative gains for middle school students in science when differentiation was utilized. Through the use of qualitative surveys, Graham (2009) and Mastropieri et al. (2006) also found that students positively regarded the differentiated methods employed in their courses. Qualitative investigations at the college level showed that students perceived the use of differentiated instruction positively (Ernst & Ernst, 2005; Livingston, 2006; and Santangelo & Tomlinson, 2010). However, no quantitative studies were reported. In the next chapter, I will explain the methods and design of the current study.

CHAPTER III

METHODS

The purpose of the current study was to further explore implementing differentiated methods in higher education to more thoroughly understand if quantitative improvements are noted in a differentiated (DI) classroom compared to a nondifferentiated (NDI) classroom in two different sections of the same course taught by the same instructor. In addition, I was curious as to whether the DI students would perceive differentiated methods as beneficial to their learning. More specifically, did the incorporation of differentiated methods in an undergraduate course of Educational Psychology result in higher achievement scores on assignments and exams for the DI students when compared to the NDI students' scores who were in a different section of the same course with the same teacher; and did undergraduate DI students perceive the differentiated philosophy and methods in the course to be beneficial to their overall learning?

This methods chapter includes an overview of the course and a description of the context. The demographics of the participants will be delineated followed by an explanation of the instruments that were utilized in the study. The course design will follow with a detailed explanation of the commonalities between the two sections of the Educational Psychology courses and then how the instructional methods in the differentiated section were unique.

Course Overview and Context

The participants in the study were a diverse group of undergraduate students in a Midwestern university who were enrolled in two sections of Educational Psychology courses taught by the researcher. The study was conducted at a Midwestern university with an enrollment over 7,000 students. The course is a liberal arts elective at the university, but also serves as a required course for Early Childhood, Elementary, and Secondary preservice teachers. Education majors typically make up the majority of the students in the course with a few others who choose to take it to fulfill a liberal art requirement or because of their own interest in the course. The course explores the influences that education and psychology have on one another from a historical and theoretical perspective, but also a current practical applied perspective. Students engage in reflection about their own schooling experiences and critically think about contemporary educational issues.

At the time of implementation of this study, I had taught full-time in the psychology department and the education department at this university for four years. In addition, I provided training for school districts in the Midwest pertaining to response to intervention, a three-tiered model of assessment and instruction that utilized student academic data for decision-making. The response to intervention initiative led me to further explore differentiated instruction, as the two fit well together. Previous to teaching at the university, I was a school psychologist in K-12 schools. My experience with K-12 students who struggled academically and behaviorally attributed to my curiosity of teaching with a philosophy that better matched students' needs. At the college level, I also found students who struggled with academics. The Educational

Psychology course lent itself well to the philosophy of differentiation because of the educational theories, particularly constructivism, that are embedded in the content.

Differentiated instruction is based on a constructivist model.

When I began teaching this course three years ago, I immediately noticed that the college students in these courses were very diverse in their life experiences, knowledge of the content, cultures, age ranges, and interests. After completing a graduate course on differentiated instruction and attending conferences focused on differentiated instruction, my belief strengthened toward this philosophy of teaching. However, the research that I read was mostly differentiation at the elementary level. I reflected on the diversity of my college students and realized that they were just as diverse, if not more so than elementary students. Simply, the fact that they had more life experiences in general, seemed to increase their diverseness. During the previous semester, I decided that I wanted to do a simple survey to see if my college students felt that differentiation of products (their assignments) was: beneficial to their learning, allowed them to connect better to the material, and sparked their interest in the course. The few research studies on differentiation in higher education did find that college students found value in differentiation and those were also my findings. However, I could not find any quantitative data at the higher education level that showed that differentiation had any effect on academic achievement. This lack of quantitative evidence led me to pursue this study.

Participants

Control Group

The control group or the nondifferentiated instructional group (NDI) consisted of 38 undergraduate students; of the 27 females and 11 males, 37 were Caucasian, and one was of Middle Eastern descent. The ages ranged from 18-30 with the majority between 18 and 20 years of age. Most of the students (89%) were preservice education teachers, while 11% were other majors: mortuary science, graphic design, psychology, and military science.

Experimental Group

Through the use of a learning profile inventory, demographic data were collected first, followed by fill-in-the-blank framed sentences and open-ended questions. The experimental group or differentiated instructional (DI) group consisted of 39 undergraduate, Caucasian students, among the 32 females and 7 males, the age span of the students ranged from 17 years to 49 years of age with the majority (72%) between 17 and 20 years of age. Data for students who were under 18 were not used in the study. The majority of the students (82%) were preservice teacher education students: early childhood, elementary education, secondary education, or special education; while the other 18% majored in the following areas: paralegal, psychology, and three undeclared. Over half the students were in their first or second years of college; however, four students had previous undergraduate degrees. For a comparison between the experimental group and the control group demographic information, see Table 1.

Table 1. Demographics of Participants in the DI and NDI Groups

	DI (n = 39)		NDI (n=38)	
	N	%	N	%
Students				
Male	7	18	11	29
Female	32	82	27	71
Ethnicity				
White	39	100	37	97
Mid. Eastern	0	0	1	3
Age in Years				
17-20	27	69	26	68
21-25	6	15	9	24
26-30	2	5	2	5
31+	4	10	1	3
Major				
Education	33	85	34	89
Non-education	6	15	4	11
Previous Degrees	4	10	0	0

Selection of Participants and Order of Instruction

Five sections of this Educational Psychology course were offered per semester, two of which I taught. The two courses that I taught were held back-to-back in the same classroom on Tuesday and Thursday afternoons with each session lasting 75 minutes. In preparation to teach the two sections of Educational Psychology different from one another, I chose the earlier (1:30 p.m.) section as the NDI group (control group) and the latter (3:00 p.m.) section as the DI group (experimental). All students who registered for the 1:30 section became part of the control group; whereas, all students who registered for the 3:00 section became part of the experimental group. The traditional lecture-style teaching for the NDI group made sense to do before attempting the differentiated teaching, because I wanted to avoid accidentally carrying the differentiated methods into

the NDI course. This was a challenge as I truly believe in differentiation and had utilized several strategies of differentiation for the past two years in this course. As I taught the earlier NDI group, I frequently caught myself wanting to incorporate differentiated methods, but intentionally tried not to differentiate.

As this was an action research study, the Institutional Review Board waived the written informed consent form. The students and I were all part of the study simply because we were participants in the classes. All students were informed that their academic grades would be used as part of a study examining differentiated teaching methods; however, all identifying information, if this research were to be published, would remain confidential. If the students did not want their data used, their request would be honored without consequence. Appendix A is the informed consent script that was read to both the DI and NDI groups.

Students were given the option to speak with me further at any time if they had any concerns or questions about the study. To ensure anonymity, on the first day of class, notecards were distributed to the DI group and the NDI group. Students wrote their first names on one side of the card, then drew a number between 1 and 85 from a basket and wrote that number on the other side. The numbers served the purpose of scoring assignments and exams with the intent of minimizing bias, because I was blind to the name of the student and the student's section. For example, students were asked to turn in assignments and exams using a version of this format: their number, the class, and their assignment number (e.g., #34, Ed Psych 294, assignment 4). After I scored all the assignments, I matched their number with their name and entered their points into the gradebook. In addition, I created rubrics to score the assignments and unit tests for

consistency and fairness. Although the choice of the assignment product may have differed, the requirements for the assignments using the rubrics remained the same for all students. For further assurance, one colleague not associated with the study, scored a random sample of Assignment 4 products and another colleague scored a random sample of Exam 2 essay questions to establish inter-rater reliability of the rubrics.

Course Design for Both Groups

On the first day of class, a digital camera was passed throughout the room and students took pictures of one another with their name cards held in front of them. I downloaded the pictures into my computer and regularly studied the photos to learn my students' names. Within the first two weeks, I knew all of my students' first names in the DI group and the majority of those in the NDI group. The purpose of this was to establish rapport with students and help them to feel a part of the classroom community.

Understanding by Design (Backward Design)

All students were held to the same course objectives in both sections. The course objectives were based on Minnesota teaching standards. Using the Understanding by Design (UbD) or backward design model (Wiggins & McTighe, 1998), the standards were broken down into unit objectives. Backward design has three stages: identify the desired results, determine acceptable evidence, and plan learning experiences and instruction based on the goals. In stage one, identifying the desired results, the instructor needs to decide the most important information that student's should master from the unit. The students need to know specific concepts, understand the relationships between the concepts and apply those concepts in a variety of situations. Essential questions are

developed that will allow the students to get to that level of understanding the “big idea,” and instigate further discussion and critical thinking (Wiggins & McTighe (1998).

Determining acceptable evidence, the second stage of UbD, is creating summative assessments that measure whether the students have mastered the objectives. For this course, those assessments were classroom assignments and exams.

The third stage is planning learning experiences and instruction to help students meet these goals. For this stage, I created lecture notes that incorporated theories and concepts from the text, gathered supplemental materials (such as current research on a topic), added activities for applying concepts, and included various media such as film clips and interactive demonstrations to show examples of specific ideas. I utilized the Understanding by Design framework throughout my planning of this course to decide the most important components of the course that I wanted all my students to learn. An example of the UbD framework is provided in Appendix B.

