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Development Of The Differentiated Instruction Assessment

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ABSTRACT

The goal of this work was to develop a reliable and valid instrument for assessing what educators know in order to implement effective differentiated instruction (DI). Construction of the Differentiated Instruction Assessment involved five steps: (a) a list of potential items was composed via the domain-sampling theory of instrument development based on a content analysis of relevant literature, (b) three expert participants on DI completed a retranslation task on the list of potential items, (c) a second retranslation task was conducted on a group of four different expert participants, (d) a test-retest analysis was conducted, and (e) data were collected on a large sample for reliability analyses and to gather evidence of content and construct validity. The instrument developed had a number of issues including problems with reliability and a lack of evidence of validity.

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PREFACE

The Differentiated Instruction Assessment begins to fulfill my dream, which is to earn a doctoral degree that will permit me to do further scholarly research in the field of education. I have taught subject matter in every grade K–14 and often relied on action research when attempting to put theory into practice. I often questioned why more of the professionals in education do not embrace differentiation theory and wanted to be more involved in ongoing research regarding the same. It is hoped that this project will become a stepping stone for further research on differentiated instruction.

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CHAPTER 1

INTRODUCTION

There has been an ongoing discussion about the theory of differentiation and how it is viewed by professionals in education. In fact, many secondary teachers do not use classroom differentiation (Midgley, Feldlaufer, & Eccles, 1988). They not only choose to forego differentiated instruction, but also the learning preferences and different intelligences of those they teach (Gregory & Chapman, 2007; Parker & Neuharth-Pritchett, 2008). Chapman (1993) suggested that many teachers prefer to create whole group lessons in the belief that one size fits all rather than being proponents of individualized instruction. One of the most important things to consider from this discussion is whether or not educators understand the theory or construct of differentiated instruction (DI).

Some concerns stem from the term *differentiation*. It may be better to say that one is teaching to the learning styles of students rather than *differentiating curricula* to the needs of the students. "Figuring out how to differentiate instruction depends on knowing students' learning and thinking styles" (Smutny, 2003, p. 8). Daniels (1993) pointed out that the term differentiation as used in educating students has an extremely malleable meaning and that it has been used in a variety of circumstances. It has also been argued that differentiation is best regarded as a process rather than as a specific teaching strategy (Dewhurst, 1996). Although the exact meaning of differentiation may not have been established, most have agreed that it is a way to meet the unique needs of students; however, *the way* regarding the theory itself has not been

clearly defined (Chapman, 1993; Gregory & Chapman, 2007; Hall, Strangman, & Meyer, 2003; Tomlinson, 1999).

Another matter is that experts in the past have viewed differentiation more of a philosophy than as a way to instruct; nevertheless, differentiation is now recognized as a best practice method of instruction (Hall et al., 2003). It is also the method that encompasses the many different intellectual abilities that students bring to the classroom (Chapman, 1993; Tomlinson, 1999) and a philosophy or a belief about a way to teach (Chapman, 1993). Differentiation theory (DT) is described in most educational settings as a philosophy. An educational philosophy is a belief system about learning, and most researchers view DT as a belief about how students learn; moreover, differentiation is a way of instructing just as is direct instruction (Morrow, Gambrell, & Duke, 2011).

Another issue regards direct instruction. There are educators who view direct instruction and DI as two distinct methods; however, direct instruction is often used in the differentiated classroom. Direct instruction and DI are each a step by step process for learning content (Tomlinson & Strickland, 2005). Direct instruction has been described as one of the most successful methods of instruction for student learning (Gersten, Keating, & Becker, 1988) and is sometimes essential in the student-centered differentiated classroom. "The term *direct instruction* refers to a rigorously developed, highly scripted method for teaching that is fast paced and provides constant interaction between students and the teacher" (Gersten et al., 1988, p. 319). Because this method involves the pre-planned drilling of content, it is also said to be rich in structure (Gersten et al., 1988, p. 319). With such a successful method as direct instruction as part of its process, it is disconcerting that differentiation as a theory is evolving so slowly as a best practice and successful method of instruction (Tomlinson & Strickland, 2005).

Most teachers are skilled in finding student differences while they instruct and assess a classroom of students, but they could better meet the needs of each student if they sought out the differences before planning to teach (Gregory & Chapman, 2007). Seeking out these differences requires a methodological approach, thereby informing instruction as a method (Gregory & Chapman, 2007; Tomlinson, 2005). DI is methodological. It would be interesting and instructive to see if educators understand the construct of this methodological approach.

Each learner is unique. Students have "designer brains" as noted by Sylwester (1995), and that means that each student brain differs in the way it acquires knowledge as much as individual fingerprints are uniquely different (Gregory & Chapman, 2007). Gardner (1983) has identified several intelligences in all learners. The intelligences are listed as verbal/linguistic, logical mathematical, musical, bodily kinesthetic, spatial, intrapersonal, and interpersonal. In 1997, Gardner (2006) added naturalist intelligence to expand his model to eight different forms of intelligence, and in 1999, he began discussions about the possibility of an existential intelligence.

Technology is another issue found within the obscurities that surround DI yet it is a catalyst that can help educators focus on the unique skills that each learner brings to the classroom (Tsantis, 2012). Another type of intelligence might be technological (currently under logical-mathematical with Gardner (2006), and this is the one that challenges today's educators (Parker & Neuharth-Pritchett, 2008). For example, most students are technologically savvy though some are better with electronic devices than others. These students bring iPods, Blackberries, cell phones and laptops into the classroom. This allows them to have access to learning with a strategy that feels comfortable and current to their technological culture and lifestyle (Gardner & Davis, 2013). Teachers are remiss if they are not including technology

within the curriculum of the content they teach (Parker & Neuharth-Pritchett, 2008). Multimedia technology can enhance any educational environment and such technology supports the skills that each unique learner brings to the classroom (Tsantis, 2012).

DI can address the use of technology in the classroom. There are secondary educators who create curriculum content as though they are blind and do not see what the students actually need (Chapman, 1993). Many refuse to consider DI as a possible method they might use to facilitate learning. They neither see technology nor the individual needs of students as vital to their planning. These teachers lecture longer giving students little time for thinking things through on their own (Oldfather & McLaughlin, 1993). Furthermore, middle school students declare that they are given less autonomy, fewer opportunities for input, and fewer cooperative group interactions than when they were in elementary school (Midgley et al., 1988; Oldfather & McLaughlin, 1993; Parker & Neuharth-Pritchett, 2008). It would greatly benefit students if both educators and their administrators could see that technology has the potential to be a catalyst for learning (Tsantis, 2012).

The use of technology broaches the subject of multitasking. Students today enjoy multitasking and while DI does not require students to multitask, it does suggest that tasks can be completed in multiple ways (Gregory & Chapman, 2007). Additionally, students are more motivated to focus on what needs to be learned as a result of multiple venues for interacting with the content (Gregory & Chapman, 2007). Although most students desire to multitask while they study, some researchers have concerns about students' use of technology (Paul, 2013). The main concern is the amount of multitasking performed by students while they are learning (Paul, 2013). Even so, Smith (2008) posited that teachers must use technology and they must touch

upon the various learning styles in their classrooms if students are to learn and remain motivated to learn.

Learning style refers to a student's preferred way to approach an academic task and includes both environmental factors such as lighting, noise level, and personal factors such as visual, auditory, kinesthetic, etc. (Tomlinson & Eidson, 2003). Differentiating content, curriculum, culture, interests, and learning styles requires the methodology of DT (Tomlinson & Eidson, 2003).

Accountability issues may also impact the classroom teacher and the choice to differentiate instruction. The No Child Left Behind Act (2001) requirements for standards-based curricula and assessment changed the focus of education reform. General educators are now being asked to "design materials and activities that can meet the needs of all students initially, rather than make modifications after the fact" (van Garderen & Whittaker, 2006, p. 12). New accountability guidelines demand that reading and math scores of students improve (Gregory & Kuzmich, 2004). Studies have shown that DI can be used to sustain and improve reading scores (Baumgartner, Lipowski, & Rush, 2003).

Just as technology must be embraced and utilized, so must DT be embraced and implemented as a classroom best practice. There are many teachers who continually meet and accept new paradigms but not all teachers are willing to encounter or accept a different way of instructing students (Delisle, 2015). Those who are new to the profession may still be developing a style and philosophy and are perhaps more willing to embrace DI; however, most veteran teachers are unlikely to develop a new philosophy, especially after many successful years of teaching (Parker & Neuharth-Pritchett, 2008; Tieso, 2004). Why veteran teachers are having difficulty embracing DT is another enigmatic piece of this discussion.

Statement of the Problem

Differentiation, as an effective method of instruction, lacks empirical validation (Hall et al., 2003). Numerous teachers have given testimony about the engagement and improved performance of their students when they differentiate not only the content, but also the products expected from the students (Gregory & Chapman, 2007; Tomlinson, 1999). Nevertheless, few studies have been completed on DT in comparison to other effective, evidence-based methods of instruction (Hall et al. 2003; Parker & Neuharth-Pritchett, 2008). Tomlinson and Strickland (2005) have written about differentiation as though it is a best practice method of instruction but there are many teachers who are not willing to utilize this method in the classroom. When research-based best practices are used, more students will develop the skills and concepts that are targeted in daily instruction (Marzano, Pickering, & Pollack, 2001). Differentiated classrooms are student-centered and engage most learners; consequently, classroom differentiation should be utilized more often as a very powerful method of instruction (Tomlinson, 1999). Whether teachers fail to differentiate because they do not understand how to differentiate or because the administration has not given them ample planning time to fully create differentiated lessons is not yet clear (McGarvey, Marriott, Morgan, & Abbott, 1998).

Delisle (2015) boldly asserted that differentiation does not work for several reasons: There are too many students of varying abilities in one classroom; teachers are not sure of what they are differentiating—instruction, curriculum, or both and it is very difficult to implement. Delisle quoted Schmoker who said, “In every case, differentiated instruction seemed to complicate teachers’ work, requiring them to procure and assemble multiple sets of materials, and it dumbed down instruction.” (as cited in Delisle, 2015, para. 9). In a report by the Fordham

Institute, “83% of teachers nationwide stated that differentiation was ‘somewhat’ or ‘very’ difficult to implement” (as cited in Delisle, 2015, para. 10).

Some professionals are hesitant to utilize activities that are defined by DT (Hall et al., 2003). There have been surveys on the perceptions of teachers regarding DI (Cataldo, 2008; Luster, 2008; McGarvey et al., 1998). Studies have also addressed factors that influence learning styles, and the acknowledgement of multiple intelligences and abilities in the classroom (Nicolino, 2007).

A master’s thesis by Hobson (2008) included a questionnaire about the strategies used by teachers when they differentiate instruction in heterogeneous classrooms. The instrument had been used in 2004 by Hobson (2008) with the permission of Tomlinson. The questionnaire created by Hobson and Tomlinson was adapted from Tomlinson’s Teacher/Peer Reflection on Differentiation Instrument (as cited in Hobson, 2008). Possible reasons have been given as to why DT is not more widely practiced in the field of education. These include such issues as not enough collaborative time or a lack of support from administrative leadership (McGarvey, Marriott, Morgan, & Abbott, 1997). Little data, if any, can be found on what professionals know about the practice of DI and its implementation in the classroom (Parker & Neuharth-Pritchett, 2008).

Researchers have used generic surveys to learn more about how much DI is used or not used in the classroom or on the perceptions of how teachers regard DI (Cataldo, 2008: Luster, 2008; McGarvey et al., 1998). Bender, Vai, and Scott asserted that valid and reliable instruments were needed to address DI by saying, “Moreover, existing instruments have not provided extensive evidence of construct validity” (as cited in Roy, Guay, & Valois, 2013, p. 1189). Roy et al. (2013) developed the Differentiation Instruction Scale (DIS) to assess how teachers in

general education classrooms use instructional adaptations and academic progress monitoring; nevertheless, no instrument that has been exclusively developed to assess what professionals in education know about the construct of this method of instruction has been found in the literature. Could it simply be that the construct of DI is not clearly understood by educators? The development of a psychometrically sound instrument to assess what a professional educator knows about the construct of DI could possibly address this question. Additionally, an instrument that assesses knowledge about differentiated instruction could add to much needed empirical data.

Purpose of This Study

The overall goal of this research was to develop a valid and reliable instrument that would assess what educators know about the construct of DI. The development of such an instrument may better help us understand why this instructional approach is not used more often as a best practice method of instruction and how such a method is regarded by educators. A definitively designed instrument that can assess educators at all levels of instruction and supervision is needed to find out what is actually known about differentiating instruction in the classroom. The ongoing controversy about this proposed best practice combined with the lack of empirical evidence further points to the need of a well-developed instrument to study this instructional method.

When discussing why DT has not been embraced or practiced more readily in the classroom, teachers and administrators participating in professional development expressed many concerns about this instructional method (Fouts & Howard, 2007). These educators also participated in action research, which was one result of a professional development seminar on DI. These same professionals collaboratively decided that certain values were necessary in order

for a teacher to implement DI in the classroom. The process used in the action research to determine these values is discussed at length in the literature review. The teachers involved in the action research project argued that certain concepts were necessary to comprehend if DI were to be successfully delivered, but they agreed that most learners of any ability could be reached through this potential best practice. These concepts, or values, were narrowed into four areas of expertise which are called dimensions. The dimensions included the following four constructs: (a) comprehension and application of multiple intelligence theory while utilizing various learning styles, (b) development of units based on such data that has a wide depth of knowledge (DOK) range, (c) multi-management of various student tasks, and (d) interpretation and utilization of ongoing formative and summative student data on a daily basis. An instrument, called the Differentiated Instruction Assessment (DIA), was designed to assess each of the four constructs. The instrument was expected to help solve some of the mysteries that surround the current understanding of DI and the obscurity found within DT and its practice.

Research Hypotheses

The following hypotheses were an intrinsic part of the research development process.

1. Experts in DI will be able to correctly classify each of the items into the appropriate construct.
2. The items will factor into the four identified dimensions.

Expert in DI, as defined for this research, is listed in the definition of terms.

Significance of the Study

Why more educators do not embrace DI is puzzling because it is considered a best practice method of instruction to many professionals in the field. The lack of empirical evidence further convolutes this issue. Numerous questions have been posited as to why this proposed

best practice is not more widely used in all classrooms. A likely outcome from using a well-designed instrument to assess knowledge about DT and application of this instructional method would be clarification about which questions need further research.

The DIA is an instrument that might have been used in subsequent studies about DT. Further studies that compare differentiated classrooms to traditional classrooms could significantly impact the lives of young adolescents and the methods that are endorsed for teaching generations to come. Before developing such studies, it would behoove those interested in education to find out how much is known about DT. The DIA was developed to be a valid and reliable instrument which can be used to determine what is known about the construct and methodological approach to learning that is called DI.

Definition of Terms

Differentiation or differentiated instruction (DI) refers to the systematic approach to planning curriculum and instruction for academically diverse learners; a dual way of thinking about honoring each student's learning needs while maximizing each student's learning potential. It is not the individualized instruction of the 1970s or homogeneous grouping. It is not chaotic, and it is definitely not like "tailoring the same suit of clothes" for each learner (Tomlinson, 1995, 1999). Tomlinson (2003) gave the following definition for DI:

> *Differentiated instruction is when a teacher proactively plans varied approaches to what students need to learn, how they will learn it, and/or how they can express what they have learned in order to increase the likelihood that each student will learn as much as he or she can as efficiently as possible* [emphasis added]. (as cited in Cooper, Irizarry, & Leighton, 2010, p. 155)

In order to adequately prepare respondents for taking the DIA, a definition for DI was supplied with the assessment. The italicized or second part of the above definition is how DI was defined.

Differentiated Instruction Assessment (DIA) was designed to be a valid and reliable instrument that assesses what educators know about the construct of DI. The assessment evaluates four dimensions of DI. The dimensions include the following constructs: (a) comprehension and application of multiple intelligence theory while utilizing various learning styles, (b) development of units based on such data that has a wide DOK range, (c) multi-management of various student tasks, and (d) interpretation and utilization of ongoing formative and summative student data on a daily basis.

Differentiation theory (DT) is an instructional theory that discusses how educators can plan and deliver instruction in multi-ability classrooms. Based on this theory, teachers can structure and manage the learning environment to address the diverse learning styles, interests, intelligences, and abilities within the classroom. DT put into practice is called DI (Tomlinson & Allan, 2000).

Direct instruction refers to a model, method, or approach that takes the learner through the steps of learning, basically one step at a time. It is a scripted method that involves constant student to teacher interaction (Gersten et al., 1988).

Educators in this research refers to both those individuals who are teaching in the classroom and the administrators of same. Administrators may refer to teacher or curriculum supervisors, counselors, and principals as well as any assistants, respectively.

Expert in DI in this research refers to an educator who has not only a knowledge base about DI but also has demonstrated such instruction as a potential best practice in his or her

classroom. An expert will have either participated in one or more workshops on DI or be able to describe how DI has been successfully used in his or her classroom. Such experts will be considered successful if they have met teacher objectives such as but not limited to "increasing lexile scores in reading" or "improving scores on state mandated assessments" while using DI as the means for gaining student achievements (Fouts & Howard, 2007, p. 7).

Multi-ability classroom refers to inclusive, heterogeneous classrooms that include learners with diverse learning levels, modalities, and intelligences. Such a classroom allows teachers to differentiate instruction based on students' needs versus age, grade, or homogenous ability groups (Greene, 2011).

Multiple intelligence theory or multiple intelligence refers to particular intelligences that are indicative of how the brain wants best to learn (Gardner, 1983, 1999). The following intelligences have been both defined and proven to be intelligences within the criteria Gardner (1999) used to define an intelligence.

A. *Verbal-linguistic intelligence* is equivalent to being word smart.
B. *Logical-mathematical intelligence* is equivalent to being number smart.
C. *Bodily-kinesthetic intelligence* means body smart as in hands on activities or natural athletic abilities.
D. *Visual-spatial intelligence* is equivalent to picture smart or having artistic tendencies.
E. *Musical-rhythmic intelligence* is equivalent to being music smart.
F. *Interpersonal intelligence* means people or socially smart.
G. *Intrapersonal intelligence* is the same as being self smart or knowing oneself.

H. *Naturalist intelligence* is the same as being nature smart.

Universal design for learning (UDL) is an approach for designing instruction, materials, and content to benefit students of all learning styles. It is a flexible approach that can be adjusted and customized for individual needs. Universal design provides equal access to learning and allows the learner to control the method of accessing information. The teacher monitors the learning process (Center for Applied Special Technology [CAST], 2015)

CHAPTER 2

REVIEW OF THE LITERATURE

This literature review provides a rationale for having created an instrument that assesses knowledge about the construct of DI as relative to DT. The founding frameworks of this method of classroom instruction are discussed along with the complexities that surround it as a proposed best practice. The review examines qualitative studies conducted over the last decade about this controversial instructional method. Additionally, the discussion transitions to and investigates the few quantitative studies that have been completed on DI as compared to whole class instruction. Finally, perceptions of the construct of this method as a best practice are both scrutinized and summarized.

Differentiated Instruction

To differentiate instruction is to recognize students' varying background knowledge, readiness, language, preferences in learning and interests, and to react responsively (Hall et al., 2003).

> Differentiated instruction is a process to teaching and learning for students of differing abilities in the same class. The intent of differentiating instruction is to maximize each student's growth and individual success by meeting each student where he or she is, and assisting in the learning process. (Hall et al., 2003, p. 2)

The above definition brings to mind the one–room school house with mixed abilities, age groups, and subjects. In the late 1800s, Francis Parker and John Dewey each discussed the necessity for hands on instruction, relevance of subject matter, and learning readiness. Dewey wrote about preferential learning though he did not name it as such. With the vernacular of his era, he spoke of learning styles or the different and preferred ways that each student learns. Regarding the child, Dewey (1902) wrote, "It is he and not the subject-matter which determines both quality and quantity of learning" (p. 13). Dewey (1897) also believed that the student should be actively involved in the learning process).

Dewey said that one of the problems in education was discerning "how to use the child's individual tendencies, his original impulses to express himself with such growing power and skill as to help him contribute with increasing effectiveness to the life of his group" (as cited in Mayhew & Edwards, 1966, p. 40). Dewey believed that a child's intellectual growth would be greatly influenced if his or her natural impulses or tendencies were utilized in the process of learning. "Dewey roughly classified and described these native impulses under four heads: the social, the constructive, the investigative, and the expressive" (as cited in Mayhew & Edwards, 1966, p. 40).

Kolb (1984) was one of the first to take the reflective thinking of Dewey and translate it into the concept of learning styles. Later, Kolb would develop his own theory about learning and he created some of the first learning style inventories. Kolb's learning styles are defined as feeling, watching, thinking, and doing. According to Kolb, concrete experiences are what will provide information as a basis for reflection. The reflections are then used to form abstract concepts which can be actively tested to gather more information and the process repeats itself; however, experience alone does not dictate how a person will reflect and learn. Learners can

choose which style or mode to use in given situations. For example, imagine that a person is learning how to drive a car. This learner can choose how to learn. One might choose to start learning vicariously or learn via reflection by observing other people as they drive. Another learner might prefer to begin more abstractly. For example, this abstract learner might read and then analyze a book on driving instruction before getting behind the wheel. In addition, another learner may prefer hands on learning and decide to jump right in and get behind the wheel of a car to practice driving on a test course (Kolb, Boyatzis, & Mainemelis, 2000). These different styles of learning how to drive a car might fit in as follows with Dewey's (1899) defined impulses or tendencies for learning: Watching others drive might stem from a social tendency; reading about how to drive from the investigative tendency; and jumping in the car to actually drive would be an example of the constructive or hands-on tendency for learning.

