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Effective Differentiation Strategies for the Secondary Social Studies Classroom

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EFFECTIVE DIFFERENTIATION STRATEGIES FOR THE SECONDARY SOCIAL STUDIES

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Abstract

The No Child Left Behind Act of 2001 sought to improve academic achievement for every child in the United States, regardless of ethnicity, socioeconomic status, or background. Since NCLB, educators and researchers have given differentiation greater attention with the hope that it will provide effective strategies for ensuring that every child reaches their full potential. Differentiation, however, requires significant resources; many teachers report feeling overwhelmed when creating a differentiated classroom without proper administrative support and collaboration. This literature review seeks to answer the question of which differentiation strategies are most likely to increase student achievement by examining the research regarding the most commonly utilized strategies for differentiation. The research compiled indicates that differentiating instruction according to Bloom's Taxonomy and Gardner's Multiple Intelligences theory, as well as using curriculum enrichment, tiered assignments, flexible grouping and technology to differentiate produced the most consistent and significant positive results on student achievement. Conversely, the research indicates that differentiating according to learning style did not demonstrate consistent positive effects on student achievement.

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CHAPTER I: INTRODUCTION

Background

Education in the United States is continually evolving to better meet the needs of students. Administrators and teachers work diligently to implement best practices in the classroom, and communities and elected officials are passionate for all students to reach their full potential. It is because of this passion and the ensuing legislation that the topic of differentiation in the classroom has received increased attention over the past several years. Differentiation has been occurring in the classroom since the beginning of education in America as teachers have intuitively responded to each individual learner, but it has recently been examined more closely through research of current best practices as they relate to differentiation. Classrooms today are full of diverse learners and educators have turned to differentiation in order to address their individual needs and help them reach their full potential.

There are many different definitions of what differentiation is, but Heacox summarizes it as "changing the pace, level, or kind of instruction you provide in response to individual learner's needs, styles, or interests" (2002). Differentiation is responding to students' unique needs with multi-modal and proven best practices. It seeks to use the most effective strategies to ensure that every student is appropriately challenged, meeting their full potential, and learning in a way that recognizes their unique preferences and strengths.

The guiding question for this thesis is, "Which differentiation strategies are most likely to increase student achievement in the secondary Social Studies classroom?" Differentiation includes a variety of different strategies which require a significant investment on the part of our teachers. In order to create a differentiated classroom, teachers need to often completely rework lessons, units, and assessments. Many studies have indicated that teachers are burdened by the amount of work that is required to effectively differentiate for each individual learner despite knowing the benefits of doing so (Danzi et al., 2008; Joseph et al., 2015; McAdamis, 2001; Valiandes et al., 2015). Teachers feel passionate about implementing differentiation in their classrooms, and if they knew which specific practices were most effective, they could strategically implement differentiation in order to provide the greatest benefit to students while maximizing their limited resources.

Within this thesis, there is a compilation of research that both proves and disproves the effectiveness of some of the most popular differentiation strategies. The strategies that were examined included: differentiating according to learning style; differentiating according to Bloom's Taxonomy and Gardner's Multiple Intelligences; commonly utilized differentiation strategies such as curriculum enrichment, tiered assignments and flexible grouping and using technology to differentiate.

Definition of Terms

Learning style is individual preferences for where, when, or how a student obtains and processes information (Heacox, 2002, p. 8).

Bloom's Taxonomy is a model for examining and differentiating the challenge level of activities that includes six levels of thinking: knowledge, comprehension, application, analysis, evaluation, and synthesis (Heacox, 2002, p. 67).

Gardner's Multiple Intelligences is Howard Gardner's theory that includes eight different intelligences (or strengths and preferences) that form the way we learn.

Tiered Assignments are a differentiation strategy that is intended to provide a better instructional match between students and their individual needs. Assignments can be tiered according to challenge level, resources, outcome etc. (Heacox, 2002, p. 91).

Curriculum Compacting is a differentiation strategy that is intended to continue challenging high-achieving students that have already met the learning outcome by providing more challenging or complex activities. It allows students who are already familiar with the content to skip introductory activities and creates opportunities for enrichment.

Flexible Grouping is placing students in flexible groups that allow them to work together according to proficiency, learning preferences, or to develop collaborative skills. It differs from ability grouping in which students are placed in inflexible groups that do not allow for fluid movement according to student strengths.

History of Differentiation

At the beginning of the 1980's, the United States Department of Education issued a report, *A Nation at Risk*, in which the National Commission on Excellence in

Education compiled their findings on the "quality of learning and teaching in the

nation's schools, colleges, and universities..." (U.S. Dept. of Ed., 1983). Their report

included thirteen factors that were cause for concern within education in the United

States. The following is an abbreviated list of the factors:

- About 13 percent of all 17-year-olds in the United States can be

  considered functionally illiterate. Functional illiteracy among minority

  youth may have run as high as 40 percent.

- Over half the population of gifted students do not match their tested

  ability with comparable achievement in school.

- The College Board's Scholastic Aptitude Tests (SAT) demonstrate a virtually

  unbroken decline from 1963 to 1980.

- Many 17-year-olds do not possess the "higher order" intellectual skills we

  should expect of them. Nearly 40 percent cannot draw inferences from

  written material; only one-fifth can write a persuasive essay; and only one-

  third can solve a mathematics problem requiring several steps.

The authors of the report advised the Secretary of Education to pursue excellence in light of

the troubling report and identified several key recommendations. They wrote,

> "Our goal must be to develop the talents of all to their fullest. Attaining that goal
>
> requires that we expect and assist all students to work to the limits of their
>
> capabilities. We should expect schools to have genuinely high standards rather than

minimum ones, and parents to support and encourage their children to make the most of their talents and abilities." (U.S. Dept. Of Ed., 1983)

The specific recommendations within the report called for stronger requirements, expectations and measurable standards. This report would mark the beginning of standards-based education. Over the next several decades, more steps would be taken to continue reforming education within the United States, ultimately leading to the No Child Left Behind Act. The NCLB Act was signed into law in 2002 by President George W. Bush and established a new set of standards that would see "every child in America – regardless of ethnicity income, or background – achieve high standards" (U.S. Dept of Ed., 2003). The NCLB intended to create an environment in which teachers would have the necessary training and resources needed to teach effectively including curricula grounded in research and annual testing that lets them know which students need extra attention (U.S. Dept of Ed., p. 5). NCLB also tied funding to accountability expectations and schools were to ensure that all students learn the essential skills and knowledge defined by the state using grade-level standards (Jorgensen & Hoffmann, 2003, p. 6). No Child Left Behind ushered in an era of standards-based education and accountability.

NCLB brought the topic of individualized instruction, or differentiation, to the forefront of education as educators recognized the need for instruction that would take into account the diversity in their classrooms. Differentiation has now become the preferred method for teachers to implement proven best practices that appropriately challenges students to meet their full potential by recognizing and accommodating their unique learning preferences and strengths. Differentiation, however, is still being researched as it

raises as many questions as it answers; questions such as: How will teachers be able to

manage the increased workload that comes with differentiation? What teaching strategies

and best practices are part of a differentiated classroom? How effective is differentiated

instruction? This literature review compiles research to help answer the question of "Which

differentiation strategies are most likely to increase achievement in the secondary Social

Studies classroom?"

CHAPTER II: LITERATURE REVIEW

Literature Search Procedures

To locate the literature for this thesis, searches of ERIC, Academic Search Premier, EBSCO MegaFILE, JSTOR, ProQuest Education Journals, and Gale Literary Sources were conducted for publications from 1990-2019. This list was narrowed by only reviewing published empirical studies from peer-reviewed journals that focused on education. The key words that were used in these searches included "differentiated instruction," "differentiation strategies," "differentiation best practices," "learning styles," and "Bloom's Taxonomy," "Gardner's Multiple Intelligences," "brain science and differentiation," "technology and differentiation," "Enrichment and remediation," and "tiered assignments and differentiation." The structure of this chapter is to review the literature on differentiated instruction in four sections in this order: Differentiating According to Learning Style; Differentiating According to Bloom's Taxonomy and Gardner's Multiple Intelligences; Commonly Utilized Differentiating Strategies, and Using Technology to Differentiate.

Differentiating According to Learning Style

One of the most widely researched and debated methods of differentiation is differentiating according to learning styles. Some educators and researchers are passionate proponents of the concept of teaching to accommodate a large variety of learning styles, while others note that the research to support the concept, however promising the idea sounds, has not shown positive results on student performance. In

addition, some researchers have found that teaching according to learning style is supported by emerging brain science.

One such team of researchers, Sousa and Tomlinson (2018), have found that while the research is still limited in scope, a few specific areas of neuroscience research do support the concept of learning styles by providing objective evidence at the biological level. Research has found links between brain activity variations according to gender (male versus female brain) as well as variations according to verbal versus visual cognitive styles. For example, research that studied the differences between the male and female brain found that the female brain uses more brain regions to process language than does the male brain. Furthermore, brain areas activated in males are different from females during mathematical processing (Sousa & Tomlinson, 2018).

Neuroscience research using an electroencephalogram (a test designed to track activity in different regions of the brain) has also supported the concept of learner preferences. Electroencephalograms (EEGs) have been able to reveal different brain regions being activated according to a learner's verbal or visual learning preference. A study done by Kraemer, Rosenberg, and Thompson-Schill supports the idea that learner preferences are represented in the way our brains function. They were able to demonstrate that those who identified as visual learners use regions of their visual cortex, while learners who identified as verbal learners use regions of phonologically-responsive cortex when presented with written and pictorial materials (2009). In an eye-tracking study, a group of college students with varied learner preferences were given

learning materials to review. While learning the material, their eye movements were tracked and the study revealed that "visualizers spent significantly more time inspecting pictures than verbalizers, while verbalizers spent more time inspecting texts" (Koc-Januchta et al., 2017, para. 1). Presently, researchers are limited by brain-imaging technology and its accessibility within a classroom, but they hope that as brain-imaging technology improves scientists will find even greater correlation between preferred learning style and the activation of specific brain regions (Sousa & Tomlinson, 2018).

While burgeoning neuroscience is still discovering new evidence regarding learning styles, education theorists have been researching learning styles since the early twentieth century, resulting in a significant number of categorizations and models for learning styles. Before we can answer the question of whether or not differentiating according to learning style will increase achievement in the classroom, we must first look at the varied classifications of learning styles. It can be quite difficult to categorize the numerous different types of learning styles and this is a source of disagreement among scholars. There are many different views of what exactly a learning style is, with some scholars seeing them as only perceptual preferences, and others seeing them as any preference that affects learning. For example, some have viewed them as cognitive or physiological styles, while some see them as developmentally defined characteristics (Leite, Svinicki & Shi, 2009). The following is a review of the most widespread concepts that have received the most research and attention.

Fleming's VARK Model

Neil Fleming, a secondary teacher educator, created the VARK model of learning preferences in 1992. The VARK model consists of four modalities: visual, aural, read/write, and kinesthetic (V.A.R.K.). These modalities are quite popular and often considered when there is discussion regarding learning styles.

The visual learner (V) prefers information presented in the form of maps, graphs, flow charts, symbolic arrows, or circles. Commonly, it is assumed that this learning preference would include still images or video, but in fact it does not. This modality could also be called Graphic (G), as that more accurately describes the modality (Fleming, 1992). This learner is also impacted by formatting that helps to convey information: whitespace, and patterns.