Instruments

Instruments utilized in the study were a learning profile created by the instructor (Appendix C), Sternberg’s Triarchic Survey (Appendix D), the Theory of Multiple Intelligences Self Assessment (Appendix E) and pretests (Appendix F) created by the instructor for the units.

In addition, a class evaluation form created by the instructor was used at the conclusion of the course (Appendix G). The evaluations consisted of a 10-item survey, developed by the instructor, which invited students to rate statements using a 6-point Likert scale. Participants rated statements from Strongly Disagree to Strongly Agree. In addition, four open-ended questions were given for students to answer.

Procedures

The current study was the first time I had taught the Educational Psychology course attempting to differentiate more than just the students' products. I chose to differentiate the content and the process and assess my students not with just summative assessments, but with deliberate preassessments and formative assessments. I differentiated instruction for the DI group according to student readiness, learning profiles, and interests.

Differentiating Instruction

The Understanding by Design mapping flows as a continuum into differentiating instruction. Once the targets are created about what all students need to know and be able to do, summative assessments are created to test the big ideas, and an instructional plan as to how information will be taught. Then the differentiation needed to meet the needs of students can be planned in response to diagnostic or preassessment data. The three components which are differentiated are the: content, process, and product.

Content

In this study each group covered the same content, but instructional methods were altered as a result of the formative assessments for the DI group. When necessary, minilessons were used to reteach specific topics, further examples were given, diagrams for structure were created or another modality was used such as a visual or kinesthetic activity (i.e., a movie or a physical activity) to ensure learning. A follow-up question and answer session or exit card was used to guarantee learning or dispel misconceptions. For example, after we covered a unit on Piaget's stages of cognitive development, according to the exit cards, a few students were still struggling with the concept, so I asked a

colleague if her preschool-aged son could join us for class. He did and the students gathered around as I demonstrated a conservation task with the preschooler. Afterwards, the students all gave thumbs up that they understood the concept.

Process

The process is how one learns the information or makes-sense of a topic. The students in the DI group learned about various topics through role plays, think-pair-share activities, using their preferred intelligence, tic-tac-toe boards, choice boards, jigsaws, cubing, and small group discussions. An example of differentiating process occurred when I gave the DI class an exit card asking them what concepts in the unit were still unclear. After reading through their responses, I created a tic-tac-toe review board. In small groups, students had to answer three questions on the board to make tic-tac-toe and then share their answers with their group until all nine squares had been answered (Appendix H). The students retaught one another and I simply “listened in” on conversations to make sure answers were correct.

Product

Students in the DI group were given choices regarding how they would show their knowledge in class and in their assignments. Students were given choices such as writing reflection papers, drawing cartoons, writing an editorial, creating a diorama, creating a short film, interviewing someone or creating a song to demonstrate their knowledge. Each assignment had choices and oftentimes in-class activities had choices of ways to express their knowledge. The products created for assignments were graded, so a rubric was utilized to eliminate scoring bias.

Diagnostic Assessments

Information from the learning profile questionnaire, Gardner's Multiple Intelligence Survey, Sternberg's Survey, and unit preassessments were used for diagnostic purposes. Although the learning profile inventory and the two intelligence surveys were given to both sections, these instruments are typically used as a differentiated instructional technique. Therefore, the data for the NDI group was not analyzed or utilized to plan for their instructional needs. The following information pertaining to the diagnostic assessments and how they were utilized for instruction are only with regard to the DI group.

The learning profile contained questions and statements regarding demographic information, past school experience, preferred ways of learning, preferred contextual environments, and interests. Through examination, studying, and frequent referencing of my students' learning profiles and the intelligence surveys, I discovered many interests and preferences of my DI students that I incorporated into my instruction. For example, one of my students was a baseball enthusiast, so when trying to explain intrinsic and extrinsic motivation, I began by asking the student whether he thought that pro baseball players played the sport because of intrinsic (love of the game) or extrinsic (big money) motivations. This resulted in a class-wide discussion about professional sports and then spurred a discussion all students could relate to, jobs in general. An additional example was when an art education student needed further guidance in understanding what "prototype" meant. I asked her and the rest of the class to create in their minds a drawing of a bird. After surveying the students and tallying the types of birds that they imagined, we discovered together that most people imagined a bird with features of a robin or an

eagle, but no one drew an ostrich or a penguin as these were not the prototype of a typical bird in our Midwestern minds.

Also, Sternberg's Triarchic Theory discusses three ways in which students use their knowledge: creatively, practically, and analytically. Using the students' surveys, I divided my students into groups according to their highest rated way to use information: creative, practical, or analytic. Then I gave the small groups a choice board, each with three activities to choose from within their preferred way to demonstrate their knowledge on the subject of "creating classroom rules." (Appendix I). Each group shared their findings with the class. Interestingly, I asked the students whether they appreciated their three choices in their preferred way and all groups with the exception of one said they liked their choices. I further questioned the one group and found that these three students were not in class on the day that we completed the survey forms, so were assigned the "creative" choice board that may not have meshed with the way they would have chosen to use their knowledge.

Diagnostic academic preassessments were also utilized to ascertain background knowledge about a specific unit of study before beginning the unit. Entrance cards, thumbs up/thumbs down, and question/answer sessions were implemented to help the instructor understand where to begin instruction on each Educational Psychology topic.

Formative Assessments

Formative assessments were used on a daily basis to check for student understanding of the current topic with the DI group only. Formative assessments included thumbs up/thumbs down, question and answer sessions, reviews, cold calling, quick writes, exit cards, review of notes, observation of activities completed, and small

group performance tasks to show understanding. The formative assessments allowed me to adjust my instruction immediately and/or plan for the next day's instruction. For example, after instruction and a video, I asked my DI students how well they felt they understood the components of classical conditioning using thumbs up or down. Several students felt unsure, so then we worked through several examples together on the whiteboard. A few days later, I gave the DI class a post test to ensure their understanding. When I noted that several students still had difficulty, I put them in small groups and assigned each group several case studies to determine the components. Each small group recorded their answer to one of the questions on the whiteboard. As a class we analyzed each scenario and gave thumbs up if we felt that the components were correctly identified on the board.

Also to assist with future instructional planning, I kept a journal, though sometimes sporadically, throughout the course. Typically, I wrote down what we did each day and then how I altered instruction to respond to the formative assessment I had given. Sometimes, I also included concerns or information in general about specific students. For example, one day I wrote, "One of the students in this class seems to be a very slow processor and during discussion times, has trouble articulating her responses succinctly. I can see some of the other students becoming frustrated with her. I need to keep in-tune to this." I noticed affective differences between the groups that I noted several times. On group presentation days, the NDI students were not attending as well. I noted that the DI group seemed to be more cohesive and that frequently several from the DI group stayed after class to continue discussions with me.

Summative Assessments

Summative assessments are used to verify learning. For this study, seven assignments and three exams were used to verify student learning. The seven assignments were essentially the same for the DI group and the NDI group, with the exception of product choice. The DI group had at least two different choices for each assignment as to how they could show me that they learned the information and could apply it. For example, on Assignment 3, the DI students could use classical or operant conditioning, or observational learning to make three attempts to alter a person's behavior and write up their results. The NDI students were only given the option of using classical conditioning. Appendices J and K provide the list of assignments for the DI and NDI groups.

The exams consisted of multiple choice, true/false and short essay questions for all students. Each exam was worth 50 points. Exam 1 consisted of 40 multiple choice questions and five short answer essays, each worth five points. Students in both groups were required by forced choice to only answer 35 multiple choice questions and three of the short answer essay questions. Exam 2 included 35 multiple choice questions of which 30 had to be answered; 10 true and false which all had to be answered; and four short answer essays of which 2 needed to be answered. To expedite correcting time of the final exam, Exam 3 was composed of 55 multiple choice items. Again the students were forced to eliminate any five questions.

Design and Data Analysis

The current study is a quasi experimental design because students were not assigned randomly to groups. Students in the study were assigned to either the experimental or to the control group, according to the course section in which they were

enrolled. The independent variable, or the group the students were in, had two levels (DI and NDI) and the dependent variables were assignment scores and exam scores.

The Levene's Test for Equality of Variances was conducted to ensure that the variance of scores within the DI group and the variance of scores within the NDI group were equal and the data would not be skewed. I conducted two separate Independent-samples t tests using SPSS to compare differences in mean scores on the assignments and the exams between the DI group and the NDI group. Significance level was set at the $p < .05$ level.

To further analyze the data, an ANOVA was used to analyze the scores between groups to test for significance on each assignment. Finally, Pearson's Pairwise Comparison was used to determine inter-rater reliability on the assignments and exams.