Dewey (1902) actually stated that education is life itself. He wrote that children come to school to do things and live in a community that will give them real, guided experiences. He believed that students should be involved in real-life challenges and tasks. Not only is this evidence that Dewey would understand multiple intelligence theory (Gardner, 1983), but it also confirms that he was the first to put this line of thinking into text. It would be nearly a century later that Gardner (1983) and Tomlinson (1999) would put names to Dewey's thought processes on education, i.e., Gardner birthed the term multiple intelligence and Tomlinson posited DI. "There is no single uniform power of thought, but multitude of observations, memories, imagination, and common sense, that together comprise thoughts. To develop thinking we need to develop curiosity and the habit of exploring and testing" (Dewey, 1933, p. 55). The idea of inquiry and an increase in questioning to develop curiosity and reflective thought fits in well with Tomlinson's (1996) theory on DI because students can learn via the process of investigation

and inquiry. Additionally, Dewey (1899) believed that students thrive in an environment where they are allowed to experience and interact with the curriculum, and all students should have the opportunity to take part in their own learning. He also argued that in order for education to be most effective, content must be presented in a way that allows the student to relate the information to prior experiences, thus deepening his or her connection with this new knowledge. Dewey (1938) believed the process of learning was just as important as the outcome and that the teacher should serve as a facilitator of the process instead of standing up front and dispersing information. Tomlinson (1996, 1999, 2001, 2005) has authored similar statements in her books on differentiation.

Multiple Intelligences

When Gardner (1983) wrote *Frames of Mind* and described each of the multiple intelligences, he was constructing a rationale and laying a foundation for more easily engaging students. Likewise, Dewey also attempted to explain how students can be more easily motivated to learn. Dewey (1897) believed that each learner constructs his or own knowledge based on unique world experiences and the meanings learned from these same unique experiences. Dewey (1899) argued that intelligence cannot be quantified and that it is the "sum-total of impulses, habits, emotions, records, and discoveries" (p. 68). It is because of these lines of thinking that the educational implications of Gardner's multiple intelligence theory stand in a direct line from and were influenced by Dewey (Deblois, 2002). Just as Dewey believed that the expressive arts such as painting, modeling, or drawing come from the constructive impulse or that a child's instinct to learn by communicating with others is derived from the social impulse, Gardner believed that all learners are gifted with certain impulses, instincts, or in his words, intelligences (Armstrong, 2009).

Initially, Gardner (1983) described seven such intelligences, which are linguistic, logical-mathematical, bodily-kinesthetic, visual-spatial, musical, interpersonal and intrapersonal and then he wrote about putting them into practice. Gardner explained that several things must exist for an intelligence to become legitimate. He viewed intelligence as "the capacity to solve problems or to fashion products that are valued in one or more cultural settings" (Gardner & Hatch, 1989, p. 5).

> Gardner reviewed the literature using eight criteria or "signs" of an intelligence: potential isolation by brain damage; the existence of idiots savants; prodigies and other exceptional individuals; an identifiable core operation or set of operations; a distinctive development history; along with a definable set of "end-state" performances; an evolutionary history and evolutionary plausibility; support from experimental psychological tasks; support from psychometric findings; and susceptibility to encoding in a symbol system. (as cited in Smith, 2008, p. 2)

Later, he determined that an eighth intelligence did exist and he defined it as naturalist intelligence (Gardner, 1999). Gardner has been conducting ongoing research since 1997 to determine whether or not other intelligences exist with regard to spirituality, existentialism, and morality. As shown in Table 1, eight intelligences have been confirmed.

Table 1

Gardner's Currently Defined Intelligences

Intelligences named	Intelligences defined
Linguistic	Word smart: includes the ability to use language to express oneself and to remember information
Logical-mathematical	Number smart: having the capacity to analyze problems logically, carry out mathematical operations, and investigate issues scientifically
Bodily-kinesthetic	Movement smart: ability to use one's whole body or parts of the body to solve problems
Visual-spatial	Art smart: having potential to recognize and use the patterns of wide space and more confined areas
Musical	Music smart: having skills in the performance, skill and composition of musical patterns.
Interpersonal	People or social smart: the capacity to understand the intentions, motivations and desires of other people and to work effectively with people
Intrapersonal	Self smart: the capacity to understand one's self and to appreciate one's feelings, fears and motivations
Naturalist	Nature smart: ability to recognize and categorize plants, animals, and other objects in nature (1993)
Existential*	Wondering smart: sensitivity and capacity to tackle deep questions about the meaning of life such as, What is the
*not confirmed	meaning of life? Why do we die? How did we get here?

Note. The first seven intelligences listed were named and defined by Gardner (1983). Naturalist was added in 1993 and Existential has been discussed since 1999 (Gardner, 2006).

Smith (2008) noted that some researchers felt that a spiritual intelligence would be better titled as existential but at the time, empirical evidence was sparse. In fact, two common criticisms of Gardner's work is that (a) he is a psychologist and not an educator and (b) though he has a basis for defining an intelligence, his work is primarily subjective (Smith, 2008). Gardner (2006) has not definitively added the ninth intelligence to his original list. "Perhaps the difficulty is that Gardner wisely believes that this will open a can of worms best left out of the arena of education" (Wilson, 2015, para. 3). The can of worms might include issues such as

conflicts with spirituality or the probability of offending various religious orders and denominations. Despite Gardner's avoidance of committing to an existential intelligence, there are many who have embraced it as a true intelligence (Wilson, 2015). Some have called this intelligence cosmic smarts (Wilson, 2015). Gardner has not yet been able to scientifically prove that the ability to think existentially is a multiple intelligence, but he has unofficially defined this potential intelligence as *wondering smart* (Carlson-Pickering, 1997, p. 21).

With the onset of digital media and other advances in technology, students have better control of how and what they learn possibly lessening the importance of the best multiple intelligence one should use when acquiring knowledge (Davis, Christodoulou, Seider, & Gardner, 2011). One of Gardner's latest books is more about how the digital generation chooses to learn than it is about his theory of multiple intelligences (Gardner & Davis, 2013). Gardner (1999) will admit that much of his work is subjective; however, he still feels that the eight intelligences can have a place in the field of education.

Gardner (1993) also viewed the intelligences as ways to find meaning in knowledge or styles of learning. The learning style would be the same as the intelligence. For example, if a person can best learn by coordinating his or her mind with the body, then he or she has a bodily-kinesthetic learning style. In some studies (CAST, 2015; Tomlinson, 2005; Tomlinson & Eidson, 2003), learners are described as having a learning style or mode that is visual, auditory, or hands-on. Learning styles have been greatly simplified; however, for the purpose of this study, learning styles have been viewed as linked to the multiple intelligences identified by Gardner.

All people have different learning styles and learn at different paces. While some learners put in very little effort to receive high marks, other learners may have to work very hard to earn

an average grade. Learning activities and methods can be modified to ensure that a learner is in the most comfortable learning environment. One method of such modification is applying the theory of multiple intelligence to the various modes of learning (Gardner, 1993).

If the teacher or learner is aware of the multiple intelligences that the learner possesses, then a learning style can be chosen that will enhance the cognitive abilities of the learner. Application of the multiple intelligences via learning styles is what has come to be known as DI (Tomlinson, 1996, 1999). Tomlinson (1995) noted various examples of the intersections of DI with multiple intelligence theory and those examples follow: Acquiring information using this method of instruction are researching information using the internet, the library, books, or other such resources which would be verbal or linguistic; if information is classified, sorted, or organized according to certain attributes then mathematical and logical intelligences or learning styles are utilized; when a learner is self-reflective, an intrapersonal learning mode is addressed; whole group or community learning would be interpersonal; if a learner is exposed to information via musical jingles to help learn key points or facts, then the learning mode would be musical. Some learners have strengths in more than one area of multiple intelligences and by trying different methods when learning, the needs of learners can be more easily met.

In less than 20 years, Tomlinson's philosophy is now being called a theory (Gregory & Chapman, 2007; Tomlinson, 2005). Tomlinson (2000) developed an implementation philosophy for utilizing Gardner's intelligences. She wrote,

> What we call differentiation is not a recipe for teaching. It is not an instructional strategy. It is not what a teacher does when he or she has time. It is a way of thinking about teaching and learning. It is a philosophy. (Tomlinson, 2000, p. 6)

Since Tomlinson coined the term differentiation, several authors have written books or articles promoting philosophy from practice to theory as they write about the theory of DI (e.g., Chapman & King, 2005; Foucault, 2008; Gregory, 2003; Gregory & Chapman, 2007; Hall, 2002). Per Delisle (2015), the Association for Supervision and Curriculum Development (ASCD) has released more than 600 publications on differentiation.

Some teachers also claim to provide *differentiation by outcome*; however, most common student tasks often produce *different outcomes* (McGarvey, Day, & Harper, 1996). "The fact that common tasks almost always produce different outcomes for a range of different pupils does not in itself provide differentiation" (McGarvey et al., 1998, p. 148). Furthermore, researchers from Northern Ireland found that though most students prefer differentiated lessons, DI is not widely used by secondary teachers in Ireland (McGarvey et al., 1998).). A similar study in New York asked high school seniors to look back over their high school classroom experiences. These students were well aware of differentiating teaching methods but realized they were not often exposed to the implementation of such engaging, effective instructional methods (Turley & Zumwalt, 1995). Russell et al. noted that DI is often confused with terms related to different learning outcomes, and only takes place when educators respond to learning differences in order to challenge students to take the next step in learning (as cited in McGarvey et al., 1998). Until recently, the term differentiation has been used in varied circumstances and with different meanings that can be easily changed or adapted (McGarvey et al., 1998).

The Evolution of Differentiated Instruction

Dewhurst (1996) argued that differentiation should be considered a process instead of a teaching strategy. In addition, Daniels (1993) discussed the complexity of differentiation with little hope for it to become a best practice method of instruction. It is no wonder that it has taken

several years for this concept to become more positive and less impractical for teachers to embrace. DT is evolving; however, the ways that teachers differentiate has not evolved as quickly (Smutny, 2003). In fact, most teachers are still using traditional methods as if whole class instruction fits each individual student (Gregory & Chapman, 2007). Additionally, a new look at learning has been designed to do precisely what DT is meant to do (Rose & Meyer, 2002).

Differentiated Instruction and Universal Design

Universal design for learning (UDL) is an example of yet another philosophy or method that opposes teaching students as if one lesson methodology was instructionally appropriate for all. UDL is a set of principles for designing curricula that provides all individuals with equal opportunities to learn (Rose & Meyer, 2002). UDL is designed to serve all learners regardless of ability, disability, gender, age, and cultural or linguistic background (van Garderen & Whittaker, 2006). UDL calls for multiple approaches to representation, action and expression, and engagement (Rose & Meyer, 2002). Just as DT uses multiple ways of presenting instruction, provides alternative ways for demonstrating knowledge, and offers a variety of content and tools, so does UDL (van Garderen & Whittaker, 2006).

The roots of UDL are found in early civil rights and special education legislation that emphasized the right of all students to a free, appropriate public education in the least restrictive environment (Hitchcock, Meyer, Rose, & Jackson, 2005). The UDL framework was conceived by researchers at the CAST in 1984 as the result of the alignment of three conceptual shifts: advancements in architectural design, developments in education technology, and discoveries from brain research (CAST, 2015). The term *universal design* came into existence after the passage of two public laws: (a) the Americans with Disabilities Act (ADA) and (b) the

Individuals with Disabilities Act (IDEA) in 1990 (ADA, 1990, 2004). The ADA demanded that public buildings, including schools, were retrofitted with architectural features such as ramps and wider doors to provide physical access for all (as cited in CAST, 2015). This was not an inexpensive design and after many organizations experienced the high cost of such design, a more cost-effective strategy was suggested by leaders in the field of architecture. Buildings would be designed from the beginning so that all users could have access; they would be built with universal design principles in mind (CAST, 2015). Public education experienced change as IDEA demanded that services be delivered to millions of students who had previously been denied access to an appropriate education. Inclusion, which is including students with special needs with peers who do have needs, was emphasized as one way to be in line with IDEA Educators who sought "tools and methods to make inclusion education practical and manageable." (CAST, 2015, p. 2)

According to the National Center on Universal Design for Learning at CAST (2015), the basis of research that supports UDL is derived from the work of Lev Vygotsky and Benjamin Bloom on understanding individual differences and the pedagogies required to address them.

> The variable that needed to be addressed, as Bloom saw it, was time. It made no pedagogical sense to expect all students to take the same amount of time to achieve the same objectives. There were individual differences among students, and the important thing was to accommodate those differences in order to promote learning rather than to hold time constant and to expect some students to fail. Education was not a race. (as cited in Barlow & Leston, 2012, p. 219)

Similarly, Vygotsky (1978) created a concept called the zone of proximal development (ZPD). According to Vygotsky, ZPD "is the distance between the actual development level as

determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p. 86). In other words, ZPD is the distance between what a learner can do with help and without help. Vygotsky (1978) also believed that peer interaction was an important part of the learning process, and he suggested pairing more skilled students with those less competent to help the latter learn new skills more quickly. The bridge he used to close the gap of frustration is what we now know as scaffolding (Wood, Bruner, & Ross, 1976, p. 90). Scaffolding gives a student what is necessary to acquire a new skill and can be removed as the student is able to complete a task independently.

> The term *scaffolding* comes from the works of Wood, Bruner, & Ross (1976) and was developed as a metaphor to describe the type of assistance offered by a teacher or peer to support learning. In the process of scaffolding, the teacher helps the student master a task or concept that the student is initially unable to grasp independently. The teacher offers assistance with only those skills that are beyond the student's capability. (as cited in Lipscomb, Swanson, & West, 2004, p.3)

It is essential to think of the ZPD as a constantly moving target. It is a target that becomes smaller as the learner moves progressively forward. It is also possible to view ZPD as the bridge of scaffolding that supports the learner.

Keeping this in mind makes it easier to see how the ZPD is related to both DT and UDL. The purpose of UDL implementation is to create expert learners—learners who can assess their own learning needs, monitor their own progress, and regulate and sustain their interest, effort, and persistence during a learning task (CAST, 2015). Many students learn within traditional

classrooms with a traditional curriculum. However, most students need supports and/or scaffolds to become expert learners (Lipscomb et al., 2004).

According to CAST (2015), UDL is not in conflict with other avenues of instruction. Rather, UDL serves as a branch that includes cooperative learning, DI, performance-based assessment, project-based learning, multisensory teaching, theory of multiple intelligences, and student centered learning.

No wonder it has been said that the meaning of differentiation is malleable (National Center on Accessible Instructional Materials [AIM], 2014). DT serves as an umbrella for the several methods and practices that are part of UDL (CAST, 2015). UDL was conceived about 19 years ago and has been recognized as part of the National Institute of Learning; however, DT, which has been in existence for more than thirty years, is still striving to earn its reputation and usability (CAST, 2015). DI is a method that combines many practices into lessons and curricula that will benefit the multi-ability classroom (Gregory & Chapman, 2007). Multi-ability is the new language for what has been called the heterogeneous classroom; and in addition, there has been much discussion in educational literature about the impact of ability groupings on learning (Gregory & Chapman, 2007). Although teachers tend to believe that achievement is improved by creating homogeneously grouped classes, this is not generally supported by the research (Gregory & Chapman, 2007; Gregory & Kuzmich, 2004). In 1987, Robert Slavin (1988) coordinated the findings of 14 studies on this issue and found that "the achievement effects of ability grouped class assignment are essentially zero" (p. 76). Slavin further found that while there is more evidence that ability grouping may have advantages for academically gifted students, it does not raise the achievement level of students on most ability levels. Additionally, students who learn at a lower level are stigmatized by homogenous groupings (Gregory &

Chapman, 2007). Why it is not embraced more often by teachers is inexplicable and a mystery to be investigated.

The Methodology of Differentiated Instruction

Tomlinson (1996, 1999) asserted that differentiating instruction encompasses an instructor's response to learner differences by adapting curriculum and instruction on six dimensions. Content, process, and product are the three teacher-dependent dimensions while the three learner-dependent dimensions are interest, learning profile, and readiness.

The teacher dimensions can be varied across a lesson or unit of instruction. Content is the *what* of the lesson, process is the *how* of the lesson, and the product is the demonstrated learner results. Content can be adapted by changing lesson complexity, using a variety of resources, and altering the context of the lesson by converting the environment into a productive and enjoyable place to learn (Tomlinson, 1996, 1999).

Tomlinson (1996, 1999) continued to explain that process is changed by adapting how the lesson is presented. Instruction can be delivered a variety of ways: one on one, small group, peer sharing, and whole class. If necessary, material can be chunked or compressed as needed by specific learners. There are several ways to build cooperative activities and inquiry can be structured via project-based learning, service learning, or performance-based experiences. Student work can also be accepted in various ways. The diversity of product should reflect the different multiple intelligences with corresponding rubrics for assessment. Students, as learners, should have some choice in the teacher-dependent dimensions.

No one learner-dependent dimension is more important than another (Tomlinson, 1996, 1999; Tomlinson & Strickland, 2005). Students must have some interest in what is to be learned. Relevance of material can make learning palatable for students with learning disabilities and

more interesting for those who learn more easily than others (Gregory, 2003). Numerous interest inventories are accessible to assist teachers in getting to know their students; additionally, there are profile sheets that once completed will enlighten teachers about student strengths, weaknesses, or gaps (Gregory, 2005). Readiness is also important, and teachers must look beyond test scores to schema or background knowledge, past school history, and student self-efficacy (Gregory, 2003, 2005; Heacox, 2002).

Multi-ability classrooms are diverse and with DI, diversity can be celebrated and used to support teacher and student dimensions of learning (Gregory & Chapman, 2007). For example, the new student who speaks little English can utilize an intelligence other than linguistic to demonstrate what he or she has learned. Or if he or she is placed with a peer who can somewhat speak the language of the new student, a peer project can be created for representation, expression, and engagement for nearly any lesson. This is more easily done in a differentiated classroom than in a room where whole class instruction is taking place.

> Differentiation can be defined as a way of teaching in which teachers proactively modify curriculum, teaching methods, resources, learning activities, and student products. The needs of individual students and/or small groups of students are addressed to maximize the learning opportunity for each student in the classroom. (Tomlinson et al., 2003, p. 121)

Gregory (2003) further stated that

> differentiated instruction is a philosophy that enables teachers to plan strategically in order to reach the needs of the diverse learners in classrooms today. Differentiation is not just a set of instructional tools but a philosophy that a teacher and a professional learning community embrace to reach the unique needs of every learner. (p. 27)

"Differentiation is changing the pace, level or kind of instruction you provide in response to individual learner needs, styles, or interest" (Heacox, 2002, p.5). Many books now exist with different definitions of DI; however, each author in so many words, has the same method for achieving competency in this type of instruction (Williams, 2015). Foucault (2008) specifically addressed parents and encouraged them to find out in which dimensions teachers were using DI. She listed several points about what DI is and what it is not. For example, Foucault (2008) stated that while this method of instruction is assigning different activities that are geared to unique learning styles, interests, and levels of thinking, it is not individualized learning plans for each student. She explained that DI is providing students with choices about what and how they learn but it is not free time to draw or practice their talents or learning strengths. She encouraged parents to ask specific questions about this probable best practice method and to understand that not all assignments or materials should be differentiated every day (Foucault, 2008).

Although DT is viewed by many professionals as a theory that should be put into practice, DI is not the only method of instruction that has been proven profitable for academic gain (CAST, 2015). Hall et al. (2003) maintained that UDL, for example, is considered both successful and practical. In addition, UDL has been widely recognized by most professionals in the field of education (Hall et al., 2003). Accomplished teachers tend to use a variety of instructional methods to ensure that their students learn. They realize how important it is to acknowledge student learning profiles and that there is more than one way to engage students for academic productiveness (Foucault, 2008; Gregory & Chapman, 2007).

DI is one method that encompasses many other methods and strategies but Foucault (2008) also cautioned parents about the way DI is utilized. She specifically defined DI using two categories: what DI is and what DI is not (Foucault, 2008). Foucault stated that DI is several

things such as having high expectations for students, adjusting core content and curriculum, and using assessment to determine ongoing needs of students. While Foucault stated that DI is acknowledging individual needs and assigning some activities to varied interests and learning styles, she also stated that DI is not individual learning plans for each student. Additionally, Foucault ascertained that DI is not extra reading time, more problems, or free time to improve one's talent or special multiple intelligence. She went on to say that DI is not teacher centered; it is student-centered and provides students with choices how they will learn, and to some extent, what they will learn. DI uses flexible educational experiences. Students can move in and out of groups depending on their instructional needs but in DI they would not be placed in cooperative learning groups where the same students lead again and again (Foucault, 2008; Gregory & Chapman, 2007). Groups would be assigned only if based on core content and a complex level of learning. DI may include some activities that not all students can do because this proposed best practice of instruction utilizes high level goals with progression of continuous formative assessment (Foucault, 2008; Gregory & Kuzmich, 2004).

Differentiated Instruction Versus Whole Class Instruction

When learning tasks are consistently too hard, students become anxious and frustrated but when tasks are consistently too easy, boredom results (Gregory, 2005). Both boredom and anxiety inhibit a student's motivation to learn, and eventually student achievement may be inhibited as well (Margolis & McCabe, 2006). DI helps teachers avoid student anxiety and boredom that can be evident in one-size-fits-all curriculum (Foucault, 2008). Though this review highlights the positive aspects of DI as compared to whole group instruction, there is evidence that there is a time and a place for whole group learning.

In a recent doctoral study, Luster (2008) found that while instruction should be based on the interests of the students and it is unrealistic to believe that students will achieve equally, fundamental skills are best taught to the whole class. However, Luster also discovered that innovative instruction such as DI can enhance learning and increase test scores more than whole-class instruction. The two instructional strategies that were used in the Luster study were DI and whole-class instruction. Luster investigated and compared how 135 students in six, Grade 4 math classes performed while receiving whole-class or DI. The comparison group receiving DI also served as a causal-comparative nonequivalent control group. This quantitative study utilized a descriptive research design with a pretest and posttest nonequivalent control group.

Nonequivalent control is a term that means the way the researcher assigned the groups was not random (Trochim, 2006). This method was appropriate for Luster because "McCombs (2003) explained that causal-comparative studies are designed to establish cause and effect relationships among groups" (as cited in Luster, 2008, p. 47). Causal-comparative research attempts to identify a cause-effect relationship between two or more groups (Gay, 1987). In the Luster (2008) study, the independent variables were the two instructional strategies and the dependent variable was student performance. After the pretest, both strategies were implemented for 56 days, after which a posttest was given to determine which group had the greatest student achievement. The populations were cognitively and demographically similar in both classes and the teachers who taught the classes had comparable abilities and experience. The test scores were used to compare student math achievement among participants receiving whole-class instruction versus DI.

In the pretest, the group receiving whole-class instruction had a statistical mean of 313.56. The group receiving differentiated instruction had a statistical mean of 308.42.