The Aural/Auditory (A) learner prefers information that is heard or spoken and learns best from lectures, group discussion, radio, email, speaking and talking things through. Those with an aural preference may find they want to "sort things out by speaking first, rather than sorting out their ideas'' (Fleming, 1992). Oftentimes, the Aural learner will prefer to speak to themselves or others, repeating information in their own way in order to learn. Furthermore, they give special attention to words spoken by teachers and prefer listening over taking detailed notes. They also have a preference towards discussions, seminars, and listening to recorded lectures (Prithishkumar, 2014).

The read/write (R) learner prefers information displayed as words. This is the most common modality found in the classroom and, uncoincidentally, many employers

seek efficiency in reading and writing. It is worth noting that those with this modality

find the largest amount of material presented in their preferred mode. For example,

most academic mediums such as dictionaries, encyclopedias, Google, PowerPoint, and

Wikipedia, come in the form of reading/writing (Fleming, 1992).

The final modality is kinesthetic (K) and it refers to the "perceptual preference

related to the use of experience and practice (simulated or real)" (Fleming, 1992, p.140).

Fleming writes, Kinesthetic teaching experience is defined as one in which all or any of

these perceptual modes are used to connect the student to reality, either through

experience, example, practice, or simulation. To offer these experiences, the teachers

may be presenting information visually (V), aurally (A), or in a read/write fashion (R), but

the experience is kinesthetic because of the integrative and real nature of the

information (Fleming, 1992, p.141). The kinesthetic mode is somewhat more complex

than the other modes because it is less about what mode the information is presented

in (whether it is a visual, audible, or written aid), and more about the information being

presented in a real-life, concrete manner.

In his original publication, Fleming addresses three ways in which the VARK

technique has been used in education: one-to-one counseling (for those who are

seeking to improve their learning), among groups of faculty, and lastly, in the classroom

with students (Fleming, 1992). Students are instructed to fill out a questionnaire and use

their data to discover their modal preference that then provides a framework for

students to discover, challenge, and discuss their preferred method of learning. Perhaps

one of the most important uses of the questionnaire is the opportunity it provides for

reflection from faculty. It helps educators become aware of how they are delivering

both content and assessments and can help them to adjust their lessons to bring more

modalities into their classroom. One such science instructor wrote, "I realize I have been

requesting R & W assessment and examples for my students. Now I need to provide

more variation in both my lectures and assessment (Fleming, 1992, p.145). VARK not

only aids in encouraging students to improve upon their systems of learning, but it also

encourages instructors to take a second look at their teaching practices.

Empirical Research Using VARK

Leite, Svinicki, and Shi conducted the study, "Attempted Validation of the Scores

of the VARK: Learning Styles Inventory" in 2009 with the intent to test the reliability of

the VARK scores using psychometric analyses. Fleming's VARK model focuses on

perceptual modes (visual, auditory, and kinesthetic modes), and attempts to "measure

instructional preferences independent of personality characteristics, information

processing strategies, and social interactions in the classroom" (Leite et al., 2009). The

authors of this study noted that Fleming's questionnaire had never been rigorously

tested, not even by Fleming himself who only obtained three components from four

variables. The authors argued that this was an insufficient amount of data (Leite et al.,

2009). Leite et al. sought to answer the following two research questions:

1. Does the four-factor hypothesized structure of the VARK scale

adequately explain the relationships between the observed scores on the VARK items?

2. Can adequate reliability estimates be obtained for the VARK scores?

The study included 14,211 students from the United States that ranged in age from under 25 to over 45 and were in varying stages of education from high school students to university students. In order to collect data, the participants answered a 16-question VARK questionnaire. The study found that the evidence regarding the validity and the reliability of the VARK scores was sufficient for users to feel confident when using VARK as a "low-stakes diagnostic tool by students and teachers" (Leite et al., 2009). Leite et al. noted that for those who want to use VARK as a diagnostic tool to help students identify their preferences should feel comfortable doing so (p. 5). As far as using VARK as a research instrument whose scores could "serve as predictors or outcomes for the evaluation of instructional methods" (p. 5), there was not sufficient evidence to support the use of VARK with research. The authors noted that in order for VARK to be reliably used with research, there needs to be further testing that their study did not delve into.

Much of the research that seeks to validate learning styles can be conflicting. Hussmann and O'Loughlin's 2019 study, "Another Nail in the Coffin for Learning Styles? Disparities among Undergraduate Anatomy Students' Study Strategies, Class Performance, and Reported VARK Learning Styles," was one such study that provided conflicting results when compared to other studies that examined learning styles.

Husmann and O'Loughlin, sought to "assess if undergraduate anatomy students are more likely to utilize study strategies that align with their hypothetical learning styles" using the VARK analysis and whether or not the alignment correlated with their outcome in their course (p. 6). Additionally, the researchers sought to answer two more questions: whether students' VARK learning styles are correlated with course outcomes regardless of the students' study strategies, and whether any study strategies are correlated with course outcomes, regardless of students specific VARK results (Husmann & O'Loughlin, 2019). To perform the study, 426 anatomy students over the course of two years completed online surveys that included both the VARK assessment and a study strategies survey. The results of this study demonstrated that most students did not report study strategies that correlated with their VARK learning style and that the reported study strategies that aligned with the VARK results had no correlation with anatomy course outcomes (Husmann & O'Loughlin, 2019). Based on the results of this study, Husman and O'Loughlin assert that the conventional wisdom regarding learning styles should be disregarded by educators.

Wright and Stokes published the study, "The Application of VARK Learning Styles in Introductory Level Economics Units," in 2015 with the purpose of measuring the effectiveness of using the VARK method on student achievement and learning outcomes in economics. The researchers wanted to answer the basic question of whether or not using learning preferences categorized by VARK would improve achievement of national learning standards.

According to Wright and Stokes, the discipline of economics, a division of social studies, has been consistently ranked by students as having the lowest quality of teaching (2015). Even though researchers called for the end of "chalk and talk" and an overhaul of economics teaching methods, many within universities are still using the traditional methods, and certainly not implementing differentiation based upon learning styles such as VARK (Wright & Stokes, 2015, p. 62). The methodologies for this study included both qualitative and quantitative analysis to measure the effectiveness of the implementation of the VARK method. In regards to the qualitative data, students were surveyed and asked to rank aspects of their learning, as well as providing an overall score regarding the quality of teaching. For the quantitative aspect of the study, students were asked to provide feedback in regards to the quality of teaching and learning they experienced.

The results of this study conclusively reflect positively on teaching with the VARK method. The university that implemented VARK was ranked by students as having a teacher quality of 90, compared to an average score of 64 for the other nine local universities. Furthermore, the average score achieved by the students was 97, while the other nine universities had an average score of 84 (Wright & Stokes, 2015, p. 76). While there is little room for arguing against the success of implementing the VARK method in this study, one can find the variation among studies frustrating when trying to research the success of differentiating according to learning styles categorized under the VARK method. Wright and Stokes (2015) write,

Students learn more effectively if they are interested in the subject matter that

they are studying. One major advantage of teaching economics at a university in

Australia is the contemporary nature of the course. It is important to relate the

learning process to the prior learning and experiences of the students and to

teach economics in a real world context. (p. 76)

While this study focused on the VARK method and implementing teaching

practices that match student learning preferences, one thing that this study also did was

make the teaching relevant to the student. They did not qualitatively measure that

aspect of the study, but they did discuss making learning more interesting and engaging

to the student through real-world context and building intrinsic motivation. Perhaps this

is where this study differed from the previous study (Husmann & O'Loughlin, 2019) and

further research may be needed to pinpoint precisely what fostered the significantly

greater achievement among these students.

Kolb's Learning Style Inventory (LSI)

Learning styles and their effect on pedagogy have become increasingly debated

in the several years, yet they have been a part of education theory for much longer.

David Kolb, a Professor of Organizational Behavior at Case Western Reserve University

and an educational theorist, created one of the most influential categorizations in the

1970's. Throughout the 1970's and 1980's, Kolb studied experiential learning and how it

affected education, and in 1984 he published the ground-breaking book, *Experiential*

Learning: Experience as the Source of Learning and Development.

In the book *Experiential Learning*, Kolb writes, "learning is the process whereby knowledge is created through the transformation of experience [and] knowledge results from the combination of grasping experience and transforming it" (Kolb, 1984, p. 41). His theory revolves around the idea that we learn through first experiencing our world and then processing, assessing, and arriving at a conclusion about our experience. He writes that experiential learning theory can provide a "holistic integrative perspective on learning that combines experience, perception, cognition, and behavior" (Kolb, 1984, p. 21). In short, we learn by doing. It is the function by which even the youngest child begins to learn - by doing, experimenting, experiencing.

The four stages of Kolb's learning cycle each represent a specific point in the process of learning. Kolb believes that learning can begin at any point in the cycle, but the cycle must be completed in order for the learner to gain knowledge. The "concrete experience" stage, often recognized as the first stage of the cycle, involves the learner observing a new experience. The learner cannot gain knowledge by simply watching or listening, they must be an active participant in the experience to gain knowledge. The second stage of the cycle is the "reflective observation," and is the stage in which the learner has the opportunity to reflect back at their experience. The third phase, the "abstract conceptualization" phase, is when the learner has the opportunity to theorize about what they have observed. Lastly, the final stage of "active experimentation," is when the learner theorizes about what they've observed and forms hypotheses about how they can apply this newly gained knowledge to other areas.

In Kolb's original Learning Style Inventory (a self-assessment that is used to determine one's learning style) Kolb termed his learning styles the converger, diverger, assimilator, and the accommodator. However, because of a recent push toward recognizing that learning styles are not rigid, but fluid, his latest publication of the LSI refers to learning styles as "the converger *style*," or the "diverger *style*," etc. (Coffield et al., 2004, p. 70). Other educational theorists such as David Sousa and Carol Ann Tomlinson, authors of the book *Differentiation and the Brain: How Neuroscience Supports the Learner-Friendly Classroom*, further emphasize the importance of recognizing fluidity of learning styles. They write, "Learning style is best conceived as acquired, adaptable, and evolving rather than inborn of fixed. While some individuals may have strong preferences for some learning approaches, virtually all people can and do learn in more than one way" (Sousa & Tomlinson, 2018, p. 150). Learning styles are of course, a matter of learner preference, but learners should also be aware of their less predominant learning styles, so that they feel confident to effectively learn multiple ways.

Kolb's own definition of learning styles reiterates this notion of fluidity. He defines learning styles as, "...preferences for one mode of adaptation over the others; but these preferences do not operate to the exclusion of other adaptive modes and will vary from time to time and situation to situation" (Kolb, 1984, p. 290). Kolb believes that while there is a persistent preference in learning style, there still remains an amount of

variation based upon our interactions and environments, and learning styles will and should shift to facilitate effective learning.

In his book, *Experiential Learning*, Kolb has created a chart in which helpful and harmful activities and assignments for each learning style are listed. For example, those learners favoring abstract conceptualization are helped by theory readings, thinking alone, and case studies. However, they are not helped by exercises and simulations, or expert talks. Kolb also provides practical tips to teachers that include teacher and student explicitly sharing their respective theories of learning so that the student can "gain insight into why the subject matter is taught as it is and what adjustments he need make in his approach to learning this subject," and the teacher can "modify his/her approach to accommodate these differences" (Kolb, 1984, p. 202). In addition to this, he emphasizes that empathy and communication are central to the learning process and urges teachers to make contact with the students' inner resources, attitudes, and ideas (Kolb, 1984, p. 202). He also encourages educators to use individualized instruction in their classroom. He notes that one way to make such a transition is for the teacher to shift from "dispenser of information to coach or manager of the learning process" (Kolb, 1984, p. 202). Kolb advocates for a functional partnership between teacher and student; one in which the student is aware of their preferred learning style and the teacher is equipped to guide them to pursue learning in a manner that suits them best.