For the evaluation of the course survey, I utilized a Likert scale. The original Likert scale was developed in 1932 by Rensis Likert to measure invisible constructs such as attitude. Likert believed that "the key to successful attitude measurement was to convey this underlying dimension to survey respondents, so that they could then choose the response option that best reflects their position on that dimension," (Johns, 2010, p. 2). When creating a reliable and valid Likert-type scale, a few different issues need to be considered. One concern is that research participants have a tendency to fall into a response pattern of always choosing the neutral, noncommittal and/or middle of the road answer. Johns (2010) recommended an alternative format that may help to overcome this issue, namely, to create forced choice using an even number of ratings and no neutral or noncommittal response. For example, the response continuum of strongly agree, agree, slightly agree, slightly disagree, disagree, and strongly disagree does not allow for a

middle or neutral response. Johns (2010) stated, “There may sometimes be a case for forcing respondents to come down on one side or the other. The reason is that some people use the midpoint to avoid reporting what they see as less socially acceptable answers” (p. 7).

The purpose of the survey was to understand students’ perceptions of the course. I created the survey, and it was based on the components of differentiated instruction as well as teacher effectiveness. I also wanted to see whether the NDI group would perceive the course differently from the DI group. Previously, I had piloted a survey that this survey was based upon. The reliability of the current survey is very good with a Cronbach Alpha of .885 across the ten items. I attached four open-ended questions and an “additional comments” space to the survey. This is not necessarily a typical procedure, but I wanted to give the students the opportunity to express their thoughts using their own words. Surveys may not capture the emotion underlying the ratings. The open-ended questions which are qualitative can help strengthen the understanding of the quantitative survey (Miles & Huberman 1994).

The survey questions were distributed at the end of the course. I distributed them and then left the room. The students placed the completed surveys in an envelope. When all students were out of the room, a student from the class sealed the envelope and gave it to the departmental secretary who tallied the scores of the survey. After grades for the course were posted, the secretary returned the evaluations to me.

Summary

The methods section contained an explanation of the context of the Educational Psychology course, a demographic description of the NDI and DI students, and the

reasoning as to how students were assigned to the groups. An Understanding by Design format was described, as this was used to plan instruction and assessment for all students based on the course objectives. Explanations of the various instruments used in this study were provided and the procedures used to differentiate instruction for the DI students were clarified. Finally, the data analysis that was utilized was discussed.

CHAPTER IV

RESULTS

The purpose of the current study was to further explore implementing differentiated methods in higher education to more thoroughly understand if quantitative improvements are noted in a differentiated (DI) classroom compared to a nondifferentiated (NDI) classroom in two different sections of the same course taught by the same instructor. In addition, I was curious as to whether the DI students would perceive differentiated methods as beneficial to their learning. More specifically, did the incorporation of differentiated methods in an undergraduate course of Educational Psychology result in higher achievement scores on assignments and exams for the DI students when compared to the NDI students' scores who were in a different section of the same course with the same teacher; and did undergraduate DI students perceive the differentiated philosophy and methods in the course to be beneficial to their overall learning?

In this chapter, I provide an explanation of the types of statistical analyses that were conducted on the data. In addition, the results of the mean scores for the seven assignments and three exams for both the DI and NDI students are reported. I also include the students' perceptions of the course as reflected by their course evaluations, which consisted of a Likert-type rating scale survey and open-ended questions about the course.

SPSS was utilized to conduct all analyses. To ensure that the DI group's internal variance of mean scores was not significantly different from the NDI group's internal variance of mean scores, a Levene's Test for Equality of Variances was conducted. Using a 95% confidence interval, no significant variance was found between the groups for the exams ($p = .157$) or the assignments ($p = .935$); therefore, equal variances are assumed as shown in Table 2. Equal variances allows for a more powerful t test.

Table 2. Levene's Test for Equality of Variances between the DI and NDI Groups.

		F	Sig.
Assignments	Equal variances assumed	.007	.935
Exams	Equal variances assumed	2.046	.157

$p < .05$

An independent-samples t test was used because two different sample populations (DI and NDI) were compared and both populations completed the same tasks (assignments and exams). The independent-samples t test was conducted to compare the overall difference in mean scores of the DI and NDI groups on six of the assignments and all three exams. Assignment 5 was not included in the analysis because the assignment erroneously was not differentiated for the DI group. As shown in Table 3, the overall mean score for the DI group ($M = 18.96$) was significantly higher than the mean score for the NDI group ($M = 18.46$) on the seven assignments ($t(75) = 2.128, p < .05$). Also the overall mean score for the DI group ($M = 39.77$) was significantly higher than the mean score for the NDI group ($M = 37.35$) on the three exams ($t(75) = 1.995, p < .05$).

Table 3. Overall Mean Score Differences between Groups on Assignments and Exams.

Measure	Group	N	M	SD	p
Assignments	DI	39	18.96	.99	.037*
	NDI	38	18.46	1.07	
Exams	DI	39	39.77	4.76	.050*
	NDI	38	37.35	5.84	

Note. Assignment 5 was not included in the calculations due to failure on the part of the instructor to differentiate the task for the DI group.

* $p < .05$

Table 4 shows the comparative mean scores for each of the assignments and for the exams using an ANOVA. All assignments were worth 20 points and all exams were worth 50 points. Appendices J and K are the assignment instructions that were given to the DI and NDI groups. I will explain what each assignment entailed for the NDI and DI groups and give the mean comparison scores for each, followed by the mean scores of the three exams.

For the NDI group, Assignment 1 asked the students to write about a math intervention found on one of two specific websites, write a reflection including pros and cons of the intervention and then explain the importance of using research to guide instruction. The DI group was given the same instructions, but they could write about any school intervention and had three websites to choose from. The DI group mean score ($M = 18.95$, $SD = 1.68$) was slightly higher than the mean for the NDI group ($M = 19.26$, $SD = 2.06$), but not significantly higher ($p = .44$) for Assignment 1.

Assignment 2 addressed diversity in schools. Students watched 15 commercials on tv documenting the gender, ethnic group, and perceived class of the commentator and what the individual was advertising in a table or graph. Then each student wrote a reflection about how diversity in media could affect a child's self-efficacy in education.

The DI group was given the same instructions, but could choose to write a reflection, create a cartoon, write a letter to the tv station, or choose another method to demonstrate their understanding of how diversity is represented on tv and the possible effects to a child's self-efficacy. The mean score for the DI students ($M = 19.26$, $SD = .98$) was significantly ($p = .001$) higher than for the NDI group ($M = 18.18$, $SD = 1.74$).

Behavioral conditioning was the topic for Assignment 3. All students were asked to define a behavior that some person does and make three attempts to alter that person's behavior. Next, they wrote a reflection documenting what occurred and discussed how a teacher could use this type of conditioning in the classroom. The NDI students had to use classical conditioning, but the DI students could choose classical conditioning, operant conditioning, or observational learning to conduct their study. For the DI group, the mean score ($M = 19.16$, $SD = 1.28$) was significantly ($p = .000$) higher than the NDI group mean ($M = 17.89$, $SD = 1.33$).

For Assignment 4, students watched a video on Positive Behavioral Supports in Schools (PBIS) and wrote a reflection explaining PBIS, how a PBIS school compared to their K-12 school, and gave their opinion on PBIS. The DI students had the additional choices of creating a brochure on PBIS or creating a 60 second video promoting PBIS. Interestingly the NDI group mean score ($M = 18.69$, $SD = 2.20$) slightly higher than the DI group mean ($M = 18.38$, $SD = 1.73$), but not to a level of significance ($p = .518$).

Students worked in collaborative small groups and taught one another different learning strategies that they had researched in Assignment 5. Afterwards, each student wrote a reflection about the teaching experience and explained how the learning strategy could be used in a teaching experience. Finally, the students had to give their opinion of

the strategy. Assignment 5 was not included in the computation of the overall mean score for the assignments, because I mistakenly did not differentiate the assignment for the DI group. Interestingly, the NDI group's mean score ($M = 19.87$, $SD = .41$) was significantly ($p = .001$) higher than the mean score for the DI group ($M = 19.21$, $SD = 1.14$).

On Assignment 6, students were asked to differentiate a lesson in reading for students in a K-12 grade and create a written plan as to how they would do this using Sternberg's Triarchic theory. The DI students could differentiate on a topic of their choice and in addition could choose to differentiate according to Sternberg's Triarchic theory or differentiate for three levels of learners. The mean score ($M = 18.95$, $SD = 1.58$) for the DI group was slightly higher than the mean score ($M = 18.95$, $SD = 1.72$) of the NDI group, but not significantly ($p = .549$).

Students were to draw their idea of a perfect learning environment for any grade level of K-12 students and write a reflection stating why this would be a good learning environment for Assignment 7. The DI students had the additional options of creating a diorama of the environment, or a computer layout, if they chose not to simply draw the environment. Again the DI group's mean ($M = 19.08$, $SD = 1.60$) was slightly higher than the NDI group mean ($M = 18.97$, $SD = 1.62$), but not to a significant extent ($p = .779$).