> Based on the pretest scores the group receiving whole-class instruction was the higher performing class. In the pretest, the mean score of the group receiving whole-class instruction decreased to a mean score of 310.76 (-2.8). The class receiving differentiated instruction had an increased mean score of 326.00. The mean score increased by 17.58. [The confidence interval was not discussed.]. There was a significant difference in the score increase of the class receiving differentiated instruction and the class receiving whole-class instruction. (Luster, 2008, pp. 92-93)

Additionally, the six teachers participated in a survey with both closed- and open-ended questions that were designed to appraise teachers' attitudes towards differentiated and whole-class instruction. The survey questionnaire composed of 16 statements was one that was modified by an existing survey by the research department of a particular school system. A 5-point Likert scale was used. The choices in the 5-point Likert scale were *strongly agree, agree, neutral, disagree,* and *strongly agree* (Luster, 2008, p. 53). The results of the survey indicated which form of instruction was perceived by these teachers as being most effective. The data in the Pearson Correlations Test indicated that classroom instruction should be teacher centered but based on the interest of the students and that teachers should incorporate real-life applications of ideas and skills into the instruction.

> The participants in the survey tended to support and espouse a constructivist view of learning that incorporated a differentiated strategy. The only exception to this view was in the belief that fundamental skills are perhaps taught best to the whole class. This aspect of the results is not surprising because it is a common teaching strategy to introduce new concepts to the whole class before implementing varied instructional methods. (Luster, 2008, p. 88)

Luster (2008) concluded that while fundamental instruction should occur within the whole class instructional setting, educators need to be innovative and introduce new instructional methods such as DI into the classroom.

Although some researchers have found that whole class instruction may be more beneficial to students when introducing new concepts, others have discovered that alternative methods of instruction are vital at any stage of learning. This is especially true when students' predominant learning style is not verbal or linguistic. For example, Caltaldo (2008) investigated the perceptions of teachers in the Charleston County School District in North Carolina. This mixed-method study examined perceptions' of 47 elementary school teachers regarding student variances and differentiation. The research questions were

> How do teachers identify the varied needs of their students? What barriers impede teachers from doing so effectively? What do teachers consider the predominant learning styles of students in their classrooms? What do teachers think accounts for the differences in how their students learn? What strategies do teachers most use to differentiate instruction? (Cataldo, 2008, p. 8)

Caltaldo found that 29% of the respondents identified their students' predominant learning style as kinesthetic and visual.

Although the generalization of her study was limited, Caltaldo (2008) found that differentiation is a way to address the individual needs of students. Other implications of this study indicated that (a) teachers need to be better trained in strategies to differentiate instruction, (b) time was a barrier to teachers having the time to get to know their students' interests, and (c) teachers needed support when DI was to be implemented. It would be helpful to determine if

other educators are limited in the extent of their own knowledge of how best to differentiate instruction.

Standards based learning requirements are driving the instruction of today's teachers and they are setting up their classroom instruction as if one size fits all (Gregory & Chapman, 2007). Many states in the United States have mandated that students must pass qualifying exams in order to receive an academic diploma. The testing process has come under scrutiny by teachers, administrators, and the public. Chapman and King (2005) have designated an entire book on how a single assessment cannot fit all. The literature has been ambiguous about how DI can benefit students, but it is clear that there are many ways this method of instruction can be effective (Chapman & King, 2005; Gregory & Chapman, 2007; Hall, 2002; Tomlinson, 1999).

Differentiated Instruction and Response to Intervention

Even though Luster (2008) found that whole class instruction is better for teaching fundamental skills, many researchers have found that response to intervention (RTI) has been proven most successful when fundamental skills are introduced and retaught in the differentiated classroom.

> There is no single, absolute definition of RTI. A quick and descriptive summary, though, comes from the National Center on RTI (NCRTI) and reads: With RTI, schools identify students at risk for poor learning outcomes, monitor student progress, provide evidence-based interventions and adjust the intensity and nature of those interventions depending on a student's responsiveness, and identify students with learning disabilities or other disabilities. (NCRTI, 2012, p.2)

RTI has been used most often for students with disabilities but typical pull-out programs for such students are disappearing. This is happening for several reasons but the main issue is one that is economical (Landrum, 2001).

As traditional pull-out programs for students who are identified as gifted and talented (GT) decrease in number (Landrum, 2001), classroom differentiation is becoming more essential for general-education teachers at the elementary level. According to Hertzberg-Davis and Brighton (2006), a typical public-school classroom contains at least 27 students whose academic performance easily spans five grade levels (p. 91). Teachers can no longer teach to the middle and effectively reach their students (Tieso, 2004). Whole group teaching may be more convenient but DI can maximize gains for all students and not just those who fall in the middle. Teaching to the middle can result in adverse effects for advanced learners, as well as struggling learners. If advanced learners are not challenged they become mentally lazy (Tomlinson, 2001). As cited by Tomlinson (2001), brain researchers Ornstein and Thompson agree, "We have evidence that a brain loses capacity and *tone* without vigorous use, in much the same way that a little-used muscle does" (p. 11).

RTI and DI are seen by Heintzman and Hanson (2009) as the *dynamic duo*. Today's teachers are using both powerful approaches to help their students succeed. RTI and DI share a common goal which is to modify instruction until it meets the needs of all learners (Heintzman & Hanson, 2009). While some teachers view multiple intelligences, learning styles, UDL, DI, and RTI as separate approaches to instruction, accomplished teachers see the relationship between all and how each complements the other (Goddard, Goddard, & Tschannen-Moran, 2007).

Tomlinson (1995) asserted that research supports evidence such that when teachers adjust their instruction to accommodate differences in student learning styles, student achievement and

positive attitudes toward the subject area increase. When differentiating instruction, teachers acknowledge that students come to a lesson with different starting points and whole class instruction will not meet the needs of all students (Hall, 2002). Craft (2002) defined whole class instruction as "one group of students, one set of outcomes, and one instructional plan" (p.1). While whole class instruction is teacher-centered, DT is student-centered and acknowledges that any one group of students is composed of mixed-abilities, interests, learning styles, and needs. Basically, differentiating instruction is more effective than solely teaching to the whole group because student needs and interests differ (Gregory & Chapman, 2007). Differentiation is essential in the classroom as it allows the teacher to cater to the individual student, rather than adopting a whole-class approach (Gregory & Chapman, 2007). Students are presented with curricula tailored to their individual needs; subsequently, improving student access to the curriculum (Hoover & Patton, 2005). Consequently, RTI using DI is an excellent approach for remediation of academic skills and content to be learned by students (Hoover & Patton, 2005).

Differentiated Instruction and Direct Instruction

Many teachers and administrators seem to believe that DT is much too complex and far too time consuming to incorporate into daily lessons (Gregory & Chapman, 2007). Differentiation, however, does not have to be complex. In fact, while one student group is completing seatwork (intrapersonal and possibly linguistic intelligence) and another group is working together cooperatively (interpersonal intelligence), the teacher may be teaching a third group via direct instruction (Tomlinson, 2005). The term *direct instruction* refers to a rigorously developed, highly scripted method for teaching that is fast-paced and provides constant interaction between students and the teacher (Gersten et al., 1988). "This method, rich in structure and drilling and content, is the opposite of the favored methods of today's high-paid

education gurus, and contradicts the popular theories that are taught to new teachers in our universities" (Gersten et al., 1988, p. 319). The other methods and theories include labels such as *holistic*, *whole class instruction, student-centered learning, cooperative education*, and *whole language* (Lindsay, 2014). A teacher who uses direct instruction imparts knowledge directly to the student via whole class, small group, or one on one; likewise, information is provided in a straight forward manner and directly to the learner who is receiving the input (Gersten et al., 1988; Lindsay, 2014).

According to Gersten et al. (1988), direct instruction should be no secret at all, for it has been proven in an educational study conducted by the U.S. Department of Education and continues to bring remarkable success at low cost when it is implemented (as cited in Lindsay, 2014). According to this longitudinal study (Gersten et al. 1988), direct instruction was found to be the best strategy and best practice method of instruction over a time period of five years. Students receiving direct instruction tested better in reading, arithmetic, spelling, and language. The study led by Gersten was named *Project Follow Through* with the original intention to study instructional methods that would reduce disparity between low- and high-performing students (Gersten et al., 1988). Project Follow Through was also the largest educational research study ever conducted, costing over $600 million, and covering 79,000 children in 180 communities (Lindsay, 2014). This study began in 1967 under President Lyndon Johnson and lasted nearly 30 years. By its conclusion in 1995, the project had consumed $1 billion and conducted research on an additional 20,000 students in the United States (as cited in Lindsay, 2014). Direct instruction was one of three major models studied in this research.

Direct instruction was defined by Gersten and Keating (1988) as a model, method, or approach that takes the learner through the steps of learning, and basically, one step at a time. DT

does not have to compete with direct instruction. Instead, direct instruction may be included as a student choice or teacher directed activity within the differentiated classroom (Chapman, 1993). Direct instruction, itself, can be differentiated, and teachers can change how this extremely successful method is delivered (Tomlinson, 2005). This scripted method can be delivered in various ways to the whole class, small groups, and individuals (Pearson Education, 2010).

Differentiated Instruction and Student Self-Efficacy

Self-efficacy is the belief in one's capabilities to organize and execute the courses of action required to manage prospective situations (Bandura, 1995). Now that education has become a data-driven business, and accountability is a huge factor in standards-based learning, self-efficacy has also become a part of the differentiated method of instruction (Gregory & Kuzmich, 2004). "Although much has been discovered about relations between self-efficacy and academic achievement, questions remain about links between achievement, the structure of learning tasks, and changes in students' self-efficacy as students engage with a single, complex authentic task" (Lodewyk & Winne, 2005, p. 3).

It is befitting that educators have concerns about the self-image of their students. Self-image is a general term and defines the positive feeling that one has of self; however, it must be taken a step further to persevere in more difficult situations. According to Bandura (1995), self-image by itself does not provide enough strength to enable a student to perform more challenging tasks. Understanding the concept of self-efficacy and how to nurture it are important teacher tools (Bandura, 1995). Self-efficacy is a task specific self-image that is based on past successes (Bandura, 1995; Margolis & McCabe, 2006). The student with a high level of self-efficacy, through his or her accomplishments, has earned a positive feeling of self. This, in turn, proves self-worth and the student is able to say "I can do it!" When self-efficacy has been developed,

students are able to complete tasks with minimal assistance and gain a true feeling of self-satisfaction (Bandura, 1995). Developing a sense of self-efficacy in mixed ability classrooms can be challenging (Margolis & McCabe, 2006). If learning becomes too difficult students become frustrated and want to give up for fear of failure. Differentiation can provide advanced students with the challenge they need to develop a sense of self-efficacy (Tomlinson, 2001). At the same time, various and prescribed instructional activities can reinforce a student's intervention needs (Tomlinson & Strickland, 2005). For example, students collaborating about a lesson may increase social competence or students who successfully complete a lesson kinesthetically will begin to feel more confident after having failed paper and pencil lessons that rely solely on linguistic intelligence (Tomlinson & Strickland, 2005).

An action research study was completed while attempting to foster and sustain engagement during a ninth grade English unit in poetry (Kozak, 2012). In the beginning, students were pessimistic about learning poetry but as the unit progressed, students became more engaged and were discussing the content of the poems more deeply as the unit moved on. One finding was that student enthusiasm and engagement levels were higher when given assignments for which they were given a greater degree of autonomy or more control to explore (Kozak, 2012, p. 70).

DI is student centered and inclusive (Chapman, 1993; Tomlinson, 1999). It gives the students power to make choices as they strive to be in control of their learning experiences (Margolis & McCabe, 2006). Teachers today also compete with inappropriate behavior and students strive for self-efficacy (Bandura, 1995); furthermore, choice making has proven to be an effective intervention for reducing problem behavior and increasing appropriate behavior (Kern,

Montegna, Vorndran, Bailin, & Hilt, 2001). However, self-efficacy has not always been proven as successful for academic achievement.

In a study by Lodewyk and Winne (2005),

> Students' self-efficacy for learning (SEL) and for performance (SEP) was tracked as they worked on well- and ill-structured tasks during their regular class. Students reported higher SEL and SEP for a well-structured task. Moderate achievers reported significantly more difficulty with the ill-structured task. SEP was higher and more stable than SEL, especially in early phases of both tasks. After accounting for overall academic achievement, self-efficacy was a negligible predictor of achievement. (p. 3)

On the other hand, in a correlational study conducted by Pintrich and de Groot (1990) that examined relationships between motivational orientation, self-regulated learning, and classroom academic performance, self-efficacy and intrinsic value were positively related to cognitive engagement and performance. Participants included 173 seventh graders from eight science and seven English classes. A self-report measure of student self-efficacy, intrinsic value, test anxiety, self-regulation, and use of learning strategies was administered, and performance data were obtained from work on classroom assignments (Pintrich & de Groot, 1990).

Zajacova, Lynch, and Espenshade (2005) attempted to link self-efficacy and stress. They surveyed 107 nontraditional (immigrant and minority) college freshmen at a large urban commuter college. The results suggested that academic self-efficacy is a more robust and consistent predictor than stress of academic success (Zajacova et al., 2005).

Differentiation is becoming a way to support teachers in structuring learning tasks for improved student engagement (Tomlinson & Strickland, 2005). This is true for all classrooms but especially for those inclusive classrooms that span more than three or four academic levels

(Gregory & Chapman, 2007; Tomlinson & Strickland, 2005). Many learners who struggle on a daily basis believe that they cannot succeed in school; they feel certain that anything school and academically related will warrant failure and embarrassment (Margolis & McCabe, 2006). Bandura stated that such struggling learners do not believe that they have the "capabilities to organize and execute the courses of action required to produce given [academic] attainments" (as cited in Margolis & McCabe, 2006, p. 220).

While DT provides opportunities for self-efficacy, the activities must be well-structured to enhance and support academic achievement (Chapman, 1993). In another study by Midgley and Feldlaufer (1987), it was found that students are given fewer opportunities to make their own decisions in middle school than in elementary school.

> Student and teacher perceptions of actual and preferred student decision-making opportunities in mathematics classrooms were assessed before and after the transition to junior high school in a longitudinal sample of 2210 students. The results were that students and teachers perceive fewer actual student decision-making opportunities after than before the transition and that students express a preference for more decision-making opportunities while teachers believe students should have fewer opportunities after than before the transition. (Midley & Feldlaufer, 1987, p. 225)

In DT, the teacher is the manager yet students may be provided with opportunities of choice thereby providing a form of self-efficacy (Chapman, 1993). Studies show that differentiating instruction can increase student motivation, as well as feelings of self-confidence and self-efficacy (Erwin, 2003; Glasser, 1988). Self-efficacy encourages student engagement.

Differentiated Instruction and Student Engagement

Teachers often feel frustrated by the lack of motivation on the part of students from all readiness levels (Tomlinson, 1999). However, by differentiating instruction teachers are able to promote intrinsic motivation in learners (Tomlinson, 1999). The value that students place on a topic is directly related to how relevant they believe the material is to their lives (Heacox, 2002). Therefore, by taking the time to discover students' interests, teachers will become more adept at developing lesson plans and assignments that will motivate them (Tomlinson, 1996, 1999). One of the primary dimensions of DT is student interest (Tomlinson, 1996).

The use of choice helps to intrinsically motivate students (Palmer, 2007). A choice of activities is engaging because students feel they are valued for their personal achievements; they are able to identify their preferred learning style and claim their own personal qualities such as their ownership of specific intelligences (Palmer, 2007).

When students are engaged and take responsibility for their own learning, the need for behavior management lessens (Erwin, 2003). DT can reinforce effective classroom management and when combined with practice will support teachers as they meet the everyday challenges of effective organizational and instructional practices (Erwin, 2003; Gregory & Chapman, 2007; Tomlinson & Strickland, 2005). Engagement is one of the most important components of any instructional method (Tomlinson & Strickland, 2005). Effective DI includes good management and organizational skills (Gregory & Chapman, 2007) and lessons are usually prepared to maximize students' strengths and intelligences (Tomlinson, 1996, 1999). For example, students learning algebra who are logical-mathematical challenged, but are strong kinesthetically, benefit from using manipulatives to learn various math principles (Tomlinson & Eidson, 2003). Because lessons are developed to address the varied learning needs of students, most learners are actively

engaged and on task during the class period (Tomlinson & Eidson, 2003). Classroom differentiation actually benefits all learners and lowers classroom behavioral problems since students are more engaged in subject matter (Cooper, 1998; Knopper & Fertig, 2005; Landrum, 2001).

Differentiated Instruction and Technology

Bransford, Sherwood, Hasselbring, Kinzer, and Williams (1990) stated that digital learning programs would offer several methods for providing DI to classrooms. These programs are now available to teach students through individualized computer instruction (Gardner & Davis, 2013). Students who like to work independently enjoy learning digitally or those who prefer group work can work together via social networking applications (Bransford et al., 1990; Gardner, 2006; Gardner & Davis, 2013). Research affirms that the use of individualized computer instruction in the classroom results in students learning more, acquiring content faster, and having a deeper understanding of the lesson (Bransford et al., 1990).

Online Formative Assessment

Online assessments tend to have a greater impact on student achievement compared to paper assessments (Styers, 2012). The impact is greater because feedback is, in most cases, immediate. Not only do students want this feedback, but teachers also can use the data instantly (Styers, 2012). "During the guiding instruction stage, teachers use real-time student data to change ability groups or modify pacing. Once teachers have feedback on student performance, they can use the data to inform and modify the teaching cycle" (Styers, 2012, p. 3). Teachers can tailor their classrooms and digital instruction to meet the needs of all learners. Digital learning programs are systematic, responsive, and accommodating to the needs of a diverse classroom environment (Styers, 2012). Technologies can support DI.

> Given the availability of low/no cost technologies and multilevel instruction strategies, responsible to maximize achievement of general curriculum standards, we must increase our efforts to differentiate instruction. Any student may at times benefit from additional supports; all students deserve efforts to discover and enrich their individual gifts and talents. Multilevel instruction supports the general education classroom as a community to which age peers belong, where they can and should be nourished as individuals. With differentiated instruction and appropriate supports, intended benefits of inclusion for both students with and without disabilities can be realized. (Lawrence-Brown, 2012, p. 8)

Multitasking Pros and Cons

"Using tech tools that students are familiar with and already enjoy using is attractive to educators, but getting students focused on the project at hand might be more difficult because of it" (Paul, 2013, p.1). As stated in the first chapter, students today enjoy multitasking. But there is legitimate concern regarding multitasking and the way that some students say they learn.

> Attending to multiple streams of information and entertainment while studying, doing homework, or even sitting in class has become common behavior among young people—so common that many of them rarely write a paper or complete a problem set any other way. (Paul, 2013, p. 1)

Several studies have been completed about media multitasking habits. The concern about the learner's use of technology is not new but there is a growing body of concern about media multitasking while learning. A recent study by Rosen, Carrier, and Cheever (2013) found that students' *on task behavior* began to decline at the two-minute mark as they responded to social media or texts on their phones. The participants in the study also knew they were being watched while doing homework. They also knew the observation time was fifteen minutes long yet they

were not able to stay on task. In fact, they were doing their homework only 65% of the time they were observed.

> We were amazed at how frequently they multitasked, even though they knew someone was watching. It really seems that they could not go for 15 minutes without engaging their devices, adding, It was kind of scary, actually. (Rosen, 2013, p. 952)

Media multitasking includes activities such as checking email, posting or looking on Facebook, texting, talking on the phone, instant messaging, watching television, listening to music, tweeting, or surfing on the internet (Gardner & Davis, 2013).

A survey conducted by the Kaiser Family Foundation found that almost a third of the students surveyed said that when they were doing homework, that *most of the time* they were also listening to music, texting, watching television, or using some other medium (Rideout, Foehr, & Roberts, 2010). The study is called *Generation M²: Media in the Lives of 8- to 18-Year-Olds* and is the third in a series of large-scale, nationally representative surveys by the Foundation about young people's media use. Although the study looked at all aspects of kids' media use, one of the researchers admitted that she was particularly troubled by its findings regarding media multitasking while doing schoolwork (Paul, 2013).

> This is a concern we should have distinct from worrying about how much kids are online or how much kids are media multitasking overall. It's multitasking while learning that has the biggest potential downside, she says. I don't care if a kid wants to tweet while she's watching *American Idol*, or have music on while he plays a video game. But when students are doing serious work with their minds, they have to have focus. (Paul, 2013, p 2)

The media multitasking habit extends into the classroom for older students. For most middle and high school students, certain media is forbidden. These students may have access to text or use the internet while in class, but mobile phones are generally not permitted to be used in class and students who choose to do so will have consequences if caught. However, emailing and texting is nearly a universal practice in college and vocational schools (Paul, 2013). In a study that surveyed students in higher education, it was found that 80% of college students admit to texting during class (Coleman, Eastman, & Norman, 2011). In a study about how 1,072 law students use laptops during class, it was found that more than half the upper-year students seen using laptops employed them for non-class purposes more than half the time, raising serious questions about how much they learned from class (Sovern, 2011).

Multitasking and Attention to Learning

A psychology professor, David Meyer, at the University of Michigan has studied the effects of divided attention on learning (Paul, 2013). While it may not be difficult to listen to music and clean house, or fold clothes while watching a weather report, Dr. Meyer takes a firm line on the brain's ability to multitask, stating that "under most conditions, the brain simply cannot do two complex tasks at the same time" (as cited in Paul, 2013, p. 1). Meyer went on to say, " . . . listening to a lecture while texting, or doing homework and being on Facebook—each of these tasks is very demanding, and each of them uses the same area of the brain, the prefrontal cortex" (as cited in Paul, 2013, p. 1). Paul (2013) stated there are actually several reasons why multitasking can be detrimental to academic success and definitively gives three examples: Assignments may take more time to complete; changing mental tasks so often can lead to mistakes; and dividing one's attention and having to refocus often can lead to memory impairment (Paul, 2013).

Multitasking can result in weaker encoding of primary information into long-term memory (Ophira, Nass, & Wagner, 2009). Stress and multitasking are among the chief causes of memory lapses (Wesson, 2012). Dewey (1902) also acknowledged that "mental assimilation is a matter of consciousness; and if the attention has not been playing upon the actual material, that has not been apprehended, nor worked into faculty" (p. 30). In other words, if a learner is not focused on the task, content may not be remembered.