Empirical Research Using Kolb's Theory

Researchers who have conducted studies to test the validity and reliability of Kolb' theory have arrived at conflicting results. Many researchers have found no considerable positive relation between learning according to learning style and improved achievement or knowledge acquisition, while others cite Kolb's learning style inventory as an integral and impactful part of education today. One recent review conducted in 2002 stated that "for each research study supporting the principle of matching instructional style and learning style, there is a study rejecting the matching hypothesis" (Smith, Sekar & Townsend, 2002, p. 411).

McNeal and Dwyer conducted the study, "Effect of Learning Style on Consistent and Inconsistently Designed Instruction," in 1999 and found insignificant differences in achievement among a group of 154 nursing students. The students were organized into three groups: a control group, a group taught traditionally, and a group taught according to their learning style. It was hypothesized that "treatments consistent with the learner's individual learning style would have a positive effect on learning; opposite conditions would have a negative effect" (McNeal & Dwyer, 1999). In order to accommodate the different learning styles, instruction was tweaked according to learner preferences. For example, a visual presentation was provided to supplement the verbal presentation for the abstract conceptualization/concrete experience (AC-CE) dimension learners. The accommodations, however, proved ineffective in increasing achievement among the nursing students. One of the possible reasons that the

researchers provided for the insignificant difference in achievement was that Kolb's

inventory is not a valid instrument for assessing learning styles (McNeal & Dwyer, 1999).

In 2013, Manolis, Burns, Assudani, Chinta and Ravi conducted the study,

"Assessing Experiential Learning Styles: A Methodological Reconstruction and Validation

of the Kolb Learning Style Inventory." Manolis et al. recognized the dramatic shift

occurring in education and the important role that Kolb's learning style inventory fulfills

within this shift. They noted that traditional pedagogical methods of lecture and

memorization of facts are falling out of favor and are being replaced with a call to

develop critical thinkers who can use information to problem solve real-world issues.

Manolis et al. identified the lack of experiential learning as an exacerbating factor in

lackluster performance, writing, "A move to an experientially based education explicitly

acknowledging different learning styles...has been forwarded as a more effective

alternative to traditional pedagogy" (Manolis et al., 2013). Experiential learning moves

the educator from a primary position of a distributor of information to a primary

position of a facilitator who creates meaningful experiences that foster learning.

While acknowledging the importance of experiential learning has in creating

critical thinkers, Manolis et al. also recognized the deficiencies in Kolb's Learning Style

Inventory (LSI), or the assessment used to identify a learner's specific primary and

secondary learning style. As stated previously, many researchers have criticized Kolb's

theory, specifically the LSI. After noting that many of the criticisms toward Kolb's theory

related to the LSI, Coffield et al. (2004) wrote, "An overall evaluation of Kolb's

contribution therefore needs to differentiate between the theory of experiential learning and the instrument, the LSI, that is designed to measure individual learning styles" (p. 78). Manolis et al., therefore, focused specifically on the LSI's reliability. The researchers sought to produce a "revised instrument to measure learning styles for use by educators and researchers which is valid, easy to administer, and acknowledges that individuals can simultaneously possess more than one learning style" (Manolis et al., 2013). Manolis et al. created a study with the following objectives: to develop an inventory that measures degree (versus type or category) of learning styles, to shorten considerably the length of the LSI by reducing the number of items utilized in the scale, and lastly, to validate this newly devised measure and verify its validity. The results of the study confirmed other researcher's findings regarding Kolb's two dimensions (concrete experience/abstract conceptualization and active experimentation/reflective observation). Research has consistently found that while the four modes (accommodators, convergers, divergers, and assimilators) may be valid, "little evidence is provided to confirm Kolb's two dimensions," and that because the "learning styles were developed based on his two dimensions, the results of this study suggest a need for further research" (Manolis et al., 2013). Even though this study confirmed areas of concern regarding Kolb's theory of experiential learning and the Learning Style Inventory found in previous research, the authors still emphasized the positive impact of being able to identify learning styles, both for the teacher and the student.

In 2009, Abdulwahed and Nagy conducted the study, "Applying Kolb's Experiential Learning Cycle for Laboratory Education," and found that teaching is more effective when learning styles and teaching styles are matched. This study sought to explain why laboratory learning, despite being a hands-on learning experience, was failing to produce the expected learning outcomes. The authors write, "There is general consensus that laboratory work generates poor learning outcomes compared to time, effort and costs invested in laboratory education. One possible reason for the poor learning outcomes is that engineering labs are very seldom designed based on well-defined constructivist pedagogical models" (Abdulwahed & Nagy, 2009). The authors theorized that the insufficient acquisition of knowledge during lab was related to the lack of activation of the prehension dimension before coming to the lab. The prehension dimension refers to the phase by which knowledge is constructed between concrete experience and abstract conceptualization. The researchers proposed that by using a virtual lab activity before the lab could aid in better activating the prehension dimension.

The researchers divided the group of learners into experimental group that received the pre-lab activity, and a control group and measured the success of the pre-lab activity with a post-lab test. The results of the test did, in fact, support better learning among the experimental group, which achieved a considerably higher average rate of achievement of 56.9% versus 44.5% of the control group. The data was even more compelling when looking at the question that directly related to the pre-lab

activity with the experimental group's rate of achievement at 90.6% versus 72.8% of the control group. The results of the study support the effectiveness of Kolb's learning theory as researchers were able to tweak the learning process according to Kolb's theory and see considerable positive results.

To conclude, Kolb's theory, just like Fleming's VARK theory, has received both praise and criticism from researchers. Some research has demonstrated that implementing Kolb's concepts has boosted test scores, while other researchers have found little evidence to support Kolb's theory of two dimensions of learning, and consequently had little success in teaching students with modified lessons according to their preferred learning styles.

The Dunn and Dunn Model

Rita Dunn, a professor at St. John's University, and husband, Kenneth Dunn, a professor at Queens College, City University of New York, began their partnered work on learning styles in the 1960's. Their work has had reverberating effects that have changed education not only throughout the United States, but the globe as well. Their research began as a response to the New York State Education Department's concern for students who were achieving poorly. Rita Dunn began her career teaching students with learning disabilities and that spurred her to further investigate how children have different responses to learning environments and stimuli. She theorized that a student's success was less about their intelligence, and more about their preferences surrounding their work environment (Coffield et al., 2004, p. 30). Their theories have been instituted

around the world with proponents encouraging educators to "identify and then match

students' individual learning style preferences with appropriate instructions, resources

and homework" (Coffield et al., 2004, p. 30).

The Dunn and Dunn model is a self-assessment that includes five major strands

(stimuli) and they are: a) environmental, b) emotional, c) sociological, d) psychological,

and e) physiological. The 1989 learning styles inventory (LSI) developed by Dunn et al.

(as cited in Cassidy, 2004) included a 100-item questionnaire that included a variety of

related to the five categories of stimuli. These included items such as light, sound,

temperature, peers, self v. group, time of day, tactile, and time of day. Rather than

measuring strengths, the Dunn and Dunn model seeks to measure preferences and

proponents urge teachers to use these preferences as a tool when teaching to improve

achievement and motivation. The intention of the model is for teachers to have a

resource that can indicate a student's very strong preferences (qualitatively through the

LSI) in order to better accommodate the student and consequently improve their

achievement.

Empirical Research that Tests the Dunn and Dunn Model

Rita Dunn asserted (as cited in Coffield, 2004) that "students whose learning

styles were being accommodated could be expected to achieve 75% of a standard

deviation higher than students who had not had their learning styles accommodated"

(Coffield et al., 2004, p. 31). Dunn and Dunn's model is one of the most widely

researched learning style models, however, there is much contention about its success

as with the other learning style models. A significant amount of research has been devoted to this model, but there are inconsistent results between Dunn and Dunn's own research and outside evaluators. The most significant weakness of this model is that its creators have made significant claims of universal success while the model significantly lacks independent research (Coffield et al., 2004, p. 45). The following empirical studies examine some of Dunn's own research as well as independent research that proves the validity of portions of Dunn and Dunn's model.

Susan Brand, Rita Dunn and Fran Greb, published the article, "Learning Styles of Students With Attention Deficit Hyperactivity Disorder: Who Are They and How Can We Teach Them?," in which they sought to examine how educators can implement the Dunn and Dunn model to most effectively serve students who have Attention Deficit Hyperactivity Disorder (ADHD). In order to find the most effective teaching strategies, Brand, Dunn and Greb referenced two different quantitative studies done by Brand (1999) and Greb (1999). Brand focused on elementary aged children in grades three through six and Greb focused on a parallel study of grades five through twelve.

These studies can provide unique insight into the potential of teaching according to learning styles, specifically when it comes to stimuli (as in the Dunn and Dunn model), because students who have been diagnosed with ADHD and have been categorized as failing have been found to achieve "statistically higher standardized achievement test scores in both reading and mathematics when they were taught with approaches and resources that complemented their learning styles" according to a study by Brunner and

Majewski (as cited in Brand, Dunn, & Greb, 2002). The data would indicate that there is

a strong influence on these students when taught according to learning preferences.

Brand and Greb's studies included 230 students (187 males and 43 females) that

had all been diagnosed with ADHD and were undergoing medical treatment. The Dunn

and Dunn model requires students to self-assess their preferences and then informs the

educator which elements the students significantly prefer (slight preferences are not

noted). Of the elementary aged children, there were four significant preferences that

either a majority or large cluster preferred. The first preference that presented itself

among a large cluster of children was that children preferred low rather than bright

light. The second was that the majority of students lacked persistence (this falls under

the category of emotional factors and indicates a need to take breaks). The last

preference was that students were not able to "function well academically in the

morning" (Brand, Dunn, & Greb, 2002, p. 270). Interestingly, the children were also

significantly motivated by parental encouragement, far more than students that are not

diagnosed with ADHD.

Perhaps the most important discovery of this study was that it provided

quantitative evidence that refuted previous notions that all students diagnosed with

ADHD were to be taught in the same style and with the same strategies. For example,

throughout the 1990's when diagnoses and awareness of ADHD skyrocketed, the U.S.

Department of Education along with other federal agencies issued blanket directives on

how to teach students with ADHD. Previously issued directives included everything from

seating students away from air conditioners, doors, or windows, to providing students with increased active learning, choices, and motor activities (Brand et al., 2002, pp.268-269). This study by Brand et al., however, found that "none of the elements normally associated with children with ADHD were significantly different from those of average children. They needed no more mobility than others, were not particularly kinesthetic, had similarly limited perceptual preferences, and revealed the same range of seating design preferences" (Brand et al., 2002, p. 270). Apart from the four trending preferences, which a teacher can tangibly provide for their students, there was a great amount of diversity amongst the students with ADHD just like with any other student group. One possible limitation within this study is that the creator of the Dunn and Dunn model was one of the authors, but it can still provide us with valuable insight toward student learning preferences. Educators can see quantitative evidence that students with ADHD do not fit into a mold, just like with any other student group, however, they also have a few strategies to help improve learning according to a limited number of stimuli preferences.

One of the critiques of the Dunn and Dunn Learning Style Model is that it creates too strong of a dichotomy between the two learning styles of analytic learners and global learners. According to Dunn (as cited in Coffield et al., 2004), analytic learners "learn more easily when information is presented step by step in a cumulative sequential pattern that builds towards a conceptual understanding," while "global learners respond better to information taught globally" (p. 36). For example, global

learning may include content being presented in a real-life way that the learner can personally relate to.