The exams for both groups were identical. Exam 1 consisted of multiple choice and short answer essay questions. The DI group mean ($M = 40.10$, $SD = 5.41$) on Exam 1 was higher, but not significantly higher ($p = .141$), than the NDI group mean ($M = 38.18$, $SD = 5.90$). Exam 2 consisted of multiple choice, true/false, and short answer essay questions. The DI group mean ($M = 39.59$, $SD = 6.06$) was significantly ($p = .022$) higher than the NDI group mean ($M = 35.89$, $SD = 7.77$). Exam 3 consisted of only multiple

choice questions. On Exam 3, the DI group mean ($M = 39.62$, $SD = 5.29$) was higher than the NDI group mean ($M = 37.97$, $SD = 5.87$), but not significantly ($p = .201$).

Table 4. Between Group Score Differences for Each Assignment and Exam.

Measure	Group	N	M	SD	p
Assignment 1	DI	37	18.95	1.68	.437
	NDI	35	18.60	2.06	
Assignment 2	DI	38	19.26	.98	.001*
	NDI	38	18.18	1.74	
Assignment 3	DI	37	19.16	1.28	.000*
	NDI	36	17.89	1.33	
Assignment 4	DI	39	18.38	2.20	.518
	NDI	35	18.69	1.73	
Assignment 5	DI	38	19.21	1.14	.001*
	NDI	38	19.87	.41	
Assignment 6	DI	37	18.95	1.58	.549
	NDI	36	18.72	1.60	
Assignment 7	DI	39	19.08	1.60	.779
	NDI	37	18.97	1.62	
Exam 1	DI	39	40.10	5.41	.141
	NDI	38	38.18	5.90	
Exam 2	DI	39	39.59	6.06	.022*
	NDI	38	35.89	7.77	
Exam 3	DI	39	39.62	5.29	.201
	NDI	38	37.97	5.87	

Note. Assignment 5 was the same for both groups; of note is that the instructor failed to differentiate the task for the DI group, therefore Assignment 5 was not included in the overall mean score calculation for assignments.

Mean differences between groups are significant at $\alpha = .05$.

* $p < .05$

Inter-rater reliability was calculated for the rubrics used to score student assignments and exam essay questions using Pearson's Pairwise Correlation. The inter-rater reliability coefficient between scorers on Assignment 4 was ($r = .95$) and on Exam 2 was ($r = 1.00$) which are both considered highly sufficient (Salvia, Ysseldyke & Bolt, 2007). Inter-rater reliability was not conducted on the other assignments and exams.

End of Course Evaluation

The first ten statements in the end of course evaluation that I created were in a survey format. Students rated the statements using a six point Likert-type scale from Strongly Disagree to Strongly Agree. In the NDI group, 32 students completed the optional survey while 34 students of the DI group did. No students from either group rated any of the items at the Strongly Disagree or Disagree level. Ten of the raters in the NDI group and only one in the DI group placed a rating at the Slightly Disagree level. Over 90% of the students in both groups rated each statement with some form of agreement (Slightly Agree, Agree, and Strongly Agree); however, the ratings between the NDI and DI groups do differ in the intensity of ratings with the DI group giving stronger ratings on all of the statements. Table 5 represents the number of students and percentage of disagreement and agreement for each statement.

Table 5: Number of Students Indicating Disagreement and Agreement for Instructor End of Course Evaluations.

		Slightly Disagree	Slightly Agree	Agree	Strongly Agree
The instructor was knowledgeable regarding the course material.	NDI	--	--	10	22
	DI	--	--	4	30
The instructor demonstrated respect for individual differences.	NDI	--	--	6	26
	DI	--	--	5	29
The instructor stimulated my interest in the course.	NDI	--	4	10	18
	DI	--	1	2	31
The instructor taught me information in ways that allowed me to understand the material.	NDI	3	6	12	11
	DI	--	2	5	27
I would recommend this instructor to my friends.	NDI	1	2	6	23
	DI	--	1	2	31

Table 5: (continued)

		Slightly Disagree	Slightly Agree	Agree	Strongly Agree
The general climate in this course was good for learning.	NDI	1	3	8	20
	DI	--	--	6	28
The course respected diverse ways of learning.	NDI	2	2	6	22
	DI	--	--	4	30
The assignments engaged me in learning.	NDI	2	5	10	15
	DI	--	1	9	24
Overall, I learned a great deal from this course.	NDI	1	2	10	19
	DI	--	1	4	29

Note: NDI ($n = 32$), DI ($n = 34$).

The evaluation form also included five open-ended questions. Two of the questions were answered more logistically (What suggestions do you have for improvements regarding this course and approximately how many class sessions were you absent from?) and did not really refer to differentiation. Two of the five questions were particularly relevant to this study, along with the “additional comments” at the end of the survey. The first question was “What did you like MOST about this course? Explain.” The second of the open-ended questions was “How was this course different from other courses you have taken? Explain.” The majority of the student comments for this question were the same as the first question comments. All students answered both of these questions, while some students (15 from the DI group and 26 from the NDI group) responded in the additional comments and the comments corroborated with the two open-ended questions. A great variety of answers were given for this question with several

similarities between the two groups. I established four overarching themes of the comments for the two groups: Environment, Instruction, Curriculum, and Teacher Qualities.

I categorized comments under Environment if their statement regarded the feel of the room or the actual physical set up. Comments under Instruction included items about how instruction was delivered and the process of learning. The Curriculum category included comments pertaining about the text, supplemental materials such as videos, assignments, and exams. Under the Teacher category were direct comments about personal qualities of the teacher. The categories are not perfectly isolated from one another. For example, classroom activities could be categorized under Instruction as a way of learning, but also under curriculum as the activities were based on the curriculum. The similar and dissimilar comments from each group are listed in Table 6.

Table 6: Similar and Dissimilar Comments between the NDI and DI Groups on the Two End of Course Evaluation Questions and Additional Comments Section.

Similar
Considering the environment, both groups indicated the following: <ol style="list-style-type: none">1. Students liked the classroom dynamics.2. Students felt safe to share in a nonjudgmental classroom.3. Students felt that their opinions mattered.4. Students liked that the course was laid back, relaxing, and stress-free.5. Students enjoyed/didn't mind coming to class.
With regard to the instruction, both groups conveyed these ideas: <ol style="list-style-type: none">1. Students stated that the instruction was exciting, engaging, fun, and interesting.2. Students found that the topics were related to real life making content more understandable.3. Students liked the discussions and group work.4. Students appreciated that the instructor provided many examples.5. Students liked the varied ways of teaching the instructor used—not just lecture.6. Students liked applying the things they learned.7. Students felt that they learned a lot.
Concerning the curriculum, both groups highlighted the following: <ol style="list-style-type: none">1. Students liked learning the material in this course.

2. Students liked the assignments and the options on the tests.
3. Students liked the study guide outlines for exams.
4. Students liked the in-class activities.

Table 6: (continued)

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5. Students liked the video clips used in class.

Pertaining to teacher qualities:

1. Students felt the teacher was caring and understanding.
 2. Students appreciated the passion that the teacher displayed about the topics.
 3. Students felt that the teacher was helpful.
 4. Students stated that the teacher was knowledgeable about the subject matter.
-

Dissimilar

Unique to the NDI group:

Environment:

1. One student stated that he liked the chairs in the room because they allowed him to move around a bit (the chairs were on wheels and could recline slightly).

Teacher:

1. Another student commented the teacher was fair in her practices.

Unique to the DI group:

Instruction:

1. Students stated that they learned material to a deeper level.
2. Students stated that the course was well-organized.
3. Students felt that the course was fit for them.
4. Students noticed that the teacher taught for different learning styles.

Curriculum:

5. Students appreciated the applied assignments.
 6. Students liked that the assignments were differentiated.
 7. Students valued having choices when completing their assignments.
 8. Students liked doing self-reviews.
-

In the categories of Teacher Qualities and the Environment, students' comments in the NDI group and the DI group were quite similar. The following are actual comments as written by the students. The first two comments under each theme will be from DI students and the second two from NDI students.

Teacher Qualities

DI: "I liked Professor Dosch's passion for teaching psychology. She really knew her material and put a lot of time and thought in her lessons! Awesome Professor! Loved the class!"

DI: “The teacher was great! Psych has never been a good subject for me but I always enjoyed this class. The different teaching styles helped me learn in ways that I understood. I absolutely loved this class (*sic*) thank you!”

NDI: “I liked the professor. She was very fun and passionate about what she was teaching. She had experiences that she was able to share that made the class more interesting.”

NDI: “Teacher was engaged in all of us students, and LEARNED NAMES!! Loved that (*sic*). I am not a huge psychology person but this class kept me interested and engaged all semester.”

Environment

DI: “ Very interesting material (*sic*) Teacher knows all of us—open discussions without judgment. I always felt important.”

DI: “The environment made it easy for me to learn. I am a freshman, so I haven’t taken many courses, but I feel very comfortable and relaxed in this environment and I am still able to learn a lot.”

NDI: “I liked the overall feel and topics of the course. I rarely came to class with a bad attitude because the topics were interesting enough to keep my attention. It was a fun course. Nothing was awkward and the material that was presented was interesting and made me want to learn more about the subject.”