Researchers are beginning to demonstrate that media multitasking while learning is negatively associated with students' grades. Meyer is concerned more about the actual learning process than the grades and said, "There's a definite possibility that we are raising a generation that is learning more shallowly than young people in the past" (as cited in Paul, 2013, p. 2). "The depth of their processing of information is considerably less, because of all the distractions available to them as they learn" (Meyer as cited in Paul, 2013, p. 2).

Embracing Technology

So while technology must be embraced, it should be used with caution (Paul, 2013). Computers, tablets, smart phones can allow students to learn through exploring the internet and doing research (Gardner & Davis, 2103). Using such media can keep students engaged in a project and learning far longer than they would with a set of encyclopedias (Hermitt, 2012). One of the problems is that some students will explore beyond the bounds and parameters of the project and become distracted by other activities that they find on the internet or they will begin texting or emailing on their devices (Hermitt, 2012; Paul, 2013). These are just two examples of technology in the classroom which may create a stalemate that can prevent technology from being used more widely in the classroom (Hermitt, 2012). Practicing DT by using DI can actually assist an educator in managing technology as a resource in the classroom (Smith &

Throne, 2007). For instance, technological devices such as iPads permit students to work independently or in learning groups which gives more time to teach using direct instruction or to respond to intervention needs (Gardner & Davis, 2013). Technology is a stratagem that can help prevent educators from teaching as if all students learn in the same manner (Gardner & Davis, 2013; Gregory & Chapman, 2007).

Differentiated Instruction As a Best Practice

Classrooms of today are becoming far more inclusive and so it would follow, then, that general classroom teachers who are "key service providers for exceptional learners would be able to modify or differentiate curricula and instruction in ways that extend the potentials of exceptional learners, as well as other learners closer to the norm in readiness and performance" (Tomlinson et al., 1997, p. 272). For some reason, however, there has been little change in the number of teachers who are willing to differentiate their instruction (VanTassel-Baska et al., 2008). Yet, there are many in the field that claim DT as a best practice method of instruction (Tomlinson & Allan, 2000).

DI is an instructional process that has excellent potential to positively impact learning by offering teachers a means to provide instruction to a range of students in today's classroom situations. "This method of instruction, *although somewhat still developing in educational settings* [emphasis added], has received significant recognition" (Hall et al., 2003, p.1). As stated previously, UDL is a curriculum designed approach that increases flexibility in teaching and decreases the barriers that often limit student access to materials and learning in classrooms (Rose & Meyer, 2002). "When combined with the practices and principles of UDL, differentiated instruction can provide teachers with both theory and practice to appropriately challenge the broad scope of students in classrooms today" (Hall et al., 2003, p. 11). DT is an

approach that is flexible, responsive and provides curricula that can reduce and eliminate learning barriers. Content can be presented in a variety of ways and learners can express what they know in ways that match their preferred intelligences and learning styles. Students become engaged in their own education, learn with a greater DOK and achieve at higher levels because they are motivated to learn and continue learning. There is ample evidence that students are more successful in school and find it more satisfying if they are taught in ways that are responsive to their readiness levels (e.g., Vygotsky, 1986), interests (e.g., Csikszentmihalyi, 1997) and learning profiles (e.g., Sternberg, Torff, & Grigorenko, 1998). There is no better strategy for meeting students where they are than that of differentiating instruction (Hall et al., 2003).

Implementation of Differentiated Instruction

Despite the importance of differentiation, teachers are still not implementing it on a regular basis (Hall, 2002; Gregory & Chapman, 2007). "One study found that in core academic areas, high-ability students received no differentiated instruction in 84% of the classroom activities" (Westberg, Archambault, Dobyns, & Salvin, 1993, p. 122).

There are still those who find differentiation difficult to implement (VanTassel-Baska et al., 2008).

> Teachers approach professional development and in-service opportunities as if they're approaching a train wreck. They know they must see what's ahead, but they can't bear the sight of it. Most teachers recoil in fear when professional development days appear on the school calendar. Further, when allowed a choice, they will generally choose workshops that will add to their 'bag of tricks'—brief, hands-on activities they can use in their classrooms on Monday, instead of the sometimes painful specter of initiating long-term, systemic change in their standard operating procedures. **(**Tieso, 2004, p. 58)

While differentiation is considered a bag of tricks to some, it is not considered a best practice that is easy to implement (VanTassel-Baska et al., 2008), and many teachers have said that they have little time to change their teaching style (Westberg & Daoust, 2003). In fact, most studies that have been completed within the last decade have shown that there has been little change in teachers' classroom practices (Westberg & Daoust, 2003). When Roy et al. (2013) developed and utilized their Differentiation Instruction Scale (DIS), the results in part "revealed that teachers tend to use instructional adaptions that do not require much preparation or tailored instruction" (p. 1).

Embracing Differentiation Theory

Even though some researchers will agree that DT has evolved into a best practice method of instruction, it is not always being used in the classroom (Latz, Speirs Neumeister, Adams, & Pierce, 2009). According to Latz et al. (2009), many teachers are resistant to differentiation for a multitude of reasons. Some of those reasons, with no particular order, were listed as follows:

> In order to effectively integrate differentiation into the classroom, teachers must first embrace the concept. Many teachers are resistant to differentiation because (a) they do not receive administrative support (Hertberg-Davis & Brighton, 2006); (b) they fear that straying from the mandated curriculum may result in lower standardized test scores (VanTassel-Baska, 2006; VanTassel-Baska & Stambaugh, 2005); (c) they have classroom management or student behavioral problems (Hertberg-Davis & Brighton; Knopper & Fertig, 2005; Westberg et al., 1993); (d) they are resistant to long-term changes in teaching style (Tieso, 2004); (e) they do not have time to plan for

> differentiation (Hertberg-Davis & Brighton, 2004; Knopper & Fertig; Westberg et al); or (f) they fear that students' parents may not agree with the practice (Knopper & Fertig). (Latz et al., 2009, p. 27).

According to the National Center for Education, UDL should be applied to all classrooms and requires three steps: define appropriate goals that allow for multiple means of attainment, assess diverse learner needs, and evaluate barriers that may exist in the current curriculum (as cited in Rose & Meyer, 2002). Many teachers have embraced UDL even though the process for attaining the three steps has not been clarified (Rose & Meyer, 2002). DT states how to determine goals and assess learner needs. Many interest inventories and learning style assessments exist that simplify the initial part of planning classroom differentiation (Hall et al., 2003). And all dimensions of DT do not have to occur simultaneously for a teacher to say he or she practices DI (Tomlinson, 1999).

> You differentiate content when you pre-assess students' skills and knowledge, then match learners with appropriate activities related to readiness; when you give students choices about topics to explore in greater depth; and when you provide students with basic and advanced resources that match their current levels of understanding. (Heacox, 2002, p. 10)

Consequently, a teacher may be using whole class instruction yet pre-assesses students' skills and background knowledge before planning the group lesson. This is a form of differentiation.

Teaching to the Middle

Most educators will agree that children deserve individual attention concerning their differing needs, but in reality, they focus on meeting the needs of the average students (Tomlinson, 1999). They fall short of effectively reaching struggling and advanced students

(Tomlinson, 1999). This is not because they do not want their students to achieve success. Rather, it is because most teachers do not know how to differentiate instruction (Hess, 1999). Furthermore, they are overwhelmed with new requirements regarding standards and accountability (Tomlinson, 2005) and feel unprepared to make the changes needed to implement new strategies (Erwin, 2003). Differentiation as a best practice method of instruction will only be accomplished when readiness and progress levels are consistently evaluated and utilized (Van Tassel-Baska et al., 2008).

Differentiated Instruction and Higher Education Classes

Two college professors (Sands and Barker, 2004) wrote an article to describe an activity they developed to introduce the construct of DI to preservice teacher candidates. These instructors taught a class in preservice teacher education and the article included information about a lesson plan that required teacher candidate participation. Pre-assessment data drove the actual planning of the lesson and teacher candidate evaluations assessed the effectiveness of other lesson plans which may be developed in the future. The lesson plan included a differentiated lesson that was significantly different from instructional approaches generally seen on university campuses (Sands & Barker, 2004).

Today's classrooms include diversity in culture, ethnicity, language, and socioeconomic background as well as multi-academic abilities (Tomlinson, 1996). Consequently, educators must use instructional strategies to meet this wide range of learning differences in their students. (Gregory & Chapman, 2007; Sands & Barker, 2004; Tomlinson, 1996) A more diverse student body must be served in a way to meet the varying needs of learners. "Given the integral role of differentiated instruction in meeting the needs of diverse learners, as the instructors of this course

we were compelled to model a differentiated lesson during one class session for several reasons" (Sands & Barker, 2004, p. 31).

First, some professors and curriculum supervisors ask teachers who have gone through education programs to differentiate instruction for their learners (e.g., Tomlinson, 1999, 2001); however, DI is not always modeled in higher education classrooms (Sands & Barker, 2004). Furthermore, modeling is an extremely effective strategy for instructing more complex skills (Dewey, 1899). Next, the students who are teacher candidates bring a variety of schema and diversity to any program so "to assume that an instructor in higher education can meet the learning needs of this vast range of teacher candidates through a single approach to content, process, and product is absurd. Yet, prevailing practice is just that" (Sands & Barker, 2004, p. 32). Sands and Barker (2004) suggested that it takes a team to meet the many needs of today's diverse learners. They also cited some reasons why teachers are not better prepared to attempt DI:

> Recommended practices include collaborative instructional and organization models, integrated curricular strategies, culturally responsive teaching strategies, datadriven instruction, and differentiated instruction (Glickman, 2002; Ladson-Billings, 1994; Orkwis & McLane, 1998; Schmoker, 2001; Short, Schroeder, Laird, Kauffman, Ferguson, & Crawford, 1996). Unfortunately, many school professionals lack the training necessary to carry out new roles and implement these recommended practices for addressing the needs of all students (Frieberg, 2002; McNaughton, Hall, & Maccini, 2001; Whitaker, 2001). The lack of teacher preparation to address student diversity is due, in part, to the failure of faculty in teacher preparation programs to adequately model

> and integrate recommended strategies within their own teaching (Elksmin, 2001; Whitaker, 2001). (as cited in Sands & Barker, 2004, pp. 28-29)

The authors of this article decided that it was imperative to model various instructional strategies and, in particular, that DI needed to be incorporated not in just one lesson but throughout the course they teach (Sands & Barker, 2004).

Beginning and Veteran Teachers

Renick (1996) found that first-year educators experience many problems during the transition from student to teacher. First year regular and special-education teachers lack material, necessary planning time, and many lack administrative support (Renick, 1996). New special educators need to know how to differentiate instruction. Renick found that no matter how much preparation teachers received in DI, that what they learned in theory was "washed out" by their student-teaching experiences. McGarvey et al. (1997) learned that educators were attempting to differentiate instruction in their classrooms; however, they had not been trained to know how to provide proper activities for a wide range of student abilities. Manson (1999) completed a study to determine which teacher-education programs prepared teachers to work with groups of students with diverse needs. Many teachers admitted that there was *room for improvement* in their preservice preparation regarding how to teach students with a wide range of academic needs (Manson, 1999). Tomlinson (1999) found that most teacher-education programs are not preparing teachers for the many diverse needs of students. Few preservice teachers, if any, experience DI in their teacher-preparation programs (Manson, 1999; McGarvey et al., 1997). The teachers also reported that education professors, university supervisors, and master teachers rarely encouraged them to actively differentiate instruction (Manson, 1999). In fact, during preservice training, master teachers often discouraged preservice teachers from differentiation,

recommending rather that they *keep everyone together* and finally, not many of these teachers felt comfortable using what limited strategies they had learned to address students' diverse needs (Manson, 1999). Manson (1999) found that few preservice teachers, if any, possessed images of multitask classrooms to carry with them to their first teaching assignments and that several of the preservice teachers in the study reported that they were seldom encouraged to actively differentiate instruction.

Action Research and Values of Differentiated Instruction

Fouts and Howard (2007), along with colleagues from their school corporation and a local community college, had previously done some action research on DI. The goal of this earlier research was to plan appropriate professional workshops regarding DT. First, the team had to determine how many colleagues had embraced this method of instruction. If they had not yet tried to apply DT, the team wanted to find out why and then plan professional development accordingly (Fouts & Howard, 2007). Several teachers and administrators met semi-annually to discuss the progress of a variety of best practice methods of instruction and when DI was once again on the agenda, the researcher chose to utilize the expertise of this group to specifically learn how the construct of DT might be perceived. The researchers explained that many teachers still did not embrace DT and that the administration had questioned how much teachers knew about DI. The group had previously discussed things that an educator must know in order to implement DT in their classrooms, but this time the group brainstormed as many different values as they could that were related to the exemplification of successful DI. The group also determined that only experts in the field of DT would participate in this discussion. An expert was defined as one who had not only a knowledge base about DI but also had successfully demonstrated such instruction as a best practice in his or her classroom (Fouts & Howard, 2007).

As an active research group of experts, they selected those values or categories that might be used in professional development settings. Those values were equivalent to what the researchers believe an educator must know in order to practice DI effectively (Fouts & Howard, 2007).

Using a domain model (Fowler, 2003), the researchers examined the phraseology used in the literature and counted the number of citations used for a given value. "A domain model captures the most important types of objects in the context of the business. The domain model represents the 'things' that exist or events that transpire in the business environment" (Fowler, 2003, p. 117). In this case, the business was education and instructing students using DT. The specific objects were the words or phrases in the literature about DT. Initially the team led by Fouts and Howard (2007) identified the following eight values that were cited most often in the literature: (a) ability to multi-manage various tasks, (b) knowledge of the various learning styles, (c) ability to interpret and utilize ongoing student data on a daily basis (formative, summative), (d) knowledge of multiple intelligence theory, (e) ability to foster student self-efficacy, (f) ability to engage students, (g) ability to use environment effectively, and (h) ability to develop similar units of instruction with varying DOK (ability to reach below and above the average student– teaching the middle as well as the struggling and gifted student).

Fouts and Howard (2007) explained that a minimum of three such values were to be employed for developing professional development on DT. Twelve professionals were asked to identify the three values they thought most important for an educator to be able to differentiate instruction. These professionals submitted their choices and insight for same. They were asked to do this by listing all eight values in numerical importance as the most important as number one, and the least important as number eight. The professionals were cautioned to consider the value as a must to differentiate instruction. For example, the literature also suggested that relevance is

highly important when a teacher differentiates instruction; however, relevance has proven important in nearly every method of instruction (Daggert, 2005). Relevance can be seen when students are able to gain personal meaning from curriculum by making connections with prior knowledge or by working out how it "fits" into their world (Daggert, 2005). Therefore, a teacher must know how to make content relevant regardless of type of method and not just for DI (Fouts & Howard, 2007). There were five top values as chosen by these twelve professionals. There was much discussion as to whether or not the ability to engage students was required more for DI as compared to other methods, and despite the number of times student self-efficacy was discussed in the literature as a positive proponent of DI, these professionals felt that student self-efficacy was a proponent of other methods as well and that it was not primarily a benefit of DI (Fouts & Howard, 2007).

Eight of the 12 respondents gave both knowledge of multiple intelligence theory and learning styles a vote as the number one construct needed to differentiate instruction; thus, there was much discussion about merging these two categories into a single value. The ability to use classroom environment effectively did not score high with these 12 professionals. The team discussed and determined that the physical surroundings of the classroom were crucial factors when similar units of instruction with varying DOK are developed (Tomlinson, 2005; van Garderen & Whittaker, 2006; Webb, 1997). For example, it is much easier to differentiate instruction in a larger space. Varied activities can occur in smaller classrooms; however, the capacity to adapt the learning environment can make the acquisition of knowledge more accessible for all students. It was therefore decided that classroom environment could objectively be addressed within the content of developing similar units of instruction while varying DOK (Fouts & Howard, 2007).

Five top scoring values became topics for future professional development. The overall goal was to better implement DT in both general and special education classes. The five high scoring values were: (a) knowledge of the various learning styles, (b) knowledge about the relevance of Gardner's multiple intelligence theory, (c) ability to develop similar units of instruction with varying DOK (ability to reach below and above the average student–teaching the middle as well as the struggling and gifted student, (d) ability to multi-manage various tasks, and (e) ability to interpret and utilize ongoing student data on a daily basis (formative and summative).

Differentiated Instruction and Management of Ongoing Assessments

Ongoing assessment is what drives DI (Chapman & King, 2005). The basics of this proposed best practice must be remembered such as knowing where students' starting points are and adjusting instruction to develop goals and outcomes for students. This is easily accomplished by interpreting data every day (Gregory, 2005). "It has been recognized that academic progress monitoring procedures can be particularly helpful in making decisions about how in how to differentiate instruction to match a sufficient range of learning needs" (Salend, 2009 as cited in Roy et al., 2013). The two types of assessment data that educators rely on for relevant information are summative and formative.

Summative Assessments

Summative assessment data are obtained via a variety of ways that include tests, projects, and student portfolios (Garrison & Ehringhaus, 2007). SATs and ACTS are two examples of summative assessments. Summative data assessments measure where students are at a specific time (Gregory & Kuzmich, 2004). Other examples include annual achievement tests or examinations such as those required for earning a high school diploma. The Graduate Record

Examination measures readiness for graduate work at the collegiate level. Garrison and Ehringhaus (2007) stated that summative assessment data can be collected at the end of a chapter, unit, or course. Further examples follow: After instruction has taken place in a college class, a final is administered to all students to see where they are after the instruction has taken place; experts on curricula, school districts, and local institutions for higher education analyze summative assessment data; administrators as well as educators want and need to see data from these types of assessments; and school personnel are expected to use information from yearly summative data assessments to improve student learning outcomes and make curricular decisions to direct future instruction (Garrison & Ehringhaus, 2007).

Formative Assessments

Educators use formative data assessments to provide feedback to students (Garrison & Ehringhaus, 2007; Gregory & Kuzmich, 2004). They use data from formative assessments to maximize individual students' learning, to measure progress, and to adjust instructional practices (Garrison & Ehringhaus, 2007). Formative data provide educators with timely evidence that indicate skill level and concept mastery; consequently, educators use formative assessments to plan daily instruction (Garrison & Ehringhaus, 2007). Specifically, educators collect, organize, and analyze formative data during an instructional time period; during lessons, through homework, and other instructional activities (Tomlinson, 2005). Formative data assessments can be conducted in many different ways (Tomlinson, 2005). Some examples include but are not limited to daily quizzes, using proximity to observe students working, questioning strategies, and self and peer assessments (Garrison & Ehringhaus, 2007). Formative data are utilized to develop challenging, meaningful, and relative instruction for students (Garrison & Ehringhaus, 2007).

Depth of Knowledge

Webb's (1997) Depth of Knowledge (DOK) provides a vocabulary and a frame of reference when thinking about our students and how they engage with the content. DOK offers a common language to understand "rigor," or cognitive demand, in assessments, as well as curricular units, lessons, and tasks (New York City Department of Education, 2011). Webb (1997) developed four DOK levels that correlate with the common core standards.

> The Common Core State Standards provide a consistent, clear understanding of what students are expected to learn, so teachers and parents know what they need to do to help them. The standards are designed to be robust and relevant to the real world, reflecting the knowledge and skills that our young people need for success in college and careers. (National Governors Association Center for Best Practices, 2010, p.1)

The four DOK levels, from the simplest to the most complex, are (a) recall and reproduction, (b) skills and concepts, (c) short-term strategic thinking, and (d) extended reasoning (Webb, 1997). These levels transform with cognitive complexity and support educators in such a way that they can more effectively engage and challenge students with appropriate DOK tasks (Webb, 1997). It would be simple if all students in the whole classroom setting were actually working and learning at the exact DOK level; nevertheless, in reality, students are working at many different levels and at their own pace (Gregory & Chapman, 2007). DI makes aligning lessons to the common core standards somewhat easier while complementing use of the DOK levels (Chapman & King, 2000).

Teacher As Multi-Manager

Multi-level classrooms vary as much as the students in them (Chapman, 1993). Usually, they include students who communicate in English at a variety of levels; however, they may also

be considered multi-level because they include students with different types of schema, or learning backgrounds (Chapman & King, 2005). The term multi-level could refer to students who range greatly in age, or who learn cognitively at a variety of DOK levels (Webb, 1997). The teacher of an effectively differentiated classroom is one who is able to manage most of the students at all levels most of the time (Tomlinson, 2005). The teacher as multi-manager must also manage a variety of assessments, both formal and informal (Tomlinson, 2005).

There are several ways to conduct needs assessment, depending on the size of the class, and a teacher's access to a computer (Gregory & Kuzmich, 2004; Tomlinson, 1996). Many schools use a standardized test for new students. A teacher who wishes to differentiate instruction may choose to give the student an informal oral reading test or a standardized lexile test (MetaMetrics, 2013) to determine what grade level the student best performs. Or the teacher may give the student a learning inventory to determine student strengths such as preferred multiple intelligences or learning styles (Tomlinson, 1996, 2002). Sometimes the teacher will invite students to simply chat for a few moments in an attempt to get to know them better and then relate lessons and assessments to the strengths and needs of the students (Gregory, 2003).

With so much emphasis on teacher accountability, DT is a benefit to both the teacher and student. Education has become a data driven business (Gregory & Kuzmich, 2004). Educators use summative data from annual standardized achievement tests; however, daily formative data are utilized to navigate the unknown levels in a classroom (Gregory & Kuzmich, 2004). Understanding and implementing DT is a way to multi-manage and multi-assess data (Tomlinson, 1996). Educators must multi-manage to ensure that students are challenged and achieve to their fullest academic potential (Gregory & Kuzmich, 2004).

Conclusion

DT, and more specifically, DI is rooted in the seminal work of John Dewey and has a rich evolution that draws upon many other contemporary theories and constructs (Deblois, 2002). multiple intelligence theory and Gardner's defined intelligences have greatly added to DI and its practice in the classroom. UDL parallels DI in many ways as both methods describe multiple ways for students to receive information (Hall et al., 2003). UDL and DI also include numerous ways for students to demonstrate what they have learned (CAST, 2015; Hall et al., 2003).