To explore this further, in 2013, Englander, Terregrossa and Wang conducted the study, "Testing the Construct Validity of the Productivity Environmental Preference Survey Learning Style Inventory Instrument," in order to test the validity of the Dunn and Dunn model in relation to analytic and global learners. Englander et al. used the Building Excellence (BE) self-report to conduct this study. The BE was created in 2009 and is a revised version of the original Dunn and Dunn Learning Style Inventory. The BE is an online survey that consists of 118 questions that explore the learning style categories associated with the Dunn and Dunn model (environmental, emotional, sociological, perceptual, physiological and psychological). One set of the BE survey questions directly inquires about the preferences associated with analytic/global learning, i.e. noise, light, design, persistence, and intake (Englander et al., 2013). For this study, the BE was administered to twenty-six hundred freshman and sixty-one students were analyzed. The results of the study concluded that the BE did in fact provide reliable information indicating whether a learner was analytical or global. Englander et al. write, "the results provide indirect evidence which supports the construct validity of the BE instrument and the internal validity of the DDLSM" (2013). Some of the preferences that were looked at closely included bright or low light, background noise, and whether learners needed to take breaks. All of these variables are indicative of analytical/global learners.

One of the most pressing criticisms of the Dunn and Dunn model is that most of the research is conducted by Dunn and Dunn themselves, bringing into question the validity of the model. Coffield et al. writes, "there appears to be little independent evaluation of their model...further difficulty is created by Rita Dunn's rejection of any evaluations that are 'third party'" (2004, p.38). This study is a quantitative study that was done independently of Dunn and Dunn and helps to establish objective validity of the model.

In 2018, Bosman and Schulze conducted a study titled, "Learning Style Preferences and Mathematics Achievement of Secondary School Learners," in response to poor performance in math among South African learners. Math is of critical importance in developing countries because there are many roles that need to be filled that are both necessary for continued development and require math (engineering, natural sciences, accountancy, etc.) (Bosman & Schulze, p. 1) The researchers sought to answer two questions:

1. Is there any significant inter-relationship between academic achievement in Mathematics and learning styles of a group of secondary learners?

2. Is there a significant difference between the learning styles of the top and the low achieving learners in Mathematics?

Bosman and Schulze chose to utilize not only the Dunn and Dunn model, but also the VARK model of learning styles. The students were given an assessment that included 85 questions that were representative of seven learning styles (auditory,

kinesthetic, visual, reading, writing, individual learning, and group learning). Learners were also given interviews in which they discussed their personal practices when studying math (in school and at home) and what they liked about particular math teachers.

The study had two significant results, the first being that students who had a strong capacity for individual learning had the greatest achievement in mathematics (Bosman & Schulze, 2018, p.6). If students were strong individual learners, they were able to better engage with self-learning at home, which seemed to be an important part of the learning process in South Africa. The second finding was that multimodal learners (having a propensity for visual, auditory, kinesthetic, individual, and group learning in any combination), were the highest achieving learners. They were able to implement more than one learning style and benefit from any form of instruction. This finding also emphasizes the value of multimodal teaching (Bosman & Schulze, 2018, p.6). This study provides useful guidelines for teachers who want to implement more instruction in their classroom that accommodates different learning styles, or even multimodal learners.

In addition, Bosman and Schulze study also provided qualitative commentary that encouraged teachers to have a positive learning environment that is both helpful and empathetic. Students who were interviewed noted that these were some of the qualities they appreciated from their teachers and helped them feel successful and gave them a strong self-concept that influenced their achievement (2018, p. 6).

Differentiating According to Bloom's Taxonomy and Gardner's Multiple Intelligences

Just like students come to our classrooms with varying learning profiles and preferences, students also come with diverse academic strengths and abilities. To help explore how to successfully differentiate according to these diverse abilities, it is useful to look at two twentieth century education authorities, Benjamin Bloom and Howard Gardner. They left an indelible impression on the world of education and their work provides teachers today a framework for creating differentiated activities that are appropriately challenging and accommodating for each student.

Benjamin Bloom was an educational psychologist who created Bloom's Taxonomy in 1956. The taxonomy is a classification of cognitive skills that follows the sequence of knowledge, comprehension, application, analysis, synthesis, and evaluation. In 2001, the framework was revised to remove synthesis and add "creation" as the highest level of learning, and became the revised Bloom's Taxonomy. When using Bloom's Taxonomy, teachers are given a clear framework that reliably identifies appropriate activities for students given their academic ability. One important aspect of Bloom's Taxonomy is that wherever a student may fall, they are using all previous cognitive skills (Heacox, 2002, p.68). For example, if you ask a student to summarize a concept, they are operating in the higher-level thinking categories of analysis or creation (critique, compose, hypothesize) while simultaneously having to use the lower category of knowledge (definitions, memorization, recall). Thus, the revised Bloom's Taxonomy is an excellent tool to structure learning activities that are varied for students that are in different stages of learning. A teacher can utilize formative assessments to identify

where their students are in their learning and then use Bloom's Taxonomy to identify how challenging a particular task is. While some students need more time to learn the basic information, students who have already mastered the basics can do activities that fall in the higher categories of thought.

Howard Gardner, a Professor of Education at Harvard University, developed the theory of multiple intelligences (MI) in which six intelligences describe how a person learns best as well as how a person prefers to learn. The list has since grown to include nine total intelligences: verbal-linguistic, logical-mathematical, spatial-visual, bodily-kinesthetic, musical, interpersonal, intrapersonal, naturalist, and existential. Gardner's theory of multiple intelligences can provide two significant outcomes. First, students can learn according to their own strengths with greater ease, and second, students can branch out and gain greater proficiency with other intelligences when they feel ready (Heacox, 2002, p.70).

Empirical Research Using Bloom's Taxonomy and Gardner's Multiple Intelligences

Toni Noble conducted a study titled, "Integrating the Revised Bloom's Taxonomy with Multiple Intelligences: A Planning Tool for Curriculum Differentiation," in 2004 which documented the process of sixteen teachers who instituted Bloom's Taxonomy and Gardner's theory of multiple intelligences over the course of eighteen months. Using a number of surveys and interviews, Noble found that seventy-three percent of teachers "perceived that multiple intelligence theory provided them with a tool for catering to different strengths or ways of learning," and in addition several of the

teachers saw students become more aware of their strengths and weaknesses (Noble, 2004, p. 196). Noble also noted that over ninety-one percent of teachers wrote comments that indicated that not only were their students gaining insight into their strengths and choosing partners based on strengths, but their own assumptions of their students' strengths broadened. One teacher wrote, "All students can be perceived as strong in one area" (Noble, 2004, p.199). In response to the Revised Bloom's Taxonomy (RBT), sixty-four percent of teachers on the questionnaire indicated that RBT "facilitated their programming to cognitively challenge their students" (Noble, 2004, p.200). In addition, forty-five percent of teachers felt that using the strategies of multiple intelligences/RBT allowed them to move effectively differentiate their curriculum to best teach students of differing abilities. As one teacher wrote, "Brighter children can be extended and less able children can spend more time on developing knowledge of the topic" (Noble, 2004, p. 201). The overwhelming majority of teachers found significant benefits for both themselves and the students while implementing the Multiple Intelligences/Bloom's Taxonomy approach to teaching.

While many teachers commented on the benefits of the MI/RBT, there was one caution issued from one of the school's principals. She believed that while many of the activities that were created while implementing the MI/RBT were "novel and fun," she cautioned that they needed to maintain academic rigor. Moreover, she also noted that when developing a curriculum that utilized MI/RBT, it took "far more time to use than teachers typically have at their disposal" (Noble, 2004, p. 208). Noble noted that these

same sentiments had been expressed in previous research as well (2004, p. 208).

However, differentiation takes more time regardless of the tool being utilized, and the

MI/RBT framework provides a consistent, effective tool to help teachers identify what

type of activity a student should be doing to maximize learning on an individual basis. It

may be a cost worth paying in order to have reliably differentiated curriculum.

A 2012 study conducted by Reni Francis titled, "Multiple Intelligence Approach

to Curriculum Transaction in Achieving the Educational Objectives at Secondary School

Level," examined the effectiveness of the Multiple Intelligence Approach in achieving

educational objectives across the levels of the Revised Bloom's Taxonomy. Francis used

a sample of 736 sixth grade students and prepared two separate units of equal

difficulty; one unit was on pollution and the other on energy. The study was conducted

in multiple schools and students were divided into groups of 5-6 students. For each

class, the students were taught the unit on Energy on the first day according to

traditional teaching methods. On the second day, students were taught the unit on

pollution according to the Multiple Intelligence Approach. The students were evaluated

throughout the process and each activity gave "scope for analysis, evaluation and

creation which aimed at higher order level of thinking" (Francis, 2012, p.86). While

analyzing her data, Francis found that there was a significant effect on the achievement

of objectives on the Revised Bloom Taxonomy, implying that the "objectives as given by

the RBT was favourable for student learning" (Francis, 2012, p. 141). Francis also writes

that the students "seemed to have benefitted from group work which promoted

inclusive learning environment" (Francis, 2012, p.86). Francis found that the MI/RBT methods ensured that children were able to work in groups with other students that were different from them while developing leadership and communication skills. She also noted that students showed significant joy, satisfaction, and pride when able to select their own MI activities according to RBT (Francis, 2012, p.159). Francis performed a thorough, well-detailed study that provided educators with quantitative evidence that the MI/RBT approach to differentiation can provide great success for students and educators, both academically and emotionally.

Researchers Altintas and Ozdemir conducted an in depth study in 2015 in order to evaluate the effectiveness of using the Multiple Intelligences Approach when teaching mathematics to gifted and non-gifted students. The study tested sixty-eight gifted and one hundred and forty-four non-gifted students ranging from grades five to seven. The study utilized several types of lessons for comparative purposes. The first set of the lessons were designed with differentiation in mind. They were project-based, multiple intelligences-based, and used an interdisciplinary approach that used creative thinking and enrichment activities (Altintas & Ozdemir, 2015, p. 1106). A second set of lessons was created using a traditional curriculum for comparative purposes. The authors of the study wrote,

Six teaching practices were implemented within the scope of this study: two featured comparisons between the newly developed differentiation approach and the Purdue model, three compared the differentiation approach lessons

with national educational curriculum activities, and one compared the new

model with a lesson that was conducted as a part of differentiation studies.

(Altintas & Ozdemir, 2015, p. 1108)

In order to collect data regarding the differentiated lessons, specifically the

lessons that utilized the Multiple Intelligences approach, the students' primary

intelligences were identified before the lessons were conducted. The instruction was

presented using project-based activities that were suited to the student's dominant

intelligence domain. The researchers found that the differentiated curriculum increased

student's achievement significantly. The data showed that before the lessons, there was

virtually no statistical difference between the control and experimental groups. After

the lessons, the control group had a rank of 16.53, while the experimental group (the

group that received the differentiated lessons) had a rank of 46.46.

In addition to assessment data, Ozdemir and Altintas also asked for teacher's

responses to the differentiated lessons. One hundred percent of teachers stated that

the activities taught social skills as well as provided opportunities to observe academic

skills. Twenty percent of teachers articulated that the challenges in implementing the

differentiated curriculum included the preparation and time were difficult to manage

(Altintas & Ozdemir, 2015, p. 1114).

The study done by Ozdemir and Altintas also tested whether or not the Purdue

Model created a significant difference in test scores. The Purdue Model was created

specifically for gifted students, and according to Fedhusen and Kolloff, it is comprised of

three stages.