NDI: “It was layed (*sic*) back and nice to come to class. I say this because of the class discussion (*sic*) and amount of personal input the students are allowed.”

The comments about Curriculum and Instruction, however, differed in their focus. In regard to curriculum, the DI group talked about choices and freedom; whereas, the NDI group talked about the material being engaging and important to know.

Curriculum

DI: “I liked how all the assignments had different choices. There was a lot of freedom for the students to do something their own way. The teacher really tried to make everyone feel welcome and give them the choice to do something they liked for assignments that addressed all the different learning styles and uniqueness of every student.”

DI: “It had a lot more options. For example when we had assignments we could do them in a variety of ways.”

NDI: “This class is very interesting and I learned many different things. The assignments were engaging. The assignments and tests match up extremely well. They made perfect sense.”

NDI: “I liked what we learned about. I am a Psychology major and a lot of this information I didn’t know before! All of the things I learned would be very beneficial as a teacher to know in the classroom.

When considering instruction, the DI group talked about more in-depth learning and that the course was created specifically for them with differentiation according to learning styles. The NDI group stated that they liked the way information was taught and presented.

Instruction

DI: “My favorite part of this class was how it was taught. You provided us with examples and situations to take learning to a deeper level. Not only do I have knowledge of the course material, but I can apply it. This has been my favorite class at MSUM because of how engaging it is and that you really care. I am not and will never be a number, but rather a person with a name. I feel like I can share in this class and that my questions and opinions are valued. Understanding of course material is also easier to learn because of how it’s taught.”

DI: “That she just considered how we learned and took time out to make the course fit us (*sic*).”

NDI: “The way Mrs. Dosch held group discussions (*sic*). She made our opinions feel like they really mattered and she was so good at giving information to us. It was a bigger class but I still was able to voice my opinion and participate in the lecture. That helped me to learn better.”

NDI: “I like the ways that material was presented. Yes, there were notes but their (*sic*) were also pictures and videos that went along with what was being taught.”

Summary of Results

In summary, using an independent samples *t* test, significant differences were found between the aggregate mean group scores on the 6 assignments and the 3 exams (see Table 3). However, individually, only 2 of the assignments and 1 of the exams showed significant differences for the DI group (see Table 4). The answer to the first research question (Did the incorporation of differentiated methods in an undergraduate course of Educational Psychology result in higher achievement scores on assignments

and exams for the DI students when compared to the NDI students' scores who were in a different section of the same course with the same teacher?) is that differentiated methods incorporated into one Educational Psychology undergraduate course did show some significant improvement in students' academic learning compared to students' scores who were in the same course where instruction was not differentiated.

With regard to the second research question (Did undergraduate DI students perceive the differentiated philosophy and methods in the course to be beneficial to their overall learning?), students in the differentiated course did perceive differentiated methods to be beneficial to their overall learning as shown in their ratings on the course evaluation survey. In addition, the ratings given regarding the course were stronger for the DI group than those of the NDI group on all ten evaluation statements. The open-ended questions on the evaluation showed that both groups had similar comments regarding the course's environment and the teacher qualities; however, differences were shown regarding instruction, and curriculum. Particularly, students in the DI group appreciated choice, more freedoms and consideration of their learning styles.

CHAPTER V

SUMMARY, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

The organization of this chapter begins with a summary, continues with a discussion of the findings and is followed by the conclusion. Finally, the recommendation section includes the implications, limitations, and college classroom recommendations and future research.

Summary

The purpose of the current study was to further explore implementing differentiated methods in higher education to more thoroughly understand if academic improvements were noted in a differentiated (DI) classroom compared to a nondifferentiated (NDI) classroom in two different sections of the same course taught by the same instructor. In addition, I was curious as to whether the DI students would perceive differentiated methods as beneficial to their learning. More specifically, did the incorporation of differentiated methods in an undergraduate course of Educational Psychology result in higher achievement scores on assignments and exams for the DI students when compared to the NDI students' scores who were in a different section of the same course with the same teacher; and did undergraduate DI students perceive the differentiated philosophy and methods in the course to be beneficial to their overall learning?

The experimental group or DI group consisted of 39 undergraduate students enrolled in one section of an undergraduate Educational Psychology course. The control group or NDI group consisted of 38 undergraduate students enrolled in a second section of the same course. The majority of the students (82%) were preservice teacher education students: early childhood, elementary education, secondary education, or special education.

An independent-samples *t* test was conducted to compare the overall difference in mean scores of the DI and NDI groups on six of the assignments and all three exams. The results confirmed that the incorporation of differentiated instructional methods significantly improved achievement scores for the DI Educational Psychology class when compared with the NDI Educational Psychology class on the overall composite scores of the assignments and the exams. An ANOVA was utilized to look at each of the individual assignments and exams giving a more detailed view of which assignments and exams were individually significant. On the open-ended survey questions, students in the NDI and DI sections shared similar responses in relation to the Teacher and the Environment; however, differences existed between the two groups regarding the Curriculum and the Instruction. In addition, students in the DI group did perceive differentiated methods as beneficial to their learning as indicated by the high ratings on the surveys and answers to the open-ended questions.

Discussion and Conclusions

Research Question One

Did the incorporation of differentiated methods in an undergraduate course of Educational Psychology result in higher achievement scores on assignments and exams

for the DI students when compared to the NDI students' scores who were in a different section of the same course with the same teacher?

Assignments

The assignments for each group were the same, except the students in the DI group were given choices as to how to show their learning of the material. Several researchers (Jang et al., 2010; Santangelo & Tomlinson, 2010; Vansteenkiste et al., 2006) state that choice allows students to feel in control of their learning and feel more intrinsically motivated to be engaged. The current study confirms these findings for Assignments 2 and 3 which were significantly higher for the DI group. On Assignments 1, 6, and 7, the DI group scored slightly higher than the NDI group, but not significantly. On Assignment 4, the NDI group actually scored slightly higher than the DI group, but not to a significant level. The inconsistency of the score differences on the assignments could have been due to the fact that I created the assignments before the class commenced. At that time, I had no reference for knowing my DI students' interests. Maybe the assignments that showed significantly higher scores for the DI students contained options that better fit their learning profile.

The statements made by students in the DI group on the end of course evaluations show support for choice. The following were statements regarding what students liked about the class, specifically addressing choice from students in the DI section:

“It had a lot more options. For example when we had assignments we could do them in a variety of ways.”

“Different ways assignments were given—different types.” (sic)

“I liked how all the assignments had different choices.”

“Had options to assignments and tests.” (sic)

At the college level, this also held true in the findings of Ernst & Ernst (2005), Livingston (2006), and Santangelo & Tomlinson (2010). The students in each of these studies shared that they appreciated having choices and that they felt it improved their learning of the material.

The choices provided for the DI students also matched many of the students’ self-expressed learning profiles. Gardner (1993), Moran, et al. (2006), Sternberg & Spear-Swerling, (1996), and Tomlinson & Imbeau, (2010) corroborate that students perform better and are more engaged in their learning when their learning profiles are taken into consideration.

Interestingly, the NDI group scored significantly higher than the DI group on Assignment 5. When I was creating this assignment, I made an error by not providing choices for Assignment 5 for the DI group. Both groups received the identical instructions stating only one way for the students to demonstrate their learning. The autonomy and feeling of self-control that choice provided was nonexistent and may be why the DI group performed significantly lower on this assignment. If choice truly does have this strong of an impact, then the philosophy of differentiated instruction becomes even more imperative to meet the needs of college students. Assignment 5 was not included in the calculation of the overall composite scores for either group on the assignments because the composite scores were measuring the effects of differentiated choice.

Exams

The overall exam score composite which included three exams was also significantly higher for the DI group than for the NDI group. Not only on the overall composite, but on each of the three exams, the mean for the DI group was higher than the mean for the NDI group. However, only on Exam 2 were the scores for the DI group significantly higher than the NDI group. The content of the exams was identical for both groups. Through forced choice, students had to eliminate 5 questions in the multiple choice section and some of the short answer essay questions as well. The purpose was to give both groups choices to eliminate test items that created uncertainty and to ease test anxiety (differentiation according to affect). I wanted the exams to be a more valid measure of learning differences between the two groups. So, in this case, I actually differentiated the exams for all, as my preference for differentiation won out. Both sections noticed and appreciated these choices on their exams as relayed in the following:

NDI: "I liked the test formats a lot; being able to skip a few questions really eased my nerves."

NDI: "The tests were different in that we could throw out a couple answers. Very helpful." (sic)

DI: "I also liked that the assignments and tests were flexible for many styles of learners."

DI: "I liked the whole course, but I did think it was pretty awesome to be able to eliminate certain test questions."

Research Question Two

Did undergraduate DI students perceive the differentiated philosophy and methods in the course to be beneficial to their overall learning?