The methodology of DI adapts curriculum and instruction on six dimensions (Tomlinson, 1996, 1999). An educator who practices DI responds to learner differences by differentiating the teacher dependent dimensions which are content, process, and product. The learner-dependent dimensions are student interest, learning profile, and readiness. No learner dimension is more important than another (Tomlinson, 1996, 1999).

There have been several studies on DI as compared to whole class instruction but the literature has been ambiguous about how DI can actually benefit students. In addition, solid empirical evidence is lacking (Hall et al., 2003). More studies are needed to discern why DI is not practiced more often. Questions arise as to why this is so; however, no consistent answers have been found.

There is more than one perception of what DT is and what it is not. For example, DI is not interest or learning centers unless they are linked to core content and at complex levels. DI is not an individual learning plan for each student (Foucault, 2008); however, it is adjusting core content by adapting content, process, and product to student learning and interest inventories (Tomlinson, 1996, 1999, 2001). This is accomplished by assigning activities geared to different

learning styles, interests, and levels of thinking. High level goals and learning expectations are essential in DI but with the support of the teacher (Foucault, 2008).

Students in the differentiated classroom are not expected to learn on their own (Foucault, 2008). Those who have been assigned to RTI are generally successful when their teachers differentiate instruction (NCRTI, 2012). With RTI, students have been identified as at risk for poor learning outcomes and interventions are necessary for re-teaching fundamental skills (NCRTI, 2012). RTI and DI both utilize direct instruction, the highly scripted method that provides constant interaction between students and the teacher (Heintzman & Hanson, 2009).

Choice is another important aspect of DI. In DT, the teacher is the manager who provides the students with opportunities of choice (Daniels, 1993; Erwin, 2003). Differentiating instruction includes choices and can increase student motivation, self-confidence, and self-efficacy (Chapman & King, 2005). In turn, self-efficacy encourages student engagement (Glasser, 1988). A choice of activities intrinsically motivates students and engages them because they feel they are valued for their personal accomplishments (Lipscomb et al., 2004). Students are more easily engaged when they are able to identify their own learning style and claim their strengths regarding intelligences (Chapman, 1993). When students are engaged, they tend to take more responsibility for their learning and the need for behavior management lessens (Kern et al., 2001).

The use of technology in the differentiated classroom also has the potential to minimize behavioral concerns (Paul, 2013). Digital learning programs and technological devices can support DI (Bransford et al., 1990). Technology may support the teacher who is adapting content, process, and product with the use of specifically designed software for RTI (Rose & Meyer, 2002). While some students are working on personal computers or iPads, other students

may be receiving direct instruction; thereby making technology somewhat of a resource for the managing teacher (Gardner & Davis, 2013).

DT is relevant for today's students and though its practice has been proven important in some studies, DI is not implemented by teachers on a regular basis (Delisle, 2015; McGarvey et al., 1997; Roy et al., 2013). DI may be used widely but not consistently. Some teachers still plan lessons as if all students have similar learning styles and intelligences (Gregory & Chapman, 2007). Pre-service teachers feel that whole class instruction is preferred by many administrators, university supervisors, and education professors because they are encouraged to *keep the class together* (Tomlinson, 1999). Pre-service teachers also reported that they receive mixed messages about DI from their supervising teachers when they begin student teaching (Tomlinson, 1999).

Several reasons were given as to why teachers are not better prepared to attempt DI. These include, but are not limited to, lack of collaborative and organizational time, failure to prepare pre-service teachers to address student diversity, and not enough school professionals who can train others to carry out new roles and implement new practices (Van Tassel-Baska et al., 2008). It also became evident that few teacher preparation programs have professors that adequately model DI within their own classrooms (Sands & Barker, 2004). The above reasons are likely why some beginning teachers are not comfortable with DI; nevertheless, many veteran teachers are also hesitant to try DI (Parker & Neuharth-Pritchett, 2008).

Fouts and Howard (2007) completed an earlier study to assist one school corporation in planning professional development. In the course of their action research on DI, several values were identified as having been cited most often in the literature. After collaborating with colleagues and experts on DI, it was decided that there were five top values or dimensions that must be understood for an educator to successfully differentiate instruction in the classroom

(Fouts & Howard, 2007). Based on the information discussed in this literature review, there were at least four or five dimensions of knowledge or skills necessary to deliver effective DI. The dimensions found in this review match the values that were discussed during the action research by Fouts and Howard (2007). It is highly probable that knowledge of the construct of these dimensions is vital to the implementation of DT (Fouts & Howard, 2007). The constructs below are listed in the order of their perceived importance by this team of experts (Fouts & Howard, 2007):

- An understanding of multiple intelligence theory
- Comprehension and application of various learning styles
- Interpretation and utilization of ongoing formative and summative student data
- Development of lesson plans or units based on student data that has a wide DOK range
- Multi-management of various student tasks

Effective DI includes good management and organizational skills and lessons are usually prepared to maximize students' strengths and intelligences (Gregory, 2003, 2005). For this research, the first two values were combined into one.

The professional must be knowledgeable about various learning styles and how Gardner's multiple intelligence theory relates to student learning (Tomlinson, 1999, 2005). Professionals must be able to interpret and utilize ongoing student data on a daily basis (Chapman & King, 2005; Garrison & Ehringhaus, 2007). Educators should attempt to reach below and above the average student and not just those who are academically in the middle (Tomlinson, 2001). The constructs obtained from this research will be used to create an assessment to discover what professionals know about DI. According to the literature, the ability

to differentiate content, process, product, and learning environment may essentially depend on what is known about the above constructs.

Because there is more than one perception of DT (Hertzberg & Brighton, 2006), and because DI is yet evolving (Deblois, 2002; Roy et al., 2013), it will be important to ascertain that all who take the DIA are working from the same basic definition. DI has been defined in many ways by many scholars. In order to adequately prepare respondents for taking the DIA, a definition for DI was supplied with the assessment. The definition below was selected because more than ten scholars collaborated about skills needed for classroom teaching. These same scholars agreed that it is important to differentiate instruction and included a definition for this method; it is the definition used in Tomlinson's chapter called "Differentiating Instruction for Academic Diversity." For purposes of clarification, DI was defined as did Tomlinson (2003):

> Differentiated instruction is when a teacher proactively plans varied approaches to what students need to learn, how they will learn it, and/or how they can express what they have learned in order to increase the likelihood that each student will learn as much as he or she can as efficiently as possible. (as cited in Cooper et al., 2010, p. 155)

Additionally, there is more than one perception with respect to DT. Though most professionals in the field of education now view DT as both a theory and a best practice method of instruction, it is not embraced by many educators. Researchers have found some probable reasons why this is so.

- There may be a lack of preservice training about DT and how to differentiate instruction (e.g., Sands & Barker, 2004).
- Some educators believe it is much easier to teach to the academically average students in the class rather than plan additional lessons for those students who may be

gifted or learning challenged (e.g., Tieso, 2004).

- Managing ongoing, formative and summative data requires methodology (e.g., Garrison & Ehringhaus, 2007; Roy et al., 2013).
- It may be too challenging or time-consuming to adjust instruction to learning styles multiple intelligences (e.g., McGarvey et al., 1997, 1998; Roy et al., 2013).

In summary, there is some controversy that encompasses the use of DI in the classroom. Professionals disagree as to whether or not DT has developed into a best practice method of instruction. The discussion eventually revolves around how much professionals know about the construct of DI. Determining educators' depth of knowledge regarding DI provides the primary rationale for developing the DIA.

CHAPTER 3

METHODS

The overall purpose of this project was to develop a valid and reliable instrument assessing what educators and their administrators know about the construct of differentiated instruction (DI). The construct of DI is multidimensional. The literature suggests that several dimensions are vital to delivering effective instruction, and that DI has the potential to reach all ability levels of learners. Dimensions in this instrument included: (a) comprehension and application of multiple intelligence theory while utilizing various learning styles (Tomlinson, 1999, 2005), (b) development of units based on such data that has a wide (DOK) range (Gregory & Kuzmich, 2004; Webb, 1997), (c) multi-management of various student tasks (Gregory, 2003; Heacox, 2002; Tomlinson, 2001, 2005), and (d) interpretation and utilization of ongoing formative and summative student data on a daily basis (Garrison & Ehringhaus, 2007; Gregory & Kuzmich, 2004).

Construction of the DIA involved the following five steps, which are discussed in further detail.

1. A list of potential items was composed via the domain-sampling theory of instrument development based on a content analysis of relevant literature.
2. Three experts on DI completed a retranslation task on the list of potential items.
3. A second retranslation task was conducted on a group of four different experts.

4. The prototype instrument was administered to a small sample of educators and then re-given to the same group approximately twelve weeks later. A test-retest analysis was conducted on the data from this small sample of teachers and administrators to determine the level of temporal stability.
5. The test was administered to a large sample followed by an analysis to assess validity. This sample included administrators as well as classroom instructors.

Item Content Via Domain-Sampling Theory and Content Analysis

The domain-sampling theory proposes that any particular measure is in reality a composition of responses to a random sample of items from a hypothetical domain that consists of all the items that define the construct of interest (Guttman, 1944; Nunnally & Bernstein, 1994). This model provided the theoretical foundation for the development of the DIA. An item belongs to a domain by virtue of its content. In the domain-sampling model the sampled item subsets reflect the infinite universal item-content domain (Leung & Sachs, 2005). The one goal is to obtain a sample of items that adequately represents the domain.

Because of practical limitations, there is an issue with the domain-sampling model as test items are usually composed rather than sampled from a well-defined domain (Nunnally & Bernstein, 1994). This was the case in this project because there has been no known assessment developed in respect to what professionals actually know about the construct of DI. The domain-sampling model generally performs well because the variety of items composed for a test has effects similar to those of actual random sampling. The purpose of the domain-sampling is to estimate the measurement that would be obtained if all the items in the domain were measured (Nunnally & Bernstein, 1994).

The items in the domain-sampling model can vary in intensity, severity, or between related components of a domain; consequently, content domain sampling requires that all items in a given scale share some common feature or attribute (Pike, 1996). This model does not require that a particular number of items be sampled in order to accurately define a particular measure (Nunnally & Bernstein, 1994).

Content analysis defines as precisely as possible those aspects of a document's contents that the researcher wants to investigate and then formulates relevant categories that are so explicit that another researcher who uses them to examine the same material would find essentially the same proportion of topics emphasized or ignored (Fraenkel & Wallen, 1990). In the development of the Social Work Values Inventory (SWVI), Pike (1996) utilized content analysis to determine item content. A review of the social work literature was first conducted to define the content domain and to determine which values would be included in the SWVI. When a review of conceptual articles on social work values, social work values texts, and general practice texts failed to find a consensus within the profession about which values were considered most essential to social work practice, a content analysis was performed to identify the most commonly cited values in the literature (Pike, 1996).

In this project, a similar procedure was utilized. There is no consensus about the construct of DI and in fact, as stated in the literature review, beliefs about this method of instruction can be contradictory. The phraseology used in the literature on DI was examined and the number of times that certain values arose was counted in an effort to ascertain the most prevalent themes in the literature. Each item was designed based on one of these four categories and from the content of the literature review. For example, reading about the differences between formative and summative assessments led to an item such as this: "The type of

assessment that drives differentiated instruction the majority of the time is: A) Alternative or Performance; B) Formative; C) Summative; or D) All of the above." Because the purpose of the DIA was not to test what educators know about testing, the definitions of the three main types of assessments were included with the item. Or reading about DI as one of the better strategies for meeting students where they are led to this item about developing similar units of instruction with varying DOK:

> Webb's Depth of Knowledge (DOK) provides a vocabulary and a frame of reference when thinking about our students and how they engage with content. This is important to consider when developing lesson content. Which of the following statements is *NOT* true regarding DOK and differentiated instruction? A) Differentiated instruction is an important tool for engaging students while providing for individual needs; B) Teachers must have very specific learning objectives and provide several learning pathways to those objectives; C) Clear learning objectives are customized to challenge students as they use their knowledge to organize and make sense of ideas and information; D) Differentiation is a single instructional strategy rather than a methodology that blends a variety of strategies.

Each item on the DIA was created as a multiple choice question and listed four possible choices for the answer. Even though the sample was large, it was cost prohibitive to use a machine scoring answer sheet. Consequently, a four-response hand-scoring answer sheet was created to coincide with the DIA.

A set of 20 multiple choice items, five on each of the previously mentioned categories was developed based on a content analysis of the literature. The items additionally entertained

the importance of student engagement, student self-efficacy, and effective use of the classroom environment in respect to the four categories.

Retranslation Tasks

When developing assessments, it is essential to make certain that the content and all items thereof are both reliable and valid. The term reliability refers to the consistency of measurement (Bachman & Palmer, 1996). According to Field (2009), reliability is the ability to produce consistent results when the same dimensions are measured under different conditions. Bachman & Palmer (1996) would agree that a reliable test score is consistent across different characteristics of the testing situation. The following procedures were used to ensure face and content validity.

Content validity is the evidence that the content of a test corresponds to the content of the construct that it is designed to cover (Field, 2009). A test's reliability and validity are not always correlated. Not all reliable tests can be considered valid; however, any valid test is considered a reliable test (Alderson, 2000). One of the main issues considered when developing the DIA was the focus on content validity.

Face validity has been described as reflecting the extent to which the participants feel the instrument measures what it is intended to measure, with the upfront question: Does the item look like it measures what it is claiming to measure (Field, 2009)? Face validity differs from content validity in that face validity concerns judgments about items after an instrument is constructed, while content validity concerns the planning of content and item construction before it is constructed. However, face validity has also been considered to be a limited aspect of content validity (Nunnally & Bernstein, 1994).

It is also essential to remember that no test is entirely valid because validation is an ongoing process (Weir, 2005). Language is living so it is constantly changing just as perceptions continually evolve (Weir, 2005). The items in the DIA were retranslated to see if the instrument looked as if it were measuring what it intended to measure, that is, to warrant face validity.

First Small Group and Retranslation Task

A set of 20 potential test items including instructions and descriptions was presented to three experts for this first task. An expert was defined as one who has had not only a knowledge base about DI but also has had demonstrated such instruction as a potential best practice in his or her classroom (Fouts & Howard, 2007). Experts had either participated in one or more workshops on DI or were able to describe how DI is used in their classrooms. Each expert was selected by the researcher based on each expert candidate's working knowledge of DI. Such experts were determined to have successfully demonstrated this proposed best practice if they had met teacher objectives such as "increasing lexile scores in reading" or "improving scores on state mandated assessments" by using DI as the means for gaining student achievements. Two active teachers from southern Indiana and one recently retired administrator from northern Kentucky served as experts for the first retranslation task. The middle school science teacher had led seminars on DI in her district and the high school language arts and special education teacher had used DI as her primary method of instruction for nearly 20 years. The latter felt successful in her efforts as at least 90% of the students in her general education classes pass the mandated state exam each year. Her special education students improve and increase their scores on that same state exam. The administrator not only encouraged his teachers to use DI but he also shared his own expertise and experience with them. He utilized DI as his main method of instruction for about 15 years before becoming an assistant principal. He taught elementary and middle school

math as well as high school social studies. These three professionals had expertise across a wide spectrum of teaching levels and subjects.

The set of items including instructions and descriptions was generated to form the first working copy of the assessment. This first small group of three experts was given the domain categories, and individual assessment items for feedback. Feedback included but was not limited to such issues as item ambiguity, literal and inferred meanings of items, and placement of items in various categories or value sets on the assessment.

The Retranslation Task

Each expert was asked to perform a retranslation task of the items. The logic behind this procedure parallels a process used to translate text from one language to another. A successful language translation requires not just a literal word-to-word translation (denotation), but also adherence to the connotations of the original text so that the intention of the original meaning is preserved. Generally, material is translated into the foreign language by one translator, and then retranslated by another back into the original language by a second translator. When inconsistencies arise, the translations are corrected (Smith & Kendall, 1963).

In this project, the retranslation task was used in an effort to examine each item, and to provide a quantitative estimate of the extent that the four categories are conceptually distinct (Pike, 1996). The experts were met with individually and given time to complete the retranslation task. Each item was printed on a small slip of paper. Subjects were given a stack of 20 papers, one for each of the items from the DIA, in random order. In addition, each subject was given four labeled envelopes with the one of the following descriptions printed on the front: (a) multiple intelligence theory and learning styles, (b) unit development with varying DOK, (c) data use for formative and summative assessments, and (d) multi-managing various tasks. The

participants were instructed to place each item into the envelope they believed corresponded with the category represented by the item. By doing this, the subjects were retranslating the stack of randomly arranged items back into the original four constructs of the DIA. The extent to which the participants agreed that the item represented the category for which it was constructed provided a quantitative estimate of the conceptual distinctness of the four categories (Pike, 1996). Smith and Kendall (1963) set the criterion level for acceptable agreement of retranslation tasks at 50%; in the development of SWVI, Pike (1996) set the criterion at 70%. In this project, any item that was identified as problematic by at least one expert participant was studied, analyzed closely, and revised as deemed necessary.

Feedback on Item Content

As the retranslation task was being completed, the subjects made notations on each piece of paper about anything they found to be confusing or problematic. They also examined the entire prototype instrument, complete with instructions, in order to provide feedback on item content and quality of the instructions (McQueen, 2008). All concerns were noted and corrections on the items were made as appropriate.

Second Small Group and Retranslation Task

Following the feedback from the original retranslation task, items were redesigned as necessary and four different experts then retranslated the revised list of potential items. One of the four identified experts used DI when she taught reading in her split second/third grade classes. She had attended several workshops on DI. Another elementary teacher selected as an expert had recently taken a class on DI. He taught fourth grade. He noted that he had been quite successful using DI in all of the content areas and took the class because his principal wanted him to share his expertise. These experts were from southwest Indiana and western Kentucky,

respectively. The third expert taught special education in an alternative middle/high school setting for nine years and was a curriculum consultant for her corporation in Ohio. She had studied under Carol Tomlinson. Because there were still issues with one item a fourth expert was contacted to review the items and participate in the retranslation task. She was a full professor who taught a methods class for pre-service teachers at a college in central Kentucky; she encouraged her students to use DI on a regular basis and had modeled this method in her higher education classes. This second retranslation task was conducted in a procedure identical to that described under the first small group.

Test-Retest Analysis on a Small Sample to Gather Evidence of Temporal Stability

A measure is reliable to the extent that a subject's responses remain consistent on repeated measurements (Field, 2009; Thorndike, 1997); consequently, it is within reason to assume that an individual's DIA score will remain relatively consistent over time, unless of course, there is an event that might cause a change in background knowledge of DI. Therefore, it was logical to expect that a reliable measure of DIA would result in similar scores when given repeatedly to the same group of people over time. This evidence of temporal stability is known as test-retest reliability. In general terms, the more similar the results of the two testings the greater the test-retest reliability of the instrument (McQueen, 2008).

After the retranslation tasks had been completed and the potential items revised, the instrument was given to 36 educators from one or more school corporations in southeast Indiana and northern Kentucky. The one requirement to participate was the availability to retest in about three months. Most (n = 31, 97%) of the participants had some experience with DI. The researcher purposefully sampled across all grade levels and subjects.

The participants were retested approximately 80 days from the initial testing. All things being as equal as is possible, a person should get similar scores on the DIA if completed at two different points in time (Field, 2009). A correlation between each subscore of the pre- and posttests served as the measure of test-retest reliability. A correlation of approximately .80 or better indicates adequate reliability.

The test-retest method has an inherent problem in that subjects' memory from the first test can most certainly influence the retest. Particularly, subjects tend to repeat their responses to the extent that they remember them, and to utilize similar work habits and similar modes of guessing (Nunnally & Bernstein, 1994). Both have the potential to artificially inflate the estimate of reliability. Consequently, the DIA was given twice to the same small sample of people nearly three months apart.

In order to allow the two sets of responses to be matched, the respondents were asked to provide the last four digits of their Social Security numbers. This allowed the two assessments to be matched while maintaining participant anonymity.

Factorial Analysis Followed by Reliability Analysis

The DIA was administered to 279 educators, including both administrators and teachers. Administrators included those who are principals, assistant principals, counselors, or instructional strategists and who had a minimum of two years teaching experience. Educators from all grade levels and areas of expertise were purposefully sought and included first year teachers as well as recently retired teachers and administrators. A recently retired educator was one who had not been out of the classroom or office for more than three years. Participants were recruited from several different public and private school corporations and community colleges in southern Indiana, central and northern Kentucky, and Ohio. Each respondent was asked to

complete a demographic questionnaire prior to taking the assessment (See Appendix B). Both the questionnaire and DIA were completed on the same day. Data were collected from the assessment and evaluated for internal consistency, reliability, and content, factorial, and construct validity.

Internal Consistency

Internal consistency is an estimate of reliability which means that a measure should consistently measure what it claims to measure (Field, 2009). An easy way to assess reliability is to test the same group of people twice. An instrument that is reliable will result in in similar scores at both points in time (Field, 2009). Although there are several procedures for obtaining such estimates of reliability, Cronbach's alpha, α, was used as the measure of internal consistency for this project. "Cronbach's Alpha Reliability Coefficient is used in calculating the reliability of items that are not scored wrong versus right as in some exams where more than one answer is possible" (Fraenkel & Wallen, 1990, p. 136). Values can range from 0 to 1 (sometimes expressed as 0 to 100) with high values indicating that the examination is likely to correlate with alternate forms (a desirable characteristic). Cronbach's alpha may be affected by difficulty of the test, the spread in scores, and the length of the examination (Cronbach, 1951). An alpha coefficient .80 is generally considered adequate and indicative of a homogeneous test (Field, 2009).

Factorial Analysis

The DIA is based on a four-dimensional construct consisting of items that include information on multiple intelligence theory and learning styles, unit development for varying depths of knowledge, multi-management in the classroom, and utilizing data for formative and summative assessments. As such, four separate categories were constructed to assess each

dimension. If the DIA was adequately conceptualized, then a factorial analysis of the entire assessment should support the conception of a four-dimensional construct. If the items behave as expected in the analysis, evidence of construct validity can be argued (McQueen, 2008).

A factorial analysis using a principal components method of extraction was conducted on the entire DIA. Factorial procedures were used to reduce a large number of observed variables to a smaller number of factors in an effort to identify underlying dimensions within the original variables (Tabachnick & Fidel, 2007).