> Stage 1 is used as a basis for teaching basic thinking skills, such as fluency,
>
> flexibility, originality, imagination, and asking questions. Stage 2 is used for
>
> teaching more complex thinking strategies, such as logical inference, critical
>
> thinking, and creative problem solving. Stage 3 comprises independent,
>
> individual learning, and project activities to guide children toward creative
>
> productivity in adulthood. (as cited in Altintas & Ozdemir, 2015, p. 1104)

The data for the gifted students before and after the Purdue lessons were implemented,

showed a significant gain in achievement. Before the lessons, the control and

experimental group had a difference of less than one point. After the instruction, there

was a difference of over 13 points in favor of the experimental group (Altintas &

Ozdemir, 2015, p. 1111). This study shows us two recurrent themes across research

regarding differentiation; differentiation successfully improves student achievement,

but remains difficult for teachers to implement given considerable extra time it takes to

construct multi-faceted lessons that both teach and assess individual learners.

There are several more strategies for differentiation that are widely regarded as

best practices and those include enrichment, tiered assignments, curriculum compacting

and flexible grouping. One strategy that is often utilized is remediation and enrichment;

remediation for students who need more opportunities to master content, and

enrichment for students who have already mastered the content and have an increased capacity to continue learning. This topic has also been increasingly discussed since the passing of the No Child Left Behind Act in 2001 that increased the federal role in holding schools accountable for student progress. The objective of NCLB was to increase the global competitiveness of the United States and close achievement gaps between socioeconomically disadvantaged and minority students and their more advantaged peers (Klein, 2018). Since the passing of NCLB, researchers and educators have worked tirelessly to try to discover ways to successfully close the achievement gap while ensuring that every student meets their full potential in order to increase the United States' global competitiveness.

It is important to note that students who require remediation and those who require enrichment are never set in stone. A student may have already mastered a particular topic or skill, yet find themselves unfamiliar with, or challenged by a different topic. Tomlinson writes, "Some students may be advanced in September and not in May - or in May, but not in September. Some may be advanced in math, but not reading; or in lab work, but not in memorization of related scientific formulas. Some may be advanced for a short time, others throughout their lives but only in certain endeavors" (Tomlinson, 2001, p. 10). As educators, it is crucial to have a plan in place for both the advanced learners requiring enrichment, and the struggling learners requiring remediation; both are required to ensure that students are reaching their full potential.

In addition to enrichment and remediation, tiered instruction has also become a fundamental part of differentiation. Pierce and Adams, authors of the article "Using Tiered Lessons in Mathematics," explain the first part of creating a tiered lesson is to identify the learning standard, followed by the key concept. Next, the teacher must know what their students already know and then determine which part of the lesson they want to tier (content, process, or product). Lastly, the instructor needs to decide whether they will be tiering according to readiness, interest or learning style (Pierce & Adams, 2005, p.146). For example, if one was going to tier according to readiness, the tiers may be: below grade level learners, grade level learners and above grade level learners. If one was going to tier according to learning preferences, the tiers may be: visual learners, auditory learners, kinesthetic learners (Pierce & Adams, 2005, p.147-148). In her book, "Differentiating Instruction in the Regular Classroom," Diane Heacox identifies six ways to tier assignments: challenge level, complexity, resources (assigning different materials at different levels), outcome (same materials used, but different goals for outcomes), process (same outcome, but different routes assigned according to readiness), and lastly, tiered by product (using different learning preferences to achieve unique products) (2002, p. 91-94). Heacox advises that teachers know the basic outcome, or what they want every student to know, before they begin the process of creating a tiered assignment. They then can imagine a ladder with the bottom run being the most basic task and each subsequent step becoming more challenging and complex

(2002, p. 95). Tiered assignments ensure that a student is appropriately challenged and continually learning.

The last strategy, flexible grouping is the "heart of differentiated instruction" (Heacox, 2002, p. 85). There are three types of groups that fall within this strategy of differentiating: flexible groups, ability groups, and cooperative groups. Each type of group has different characteristics that make it suitable for specific circumstances. For example, flexible groups are grouped according to teacher discretion and are based on specific learning needs, strengths or preferences. Flexible groups are fluid (students are regrouped as appropriate) and groups typically work on different activities. The second category, ability groups, are determined by test scores and based on achievement and groups; they are rigid and different groups tend to work on the same activity. The last category, cooperative groups are used for the purpose of developing collaborative skills. These groups are fluid and grouped according to student preference. They are created with mixed strengths and learning needs to provide opportunities for collaboration within the group (Heacox, 2002, p. 87).

Flexible grouping is valuable to educators because it tackles two challenges at once; it allows teachers to group according to student preferences like multiple intelligences or visual/auditory/kinesthetic, while also allowing the teacher the opportunity to provide remediation or enrichment for students. Ability grouping is different from the practice of ability tracking, which places students on a slow, average, or fast track. The danger with tracking is that students are rarely moved from into

different tracking categories regardless of performance. Flexible grouping, however, is responsive to student learning and needs, and allows for differentiation.

Empirical Research Using Other Commonly Utilized Differentiation Strategies

Written by Margaret Beecher and Sheelah Sweeny in 2008, an article titled, " Closing the Achievement Gap with Curriculum Enrichment and Differentiation," discusses Central Elementary School's successful attempt at closing the achievement gap by utilizing differentiated curriculum with a school wide enrichment program. Specifically, the school began with the creation of "a school mission, strategic plan with broad instructional goals, specific learning objectives, and detailed action plans" (Beecher & Sweeny, 2008, p. 503). These specific steps were chosen based on evidence that learning is improved when students' interests and choices are considered and because of the diverse nature of the student body (Beecher & Sweeny, 2008, p. 503). This study occurred over the course over eight years and looked specifically at content from Global Studies, mathematics and reading. Before the wide-sweeping reforms were put into place, the elementary school's students were performing in the 30th percentile in reading, writing, and math (Beecher & Sweeny, 2008, p. 506).

After a year-long period of review in which every aspect of the school was analyzed, four critical questions were established to help answer the questions of why is this school under-performing and what can be done about it? The four questions were as follows:

1. What must the school community collectively believe about children and what motivates children to learn and grow?

2. How does a struggling school become a successful learning community where children are actively engaged and invested in their own learning?

3. What are the essential elements of curriculum and instruction that make this transformation from failure to success possible?

4. How can educators change the remedial instruction paradigm and stress students' strengths as a means to improving student learning and closing the achievement gap? (Beecher & Sweeny, 2008, p. 506)

One important thing to note about question four is that this school had previously utilized a model of remediation rather than enrichment. One of the largest curriculum shifts that this school embraced was moving from a remedial model to an enrichment model. This was due, in part, to the fact that the school leaders came from a background in gifted and talented education, and helped to advocate for the use of enrichment and differentiation (Beecher & Sweeny, 2008, p. 508). From these leaders two main goals were established to begin improving school-wide performance. The first goal was to utilize a gifted and talented curriculum for all students, and the second goal would the "immersion of students in other cultures through a social studies-based Global Studies curriculum" (Beecher & Sweeny, 2008, p. 508). From these goals, enrichment came to be the centerpiece of this school's new design. Teachers created entirely new lessons (focusing most on the Global Studies curriculum) that were

differentiated and interdisciplinary in nature. Furthermore, the school added a

Schoolwide Enrichment Team (a partnership between parents and teachers with a goal

of using enrichment to expand the students' desire to learn), an extended day

enrichment program, staff development, and accountability and assessment measures

(Beecher & Sweeny, 2008, p. 510).

The Global Studies curriculum was designed after the Enrichment Triad Model

which was designed "to encourage the creative productivity of young people by

exposing them to various topics, areas of interest, and fields of study, and to further

train them to apply advanced content, process-training skills, and methodology training

to self-selected areas of interest" (Vahidi, 2015). The Enrichment Triad Model (ETM) has

three types of enrichment: Type I (general exploratory activities), Type II, (group training

activities), and Type III (individual and small group investigations of real problems)

(Vahidi, 2015).

Because differentiation, specifically enrichment, was at the heart of this school's

mission plan, it is useful to closely examine exactly how differentiation was

accomplished in the lessons that were created. The task was considerable considering

that the reading levels of the third-grade class ranged from first through fifth grade

(Beecher & Sweeny, 2008, p. 515). To begin the process of a Global Studies curriculum

immersed in enrichment, every grade chose a culture, region, or country to study. Each

teacher used a matrix to create lessons which included the standards, objectives, and

opportunities for differentiation from Types I, II and III. Including the three types of

enrichment gave students a unique opportunity to participate in their education in a similar manner to gifted and talented students; they were able to choose activities based on their interests. In addition to the enrichment opportunities, students also received differentiated activities based on their needs and readiness through the use of flexible grouping and tiered activities. For example, students were given texts of varying reading levels depending on their individual skill level (Beecher & Sweeny, 2008, p. 515). The Global Studies curriculum was the first to be revised with differentiation and enrichment in mind, but over the next eight years, every discipline was revised in a similar manner.

Other important aspects of Central Elementary School's success were the continual, well-planned development of staff and the ongoing assessments of students, both formative and summative. The students' progress was recorded daily, weekly, monthly, and yearly (Beecher & Sweeny, 2008, p. 524). The results over the course of the eight years proved significant gains on state assessments for all student groups. Before the implementation of the new practices, students who were receiving free or reduced lunch were performing at 32% proficient in reading, writing and mathematics on state assessments. By 2004, the same demographic of students was 60% proficient. The students who were not receiving free or reduced lunch also improved from 62% proficient to 70% proficient. The gaps in achievement between students receiving free or reduced lunch and those were did not effectively dropped from 62% to 10%, thus successfully narrowing the achievement gap (Beecher & Sweeny, 2008, p. 525). This

study shows how powerful differentiation can be in increasing academic achievement for all students while simultaneously closing the achievement gap.

In her doctoral dissertation, Patricia Koeze describes the challenge that presents itself in today's classroom; students on the high and low end of academic achievement are struggling due to a lack of appropriately challenging instruction (Koeze, 2007, p. 14). She sought to examine this issue further by using quantitative and qualitative data to answer two research questions:

1. Does differentiated instruction lead to increased student achievement

2. Are there any components of differentiated instruction that have a greater impact on student achievement than others?

Koeze used the definition of differentiation provided by Tomlinson who describes it as "In a differentiated classroom, the teacher plans and carries out varied approaches to content, process, and product in anticipation of and response to student differences in readiness, interest, and learning needs" (1999, p. 10). In order to determine if differentiation increased student achievement, a study was conducted in a rural Michigan elementary school that included fourth and fifth grade classroom. This particular school and grade were chosen because the teachers had an option to receive four days of professional development related to differentiation, however, not all teachers chose to attend the personal development courses. This led to an opportunity to test if the differentiation strategies learned in the professional development courses provided would boost student achievement (Koeze, 2007, p. 16).

The qualitative data that was collected included observations and interviews, while the quantitative data included pre-assessments and post-assessments. Using both quantitative and qualitative allowed for the researcher to have data necessary to determine if the differentiation affected student achievement, but also provided information to understand both the student's and educator's beliefs and attitudes toward differentiation (Koeze, 2007, p. 41). Quantitative data was collected using the Michigan Educational Assessment Program (MEAP), which recorded math, reading, and writing scores.

In response to the first question of this research assessment (whether or not differentiation leads to increased student achievement), the researcher found that differentiating according to learning style produced a .007 level of significance on student achievement scores (Koeze, 2007, p. 96). More specifically, teachers who differentiated by the use of choice charts increased achievement in reading. In response to the second question (if there are specific components of differentiation that have a greater impact on student achievement than others), the researcher found that there was an improvement among achievement, but that it was difficult to distinguish which specific strategy improved achievement. The quantitative results showed that learning style was the sole variable that improve student achievement, however, the teachers and students were using the term "learning style" interchangeably with interest and choice. The specific differentiation strategies that the researcher observed were pre-assessment, readiness, interest, learning profile, flexible grouping, student

choice in learning, and assignments based on learning styles (Koeze, 2007, p. 46).