Survey

The survey conveyed that the majority, over 90% of the students rated the items with some form of agreement, but the highest ratings came from the DI group. On the open-ended questions (What do you like most about this course, how was this course different from other courses you have taken, and the additional comments section) students gave very similar comments about the teacher. This made sense as I was the same person in both classrooms. The comments on the environment were also very similar between the DI and NDI groups. This also was to be expected because the same physical classroom was utilized for both sections, and the feel of the environment was also similar. As noted by the comments from both sections, the students felt comfortable to share and relaxed. They felt that their opinions were of value during discussions and they were pleased that I knew them by name. Where differences occurred between the groups was with instruction and curriculum. The majority of the NDI students made typical comments about liking or disliking the curriculum, the assignments, in-class activities, discussions, and video clips. However, the DI students made comments about freedom of choice, their strong sense of engagement and interest, the fact that their learning styles were considered, doing self-evaluations, learning to a deeper level, instruction that helped them understand, and the course being “fit” to them. The DI students referenced the components of differentiated instruction: learning profiles,

readiness, and interest. These components stood out as what they appreciated most about the course.

Recommendations

Implications

Choice in product on composite scores, as discussed previously, was one of the variables that appears to have had a strong impact on these scores. However, pinpointing one component of differentiated instruction that enabled this to occur for the students' comprehensive learning as measured by the exams which were identical must refer to something more specific for just the DI group.

The overall content was the same for both sections, but the difference was that I knew my DI students more holistically. The assessments and continuous reflection on my teaching allowed for this difference. As Wormeli (2007) explained, "Differentiation is foremost a professional and responsive mind-set," (p. 7). I agree. In my DI course I considered the whole student as informed by ongoing diagnostic or preassessments, formative, and summative assessments plus continuous reflection. The preassessments were prepared ahead of time and given before we were discussing the topic in class. The preassessments exposed what the students already knew about a topic, so class time concentrated on what was unknown. Through preassessments and reflection, I altered the content, processes, products and environment to better match the needs of my students in the DI section while considering their readiness, learning profiles, and interests. Therefore, the instruction was tailored to their needs. Formative assessments allowed for further "in the moment" assessment to help correct for any misconceptions regarding the topic and to guarantee student learning along the way. Simple methods such as thumbs

up/down and think-pair-share were used on a daily basis to ensure learning. Another frequently used formative assessment were exit cards given at the end of a class session asking students to write down one thing learned that day and one thing that was still confusing. After reviewing the exit cards and acknowledging learning gaps, I again tweaked my instruction to include an extra personal story or scenario, an additional in-class activity, a video clip to demonstrate the information, or a class discussion to tap into students' previous experiences about the topic. At times, I researched topics further myself to be able to provide other means of addressing the material. Students were constantly kept in their "zone of proximal development," because the ongoing assessments provided the information for what needed to be taught next. At times, I had to create more complex activities for a small group of students or add more support for another group that struggled to grasp the concepts. Keeping all students in their "zone" was very challenging. However, constructivist teaching and scaffolding new material onto what the students already know can really only be understood through ongoing assessments and a philosophy of differentiated instruction that embraces flexibility.

I differentiated the content, the process, sometimes the products, and the environment depending on the situation or topic. Content and process often crossover and at times are difficult to separate. Frequently, I altered one or both components to address student needs. Sometimes I intentionally altered several or all of the four overarching elements. For example, on one occasion exit cards showed a need to clarify the stages of Kohlberg's moral theory. So the next day, I presented a moral case scenario (differentiated content), students were placed in small groups to discuss how an individual might react according to a specific moral development stage (differentiated

process) and then the students created a cartoon depicting their conclusions, performed a skit, or recited a rap that they created addressing the moral issue (differentiating products). At the same time, previously established classroom rules of respect for one another's views were reiterated by me or by some of the students (differentiated environment/affect). In this example, which may or may not be evident, I also addressed readiness, interests, and learning profiles of students. Readiness was addressed because students had not yet mastered the material. Interest was addressed using a case scenario in which students could relate. Finally, learning profiles were addressed through options of how they could demonstrate their learning. All of which took place in a nonthreatening setting because of an established cohesiveness within the class.

Differentiated instruction is a whole package and a philosophy. The relaxed environment, the engaging instruction, the interesting material, and being a caring teacher were mentioned by both sections as beneficial to their learning. The DI class, however, went further to share that the course "fit them." Wormeli (2007) states, "If we teach so that students learn, we do whatever it takes to make this happen. This is differentiation," (p. 11). Without previously knowing the "words" experts use to describe the differentiated instructional philosophy, students readily provided them.

"That she considered how we learned and took time out to make the course fit us." (sic)

"She included different activities and learning styles for all students."

"She just considered how we learn."

"We actually got self reviews every once in a while to see how we were doing."

The exam scores, as well as the qualitative comments supported that students learned to a "deeper level." Logically, this makes sense in that their mastery of the

material was ensured through the use of continuous assessment of their learning which guided further instruction.

This differentiated philosophy or “mind-set” of teaching, the cycle of purposefully using ongoing assessments to guide the next steps in instruction that ensure learning, is what I believe accounts for the significant difference on the overall exam scores between the DI group and the NDI group.

Another implication is that differentiation could be the difference between academic success and failure for many students. Encouraging and developing the professional mindset of differentiation which includes a learner-centered, constructivist model to meet the needs of all learners at every level may significantly alter the current remedial issues for college students.

As an instructor of preservice teachers, another implication is that differentiated instruction must be incorporated in training programs for our future teachers. Within the standards for teacher education, one can find several references for differentiation. Interstate Teacher Assessment and Support Consortium (InTASC) standards specifically state that teachers need to be able to teach to diverse learners (Council of Chief State School Officers, 2011). The following standards embody differentiated instruction:

Standard 1.1(a): The teacher regularly assesses individual and group performance in order to design and modify instruction to meet learners’ needs in each area of development (cognitive, linguistic, social, emotional, and physical) and scaffolds the next level of development. (p. 10)

Standard 2.2(a): The teacher designs, adapts, and delivers instruction to address each student's diverse learning strengths and needs and creates opportunities for students to demonstrate their learning in different ways. (p. 11)

Standard 6.6(a): "The teacher balances the use of formative and summative assessment as appropriate to support, verify, and document learning. (p. 15)

These standards are the expectations for teachers, therefore, preservice teachers need to observe differentiation in action during their teacher training and then practice differentiated instruction with their students during their practica and student teaching. Carol Tomlinson et al. (1997) stated,

If novice teachers are expected to become architects of inclusive communities of learning... it will be necessary for them to develop images of classrooms where teachers teach for understanding rather than coverage; where assessment is a tool directly concerned with individual growth; where students are helped to develop frameworks of meaning; and where students are engaged with tasks that are relevant, varied, and specifically designed to ensure that each student grow every day (p. 280).

Preservice teachers must also be well trained in conducting diagnostic, formative, and summative assessments as this is the driving force behind differentiated instruction. Without assessment, it is virtually impossible to differentiate effectively.

Differentiation must occur as a whole package just as students are whole people. As the comments of my students confirmed, differentiation must consider readiness levels, interests, learning profiles, and the affect regarding the teacher, the course material, and the environment. Each component is integral. Assessment is key.

Limitations

As others have already suggested (Tomlinson, 2008; Wormeli, 2007) differentiation has become an ethical issue for me, also. I have been using differentiated instruction for years, but more extensively in this study than I had in previous courses I taught. However, as I reflect, I see missed opportunities to differentiate that may have allowed for even stronger connections to the material and even deeper learning for my students in this study. The score differences may seem minimal, but with a teacher who has more experience with differentiation, I believe that an even larger difference would be obtained.

Another limitation to this study was that inter-rater reliability was only conducted on one assignment and one exam. Reliability measures on all of the assignments and exams would be preferable.

The possibility that students from the DI section of the course interacted with students from the NDI section could also have potentially skewed the data. For example, students could have shared information with one another or even studied for exams together outside of class.

College Classroom Recommendations

Differentiation is challenging at all levels, and the college level is not an exception. Initially, more planning time and reflection are needed to differentiate to meet the diverse needs of students. However, over the years I have realized that college students tend to stumble on the same concepts or understandings as the students in previous semesters and differentiated materials used in previous semesters can again be utilized to help clarify.

Tomlinson (2008) stated that it takes several years to differentiate well and my journey with differentiation has only just begun. A differentiated mind-set occurs gradually as does the development of methods and materials to support this philosophy. The key is to start small and build on one's repertoire of materials and methods for differentiation.

Future Research

Further quantitative research needs to be conducted at the college level to better understand the impact of differentiated instruction for diverse learners. This study refers to an undergraduate Educational Psychology class only and needs to be replicated to confirm the findings.

Another research issue is whether differentiated instruction can be implemented across all disciplines or only for certain lower level courses. In other words, would differentiated instruction be beneficial for courses in more specialized courses such as in the medical field? For example, when learning how to perform a specific medical procedure, choice in content, process, and product may not be acceptable and may have severe consequences.

Also, I would like to see an instructor who is well-established in the philosophy and use of differentiated instruction do a similar study to see if even greater differences in quantitative gains for college students would occur. If I were to repeat this study, I would keep the topics of the assignments, but not create differentiated product options for the DI group until I had collected learning profiles and spent time getting to know my students. Through using information from the learning profiles, I would cater the product options of the assignments to the interests of my students.