Principle components analysis (PCA) analyzes all of the variance in the observed variables, while factor analysis procedures analyze only the variance that each observed variable shares with other observed variables. In other words, principal components analysis analyzes variance, while factor analysis analyzes covariance (McQueen, 2008). Nunnally and Bernstein (1994) contended principal components analysis was the best choice for factor extraction when the goal is optimization of a particular property of the sample data. PCA maximizes the amount of variance that can possibly be explained through a straightforward approach that is guaranteed to provide a solution (McQueen, 2008). It was expected the principal components analysis would result in a four-component solution with the items from each of the four constructs loading on the appropriate component.

After extraction, an oblique rotation of the component solution was performed to assist in interpretation. It has been argued that oblique rotation is preferred over orthogonal rotation procedures, particularly in the social sciences (e.g., Conway, 2003; Fabrigar, Wegener, MacCallum, & Strahan, 1999; Preacher & MacCallum, 2003). An oblique rotation allows the resulting factors to be correlated while the orthogonal rotation does not. Many things in life are correlated and it was highly likely that a relationship, or correlation, among the resulting factors

would emerge. While determining the categories during the content analysis, there was overlap among the categories. Given that knowledge about learning styles and multiples intelligences, ability to develop units with varying DOK, classroom multi-management, and utilizing formative and summative data on a daily basis are believed to be four parts of the overall construct of the DIA, it was expected the four resulting components would be correlated making an oblique rotation the most logical choice.

Content and Construct Validity

Content validity is the evidence that the content of a test corresponds to the content of the construct it was designed to measure (Field, 2009). For example, it was expected that the content of the test item below would be deemed to correspond with the construct in the DIA that assesses whether or not the professionals understand the various multiple intelligences as they relate to this suggested best method practice of instruction.

Example:

Another way of saying that a student has interpersonal intelligence would be to say that s/he is

A. Word smart

B. People smart

C. Self smart

D. Nature smart

Field (2009) stated that it is possible to determine the degree to which individual items represent the construct being measured and cover the full range of the construct, or in this case, the DIA. Construct validity refers to whether a scale measures or correlates with the theorized psychological or scientific construct that it purports to measure. In other words, it is the extent to which what was to be measured was actually measured (Brown, 1996). Gathering evidence of

construct validity evidence involves the empirical and theoretical support for the interpretation of the construct. Such lines of evidence include statistical analyses of the internal structure of the test including the relationships between responses to different test items (Büttner, 1997).

In other words, the DIA was expected to measure to what extent professionals in the field of education are cognizant of the skills necessary to use DI in the everyday classroom. The findings relative to each of these steps are detailed in Chapter 4.

CHAPTER 4

RESULTS

The results of the analyses are detailed in this chapter. The statistical analyses in this study were performed using SPSS version 17.0 for Windows with a listwise deletion of missing data.

Item Summary from the Retranslation Tasks

The first three experts misclassified one item but suggested that three additional items could be classified into more than one category and that some wording might be ambiguous. Revisions were made and the second group of experts correctly classified all 20 items; however, similar comments were made on two of the items. Erroneous classifications, ambiguity, and lack of clarity as well as item comments are discussed below. The original questions are italicized and presented in numerical order. A brief discussion follows each item of concern, and if changed, the revised item is listed in bold.

1. *Differentiation Theory is an instructional theory that discusses how educators can deliver instruction in multi-ability classrooms. Based on this theory, teachers can structure and manage the learning environment to*
    A. *Diverse learning styles, interests, intelligences, and abilities within the classroom.*
    B. *Diverse learning styles and intelligences within the classroom.*

C. *Diverse interests and abilities within the classroom.*

D. *Diverse intelligences, learning styles, and abilities within the classroom.*

All seven experts placed this item in the correct category but stated that the everyday educator might consider this a question about multiple intelligence or learning styles. Initially, an expert during the first retranslation task felt like the answer choices were too similar. Later, another expert from this same task and two experts from the second retranslation task basically made this comment: "Teachers who are successful with DI know that all the resources in the first choice are necessary when using this method of instruction." Another expert commented that "choice A is necessary for successful DI – good question to sort out who really knows DI." Because participants did not suggest different wording, the item was not changed or deleted.

3. *Which of the following statements about differentiated instruction is true?*

A. *Differentiated instruction allows students to have multiple options for taking in information.*

B. *Differentiated instruction is not adapting what you teach but it is about how you give them access to information.*

C. *Differentiated instruction is about student interests, DOK, and understanding learning styles, but it is not about the pace at which a student learns.*

D. *Differentiated instruction is when teachers create appropriately varied learning experiences for individual students without modifying the prescribed curriculum.*

Two experts during the first retranslation task misclassified this item into the category for multi-management instead of lesson development. It was suggested to mention lesson design and to consider changing the word "multiple" in choice A because the word is used in so many other places and ways in this assessment. It was also suggested to spell out Depth of Knowledge (DOK) or have this item follow one about DOK. This item now follows a DOK item in the final draft of the assessment. Two from this first group of experts also suggested that the word "individual" in choice D be changed to something like "different." The second set of experts expressed appreciation for the use of the word "different" in choice D as opposed to "individual" but suggested using the term "diverse." One of these latter experts stated that too many educators think DI is a method that requires an individual lesson plan for each student which is also a concept that is assessed in a different item. This item was written with the intent of finding out what is known about the working definition of DI; therefore, the item was changed as suggested by the experts in these tasks.

3. ***When developing curriculum with the intention of designing lessons to use differentiated instruction, which of the following statements is true?***

- ***A. Differentiated instruction allows students to have a variety of options for taking in information.***
- ***B. Differentiated instruction is not adapting what you teach but it is about how you give them access to information.***
- ***C. Differentiated instruction is about student interests, DOK, and understanding learning styles, but it not about the pace at which a student learns.***

D. Differentiated instruction is when teachers create appropriately varied learning experiences for diverse students without modifying the prescribed curriculum.

The next item that raised concern was item 7 from the initial instrument.

7. *Multiple Intelligence Theory is*

A. The idea that students have different learning modalities.

B. The combination of visual, auditory, and kinesthetic learning styles.

C. The belief that an individual has at least eight different intelligences, some stronger than others.

D. The combination of visual, auditory, and kinesthetic learning styles.

This item made it through the first retranslation task without notation. An error was found by all four experts during the second retranslation task. Choices B and D were identical so another answer was created for the D choice.

7. *Multiple Intelligence Theory is*

A. The idea that students have different learning modalities.

B. The combination of visual, auditory, and kinesthetic learning styles.

C. The belief that an individual has at least eight different intelligences, some stronger than others.

D. *The combination of an individual's special abilities and intelligence quotient.*

11. *There are several ways to conduct needs assessments in order to differentiate instruction. The instructor should*

A. Consider the type of standardized tests that are available for new students

B. Consider the size of the class and a teacher's access to a computer

C. Consider utilizing informal tests that assess student readiness combined with information from student learning profiles

D. Consider utilizing student learning profiles combined with the most recent scores from student state assessments.

One expert in the first retranslation task noted a potential problem with this item and stated that the last choice was, in reality, used by all teachers. Many administrators encourage teachers to utilize the scores from student state assessments. It was suggested to ask which choice would be the best to consider when conducting needs assessments. The word "foremost" was added to the first part of the item and no comments were made during the second retranslation task.

11. ***There are several ways to conduct needs assessments in order to differentiate instruction. The instructor should foremost***

A. Consider the type of standardized tests that are available for new students.

B. Consider the size of the class and a teacher's access to a computer.

C. Consider utilizing informal tests that assess student readiness combined with information from student learning profiles.

D. Consider utilizing student learning profiles combined with the most recent scores from student state assessments.

18. *Read the scenarios below to choose which instructor most effectively uses data to assist in designing differentiated lessons in her class. All four teach 7th grade language arts.*

Darlene is modeling how to write a paragraph using this week's eight vocabulary words to 28 students. She has given each student a handout about what she is modeling. She is teaching the entire class using direct instruction though two students earned an A on the vocabulary pre-test. Darlene is permitting these students to move on to the next set of vocab words without writing the paragraph. The rest of the class has already been assigned to mixed-ability groups based last quarter's grading report so that peers can help one another if needed. The paragraph is due at end of period.	*Susan is explaining how to write a paragraph using this week's eight vocabulary words to 28 students. Two students have already aced the vocab pretest; she expects them to listen to her instruction. When she finishes her instruction, she assigns all students to mixed-ability groups. The groups are assigned by the semester reporting grades. They are to help one another with the assignment as peer coaches. The written paragraph is due at the end of period for each student to receive credit for their work and attendance this class period.*
Jane is modeling how to write a paragraph using this week's eight vocabulary words to her 28 students. She has given each student a handout about what she is modeling. She is teaching the entire class using direct instruction though two students earned an A on the vocabulary pre-test and have the option of writing the paragraph without her instruction. At the end of her instruction, Jane places the students in mixed-ability groups, and/or pairs based on not only their state exam scores, but also on weekly vocab tests and grammar bench mark exams. Jane also lets students work independently, if capable, as some students do not like working in groups – the paragraph is due tomorrow.	*Kay is explaining how to write a paragraph using this week's eight vocabulary words to her 28 students. Two students have already aced the vocab pretest; she expects them to listen to her instruction. When she finishes her instruction, she assigns the students to mixed-ability groups. The groups have been assigned according to scores from the standardized state test. They are to help one another with the assignment as peer coaches. The written paragraph will be due at the beginning of the class tomorrow as Kay realizes that all students do not work at the same pace and may need more time to work on the paragraph.*

A. Darlene *B. Susan*

C. Jane *D. Kay*

This remaining item that needed revision was one of two longer items that use scenarios as part of the question. The first group of experts correctly classified the item but had difficulty

with the item's introduction stating that it could be classified into both *lesson design* and *using data* categories. After revising the introduction, the second group of three experts had concerns with the body of each scenario. When the item was once again revised, a fourth expert was asked to retranslate the items. This time, the item was classified correctly and given a note of approval as a higher level thinking item. The expert wrote "it is good to see that a question having to do with the application of DI has been developed. Only a teacher who successfully uses DI will note the subtle differences in the scenarios."

18. ***Below are four scenarios describing the actions of four 7th grade language arts teachers, each of whom teach 28 students. After reading the scenarios, choose which instructor most effectively used data in assisting differentiated instruction in her class. Each teacher is modeling or explaining how to write a paragraph using the current week's eight vocabulary words.***

Darlene gave each student a handout about what she is modeling. She is teaching the entire class using direct instruction. Because two students earned an A on the vocabulary pre-test, Darlene is permitting these students to move on to the next set of vocabulary words without writing the paragraph. The other 26 students have been assigned to mixed-ability groups based on last quarter's grading report so that peers can help one another if needed.	***Susan has two students who have earned As on the vocabulary pretest; she expects them to listen to her instruction. When she finishes her lesson, she assigns all students to mixed-ability groups, which are assigned by the semester reporting grades. They are expected to help one another with the assignment as peer coaches.***
Jane gave each student a handout about what she is modeling. She is teaching the entire class using direct instruction. Because two students earned As on the vocabulary pre-test, they have the option of writing the paragraph without instruction. At the end of her instruction, Jane places the students in mixed-ability groups or pairs based on not only their state exam scores, but also on weekly vocabulary test scores and grammar bench mark exams.	***Kay has two students who have earned As on the vocabulary pretest; she expects them to listen to her instruction. When she finishes her lesson, she assigns the students to mixed-ability group, which have been assigned according to scores from the standardized state test. They are expected to help one another as peer coaches.***

A. Darlene ***B. Susan***

C. Jane ***D. Kay***

In summary, five items were identified as problematic during the retranslation tasks. One item was misclassified while the other four were revised and improved to solve issues with clarity. With the exception of items 1, 3, 7, 11, and 18, all items were classified correctly and received no comments or notations of concern. The edited and final version of the DIA can be read in its entirety in Appendix C.

Small Group Test-Retest Analysis

The completed DIA was given to a total of 36 participants to gather evidence of temporal stability. The participants were recruited either by phone or an email request. Educators contacted also invited colleagues to participate. Participants were from three school corporations in southern Indiana. Approximately 12 weeks later, 34 participants again completed the DIA. Two did not complete all items and were dropped from the analysis. Additionally, two failed to return for the retest. In total, 32 participants were included in the final analysis for the DIA.

Adequate test-retest reliability was found for both Multi-Management, $r(30) = .95$, $p < .001$ and Lesson Design, $r(30) = .98$, $p < .001$, all tests of significance were two-tailed. Correlations between the first and second testings for both the Multiple Intelligence and Assessment subscales were extremely low: Multiple Intelligence, $r(30) = .05$, $p < .001$; Assessment, $r(30) = .49$, $p < .001$. However, there was an extreme lack of variability in the scores which attenuated the correlation. Examination of the pretest and posttest scores provided in Tables 2 through 5 show almost identical responses between the two testings. In short, there was simply not enough variability for the scores to correlate because so many participants had such similar scores on both tests.

Table 2

Temporal Stability Test Score Comparisons for Multi-Management Subscale

	Responses							
	Pre-Test				Post-Test			
Item No.	A	B	C	D	A	B	C	D
1	5	26	1	0	4	23	5	0
12	0	17	0	15	0	18	15	0
15	0	0	5	27	0	0	6	26
19	11	3	3	15	14	1	11	6
20	0	26	0	0	0	26	6	0

Note. N = 32.

Table 3

Temporal Stability Test Score Comparisons for Lesson Design Subscale

	Responses							
	Pre-Test				Post-Test			
Item No.	A	B	C	D	A	B	C	D
2	0	26	6	0	1	24	7	0
3	5	0	0	27	5	0	0	27
4	0	1	31	0	0	1	31	0
9	32	0	0	0	32	0	0	0
16	0	5	13	14	0	6	13	13

Note. N = 32.

Table 4

Temporal Stability Test Score Comparisons for Multiple Intelligence Subscale

	Responses							
	Pre-Test				Post-Test			
Item No.	A	B	C	D	A	B	C	D
5	0	32	0	0	0	32	0	0
7	0	0	31	1	0	0	32	0
10	1	0	31	0	0	0	32	0
13	0	0	32	0	0	1	31	0
17	0	1	31	0	0	0	32	0

Note. N = 32.

Table 5

Temporal Stability Test Score Comparisons for Assessment Subscale

	Responses							
	Pre-Test				Post-Test			
Item No.	A	B	C	D	A	B	C	D
6	0	0	31	1	0	0	32	0
8	0	29	2	1	0	29	2	1
11	0	1	30	1	0	0	32	0
14	0	31	1	0	0	32	0	0
18	27	3	2	0	0	2	6	0

Note. N = 32.

All in all, adequate test-retest reliability can be assumed. Of the 32 people in the sample, 28 (88%) had identical answers on both tests indicating that scores remained relatively stable over time.

Large Group Assessment of the Instrument Prototype

A total of 279 participants were recruited from school corporations in southern Indiana, northern Kentucky, and southwestern Ohio. Two did not complete the assessment and one chose not to take the assessment after completing the demographic. These three were subsequently dropped from the analysis bringing the total useable sample to 276.

The final sample included 199 women (72%) and 77 men (28%) which is somewhat proportionate to the number of women and men who are working in the field of education. According to the National Center for Education Statistics (NCES, 2012), 76% of all teachers were female while 24% were male. The vast majority (n = 231, 84%) were teachers while 45 (16%) were administrators.

According to the United States Census (2010), a land area with fewer than 2,500 inhabitants is defined as rural. If the area includes between 2,500 and 50,000 inhabitants, then it is defined as an urban cluster. If the populace in a land area is more than 50,000, then it is

defined urban. A total of 60 (22%) worked in a rural area, 129 (47%) in an urban cluster, and 87 (32%) either taught or supervised in an urban setting.

A total of 124 (45%) held a master's degree, 89 (32%) had completed work above a master's degree, 3 (1%) had obtained doctoral degrees, and 60 (22%) had earned a bachelor's degree. The sample was academically diverse as it included nearly all grade levels and more than 12 subject or content areas: language arts, math, science, social studies, art, auto tech, career education, consumer education, French, health, physical education, and Spanish.

Participants included educators in various school levels such as the following: primary (n = 9, 3%); intermediate (n = 28, 10%); middle (n = 74, 27%); and high school (n = 79, 29%). One participant taught at the college level. Nearly one-third of the 276 (n = 85, 31%) either taught or had taught in a combination of the previously mentioned levels. Data were not available for one participant.

Undergraduate degrees were earned from 39 different institutions of higher learning with 32% being obtained from colleges in southern Indiana (n = 89) and 18% from northern Kentucky (n = 48). Of the 231 teachers, 41 (18%) worked part-time, and 187 (81%) worked full time. In addition, there were three retired teachers (1%) who substitute taught.

Eight teachers (3%) were in their first year of teaching. Forty-two (18%) had taught 2-4 years and 57 (25%) had been teaching 5-9 years. Additionally, 54 (23%) had taught between 10-14 years and 71 (31%) had taught more than 15 years.

Of the 45 administrators, 19 (42%) had taught between 1-3 years and 20 (44%) had taught 4-10 years. Four (8%) taught more than ten years before becoming administrators. Three (6%) did not teach before becoming counselors but found themselves currently teaching subjects such as, but not limited to, social skills, career education, or therapeutic life skills.

There were 73 (26%) that reported DI as their primary method of instruction. A total of 57 (21%) had never differentiated instruction while 32 (12%) had attempted DI but found it challenging. Additionally, 54 (20%) had attempted DI but basically used other methods of instruction; there were 60 (22%) who used DI often, although it was not their first choice.

There were 132 (48%) educators who considered DI either their preferred method or one they used often. Of these, there were 12 educators (9%) who had differentiated instruction for 1-2 years, and there were 24 (18%) who had differentiated instruction for 3-5 years; and 39 (30%) who had differentiated instruction for 6-10 years. There were 45 (34%) of the 132 who had differentiated instruction 11-20 years and twelve (9%) who had differentiated instruction for more than 20 years.

Of the 45 administrators, 24 (53%) encouraged DI. There were five (11%) administrators who did not support DI and for 16 (36%) administrators it was not applicable in their current position (36%). Of the 231 supervised teachers, 90 (39%) were encouraged and supported by their supervisors to use DI. There were 58 (25%) supervised teachers who were encouraged to use DI but not supported (25%) and 39 (17%) were neither encouraged nor supported in the use of DI. There were 44 teachers (19%) who did not know how their supervisor or administrator felt about DI.

Regarding colleague support, 58 teachers (25%) were supported and encouraged to use DI by their colleagues. A total of 17 (7%) were encouraged to use DI though not supported and 48 (21%) were neither encouraged nor supported in the use of DI. Most of the teachers (n = 108, 47%) did not know where their colleagues stood regarding DI.

Reliability

Estimates of internal consistency and distributions of the dimension scores were used to evaluate the reliability of the DIA scores. Cronbach's (1951) alpha was used to evaluate internal consistency.

In order to assume adequate reliability, α levels should be at least .80 (Nunnally & Bernstein, 1994); for each construct in the DIA, Multi-Management, α = .95; Lesson Design, α = .98; Multiple Intelligence, α = -.05; and Assessment, α = .49.

Each item was recoded to indicate levels of correctness. All but four items were provided with responses that ranged in varying degrees of correctness. Specifically, there was one best response that was worth 3 points, one second best response worth 2 points, one third best response worth 1 point, and one completely incorrect response worth 0 points. As such, the items were recoded accordingly. Items 2, 3, 14, and 15 were exceptions to this in that each had only one correct response. For those items, the correct response was awarded 3 points with the other responses resulting in 0 points. Descriptives for each recoded item can be found in Table 6.

Table 6

Item Descriptives from Reliability Tests for Temporal Stability

	Pre-Test			Post-Test		
Item No. and Dimension	Min	Max	*M* (*SD*)	Min	Max	*M* (*SD*)
1 Multi-Management	1.00	3.00	2.13 (.42)	1.00	3.00	2.03 (.54)
2 Lesson Design	.00	3.00	.56 (1.19)	.00	3.00	.66 (1.26)
3 Lesson Design	.00	3.00	.47 (1.11)	.00	3.00	.47 (1.11)
4 Lesson Design	1.00	3.00	2.94 (.35)	1.00	3.00	2.94 (.35)
5 Multiple Intelligence	3.00	3.00	3.00 (.00)	3.00	3.00	3.00 (.00)
6 Assessment	1.00	3.00	2.94 (.35)	3.00	3.00	3.00 (.00)
7 Multiple Intelligence	.00	3.00	2.91 (.53)	3.00	3.00	3.00 (.00)
8 Assessment	.00	3.00	2.75 (.80)	.00	3.00	2.72 (.89)
9 Lesson Design	3.00	3.00	3.00 (.00)	3.00	3.00	3.00 (.00)
10 Multiple Intelligence	.00	3.00	2.91 (.53)	3.00	3.00	3.00 (.00)
11 Assessment	1.00	3.00	2.91 (.39)	3.00	3.00	3.00 (.00)
12 Multi-Management	2.00	3.00	2.53 (.51)	2.00	3.00	2.56 (.50)
13 Multiple Intelligence	3.00	3.00	3.00 (.00)	2.00	3.00	2.97 (.18)
14 Assessment	.00	3.00	2.91 (.53)	3.00	3.00	3.00 (.00)
15 Multi-Management	.00	3.00	.47 (1.11)	.00	3.00	.56 (1.19)
16 Lesson Design	1.00	3.00	1.72 (.73)	1.00	3.00	1.78 (.75)
17 Multiple Intelligence	2.00	3.00	2.97 (.18)	3.00	3.00	3.00 (.00)
18 Assessment	1.00	3.00	1.97 (.40)	1.00	3.00	2.13 (.50)
19 Multi-Management	.00	3.00	1.06 (1.11)	.00	3.00	1.28 (1.22)
20 Multi-Management	2.00	3.00	2.19 (.40)	2.00	3.00	2.19 (.40)

Note: [a]$N = 32$. [b]The test and re-test were administered approximately 12 weeks apart.

Factorial Analysis

An initial PCA was conducted utilizing Kaiser's (1960) stopping rule, which extracts all components with an eigenvalue greater than 1. There were seven components that met this criterion for extraction. Three explained over 8% of the total variance in the correlation matrix of all the items; the fourth explained almost 7% (see Table 7).