According to the qualitative data, the differentiation strategies that produced positive

results were choice, interest, learning styles, and pre-assessment (Koeze, 2007, p. 97-

98). This study showed that when students had greater choice available to them, it

improved their achievement. Even though academic achievement was not statistically

improved using other differentiation strategies, Koeze noted that the students in the

differentiated classrooms reported a "better learning experience...and were more

excited about their work" (Koeze, 2007, p. 72).

Additionally, Koeze concluded that one of the most important findings of this

study was the importance of pre-assessments in order to plan effective differentiated

instruction. She writes, "Pre-assessment may seem too simple a concept in which to

provide training, but when connected to differentiation, it becomes the foundation of

an effective classroom, and its importance cannot be overlooked" (2007, p. 100). In a

differentiated classroom, pre-assessment is critical so that the instructor knows

students' strengths and interests and can plan accordingly.

While this study showed an increase in academic achievement when

differentiating according to learning styles, one of the limitations was that the study was

that the structure did not allow for certainty when identifying which factors improved

achievement. We know that "learning styles" did improve achievement, but because

students were using the term synonymously with "choice" or "interest," we still cannot

be sure which strategies improved achievement with total certainty.

A study conducted by Valiandes, Leonidas and Mary in 2015, titled,

"Investigating the Impact of Differentiated Instruction in Mixed Ability Classrooms: It's

impact on the Quality and Equity Dimensions of Education Effectiveness," examined the

effectiveness of differentiation. This study took place in twenty-four elementary classes

in Cyprus and involved 479 students. The study included continual assessment of

students over a duration of eight months (October through May). In Cyprus, the

education department supports the practice of differentiation, but at the time this study

was done in 2011 there was very little differentiation occurring in the classrooms. The

aim of this study was to

1. Determine whether findings from the research provide substantial evidence for

   the effectiveness of differentiation in mixed ability classrooms.

2. Determine the characteristics of effective differentiated instruction by using and

   testing the observation key for differentiated instruction (the observation key

   being based on educational literature from the previous decade on

   differentiation).

3. Evaluate the equity and quality dimension of differentiated instruction based on

   the results of effectiveness of differentiation for different groups of students

   (Valiandes, Leonidas & Mary, 2015, p.7).

To structure this study, 14 classes that received differentiated instruction were

the test sample, while 10 classes that did not receive differentiated instruction formed

the control. In order to prepare the teachers who were going to be teaching the

differentiated courses, the researched planned training seminars that prepared teachers to implement differentiation in their classrooms on a daily basis (Valiandes et al., 2015, p.7). One of the important support systems for the teachers of the differentiated classrooms was the use of an online forum in which the teachers could exchange ideas and share thoughts with the team. Given the heavy workload required to differentiate curriculum on a daily basis, this was an efficient way for teachers to collaborate and implement the needed revisions to the standard curriculum to include differentiation. Additionally, the teachers received continual training and support throughout the duration of the study via the online forum.

To collect data, the students all received a pre-assessment both at the very beginning of the year, and also immediately before the differentiated instruction began in October. They also received a post-assessment after the completion of the differentiated instruction in May. The results for the literacy comprehension test showed an improvement in student achievement. The experimental group performed better than the control group despite being the lower performing group on the pre-test. Moreover, the results showed that student achievement was increased regardless of socioeconomic group, achievement group, or any other family factors (Valiandes et al., 2015, p.9). The researchers noted that while the measured improvement was modest, the duration of the study may have been a limiting factor and speculated that had the study continued longer, it could have made an even more significant impact (Valiandes et al., 2015, p.14). The researchers concluded that differentiation must be implemented

to provide all students from varying socioeconomic statuses can reach their full potential.

Dosch and Zidon conducted a study titled, "The Course Fit Us": Differentiated Instruction in the College Classroom," in 2014 and sought to determine if differentiated education in higher education would produce quantifiable results on student achievement. The study took place in two Educational Psychology courses taught by the same instructor, one of which would receive differentiated instruction (DI), and the other nondifferentiated instruction (NDI). The differentiated instruction strategies that were utilized were constructivist, student-centered, hands-on activities, choices for completing assignments, and instruction altered based on formative assessments (Dosch & Zidon, 2014, p. 347).

The quantitative data collected included formative and summative assessments, and the qualitative data included a student survey at the end of the course. The quantitative data showed that there were significant differences between the mean group scores of the assessments, but that when looked at individually, only one of the exams and two of the assignments demonstrated significant statistical differences. The mean assignment score for the DI class was 18.96, and the mean assignment for the NDI class was 18.46. As for the exam scores, the DI class had a mean score of 39.77, while the NDI class had a mean score of 37.35. The end-of-course survey revealed two differences between the groups regarding instruction and curriculum. The students in

the DI group appreciated greater choice, freedom, and consideration of their learning

styles (Dosch & Zidon, 2014, p. 348).

Dosch and Zidon concluded this study by noting that while the statistical

differences were small, differentiation still serves a critical role in education as a way of

accommodating all learners and providing equal opportunity. They wrote,

"Differentiation could be the difference between academic success and failure for many

students. A professional mindset of differentiation includes a learner-centered,

constructivist model that will meet the needs of all learners at every level" (2014, p.

352). The researchers also noted that the change in scores, while minimal, could have

been improved even more with an instructor who had more experience with

differentiated instruction. This study, like many of the other studies regarding

differentiated instruction shows minimal gains in achievement, but significant gains in

student satisfaction and appreciation of the course.

Researchers Joseph, Thomas, Simonette and Ramsook conducted a study in 2013

that was developed in response to the fact that graduates from teacher education

institutions in Trinidad and Tobago were not fully integrating differentiated instruction

in their own classrooms. The researchers hypothesized that this could be due in part to

a lack of differentiated instruction in their teacher preparation program, and thus a lack

of modeling the process of differentiation (Joseph, Thomas, Simonette, & Ramsook,

2013, p.28).

This study was designed to examine if differentiated instruction in the teacher education programs would have an impact on undergraduate students' performance. The study included 434 students on two different campuses and lasted one semester. To organize the study, the researchers split the student body into two groups, one of which would receive whole-class instruction, and the other would receive differentiated instruction. The researchers established three parameters for the study:

1. What are the successes and challenges associated with the implementation of differentiated instruction at the tertiary level?

2. What is the relationship between differentiated instruction and student achievement in curriculum studies over a period of one semester?

3. What are prospective teachers' perceptions about differentiated instruction and its potential impact on their classroom practice (Joseph et al., 2013, p.31)?

To collect data (both quantitative and qualitative), the researchers used questionnaires, focus group discussions, interviews, classroom observations, and semester grades. The duration of the study was one semester.

The findings of this study revealed mostly positive results of differentiation, as well as the same negative results expressed in previous studies; namely that differentiation is time consuming and difficult to cater to individual needs and student preferences. The positive results of this study included improved academic achievement. The grades were categorized on an A-F scale with each grade letter being tallied. The differentiated group achieved 54 A's, while the non-differentiated group

achieved 32 A's. The number of DI students that achieved B's was 138, and 160 for NDI

students. Lastly, the number of DI students who earned a C was 33, while 47 of the NDI

students earned a C. The results showed a significant improvement in achievement for

the differentiated students (Joseph et al., 2013, p.37). The students also reported that

they enjoyed having greater choice in both activities and assessment, as well as being

able to use their strengths (Joseph et al., 2013, p.38). This study demonstrated similar

results to the other studies that had comparative parameters such as number of

students involved, duration, and strategies implemented. Similar to other studies, this

study found positive effects of differentiation in terms of academic achievement and

satisfaction among students.

McAdamis, the coordinator of staff development for the Rockwood School

district in St. Louis, Missouri, wrote an article titled, "Individual Paths: Teachers Tailor

Their Instruction to Meet a Variety of Student Needs," that discusses how the district

improved academic achievement by implementing differentiated instruction. The

district was recognized as a top district by the state of Missouri for two reasons: First,

because of the large percentage of students scoring proficient or advanced on the state

standardized exam. Second, the school reduced the percentage of students scoring in

the lowest achievement levels by 5% in math, 8% in communication arts, and 7% in

science. In addition, the school also improved the achievement of their advanced

learners, pushing their scores into the 99th percentile (2001, p. 48).

To begin the process of adapting differentiated instruction, Rockwood school district's board designed a profession development plan to give teachers additional skills. The district also hired someone knowledgeable in differentiation to train the staff. The tools for differentiation that staff was instructed on included tiered assignments, curriculum compacting, high-level questioning, flexible grouping, and independent study. In addition to the preliminary training, the district also ensured that continual professional development was critical to changing the culture of the system. McAdamis (2001, p. 50) writes,

> To ensure that student academic acceleration and differentiation continues in elementary and middle schools, the district trainer, curriculum coordinators, principals, and peers offer teachers regular feedback and support. Peer coaching, collegial sharing, action research, workshops and study groups provide ongoing staff development opportunities.

Rockwood School District's success in implementing differentiation was a slow process, taking five years for teachers to adapt to and implement differentiated coursework. The District now sees student differences as a "basis for planning," and the curriculum is shaped by student readiness, interest and learning profiles. The elementary and middle school classrooms regularly implement strategies to make instruction responsive to learners (McAdamis, 2001, p. 50). Although all of the previous six studies had positive effects on achievement, whether modest or significant, the following research studies showed either no positive effect or a negative effect.

Researchers Danzi, Reul, and Smith, authors of the study, "Improving Student Motivation in Mixed Ability Classrooms Using Differentiated Instruction," observed that students who are not taught with their varying abilities, learning styles and multiple intelligences in mind experienced an increased lack of motivation and frustration in class. In order to test if a more differentiated teaching style would remediate these problems among students, a study was created with three elementary school teachers; one taught third grade, one-fifth grade, and one eighth grade. To test if motivation was in fact increased during this study, evidence was collected through parent surveys, student surveys, and an observation checklist. The first observation of students revealed that during work time students were frequently distracted and often bored from a lack of appropriate challenges. These observations were found by watching for certain behaviors such as talking during work time, playing with objects, participation in free time activities after completion of an assignment, and working too quickly or too slowly (Danzi, Reul, & Smith, 2008, p. 29).

This study also echoed the aforementioned study regarding enrichment and differentiation in that students want choice when it comes to activities they do while learning. Danzi et al. write that students "need to feel that they have a voice when it comes to classroom decisions… these issues interfere with not only the students' academic success, but also their development of a positive sense of self" (Danzi et al., 2008, p. 30). Differentiation is a natural conduit of choice because many differentiation strategies have choice built into them. For example, if a teacher is actively

differentiating their curriculum through strategies such as tiered assignments, flexible

grouping, or learning style, students find that they have more open-ended prompts that

allow them to use their own route to arrive at the learning outcome.

In order for the researchers to test their theory that differentiation would

increase motivation among learners, they created activities for free time choices,

manipulated the classroom environment to create a central location for free time

activities, developed tiered assignments for upcoming units, and lastly, developed

authentic assessments for upcoming units. During the first two weeks, tiered

assignments and free-time choices were introduced to the students. Danzi et al.

immediately noticed that by the end of the first week the new strategies had allowed

for them to spend more time providing remediation to struggling learners (Danzi et al.,

2008, p. 48). However, they also found that the tiered assignments were not as

successful in practice as in theory. They found that they were difficult and time

consuming to create and students would choose the easier assignment regardless of

their academic level. They noted, "we did not notice an increase in motivation or a

reduction in boredom for the majority of this intervention… we think this happened

because work is work and most students did not want to do it no matter how exciting

we tried to make it." In addition to the tiered assignments being less productive than

they had hoped, they also found that authentic assessments were not as effective as

they had hoped. The students enjoyed the option to choose from a variety of styles of

assessment that accommodated different learning styles, but they found the

assessments difficult to develop in a manner that effectively measured the learning

objective. One last problem that presented itself with the authentic assessments was

that students routinely selected the assessment that was most comfortable for them,

rather than challenging themselves with different modes of assessment (Danzi et al.,

2008, p. 50).