Summary

During the implementation of this study, I experienced many points of ethical dilemma as I reflected on the two sections. Many times I questioned and struggled with the fairness of not differentiating for the NDI group. I question now even more so, especially after witnessing the academic improvements attained by the DI group. However, with the academic improvements witnessed in my students' learning and the overwhelmingly positive response that I have received from students, I cannot, in good conscience, nor would I want to revert back to my former philosophy or mindset as a teacher. Continually, I search for new and better ways to differentiate to meet the many needs of my diverse college students.

APPENDICES

Appendix A: Informed Consent Script

You are a participant in a study about Differentiated Instruction in two of the Educational Psychology courses that I teach. This is a joint research project with the University of North Dakota. I hope to learn how students at the college level perceive differentiated instruction teaching methods, and whether differentiated instruction produces higher academic outcomes for students. You were selected as a participant in this action research study because you are enrolled in this course.

No benefits accrue to you beyond the experience of this course and learning differentiated instructional methods, but your responses will be used to obtain a better understanding of the use of differentiated instruction at the college level. The results of this study may be used in publications or presentations in the future. Any discomfort or inconvenience to you derives only from being involved in a typical college course.

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will not be disclosed. Only Mary Dosch and Dr. Margaret Zidon will have access to this data. After it is analyzed, the data will be stored securely for three years in a locked file cabinet in my office.

If you choose to not allow your data to be used, it will not prejudice your future relationships with the University of North Dakota, Minnesota State University Moorhead, or your status in this class. You are free to discontinue participation at any time without prejudice.

Please feel free to ask questions regarding this study. You may contact me later if you have additional questions at 218-477-5890 or by e-mail: doschma@mnstate.edu

Any questions about your rights may be directed to Dr. Richard Adler, Chair of the MSUM Institutional Review Board at 218-477-2474 or by e-mail at adlerri@mnstate.edu.

Thank you for your time.

Appendix B: Understanding by Design Example

STAGE 1: Desired Results	
<p>Established Goals:</p> <ul style="list-style-type: none"> • Understand the cultural, social, emotional, cognitive, physical, and moral developmental of individuals and how each influence learning. 	
<p>Understandings: <i>Students will understand that...</i></p> <ul style="list-style-type: none"> • Moral development is constantly evolving. • Our culture, society, friends, family, faith, and environment all influence our morals. • <u>Possible misunderstandings:</u> moral development is based on age and everyone eventually reaches the highest stage of moral development. • Differences between moral theories 	<p>Essential Questions:</p> <ul style="list-style-type: none"> • How does moral behavior develop in early, middle, and adolescent years? • How does moral development influence learning? • What are the cultural aspects of moral development?
<p><i>Students will know...</i> <i>Students will be able to...</i></p> <ul style="list-style-type: none"> • Piaget’s theory of Moral Development • Kohlberg’s theory of Moral Development • Gilligan’s theory—gender differences • Apply Piaget’s and Kohlberg’s theories to case studies and understand a child’s level of moral development in a particular situation. • Definitions: Moral relativism, Distributive Justice, Theory of the Mind, Morality of cooperation 	
STAGE 2: Assessment Evidence	
<p>Performance Tasks:</p> <ul style="list-style-type: none"> • Group case scenarios—in class activity —sharing of results. • Role playing moral situations. 	<p>Other Evidence:</p> <ul style="list-style-type: none"> • Pretests and Exit cards • Observation of in class activities and listening in on conversations
<p>Key Criteria:</p> <ul style="list-style-type: none"> • Accurate analysis and application of Kohlberg’s, Piaget’s and Gilligan’s theories using case scenarios. • Accurate portrayal of theories in role playing. 	<ul style="list-style-type: none"> • Exam Multiple Choice and Essay questions regarding Moral theory and development.
STAGE 3: Learning Plan	
<p>Learning Activities:</p> <ul style="list-style-type: none"> • Whole class lecture and discussion on Moral theories. • Role Playing moral situations • Group case scenarios. • Video on Theory of the Mind • Video on Heinz dilemma 	

Appendix C: College Learning Profile

Name _____

Major _____

Age _____

Year in College _____

Current Workplace _____

1. My all-time favorite movie is _____.

2. I like to read books about _____.

3. In my free time, I like to _____.

4. In the future, I would like to _____.

5. I would like to travel to _____ because _____.

6. Things I dislike are _____.

7. My hobbies are _____.

8. The person I most admire is _____ because _____.

9. Things I like are _____.

10. Clubs, organizations, groups I'm involved in are _____.

11. In college I learn best when _____.

12. In college I prefer to work

a. alone or with a partner b. in a small group c. in a large group

13. If you could interview one person from the past, whom would you interview and why?

14. What is something you know a lot about or are very good at?

15. What was a negative experience that you had at school between kindergarten and 12th grade?

Appendix D: Triarchic Theory of Intelligences - Robert Sternberg

Mark each sentence T if you like to do the activity

- | | |
|--|-----|
| 1. Analyzing characters when I'm reading or listening to a story | ___ |
| 2. Designing new things | ___ |
| 3. Taking things apart and fixing them | ___ |
| 4. Comparing and contrasting points of view | ___ |
| 5. Coming up with ideas | ___ |
| 6. Learning through hands-on activities | ___ |
| 7. Criticizing my own and others' work | ___ |
| 8. Using my imagination | ___ |
| 9. Putting into practice things I learned | ___ |
| 10. Thinking clearly and analytically | ___ |
| 11. Thinking of alternative solutions | ___ |
| 12. Working with people in teams or groups | ___ |
| 13. Solving logical problems | ___ |
| 14. Noticing things others often ignore | ___ |
| 15. Resolving conflicts | ___ |
| 16. Evaluating my own and other's points of view | ___ |
| 17. Thinking in pictures and images | ___ |
| 18. Advising friends on their problems | ___ |
| 19. Explaining difficult ideas or problems to others | ___ |
| 20. Supposing things were different | ___ |
| 21. Convincing someone to do something | ___ |
| 22. Making inferences and deriving conclusions | ___ |
| 23. Drawing | ___ |
| 24. Learning by interacting with others | ___ |
| 25. Sorting and classifying | ___ |
| 26. Inventing new words, games, approaches | ___ |
| 27. Applying my knowledge | ___ |
| 28. Using graphic organizers or images to organize your thoughts | ___ |
| 29. Composing | ___ |
| 30. Adapting to new situations | ___ |

Transfer your answers from the survey to the key. The column with the most "True" responses is your dominant intelligence.

Analytical	Creative	Practical
1. ___	2. ___	3. ___
4. ___	5. ___	6. ___
7. ___	8. ___	9. ___
10. ___	11. ___	12. ___
13. ___	14. ___	15. ___
16. ___	17. ___	18. ___
19. ___	20. ___	21. ___
22. ___	23. ___	24. ___
25. ___	26. ___	27. ___
28. ___	29. ___	30. ___

Total Number of True:

Analytical ___ **Creative** ___ **Practical** ___

Appendix E: The Theory of Multiple Intelligences Self Assessment – Howard Gardner

Where does your true intelligence (processing ability) lie? This quiz can help you determine where you stand. Read each statement. If it expresses some characteristic of yours and sounds true for the most part, jot down “T.” If the statement is sometimes true, sometimes false, leave it blank.

1. _____ I'd rather draw a map than give someone verbal directions.
2. _____ I can play (or used to play) a musical instrument.
3. _____ I can associate music with my moods.
4. _____ I can add or multiply quickly in my head.
5. _____ I like to work with calculators and computers.
6. _____ I pick up new dance steps quickly.
7. _____ It is easy for me to say what I think in an argument or debate.
8. _____ I enjoy a good lecture, speech, or sermon.
9. _____ I always know north from south no matter where I am.
10. _____ Life seems empty without music.
11. _____ I always understand the direction that comes with new gadgets or appliances.
12. _____ I like to learn puzzles and play games.
13. _____ Learning to ride a bike (or skate) was easy.
14. _____ I am irritated when I hear an argument that is illogical.
15. _____ My sense of balance and coordination is good.
16. _____ I often see patterns and relationships to numbers faster and easier than others.
17. _____ I enjoy building models or sculpting.
18. _____ I am good at finding the fine points of word meaning.
19. _____ I can look at an object one way and see it turned sideways or backwards just as easily.
20. _____ I often connect a piece of music with some event in my life.
21. _____ I like to work with numbers and figures.
22. _____ Just looking at shapes of buildings and structures is pleasurable to me.
23. _____ I like to hum, whistle, and sing in the shower or when I am alone.
24. _____ I am good at athletics.
25. _____ I would like to study the structure and logic of languages.
26. _____ I am usually aware of the expressions on my face.
27. _____ I am sensitive to the expression on other people's faces.
28. _____ I stay in touch with my moods. I have no trouble identifying them.
29. _____ I am sensitive to the moods of others.
30. _____ I have a good sense of what others think of me.