The scree plot in Figure 1 graphs each component against its associated eigenvalue. A break after the third component indicates a possible three-component solution. The first eigenvalue is approximately three times the second or third in that the first component and accounted for 18% of the variance while the first and second components accounted for

approximately 8% each. In conclusion, an argument could be made for a three-component solution.

Table 7

Percentages of Variance and Cumulative Percentages for Eigenvalues Greater Than 1 and the Sum of Squared Loadings for the Four-Component Rotated Factor Solution

	Initial Eigenvalues			Rotated Sum of
Component	Total	% of Variance	Cumulative %	Squared Loadings
1	3.634	18.171	18.171	2.446
2	1.714	8.570	26.741	2.347
3	1.664	8.322	35.063	2.489
4	1.387	6.934	41.997	2.135
5	1.268	6.339	48.336	
6	1.177	5.886	54.222	
7	1.147	5.736	59.958	

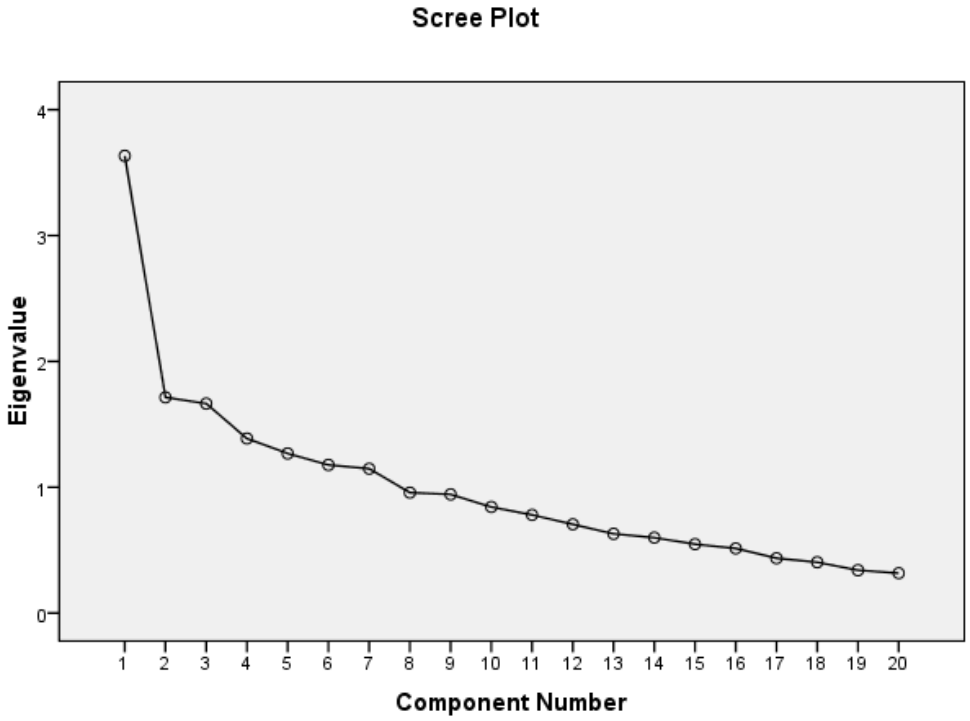

Figure 1 Scree plot of eigenvalues of the principal components analysis

Although a three-component solution could be argued, it was hypothesized a priori that DI had four underlying dimensions: (a) comprehension and application of multiple intelligence

theory while utilizing various learning styles (Multiple Intelligence), (b) development of units based on such data that has a wide depth of knowledge (DOK) range (Lesson Design), (c) multi-management of various student tasks (Multi-Management), and (d) interpretation and utilization of ongoing formative and summative student data on a daily basis (Assessment). Thus, a second PCA that was constrained to a four-component solution was conducted.

Because the components were expected to be correlated, a Promax oblique rotation was used to aid in the interpretation of the resulting components. The rotation converged in nine iterations. Correlations among the items are provided in Table 8.

Table 8

Correlations Among DIA Items

	1M	2L	3L	4L	5I	6A	7I	8A	9L	10I	11A	12M	13I	14A	15M	16L	17I	18A	19M
1M	--																		
2L	.10	--																	
3L	.20**	.13*	--																
4L	.04	.09	.28***	--															
5I	.08	.11	.28***	.40**	--														
6A	.07	.07	-.05	.00	.12	--													
7I	-.03	.07	.09	.10	.21***	-.09	--												
8A	.29**	.09	.16**	.25***	.21***	.08	.33***	--											
9L	.24**	.07	.11	.14*	.26***	.12	.07	.43***	--										
10I	.15*	.15*	.09	.16**	-.01	-.04	.14*	.16**	.14*	--									
11A	.09	.09	.02	.13*	.28***	-.01	.27***	.32***	.41***	.09	--								
12M	.13*	.03	.16**	.21***	.26***	-.02	.20**	-.06	.15*	.12*	.40***	--							
13I	-.01	.15*	-.03	.08	.11	-.02	.14*	.11	.07	-.01	.30***	.25***	--						
14A	.08	.24***	.12*	.12	.06	.06	.08	.08	.10	-.04	.23***	.21**	.30***	--					
15M	.03	.01*	.10	.14*	-.04	-.09	.25***	.21***	.09	.23***	.17**	.15*	.20**	.18**	--				
16L	.08	.16**	.20**	.24***	.22***	.02	.41***	.36***	.05	-.02	.19**	.13*	.21***	.15*	.23***	--			
17I	-.01	.08	.00	.22***	.22***	.00	.27***	.20**	-.00	.13*	.40***	.20**	.32***	.10	.35***	.24***	--		
18A	.08	.26***	-.07	.11	.02	.05	.18**	.21***	.15*	.05	.10	-.11	.19	.15*	.20**	.15*	.06	--	
19M	.12	.32***	-.06	-.01	.05	.01	.13	.13*	.06	.10	.13*	-.10	.23***	.15*	.19**	.18**	.14*	.34***	--
20M	.26**	.18**	.12*	.05	.09	-.01	-.01	.11	.19**	-.11	.10	-.02	.24***	.07	.11	-.01	.02	.28***	.08

Note. $N = 276$. DIA item labels: M = Multi-management; L = Lesson design; I = Multiple intelligence; and A = Assessment.

*p = < .05, **p = < .01, ***p = < .001, two-tailed.

The items did not load as expected (see Table 9). As a result, the factorial analysis failed to provide evidence of construct validity indicating the proposed items are problematic and would need to be revised before construct validity for the DIA could be argued.

Table 9

Communalities and Structure Matrix Component Loadings for the Promax Four-Component Solution of the Differentiated Instruction Assessment

	Rotated Component Loadings				
Item No. (Proposed Subscale)	1	2	3	4	$^{+}h^2$
9 (Lesson Design)	**.66**	.15	.03	.27	.50
8 (Assessment)	**.64**	.00	.49	.30	.59
5 (Multiple Intelligence)	**.59**	.44	.12	-.06	.52
1 (Multi-Management)	**.53**	-.26	.04	.33	.46
3 (Lesson Design)	**.53**	.10	.17	-.14	.34
4 (Lesson Design)	**.50**	.30	.34	-.08	.38
12 (Multi-Management)	.12	**.74**	.17	-.14	.59
11 (Assessment)	.36	**.66**	.29	.21	.50
13 (Multiple Intelligence)	-.04	**.60**	.20	.42	.54
14 (Assessment)	.12	**.46**	.05	.38	.36
7 (Multiple Intelligence)	.16	.23	**.66**	.09	.44
15 (Multi-Management)	.04	.20	**.65**	.25	.46
16 (Lesson Design)	.30	.26	**.56**	.19	.37
17 (Multiple-Intelligence)	.07	.51	**.56**	.10	.47
10 (Multiple Intelligence)	.23	-.09	**.44**	.05	.25
6 (Assessment)	*.24*	*.01*	*-.24*	*.16*	*.18*
18 (Assessment)	.11	-.03	.26	**.71**	.53
19 (Multi-Management)	.01	.14	.30	**.63**	.45
2 (Lesson Design)	.19	.12	.11	**.52**	.45
20 (Multi-Management)	*.03*	*.01*	*-.18*	*.36*	*.20*

Note. Factors > than .40 are in boldface. Italics indicate items with loadings < .40. $^{+}h^2$ = final communality. N = 276.

In attempt to better understand both the construct of DI and the actual nature of the items constructed, the loadings for the four-component solution were analyzed. It can be seen from the loadings in Table 9 that no simple structure emerged.

The examination of the four-component solution follows. All items are presented in order of highest to smallest loading.

Component 1: lesson design. The following six items loaded on the first factor:

9) *There are four Depth of Knowledge (DOK) levels to consider when designing student lessons . . .*
8) *There are three types of assessments: 1) Summative . . . 2) Formative assessments are used to maximize individual students' learning, to measure progress, and adjust practices . . . The type of assessment that drives differentiated instruction the majority of the time is . . .*
5) *Another way of saying that a student has interpersonal intelligence would be to say that s/he is . . . People smart.*
1) *Differentiation Theory is an instructional theory that discusses how educators can plan and deliver instruction in multi-ability classrooms. Based on this theory, teachers can structure and manage the learning environment to address the…*
3) *When developing curriculum with the intention of designing lessons to use differentiated instruction, which of the following statements is true?*
4) *Students of today enjoy using technology. When developing lessons for differentiating instruction, teachers would do well to remember which of the following?*

Component 1 was primarily about lesson design as four of the six items contained language concerning *lesson design*. However, two additional items (8 and 5) clearly loaded on this component that were not about lesson design: Item 5 was about multiple intelligence and

item 8 concerned assessment. No theoretical rationale could be found to explain why these two items loaded with the lesson design questions.

Component 2: assessment. The following four items loaded on the second factor:

12) *When differentiating instruction, accomplished teachers take which of the following measures for effective classroom management? . . .* Best Answer: *Explain rules and procedures clearly while offering activities that will engage the students.*

11) *There are several ways to conduct needs assessments in order to differentiate instruction. The instructor should foremost . . .* Best Answer: *Consider utilizing informal tests that assess student readiness combined with information from student learning profiles.*

13) *Which of the following statements regarding multiple intelligence and differentiated instruction is true? . . . the capacity to solve problems using one or more of several intelligences . . .*

14) *Please choose the statement that is most accurate in regards to differentiated instruction and assessments…Ongoing data are utilized to develop, meaningful, and relative instruction for students.*

Arguably, Component 2 was primarily about assessment. Of the four items, two items, 11 and 14, were explicitly about assessment. Item 12 was about classroom management and Item 13 explained multiple intelligence theory. It is unclear why item 8 from the first component, which contained the language of *assessment*, did not load on this component.

Component 3: multiple intelligences and learning styles. The next five items loaded on the third factor:

7) *Multiple Intelligence Theory is . . . The belief that an individual has at least eight different intelligences, some stronger than others. Is this the correct response?*

15) *Differentiation Theory and its partner in practice, differentiated instruction, include several aspects . . . Accomplished teachers . . . understand which types of strategies should be utilized when managing a differentiated classroom. Which of the following strategies does NOT . . . and is NOT in agreement with the theory of differentiation? . . . A) Flexible grouping . . . B . . . ability clusters C) Individualized lesson plans . . . D) Student choice . . .*

16) *Differentiating instruction encompasses an instructor's response to learner differences by adapting . . . When designing lessons and to better assist a student in learning, the instructor must be aware of which of the following learner-dependent dimensions?*

17) *The person who desires to have either a practice session before playing on the field, or a walk-through before a presentation is most likely . . . A kinesthetic-experiential learner.*

10) *A student who has musical intelligence would be considered . . . Sound smart.*

Component three was primarily about multiple intelligences and learning styles. Three of the five items, 7, 17, and 10, addressed multiple intelligence and learning styles directly. Item 7 essentially defined multiple intelligence theory, while items 17 and 10 were about the specific intelligences of *kinesthetic* and *musical,* respectively.

Item 16 was about lesson design. Although it did not address multiple intelligences or learning style directly, it included language about how an instructor responds to learner differences and learner-dependent dimensions, which could conceivably tie it to multiple intelligences and learning styles. Item 15 was about managing DI in the classroom. The reason for its loading on the component was unclear.

Component 4: resources used to implement differentiated instruction. The last component of this solution included the following four items:

18) . . . *After reading the scenarios, choose which instructor most effectively used data in assisting differentiating instruction in her class . . .*

19) *To help an instructor more appropriately manage grade level and academic diversity, Tic-Tac-Toe and R.A.F.T. Boards are often used as . . . Teacher designed tools that give students short-term learning choices.*

2) *Webb's Depth of Knowledge (DOK) provides a vocabulary and a frame of reference . . . This is important to consider when developing lesson content . . . which is NOT true regarding DOK and differentiated instruction?*

20) *Please read . . . classroom scenarios. Then choose which teacher is multi-managing while using differentiated instruction as . . .*

This component was primarily about resources used to implement DI. Although these items concerned the disparate areas of assessment, multi-management, and lesson design, each identified the use of specific resources for the implementation of DI. Item 18 presented scenarios in which teachers used data to create lessons and student groups. As discussed in the literature review, ongoing data are necessary for utilizing successful DI (Garrison & Ehringhaus, 2007; Gregory, 2005; Sands & Barker, 2004)

R.A.F.T. and Tic-Tac-Toe Boards are the teacher-designed resources identified in item 19. These boards are tools that give students some learning choices; therefore, the boards are both a student and instructor resource for DI. Because item 2 included the words *provides a vocabulary and framework of reference,* it might be argued that this item also supports resources used in DI.

Item 20 was about managing the classroom. Its highest loading was relatively low (.36) although it clearly loaded on the fourth component. This question with four scenarios had very little to do with resources; as such, it is difficult to provide a rationale for its loading on this component.

Failure to load. Item 6, which was about assessment, failed to load on any component. It read as follows:

6) *Accomplished teachers who differentiate instruction use assessment to . . .*

This item had generally low loadings (.01 to |.24|) and cross-loaded on components one and three. The communality was low and indicated that only 18% of the variance in this item was explained by the four-component solution, explaining why item 6 failed to clearly load on any one component. Assessment is clearly what this item was about and it is challenging to argue its fit on either the first or third components.

Evidence of Construct Validity

The goal of the project was to create an assessment that would examine what educators know about DI. It was suggested that knowledge of four different dimensions was necessary to successfully differentiate instruction and that the DIA would yield evidence of construct validity. The factors did not load as expected on either the three or four solution matrix; therefore, the DIA and its constructs as proposed, lacks construct validity.

CHAPTER 5

DISCUSSION

The goal of this project was to develop a valid and reliable instrument that would assess what educators know about the construct of DI. Results indicate this was not accomplished. This chapter elaborates on why, discusses the limitations of this project, and identifies implications for future research.

Reliability

Cronbach's (1951) coefficient alpha should be at least .80 to assume adequate reliability. The constructs of Multiple Intelligence and Assessment did not reach an alpha of .80 most likely because of a lack of variability; this restriction of range attenuated the correlation. Consequently, the items in these subscales will need to be completely rewritten or deleted from the DIA. The items about multiple intelligence and learning styles may have been too easy as nearly every participant got them right; nevertheless, it could be argued that most educators understand the construct of multiple intelligence as it relates to DI.

Assessment could be a different issue altogether. The educators of today are well-versed in assessments of all kinds as in many states teacher accountability has become dependent on mandated state exams. Perhaps those who took the DIA were so knowledgeable about assessment that, like the subscale of multiple intelligence, the items were not challenging enough. It might also be possible that while participants comprehended assessment, they did not

particularly know how to utilize its data when attempting to practice a teaching method such as DI. Further research would be necessary to make that determination.

On the pretest, of the 32 participants, 29 (90%) scored 15 and on the posttest, 31 (97%) scored 15. Though there was a restriction of range, the scores did remain relatively stable over time. The main concern was the lack of variability and the resultant attenuated correlations in the subscales of Multiple Intelligence and Assessment.

Construct Validity

In order to find evidence of construct validity, the DIA was evaluated from two perspectives: the retranslation tasks and factorial analyses.

Retranslation Tasks

There was a general consensus among the experts that the items were measuring the constructs identified. As such, the 20 items in the DIA *looked* as though they were measuring what they claimed to be measuring indicating evidence of face validity.

Nineteen of the 20 items in the DIA were correctly classified by most participants of the retranslation tasks. The suggestions from the experts were as simple as adding a word here and there to warrant proposed classification or assessment of knowledge about DI. Only one item was reworked to any extent which was the scenario about the utilization of data. These tasks provided preliminary evidence of content validity.

Factorial Analyses

The resulting four component structures from the PCA did not support the validity of the proposed DIA. The 20 items did not load onto the proposed and identified dimensions originally considered as the four constructs underlying the construct of DI: (a) comprehension and application of multiple intelligence theory while utilizing various learning styles (Multiple

Intelligence), (b) development of units based on such data that has a wide DOK range (Lesson Design), (c) multi-management of various student tasks (Multi-Management), and (d) interpretation and utilization of ongoing formative and summative student data on a daily basis (Assessment).

Though somewhat of a structure emerged for interpretation, it was one that lacked strength and, for several items, meaning. Three of the underlying constructs initially proposed partially suited the extracted factors and were retained: multiple intelligence, lesson design, and assessment. Multiple intelligence had the most items to load on one component; however, each component included a mismatch of items from each proposed subscale. The analysis also indicated that another construct might be underlying the construct of DI: resources needed to implement DI.

One item about assessment failed to load high on any one component though it did cross load on the components of lesson design and multiple intelligences. This is but one example of how the loading of certain items did not make any sense, which resulted in a weaker structure than was expected.

Limitations of this Study

One of the limitations was possibly the lack of diversity of the smaller group (n = 32) in the temporal stability portion of the study. The only requirement asked of participants was that they could return for the retest. Colleagues and their educator friends were asked to consider participating. In turn, this request expanded into additional requests of their colleagues to participate. Out of the 32 subjects, all but one had attempted to use DI in the classroom. Perhaps, a more diverse group that included those with little or no experience with DI might have resulted

in more variability in the responses, and as a result, higher measures of reliability on all of the subscales.

Another limitation to consider was the probable lack of difficulty of some of the items on the subscales of Multiple Intelligence and Assessment. It is possible that educators have begun to have their own depth of understanding regarding these dimensions but in all likelihood, the items were too easy and should be revised as more complex items. For example, two or more multiple intelligences as well as learning styles could be within each answer choice as in the italicized questions below:

Choose the answer that places the intelligences in the right order from left to right for determining the primary intelligences that would be used by 1) a politician; 2) an architect when developing new building plans; and 3) an engineer designing bridges.

A. 1) Intrapersonal; 2) Logical-mathematical; and 3) Visual-spatial

B. 1) Interpersonal; 2) Visual-spatial; and 3) Bodily-kinesthetic

C. 1) Verbal-linguistic; 2) Naturalistic; and 3) Logical-mathematical

D. 1) Interpersonal; 2) Visual-spatial; and 3) Logical-mathematical

If Jim were teaching a series of math patterns and he began comparing the math sequences to the growth pattern on pinecones or the octaves on a keyboard, which of the following multiple intelligences or learning styles would he be addressing?

A. Mathematical-logical, musical, auditory, and sensory

B. Mathematical-logical, naturalistic, musical, and visual

C. Mathematical-logical, kinesthetic, sensory, and visual

D. Mathematical-logical, naturalistic, sensory, and visual

Implications for Future Study

The goal of this project was to develop a valid and reliable instrument that would assess what educators know about the construct of DI and it was not achieved. The DIA needs to be re-developed, some items rewritten, and others deleted as discussed in detail in the preceding. The testing procedures should be reapplied to the revised items, and care taken to ascertain diversity in the small group portion of the study for temporal stability. Participants should be screened regarding knowledge of DI so that the group could include educators who have experience with classroom differentiation as well as those who do not.

DI is an important area for research for several reasons. The development of an instrument to assess what educators know about the construct of DI would help us understand why this proposed best method of instruction is not used more often in the classroom.

Conclusion

The development of the DIA, as proposed, was not successful. The instrument will need to be revised and the steps taken to create such an instrument will need to be revisited.

In this study, the researcher looked for evidence that the internal structure of the DIA was measuring what was expected to be measured. The constructs of the DIA were developed to shed light on the following questions:

- Do educators comprehend how learning styles and multiple intelligences are relative to the proposed practice of DI?
- Do they know how to develop units with varying depth of knowledge?
- Is it understood that DI requires multi-managing a classroom?
- Do these professionals understand that in order to practice this method of instruction that they must utilize formative and summative data on a daily basis?

While the original four questions remain unanswered, the DIA as currently written did illuminate the following constructs associated with DI: lesson design, assessment, multiple intelligence, and resources needed to implement DI.

In conclusion, there is an ongoing controversy about DI. That controversy combined with the lack of empirical evidence continues to accentuate the need for a well-developed instrument about the construct of DI.

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APPENDIX A: FIRST DRAFT OF THE DIA

1. Differentiation Theory is an instructional theory that discusses how educators can plan and deliver instruction in multi-ability classrooms. Based on this theory, teachers can structure and manage the learning environment to address the

   A. Diverse learning styles, interests, intelligences, and abilities within the classroom
   B. Diverse learning styles and intelligences within the classroom
   C. Diverse interests and abilities within the classroom
   D. Diverse intelligences, learning styles, and abilities within the classroom

2. Webb's Depth of Knowledge (DOK) provides a vocabulary and a frame of reference when thinking about our students and how they engage with the content. This is important to consider when developing lesson content. Which of the following statements is *NOT* true regarding DOK and differentiated instruction?

   A. Differentiated instruction is an important tool for engaging students while providing for individual needs.
   B. Teachers must have very specific learning objectives and provide several learning pathways to those objectives.
   C. Clear learning objectives are customized to challenge students as they use their knowledge to organize and make sense of ideas and information.
   D. Differentiation is a single instructional strategy rather than a methodology that blends a variety of strategies.

3. Which of the following statements about differentiated instruction is true?

   A. Differentiated instruction allows students to have multiple options for taking in information.
   B. Differentiated instruction is not adapting what you teach but it is about how you give them access to information.
   C. Differentiated instruction is about student interests, DOK, and understanding learning styles, but it is not about the pace at which a student learns.
   D. Differentiated instruction is when teachers create appropriately different learning experiences for individual students without modifying the prescribed curriculum.