To measure the success of implementing differentiation in their classrooms,

Danzi et al. conducted a post-study survey that demonstrated small gains in student

interest. According to survey results, there was a 7% gain in interest and no notable

difference in how challenged students felt. Danzi et al. noted that it was difficult to track

which level of tiered assignments were selected by students and many selected

assignments that were not challenging enough. Additionally, the data showed that there

was a 15% increase in students who were sometimes bored in class, which was

disappointing to the researchers considering that was the main goal of the study. Danzi

et al. reflected on the study and thought of several changes they would have made:

fewer tiered assignments, recording positive (rather than negative) behavior, including

more free response questions on the surveys, and offering multiple projects as a form of

assessment (Danzi et al., 2008, p. 61). This study did not elicit the results that the

researchers were hoping for, but it still provides a starting point for teachers who want

to include more differentiation in the classroom and a few areas of caution for teachers

just beginning.

Regarding the issue of students catching on to the structure of tiered assignments and choosing the least challenging activity regardless of their readiness, Heacox addressed this issue in her book on differentiation in a section titled "Making Tiering Invisible." Heacox advised that students be as unaware as possible of the levels of each activity and that all activities be introduced in an equally enthusiastic manner and in an unpredictable order. Furthermore, Heacox stressed that all levels of tiered work need to be equally interesting and engaging and also fair in terms of work and expectations. For example, a student that is ready for the advanced activity will not want to participate if it requires more time and effort to accomplish (2002, p.98-99).

In his dissertation titled, "The Effectiveness of Differentiated Instruction in the Elementary Mathematics Classroom," Brian Scott recognized the need for greater qualitative research regarding the differentiation classroom. Scott found this a curious dilemma given the extremely complex nature of differentiation as well as the fact that differentiation is grounded in assessment, which is numerical in nature. Scott argued that teachers and administrators need greater quantitative data supporting the practice if they are going to commit to the considerable task of implementing it in the classroom (Scott, 2012, p. 7). For this study, Scott chose an elementary mathematics class given that math is skills-based and differentiation strategies can be readily implemented. The study sought to answer three research questions:

1. Does differentiated instruction impact the growth of student learning in the subject of math?

2. Does differentiated instruction impact the growth of student learning of a

   particular gender in the subject of math?

3. Does differentiated instruction impact the growth of student learning of a

   particular aptitude in the subject of math?

To conduct this study, the first step was to administer a pretest, instruct students as

usual, and then administer a posttest. After phase one, the three teachers that

participated attended twelve hours of differentiated instruction training before moving

on to the next phase. The second phase included a similar process; administer a pretest,

instruct students using differentiated instruction, and then administer a posttest. The

strategies that were covered during the teacher development training included

disaggregating assessment data, compacting, flexible grouping, and anchoring activities

(Scott, 2012, p. 45).

Tomlinson discusses many of these strategies in her book *How to Differentiate

Instruction in Mixed-Ability Classrooms.* She describes the strategy of compacting as

designed "to help advanced learners maximize their use of time for learning" (2001,

p.74). Compacting occurs in three stages:

1. Identifying what students know and do not know about a particular topic

   through assessment.

2. Identifying what the students have not yet mastered and then create a plan to

   make sure that the student masters those items.

3. In order to provide enrichment, the student and teacher design an additional

   activity to engage in while other students are working to master the lesson

   (Tomlinson, 2001, p. 75).

Tomlinson also defines an anchor activity that a student can do once they have finished

their given tasks. In the differentiated classroom, students will finish assignments at

varying times and it is important to have a series of activities a student can select from.

Tomlinson suggests reading, journal writing, managing a portfolio, and practicing things

like spelling, math, and vocabulary (Tomlinson, 2001, p. 35).

The results of this study did not prove that the differentiation strategies utilized

were effective. The only portion of this study that did provide an increase in

achievement was for the subpopulation of students with above average ability (Scott,

2012, p. 60). Although Scott was unable to prove that the differentiation strategies that

were presented to the teachers during the teacher development were effective, other

important findings were revealed during conversations with the teachers. The teachers

that participated in this study reported that while they had a passion for differentiation,

they needed strong support in the form of leadership and collaboration. Additionally,

they admitted that they spend the majority of their time working with struggling

learners and often were unable to work with the advanced learners (Scott, 2012, p.61).

This could be one reason why the data only supported increased learning for the

subpopulation of students with above average learning ability. Scott concluded that

because the data did not support a broad increase in academic achievement, this type

of differentiation might need to be studied over a greater period of time as well as by more specific demographics as in the Beecher and Sweeny study that included socioeconomic status as well as ethnicity of students.

In 2017, Pablico, Diack, and Lawson *published a study titled, "Differentiated Instruction in the High School Science Classroom: Qualitative and Quantitative Analyses."* The purpose of this study was to determine if differentiated instruction (DI) was effective using both quantitative and qualitative research methods. The quantitative data was collected using an end-of-course comparison of two groups of biology students; one group had been taught using differentiation strategies, and one had been taught without DI. The qualitative data collected included teachers' beliefs, experiences and perceptions of differentiated instruction (Pablico, Diack, & Lawson, 2017, p. 30). The researchers recognized that DI has a strong "theoretical basis that includes constructivist theory, brain-based research and multiple intelligences," but that it lacks empirical validation. Additionally, many of the studies that have been done are qualitative in nature, referring often to the positive outcomes of increased motivation and excitement about learning (Pablico et al., 2017, p. 31). In response to this, Pablico et al. aimed to answer three research questions:

1. What are the science teachers' perceptions of the effect of differentiated instruction on student learning?

2. What are the students' perceptions of differentiated instruction in their science class?

3. Is there a significant effect of differentiated instruction on student learning outcomes measured by EOC (end-of-course) tests scores (2017, p.32)?

This study included six teachers, all of whom were interviewed regarding their perceptions of DI on student learning. All six teachers agreed that DI improves student engagement, two additionally felt it promotes a positive learning environment, and two others felt that it benefits the student and promotes a positive learning environment (Pablico et al., 2017, p. 44).

In regards to the quantitative data that was collected via the standardized end-of-course exam, the data showed that students from the previous year that had not undergone DI had a mean score of 88.95, while the students that had been taught with DI had a mean score of 90.05. One of the interesting things about this data was that while there was an increase in mean test scores, looking at the data we can see that there was a significant jump (14.4 percentage points) in the "excellent" score category, meaning that the DI most benefited the high achieving students.

There was a limitation with this study, however, and that was that the previous year's students had a lower mean entrance exam score, so after the mean scores from both years were adjusted, there was no statistical improvement in exam scores (Pablico et al., 2017, p. 50). Pablico et al. concluded that while the mean end-of-course exam scores were not improved, differentiation should still be implemented because of the positive impact it brings to the education process by increasing student engagement as well as the need for further empirical studies (Pablico et al., 2017, p. 51).

Using Technology to Differentiate

Considering the common responses from teachers throughout the

aforementioned research articles is that they know differentiation is effective, but it is

difficult to achieve because of the considerable time it takes to implement

differentiation strategies, it is useful to look at the way that technology can help

teachers make the process of differentiation more efficient.

Aries Cobb published a study titled, "To differentiate or not to differentiate?

Using internet-based technology in the classroom." in 2010 in an effort to determine if

differentiation worked best when teachers were using internet-based software. To

collect data in this study, an internet-based software called Compass Learning was used

to "differentiate instruction, prescribe learning paths, allow students to work

cooperatively, and increase overall achievement in reading skills for the targeted

students" (Cobb, 2010, p.37). The subject of this study was the Cleveland Metropolitan

School District (CMSD), which is the largest urban school district in Ohio and uses the

Compass Learning software. Cobb notes that "abundant research" indicates that direct

instruction is acknowledged as the preferred style of instruction in urban schools, but

that Compass Learning also has substantial outcomes in increasing "reading

achievement of minority students who live in poverty" (Cobb, 2010, p.37). In this study,

Cobb looked at not only the success of the Compass Learning software, but also

compared the strategies of direct instruction versus differentiated instruction. For the

purposes of this research article, direct instruction indicates the use of learning

outcomes to teach the entire class at once and then providing the entire class with one

assignment to complete. Differentiated instruction, on the other hand, refers to the use

of flexible group work that is guided by differentiated instruction in which the teacher

provides instruction based on the learning styles of the individual students (Cobb, 2010,

p.38).

The Compass Learning software assesses students on an individual basis before

providing an individualized instruction path that includes differentiated writing and

listening activities. The lessons all follow the same sequence:

1. A prereading activity introducing new academic ideas;

2. A digital presentation of the story; and

3. Comprehension exercises that focus on sequencing, main ideas, and predicting.

    (Cobb, 2010, p.39)

The program is customizable and allows teachers to differentiate for each student by

adjusting the lessons to incorporate additional content if mastery is not obtained, or to

increase the level of rigor for students who have already mastered the content.

While Cobb did not collect data that tracked assessment scores among students

using Compass Learning, data was collected from teachers in the form of a survey that

asked questions about using technology to differentiate. One of the key findings was

that collaboration was essential in helping teachers feel confident using software such

as Compass Learning. The survey also indicated that teachers who were previously

uncomfortable with Internet-based instruction before Compass Learning were now using it with greater comfort and frequency (Cobb, 2010, p. 42).

An additional article written in 2008 by Slavin, Cheung, Groff and Lake looked at Compass Learning and the effect it had on assessment scores in two different studies. Slavin et al., wrote, "It provides an extensive set of assessments which place students in an individualized instructional sequence, and students work individually on exercises designed to fill in gaps in their skills" (2008, pg. 298). Different researchers conducted the studies but give us useful quantitative data to assess the effectiveness of Compass Learning. The first study was conducted in 1993 by J.W. Roy and evaluated a middle school and a junior high in Texas. Roy found that Compass Learning had significantly positive effects on reading assessments at the junior high school (+0.38), but there were nonsignificant effects on the reading assessments of the students at the middle school (+.05). The weighted mean effect size across the schools was +0.15 (as cited in Slavin, 2008, p. 298).

The second study referenced in Slavin et al., was conducted by C.T.L. Hunter and evaluated the effectiveness of Compass Learning on grades two through eight in rural Jefferson County, Georgia. In this study, students across six schools across the county engaged with Compass Learning for thirty minutes a day for twenty-eight weeks and were compared to a control group that did not participate in Compass Learning. This study demonstrated significant improvement across the different grade levels that ranged from +.019 to +0.37, with a mean effect of +0.21 (as cited in Slavin, 2008, p.

298). The studies referenced in Slavin et al. demonstrate that software and internet-based learning tools that provide differentiated instruction can provide substantial and measurable improvement in academic achievement while making the task of differentiation more easily accomplished for the teacher.