Scoring Sheet

Place a checkmark by each item, which you marked as “True.” Add your totals. A total of four in any of the categories A through E indicates strong ability. In categories F through G a score of one or more means you have abilities in these areas as well.

A	B	C	D	E	F	G
Linguistics	Logical/Math	Musical	Spatial	Body/Kinesthetic	Intrapersonal	Interpersonal
7 _____	4 _____	2 _____	1 _____	6 _____	26 _____	27 _____
8 _____	5 _____	3 _____	9 _____	13 _____	28 _____	29 _____
14 _____	12 _____	10 _____	11 _____	15 _____		30 _____
18 _____	16 _____	20 _____	19 _____	17 _____		
25 _____	21 _____	23 _____	22 _____	24 _____		

Appendix F: Sample Pretest

1. Jeremy is walking down the street and when two cars collide, he falls flat to the ground. Jeremy just returned from Iraq a week ago. He was trained that whenever there is a gunshot or explosion, one is to quickly lie flat on the ground. Explain each of the following:

Unconditioned Stimulus = _____

Unconditioned Response = _____

Conditioned Stimulus = _____

Conditioned Response = _____

2. Kari wants to try out for the school play, but she is very nervous. On the day of the tryouts, Kari leaves school early. What can you say about Kari's behavior:

- a. She is being punished.
- b. She is being negatively reinforced.
- c. She is being positively reinforced.

Appendix G: Teacher Evaluation

Class Time _____

Please rate the following statements.	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
The instructor was knowledgeable regarding the course material.	1	2	3	4	5	6
The instructor demonstrated respect for individual differences.	1	2	3	4	5	6
The instructor stimulated my interest in the course.	1	2	3	4	5	6
The instructor encouraged students to actively participate.	1	2	3	4	5	6
The instructor taught information in ways that allowed me to understand the material.	1	2	3	4	5	6
I would recommend this instructor to my friends.	1	2	3	4	5	6
The general climate in this course was good for learning.	1	2	3	4	5	6
The course respected diverse ways of learning.	1	2	3	4	5	6
The assignments engaged me in learning.	1	2	3	4	5	6
Overall, I learned a great deal from this course.	1	2	3	4	5	6

11. What did you like MOST about this course? Explain.

13. What suggestions do you have for improvements regarding this course? Explain.

14. How was this course different from other courses you have taken? Explain.

15. Approximately how many class sessions were you absent from?

Additional Comments:

Appendix H: Tic-Tac-Toe Review

Why is it important to give students nonexamples?	Give an example of deductive reasoning.	Define a prototype and give an example.
What is functional fixedness?	List three ways in which we can encourage creativity.	Explain low-road transfer.
What is divergent thinking?	What does IDEAL stand for?	Define an algorithm.

Appendix I: Choice Boards

Analytical Choice Board

Instructions: Choose a grade level and decide on appropriate classroom rules for your classroom. Then choose one of the following activities to complete.

Choice 1:

With your group prepare a guide explaining the rules in your classroom. Be prepared to share this with others.

Choice 2:

With your group create a diagram showing the rules in your classroom. Be prepared to share this with others.

Choice 3:

With your group critique the rules from when you were in school. Why would the rules your group created be better? Be prepared to share this with others.

Practical Choice Board

Instructions: Choose a grade level and decide on appropriate classroom rules for your classroom. Then choose one of the following activities to complete.

Choice 1:

With your group role play how these rules would play out in your classroom. Be prepared to share this with others.

Choice 2:

Kendra and Jack are both waiting for the computer that Sarah is using. When Sarah finishes, they both run over to the computer and fight for the computer chair. As the teacher refer to and apply one of your classroom rules to explain how you would solve the issue. Be prepared to share this with others.

Choice 3:

With your group, create a scenario where you could see a problem with one of the rules you created and how could you solve it.

Creative Choice Board

Instructions: Choose a grade level and decide on appropriate classroom rules for your classroom. Then choose one of the following activities to complete.

Choice 1:

With your group use humor to show how you could teach students the classroom rules. Be prepared to share your examples with others.

Choice 2:

With your group create drawings/cartoons that represent your classroom rules. Be sure to be able to explain your drawing to others.

Choice 3:

With your group develop a rap explaining rules for your classroom. Be ready to present this to the class.

Appendix J: Assignments for NDI Section

General Instructions: Please put your number on the top of your paper. All written portions must be typed, double-spaced, with one inch margins, and 10-12 point font. At least one full page is required for any writing assignment/reflection.

Assignment 1: After class lecture and discussion about the value of research, each student will write a reflection about one math intervention on either www.whatworks.ed.gov or google intervention central and then explain why research is important to guide instruction. Include pros and cons about the intervention. Be sure to include one source that teacher's could use to guide them.

Assignment 2: After the class lecture and discussion on diversity in schools, each student will watch 15 commercials on tv observing whether the commercials starred a male or female, what ethnic group the individual belonged to, what the individual was selling, and what perceived class (lower, middle, upper) the individual was a member of? Create a table or graph displaying what you found , then write a reflection on how diversity in media can affect a child's self-efficacy in education.

Assignment 3: Through the use of a classical conditioning define a behavior that someone does and make 3 attempts to alter that person's behavior. In a written reflection, document what occurred and then create your own scenario of how a teacher could use classical conditioning to alter a child's behavior in school.

Assignment 4: Students will view a video from the PBIS (Positive Behavioral Supports in Schools) website showing system-wide models of Positive Behavioral Supports in school settings using a 3-tiered model of intervention. Students will watch the video on their own time. Students will write a reflection explaining PBIS, explain how a PBIS school compared to your own school, and give your own opinion on PBIS.

Assignment 5: Students will work within collaborative groups. Each individual will be assigned a learning strategy to research and directly teach to the other members of the group. Afterwards, the student will write a reflection about the teaching experience and explain how the learning strategy could be used in a teaching experience. Also give your opinion of the strategy.

Assignment 6: Students will work to differentiate a lesson in reading. The student will create a written plan as to how to differentiate a lesson using Sternberg's Triarchic theory. For each intelligence, one must explain what the students should know, understand, and be able to do. Each of these learners must be taught at their zone of proximal development.

Assignment 7: After the class lecture on learning environments, students will draw the perfect learning environment for k-12 students, then, write a reflection of why this would be a good learning environment.

Appendix K: Assignments for DI section

General Instructions: Please put your number on the top of your paper. All written portions must be typed, double-spaced, with one inch margins, and 10-12 point font. At least one full page is required for any writing assignment/reflection.

Assignment 1: After the class lecture and discussion about the value of research, and sharing some of the interventions found with peers. Each student will read one research study from the National Undergraduate Research Clearinghouse, What Works Clearing House, or Intervention Central websites and write about any intervention of one's choice, include pros and cons of the intervention, then write about the importance of research in guiding instructional decisions. Be sure to include one source that teacher's could use to guide them.

Assignment 2: After the class lecture and discussion on diversity in schools, each student will watch 15 commercials on tv observing whether the commercials starred a male or female, what ethnic group the individual belonged to, what the individual was selling, and what perceived class (lower, middle, upper) the individual was a member of? Create a table or graph displaying what you found then choose from the following:

Write a reflection on how diversity in media can affect a child's self-efficacy in education
OR

Create a cartoon demonstrating how media can affect a child's self-efficacy in education
OR

Write a letter to the tv station about your concerns regarding a child's self-efficacy in education according to what you witnessed when watching the commercials.

OR

A creation of your choice that addresses how media affects a child's self-efficacy in education (okay your idea with the instructor).

Assignment 3: Through the use of a classical conditioning, or operant conditioning, or observational learning, define a specific behavior that someone currently does and make 3 attempts to alter that person's behavior. In a written reflection, document what occurred and then create your own scenario of how a teacher could use whichever conditioning you did to alter a child's behavior in school.

Assignment 4: Students will view a video from the PBIS (Positive Behavioral Supports in Schools) website showing system-wide models of Positive Behavioral Supports in school settings using a 3-tiered model of intervention. Students will watch the video on their own time and 1) create a brochure on PBIS, 2) write a reflection on PBIS or 3) create a

60 second video promoting PBIS. You must include an explanation of PBIS, explain how a PBIS school compared to your own school, and give your own opinion on PBIS.

Assignment 5: Students will work within collaborative groups. Each individual will choose a learning strategy that he/she would like to research and directly teach to the other members of the group. Then the student will write a reflection about the teaching experience and explain how this strategy could be used in a teaching experience. Also give your opinion of the strategy.

Assignment 6: Students will work to differentiate a lesson on one topic of one's choice. The student will create a written plan as to how one would differentiate a lesson using Sternberg's Triarchic theory or differentiate for 3 levels of learners: struggling learners, average learners, and above average learners. You must explain what the students should know, understand, and be able to do. Each of these learners must be taught at their zone of proximal development.

Assignment 7: After the class lecture on learning environments, students will design the perfect learning environment for k-12 students—for example, the student could create a diorama of the environment, a drawing of the environment, a computer layout of the environment—then write a reflection of why this would be a good learning environment.

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