4. Students of today enjoy using technology; when developing lessons for differentiating instruction, teachers would do well to remember which of the following?

   A. Students must be entertained in order for them to learn.
   B. Lessons should be less than 15 minutes in length to maximize student interest.
   C. Many students and teachers multitask but unless the learner is focused on the cognitive task, content may not be learned.
   D. Digital learning is here to stay so it should always be used when developing lessons over content that is essential to be learned.

5. Another way of saying that a student has interpersonal intelligence would be to say that s/he is

   A. Word smart
   B. People smart
   C. Self smart
   D. Nature smart

6. Accomplished teachers who differentiate instruction use assessments

   A. To maximize individual students' learning, to measure progress, and to post the progress in hallway for district walkthroughs
   B. To measure progress and to highlight the scores of gifted students
   C. To maximize individual students' learning, to measure progress, and to adjust instructional practices
   D. To maximize the learning of the middle group which is more important than the higher and lower learning groups

7. Multiple Intelligence Theory is

   A. The idea that students have different learning modalities
   B. The combination of visual, auditory, and kinesthetic learning styles
   C. The belief that an individual has at least eight different intelligences, some stronger than others
   D. The combination of visual, auditory, and kinesthetic learning styles

8. There are three main types of assessments:

   1) Summative assessments
      i. These measure students' development in the learning process at a specific time during the academic year (e.g., at the end of a unit, a benchmark during the year, an annual achievement test)
   2) Formative assessments
      i. These are used to maximize individual students' learning, to measure progress, and to adjust instructional practices.
   3) Performance and/or alternative assessments

i. These require students to perform task(s) as opposed to selecting answers. In many cases performance assessments are designed with needs of an individual student in mind.

The type of assessment that drives differentiated instruction the majority of the time is

A. Alternative or Performance
B. Formative
C. Summative
D. All of the above

9. There are four Depth of Knowledge (DOK) levels to consider when designing student lessons:

1) Recall and Reproduction;
2) Skills and Concepts/Basic Reasoning;
3) Strategic Thinking/Complex Reasoning; and
4) Extended Thinking/Reasoning.

Which of the following objectives provides the best example of using differentiated instruction to increase strategic thinking?

A. Students will identify interrelationships (themes, ideas, concepts) developed in more than one literary work and will either write a brief comparative narrative or create a poster board that compares and identifies these interrelationships.
B. Students will identify essential information needed to accomplish a task by completing a multiple choice worksheet.
C. Students will identify information in a passage that is supported by fact by completing a fill in the blank worksheet.
D. Students will identify the appropriateness of an argument and then further develop an extension of that argument using supporting evidence.

10. A student who has musical intelligence would be considered

A. Word smart
B. Body smart
C. Sound smart
D. Image smart

11. There are several ways to conduct needs assessments in order to differentiate instruction. The instructor should

    A. Consider the type of standardized tests that are available for new students
    B. Consider the size of the class and a teacher's access to a computer
    C. Consider utilizing informal tests that assess student readiness combined with information from student learning profiles
    D. Consider utilizing student learning profiles combined with the most recent score from student state assessments

12. When differentiating instruction, accomplished teachers take which of the following measures for effective classroom management?

    A. Ignore problem behaviors while attempting to engage the rest of the class
    B. Explain rules and procedures clearly while offering activities that will engage the students
    C. Give students with behavior problems some independent work and seat them in the hallway or away from the rest of the students
    D. All of the above

13. Which of the following statements regarding multiple intelligence and differentiated instruction is true?

    A. Multiple intelligence is based on one's intelligence quotient.
    B. Multiple intelligence is based on one's intelligence quotient and environmental smarts.
    C. Multiple intelligence is the capacity to solve problems using one or more of several intelligences or strengths that have existed since one's birth.
    D. Multiple intelligence is the ability to multitask and still be able to think through problems for solutions.

14. Please choose the statement that is most accurate in regards to differentiated instruction and assessments.

    A. SATs and ACTs are two examples of formative assessments.
    B. Ongoing data are utilized to develop challenging, meaningful, and relative instruction for students.
    C. Educators and administrators use formative data from annual standardized achievement tests; however, daily summative data are utilized to navigate the unknown levels in a classroom.
    D. The Graduate Record Examination measures the readiness for graduate work at the high school level.

15. Differentiation Theory and its partner in practice, differentiated instruction, include several aspects about which teachers and administrators should be aware. Accomplished teachers are well aware of what they need to be facilitating during each of their classes. These teachers understand which types of strategies should be facilitated when managing a differentiated classroom. Which of the following strategies does *NOT* fall under the umbrella description of differentiated instruction and is *NOT* in agreement with the theory of differentiation?

    A. Flexible grouping and student-centered learning
    B. Multiple assignments and ability clusters
    C. Individualized lesson plans and different work for advanced students
    D. Student choice with teacher guidance and allowing students to opt out of what they know

16. Differentiating instruction encompasses an instructor's response to learner differences by adapting curriculum and instruction on several dimensions. When designing lessons and to better assist a student in learning, the instructor must be aware of which of the following learner-dependent dimensions?

    A. Content, process, and product
    B. Interest, learning profile, and readiness
    C. Content, learning style, and readiness
    D. Interest, process, and product

17. The person who desires to have either a practice session before playing on the field, or a walk-through before a presentation, is most likely

    A. An auditory learner
    B. A tactile learner
    C. A kinesthetic-experiential learner
    D. A visual learner

18. Read the scenarios below to choose which instructor most effectively uses data to assist in designing differentiated lessons in her class. All four teach 7th grade language arts.

Darlene is modeling how to write a paragraph using this week's eight vocabulary words to 28 students. She has given each student a handout about what she is modeling. She is teaching the entire class using direct instruction though two students earned an A on the vocabulary pre-test. Darlene is permitting these students to move on to the next set of vocab words without writing the paragraph. The rest of the class has already been assigned to mixed-ability groups based last quarter's grading report so that peers can help one another if needed. The paragraph is due at end of period.	**Susan** is explaining how to write a paragraph using this week's eight vocabulary words to 28 students. Two students have already aced the vocab pretest; she expects them to listen to her instruction. When she finishes her instruction, she assigns all students to mixed-ability groups. The groups are assigned by the semester reporting grades. They are to help one another with the assignment as peer coaches. The written paragraph is due at the end of period for each student to receive credit for their work and attendance this class period.
Jane is modeling how to write a paragraph using this week's eight vocabulary words to her 28 students. She has given each student a handout about what she is modeling. She is teaching the entire class using direct instruction though two students earned an A on the vocabulary pre-test and have the option of writing the paragraph without her instruction. At the end of her instruction, Jane places the students in mixed-ability groups, and/or pairs based on not only their state exam scores, but also on weekly vocab tests and grammar bench mark exams. Jane also lets students work independently, if capable, as some students do not like working in groups – the paragraph is due tomorrow.	**Kay** is explaining how to write a paragraph using this week's eight vocabulary words to her 28 students. Two students have already aced the vocab pretest; she expects them to listen to her instruction. When she finishes her instruction, she assigns the students to mixed-ability groups. The groups have been assigned according to scores from the standardized state test. They are to help one another with the assignment as peer coaches. The written paragraph will be due at the beginning of the class tomorrow as Kay realizes that all students do not work at the same pace and may need more time to work on the paragraph

A. Darlene B. Susan
C. Jane D. Kay

19. To help an instructor more appropriately manage grade level and academic diversity, Tic-Tac-Toe and R.A.F.T. Boards are often used as

    A. Teacher designed curriculum boards that enhance student learning
    B. Teacher designed tools that give students short term learning choices
    C. Teacher designed tools that give students curriculum choice
    D. None of the above

20. Please read the four different classroom scenarios. Then choose which teacher is multi-managing while using differentiated instruction as his primary method of instruction. All four instructors teach World History.

Steve is entering data at his desk while his students are involved in one of two activities. The first group is retaking an open book assessment while the other works on an enrichment activity based on the content in the first group's assessment. Steve told his students to raise their hand if they have any questions and that he will still be available to them. Those working on enrichment may come to his desk but those completing the assessment must remain seated until Steve is able to address their questions.	**Chad** is walking around the room checking in with individual students as well as his groups. Two students are working independently on a project of their own design. Two student groups are working through a textbook chapter and creating an assessment that Chad will use for the class. Students are permitted to move in the classroom to sharpen pencils, get a tissue, or throw away trash; however, Chad expects his students to remain seated any other time.
Bradley is conferencing with individual students while the class works independently on the chapter review. Students may work in groups if they choose. One student is writing a poem based on the content in the assigned chapter. Bradley told the student that the poem may count as extra credit but he must also complete the chapter review. Bradley does allow his students to move in his room as needed.	**Tom** is standing in the center of his classroom. Students check in with him all period. Three students are working independently – one at his desk and two at the whiteboard. Several students are writing a play about the content in the assigned chapter. Four students ask Tom to preview their Power Point presentations before submitting work. Tom quickly grades the written test of one student and gives her permission to begin reading the next chapter. Students may move about the classroom as needed.

A. Steve B. Chad
C. Bradley D. Tom

APPENDIX B: PARTICIPANT DEMOGRAPHICS

DIA Teacher Participant Demographic

1. What is your gender?
   □ Female
   □ Male

2. What is the highest degree you have earned?
   □ Bachelor's
   □ Master's
   □ Master's + 30
   □ Graduate level work above the Master's + 30
   □ PhD or EdD

3. Where did you receive your undergrad degree?_____

4. What content area(s) do or you teach? (Please check all that apply)
   □ Math
   □ Language Arts
   □ Science
   □ Social Studies
   □ Special Education
   □ Other (please describe)_____

5. What is (are) your academic level(s)? (Please check all that apply)
   □ Pre-school
   □ Primary (K-2)
   □ Intermediate (3-5)
   □ Middle School (6-8)
   □ High School
   □ Higher Education

6. How many years have you been teaching?
   □ I am a first year teacher.
   □ 2- 4 years
   □ 5 – 9 years
   □ 10 – 14 years
   □ 15 or more years

7. How would you define your current position? (Please check all that apply)
   □ I teach part time.
   □ I teach full time.
   □ I am recently retired but substitute teach. (Recent – within the last 3 years)
   □ Other (please describe)_____

8. Please define your school district to the best of your ability.
   □ My district is part of an urbanized area (more than 50,000 or more people).
   □ My district is considered an urban cluster (more than 2,500 and less than 50,000 people)
   □ My district is considered rural (less than 2,500 people).

9. Do you differentiate instruction in your classroom?
   □ I have never attempted to differentiate instruction.
   □ I have attempted to differentiate instruction but it was a challenging endeavor.
   □ I have attempted to differentiate instruction on several occasions but generally use other instructional methods.
   □ I differentiate instruction often in my classroom along with other instructional methods but do not consider it the method that I want to use the most.
   □ Differentiated instruction is one of the primary methods that I choose to use and I use it often in my classroom.

10. If you chose either of the last two statements in question #9 above, how many years would you say that you have differentiated instruction? _____years

11. Regarding your supervising administrator, would you say
   □ I am encouraged and supported in using differentiated instruction in my classroom.
   □ I am encouraged though not supported in using differentiated instruction in my classroom.
   □ I am neither encouraged nor supported in using differentiated instruction in my classroom.
   □ I do not know how my supervising administrator feels about differentiated instruction.

12. Regarding your colleagues, would you say
   □ I am encouraged and supported in using differentiated instruction in my classroom.
   □ I am encouraged though not supported in using differentiated instruction in my classroom.
   □ I am neither encouraged nor supported in using differentiated instruction in my classroom.
   □ I do not know how my colleagues feel about differentiated instruction.

DIA Administrator Participant Demographic

1. What is your gender?
   □ Female
   □ Male

2. What is the highest degree you have earned?
   □ Bachelor's
   □ Master's
   □ Master's + 30
   □ Graduate level work above the Master's + 30
   □ PhD or EdD

3. Where did you receive your undergrad degree?_____

4. What content area(s) have you taught? (Please check all that apply)
   □ Math
   □ Language Arts
   □ Science
   □ Social Studies
   □ Special Education
   □ Other (please describe)_____
   □ I have never taught.

5. What were your academic level(s)? (Please check all that apply)
   □ Pre-school
   □ Primary (K-2)
   □ Intermediate (3-5)
   □ Middle School (6-8)
   □ High School
   □ Higher Education

6. How would you describe the level of you school setting? (Please check all that apply).
   □ Primary
   □ Middle
   □ High
   □ Other (please describe unique circumstances)_____

7. How would you define your current position? (Please check all that apply)
   □ Principal
   □ Assistant Principal
   □ Curriculum Administrator
   □ Counselor
   □ Other

8. Please define your school district to the best of your ability.
   □ My district is part of an urbanized area (more than 50,000 or more people).
   □ My district is considered an urban cluster (more than 2,500 and less than 50,000 people)
   □ My district is considered rural (less than 2,500 people).

9. How many years did you teach before becoming an administrator?
   □ 1-3
   □ 4-10
   □ I did not teach.

10. If you did teach prior to becoming an administrator, did you differentiate instruction in your classroom?
    □ I have never attempted to differentiate instruction.
    □ I have attempted to differentiate instruction but it was a challenging endeavor.
    □ I have attempted to differentiate instruction on several occasions but generally use other instructional
    methods.
    □ I have differentiated instruction often in my classroom along with other instructional methods but do
    not consider it the method I wanted to use the most.
    □ Differentiated instruction is one of the methods that I chose to use and I used it often in my classroom.

11. If you chose either of the last two choices in question #10 above, how many years would you say that you did differentiate instruction in your classroom? _____years

12. Regarding the teachers whom you supervise, would you say
    □ I do not support their choice to differentiate instruction.
    □ I encourage my teachers to differentiate instruction.
    □ Not applicable in my current position.

APPENDIX C: REVISED AND FINAL DRAFT OF THE DIA

1. Differentiation Theory is an instructional theory that discusses how educators can plan and deliver instruction in multi-ability classrooms. Based on this theory, teachers can structure and manage the learning environment to address the

   A. Diverse learning styles, interests, intelligences, and abilities within the classroom
   B. Diverse learning styles and intelligences within the classroom
   C. Diverse interests and abilities within the classroom
   D. Diverse intelligences, learning styles, and abilities within the classroom

2. Webb's Depth of Knowledge (DOK) provides a vocabulary and a frame of reference when thinking about our students and how they engage with the content. This is important to consider when developing lesson content. Which of the following statements is *NOT* true regarding DOK and differentiated instruction?

   A. Differentiated instruction is an important tool for engaging students while providing for individual needs.
   B. Teachers must have very specific learning objectives and provide several learning pathways to those objectives.
   C. Clear learning objectives are customized to challenge students as they use their knowledge to organize and make sense of ideas and information.
   D. Differentiation is a single instructional strategy rather than a methodology that blends a variety of strategies.

3. When developing curriculum with the intention of designing lessons to use differentiated instruction, which of the following statements is true?

   A. Differentiated instruction allows students to have a variety of options for taking in information.
   B. Differentiated instruction is not adapting what you teach but it is about how you give them access to information.
   C. Differentiated instruction is about student interests, DOK, and understanding learning styles, but it is not about the pace at which a student learns.
   D. Differentiated instruction is when teachers create appropriately different learning experiences for diverse students without modifying the prescribed curriculum.

4. Students of today enjoy using technology; when developing lessons for differentiating instruction, teachers would do well to remember which of the following?

   A. Students must be entertained in order for them to learn.
   B. Lessons should be less than 15 minutes in length to maximize student interest.
   C. Many students and teachers multitask but unless the learner is focused on the cognitive task, content may not be learned.
   D. Digital learning is here to stay so it should always be used when developing lessons over content that is essential to be learned.

5. Another way of saying that a student has interpersonal intelligence would be to say that s/he is

   A. Word smart
   B. People smart
   C. Self smart
   D. Nature smart

6. Accomplished teachers who differentiate instruction use assessments

   A. To maximize individual students' learning, to measure progress, and to post the progress in hallway for district walkthroughs
   B. To measure progress and to highlight the scores of gifted students
   C. To maximize individual students' learning, to measure progress, and to adjust instructional practices
   D. To maximize the learning of the middle group which is more important than the higher and lower learning groups

7. Multiple Intelligence Theory is

   A. The idea that students have different learning modalities
   B. The combination of visual, auditory, and kinesthetic learning styles
   C. The belief that an individual has at least eight different intelligences, some stronger than others
   D. The combination of an individual's special abilities and intelligence quotient.

8. There are three main types of assessments:

    1) Summative assessments
        i. These measure students' development in the learning process at a specific time during the academic year (e.g., at the end of a unit, a benchmark during the year, an annual achievement test)
    2) Formative assessments
        i. These are used to maximize individual students' learning, to measure progress, and to adjust instructional practices.
    3) Performance and/or alternative assessments
        i. These require students to perform task(s) as opposed to selecting answers. In many cases performance assessments are designed with needs of an individual student in mind.

    The type of assessment that drives differentiated instruction the majority of the time is

    A. Alternative or Performance
    B. Formative
    C. Summative
    D. All of the above

9. There are four Depth of Knowledge (DOK) levels to consider when designing student lessons:

    1) Recall and Reproduction;
    2) Skills and Concepts/Basic Reasoning;
    3) Strategic Thinking/Complex Reasoning; and
    4) Extended Thinking/Reasoning.

    Which of the following objectives provides the best example of using differentiated instruction to increase strategic thinking?

    A. Students will identify interrelationships (themes, ideas, concepts) developed in more than one literary work and will either write a brief comparative narrative or create a poster board that compares and identifies these interrelationships.
    B. Students will identify essential information needed to accomplish a task by completing a multiple choice worksheet.
    C. Students will identify information in a passage that is supported by fact by completing a fill in the blank worksheet.
    D. Students will identify the appropriateness of an argument and then further develop an extension of that argument using supporting evidence.

10. A student who has musical intelligence would be considered

    A. Word smart
    B. Body smart
    C. Sound smart
    D. Image smart

11. There are several ways to conduct needs assessments in order to differentiate instruction. The instructor should foremost

    A. Consider the type of standardized tests that are available for new students
    B. Consider the size of the class and a teacher's access to a computer
    C. Consider utilizing informal tests that assess student readiness combined with information from student learning profiles
    D. Consider utilizing student learning profiles combined with the most recent score from student state assessments

12. When differentiating instruction, accomplished teachers take which of the following measures for effective classroom management?

    A. Ignore problem behaviors while attempting to engage the rest of the class
    B. Explain rules and procedures clearly while offering activities that will engage the students
    C. Give students with behavior problems some independent work and seat them in the hallway or away from the rest of the students
    D. All of the above

13. Which of the following statements regarding multiple intelligence and differentiated instruction is true?

    A. Multiple intelligence is based on one's intelligence quotient.
    B. Multiple intelligence is based on one's intelligence quotient and environmental smarts.
    C. Multiple intelligence is the capacity to solve problems using one or more of several intelligences or strengths that have existed since one's birth.
    D. Multiple intelligence is the ability to multitask and still be able to think through problems for solutions.

14. Please choose the statement that is most accurate in regards to differentiated instruction and assessments.

    A. SATs and ACTs are two examples of formative assessments.
    B. Ongoing data are utilized to develop challenging, meaningful, and relative instruction for students.
    C. Educators and administrators use formative data from annual standardized achievement tests; however, daily summative data are utilized to navigate the unknown levels in a classroom.
    D. The Graduate Record Examination measures the readiness for graduate work at the high school level.

15. Differentiation Theory and its partner in practice, differentiated instruction, include several aspects about which teachers and administrators should be aware. Accomplished teachers are well aware of what they need to be facilitating during each of their classes. These teachers understand which types of strategies should be facilitated when managing a differentiated classroom. Which of the following strategies does *NOT* fall under the umbrella description of differentiated instruction and is *NOT* in agreement with the theory of differentiation?

    A. Flexible grouping and student-centered learning
    B. Multiple assignments and ability clusters
    C. Individualized lesson plans and different work for advanced students
    D. Student choice with teacher guidance and allowing students to opt out of what they know

16. Differentiating instruction encompasses an instructor's response to learner differences by adapting curriculum and instruction on several dimensions. When designing lessons and to better assist a student in learning, the instructor must be aware of which of the following learner-dependent dimensions?

    A. Content, process, and product
    B. Interest, learning profile, and readiness
    C. Content, learning style, and readiness
    D. Interest, process, and product

17. The person who desires to have either a practice session before playing on the field, or a walk-through before a presentation, is most likely

    A. An auditory learner
    B. A tactile learner
    C. A kinesthetic-experiential learner
    D. A visual learner

18. Below are four scenarios describing the actions of four 7th grade language arts teachers, each of whom teach 28 students. After reading the scenarios, choose which instructor most effectively used data in assisting differentiating instruction in her class. Each teacher is modeling or explaining how to write a paragraph using the current week's eight vocabulary words.

Darlene gave each student a handout about what she is modeling. She is teaching the entire class using direct instruction. Because two students earned an A on the vocabulary pre-test, Darlene is permitting these students to move on to the next set of vocabulary words without writing the paragraph. The other 26 students have been assigned to mixed-ability groups based on last quarter's grading report so that peers can help one another if needed.	**Susan** has two students who have earned As on the vocabulary pretest; she expects them to listen to her instruction. When she finishes her lesson, she assigns all students to mixed-ability groups, which are assigned by the semester reporting grades. They are expected to help one another with the assignment as peer coaches.
Jane gave each student a handout about what she is modeling. She is teaching the entire class using direct instruction. Because two students earned As on the vocabulary pre-test, they have the option of writing the paragraph without instruction. At the end of her instruction, Jane places the students in mixed-ability groups or pairs based on not only their state exam scores, but also on weekly vocabulary test scores and grammar bench mark exams.	**Kay** has two students who have earned As on the vocabulary pretest; she expects them to listen to her instruction. When she finishes her lesson, she assigns the students to mixed-ability groups, which have been assigned according to scores from the standardized state test. They are expected to help one another with the assignment as peer coaches.

A. Darlene B. Susan
C. Jane D. Kay

19. To help an instructor more appropriately manage grade level and academic diversity, Tic-Tac-Toe and R.A.F.T. Boards are often used as

A. Teacher designed curriculum boards that enhance student learning
B. Teacher designed tools that give students short term learning choices
C. Teacher designed tools that give students curriculum choice
D. None of the above