In 2015, Haelermans, Ghysels, and Prince sought to determine if digital differentiation improves learning in the study, "Increasing Performance by Differentiated Teaching? Experimental Evidence of the Student Benefits of Digital Differentiation." Haelermans et al. acknowledged that differentiation is known to improve learning, but difficult to achieve due to the resource restraints of teachers. They proposed that "differentiation in large classrooms is possible and beneficial for all students, once done digitally," and provided evidence of the effect of digital differentiation among eighth graders through a quantitative study (Haelermans et al., 2015, p. 1161). The study lasted twelve weeks and involved 115 eight grade students; 57 of whom were part of the treatment group, and 58 of whom were part of the control group. The digital differentiation that was used included digital instructional materials from the publisher, digital portions of the text, and additional digital material from the Internet. Students were given weekly tests to determine at which of three levels a student would work in the following week (Haelermans et al., 2015, p. 1170).

The results of the study showed that there was a positive impact on the test group of 0.18 of a standard deviation. The results were modest, but the authors were hopeful that if the strategies were applied for a period longer than twelve weeks, the

digital differentiation could provide an even greater impact (Haelermans et al., 2015, p. 1171). One of the other significant effects was that teachers found they had more time to answer individual questions and interact one-on-one with students because the content was digital, as opposed to the traditional teaching method where the teacher presents the content with little time left over for individual questions (Haelermans et al., 2015, p. 1166). Although the gains observed in this study were modest, it provides us with a glimpse of how technology can help teachers achieve the overwhelming task of providing a differentiated curriculum for each individual student.

In her dissertation, Suzanne Heald examined the use of technology to help differentiate curriculum for gifted learners in an elementary school in Alabama (2016). Citing the No Child Left Behind policy, Heald wrote that in U.S. public schools "educators focus mainly on the academic achievement of slow learners...in this environment, gifted learners...often pursue their own individual academic interests with little guidance from their teachers" (Heald, 2016, p. 1). Heald conducted this study by first interviewing the teachers, and then observing their classrooms. The three research questions were:

1. What curricular strategies do teachers use to integrate instructional technology to support the differentiated learning needs for gifted learners in a heterogeneous classroom setting?

2. Under what instructional situations do teachers describe using instructional technology to improve learning experiences of gifted learners in heterogeneous instruction?

3. What are teachers' perceptions of instructional technology as a tool for the

   academic success of gifted learners in the classroom? (Heald, 2016, p. 62)

To answer research question one, teachers focused on the issue of a lack of time for

individual differentiation, the level of questioning, and flexibility. Many of the teachers

noted that Internet software such as Compass Learning, Time For Kids, and iStation

support their efforts by providing flexibility and appropriate enrichment for the students

(Heald, 2016, p. 82). Teachers also noted that they provided additional resources to

students through their Moodle courses.

In response to research question 2, teachers had a difficult time providing a

definitive answer because every gifted learner presents a unique set of circumstances,

however many teachers said that they "created extended learning experiences and

learning challenges for the students based on personal interests and current studies"

(Heald, 2016, p. 92).

Research question three, which sought teachers' opinions of technology as a

classroom tool, had mixed responses. Some teachers said that technology was a useful

tool for creating curiosity among students, while other teachers said that it had

negatively impacted children by making them less creative and unable to read for

content (Heald, 2016, p. 93). Moreover, some teachers criticized technology because

once gifted students began using it, they were "gone," while other teachers praised

technology for utilizing every learning style: visual, auditory, and kinesthetic (Heald,

2016, p. 94).

Heald concluded that teachers are using both a variety and abundance of technology to improve the learning of gifted students, but the challenge that teachers face is that there is no one-size-fits-all definition of gifted learners, meaning that a teacher must respond individually to each gifted learner. Additionally, one of the greatest factors in the success of providing enrichment to gifted learners is the amount of personal development a teacher receives regarding technology. Several of the teachers that were interviewed for this study noted that they had difficulty determining the proper technology to use (given the vast number of choices) as well as the appropriateness of the technology. Technology has the potential to allow teachers to be facilitators of individual learning for gifted learners, but they must be trained on how to confidently and effectively do so (Heald, 2016, p. 99).

CHAPTER III: DISCUSSION AND SUMMARY

Summary of Literature

Since the passing of the No Child Left Behind Act in 2001, educators have been diligently implementing best practices to help close the achievement gap among students while simultaneously raising every student's overall achievement to increase the global competitiveness of the United States (Klein, 2018). Some educators and researchers have criticized NCLB as creating an atmosphere were educators are only able to focus on struggling learners and high achieving learners are left to pursue learning alone (Heald, 2016), but many hope that differentiation will provide the framework for students of all achievement levels to reach their full potential.

Tomlinson defines differentiation as a classroom that "provides different avenues to acquiring content, to processing or making sense of ideas, and to developing products so that each student can learn effectively" (2001). Koeze defines it as "a framework used to implement the best practices in teaching and learning that already exist and have been researched to be effective" (2007). Following Koeze's definition of differentiation, this thesis sought to examine the most popular strategies for differentiation and discover which strategies have been proven effective. The strategies that were examined included: differentiating according to learning style; differentiating according to Bloom's Taxonomy and Gardner's Multiple Intelligences; commonly utilized differentiation strategies, and using technology to differentiate.

Differentiating according to learning style is one of the most widely discussed

modes of differentiation and there are numerous ways of categorizing learning styles.

Many scholars have debated how to even define learning styles, with some viewing

them as cognitive styles, and others seeing them as developmentally defined

characteristics (Leite et al., 2009). To further complicate learning styles, the research has

been found to be contradictory, with many saying that it has not provided consistent

quantitative data that demonstrates improved achievement when learning styles are

implemented in the classroom. There has been, however, promising brain science that

has provided scientific evidence that learning styles and preferences do exist (Sousa and

Tomlinson, 2018; Kraemer et al., 2009). For the purposes of this study, three of the most

widely researched and implemented learning styles were examined: the VARK model,

Kolb's Learning Style Inventory, and the Dunn and Dunn model.

Neil Fleming's VARK model designates four modalities for learning: the visual

learning, the auditory learner, the reading/writing learner, and the kinesthetic learner

(Fleming, 1992; Prithishkumar, 2014). Similar to most studies regarding learning styles,

the research regarding Fleming's model was contradictory. Leite et al. Found that there

was not sufficient evidence to support the use of VARK and urged further research to

determine the reliability of the model (2009). Hussman & O'Loughlin found even less

supporting evidence of VARK's success or reliability and urged that conventional wisdom

regarding learning styles should be disregarded by educators (2019). Alternatively,

Wright & Stokes provided quantitative data that supports greater academic

achievement among students when VARK is implemented (2015).

David Kolb's learning style inventory (LSI) examines the concept of learning styles

through a different lens. He theory asserts that we learn through experiencing our world

first and then processing, assessing, and arriving at a conclusion about our experience.

As with the VARK model, research regarding the LSI is often conflicting. Researchers

McNeal & Dwyer were unable to produce an increase in student achievement after

implementing the LSI (1999), and Manolis et al. found no quantitative evidence that

proves the validity of the LSI (2013). A study done by Abdulwahed & Nagy, did however,

provide quantitative data that proved increased achievement when implementing the

LSI (2009).

The last learning style that was examined was Dunn and Dunn's Model which

focuses on a student's preferences when learning. Dunn and Dunn created a self-

assessment that has students identify their preferences according to five major stimuli:

environmental, emotional, sociological, psychological, and physiological. Dunn and

Dunn's model has been widely researched, but not all research has been accepted by

peers because much of the research has been conducted by Rita Dunn herself. One such

study done by Brand, Dunn and Greb looked at how students that had been diagnosed

with ADHD responded to the Dunn and Dunn model (1999). The study determined

quantitatively how students diagnosed with ADHD can often operate best within a

learning environment. An additional study conducted by Englander et al. Sought to

determine the validity of the Dunn and Dunn model (2013). This study found that the

Dunn and Dunn model was reliable in correctly identifying analytic/global learners via

the survey.

Some studies were able to achieve greater success among students, but the

exact reason for the improved success was uncertain. For example, researchers like

Wright and Stokes, who implemented the VARK method while teaching an economics

and had success with improved achievement noted that the success could not be

decisively credited to the VARK model, and the success may have been due to a more

global teaching approach with real world context (2015). The same was true for a study

conducted by Bosman and Schulze who combined both the VARK and Dunn and Dunn

model in order to assess categories from each model (auditory, kinesthetic, visual,

reading, writing, individual learning, and group learning) (2018). Bosman and Schulze

were able to provide data that supported multimodal teaching, but unable to define

which method was the greater influence. Koeze also reported improvement to student

achievement when utilizing differentiation strategies such as learning styles, interest,

flexible grouping, readiness, and pre-assessment, but was unable to determine exactly

what produced the positive impact on achievement (2007).

Research that examined differentiation according to Bloom's Taxonomy and

Gardner's Multiple Intelligences demonstrated positive results on student achievement

as well as greater student satisfaction. Reni Francis found that implementing Bloom's

Revised Taxonomy and Gardner's Multiple Intelligences improved achievement of

learning objectives and that students benefited not only in academic achievement, but also joy, satisfaction and pride (2012). Altintas & Ozdemir conducted a study that differentiated curriculum according to Bloom's Taxonomy and Gardner's Multiple Intelligences and found a significant gain in student achievement (2015).

In an effort to explore other commonly utilized differentiation strategies, studies regarding enrichment, tiered assignments, curriculum compacting and ability grouping were examined. Many studies reflected these practices positively, but a few found no improvement in success. One of the most successful reports of differentiating in order to close the achievement gap was in a research report by Beecher and Sweeny (2008). Beecher and Sweeny analyzed the successful measures that were taken by Central Elementary School over the course of eight years that improved academic achievement from 32% proficiency among students receiving free or reduced lunch to 60% proficient. The primary mode of differentiation that was utilized was enrichment, but tiered assignments and flexible grouping were also utilized. McAdamis reported a similar result in an article that tracked the progress of a school that implemented tiered assignments, curriculum compacting, high-level questioning, flexible grouping, and independent study and was able to significantly improve student achievement. In addition to the differentiation strategies implemented, this school also invested heavily in teacher development, district trainers, and curriculum coordinators (2001). Valiandes et al. (2015), Dosch & Zidon (2014), and Joseph et al. (2013) all reported modest, yet positive improvements after implementing similar differentiation strategies.

There were also studies that indicated no academic gains after using differentiated instruction in the classroom. Danzi et al. reported that after implementing strategies such as tiered assignments, free-time choices, and authentic assignments (2008). They reported that there was no significant positive impact on student achievement. Even though many studies lacked quantitative data that indicated improved achievement, many students reported feeling a more significant intrinsic motivation after differentiation was implemented in the classroom. For example, in the 2013 study done by Manolis et al., the researchers found little evidence proving the theory of Kolb's two dimensions, but still noted the benefits of identifying learning styles for both teachers and for students. Bosman and Schulze also used qualitative commentary to encourage teachers to utilize multimodal teaching regardless of improved achievement because of students' stronger sense of personal achievement. Dosch & Zidon reported that even though the academic gains from differentiation were minimal, the gains in student satisfaction and appreciation were significant (2014). Joseph et al. reported that students enjoyed having greater choice in both activities and assessments, as well as greater satisfaction being able to use their strengths (2013). The qualitative effects of differentiation seem to be consistent - that it strengthens the invaluable relationship between educator and student and thus fosters greater intrinsic motivation and satisfaction among learners.

Several studies that experienced limited or no success when implementing differentiation shared a common reflection; that perhaps a longer study could have

produced greater results. Valiandes et al. found differentiation had a positive impact,

but speculated that had the study continued longer, the differentiated instruction could

have made an even greater impact, as well as Haelermans et al. whose study lasted 12

weeks with no significant positive impact. Scott also speculated that the reason his

study did not produce positive results on achievement was because the duration was

not long enough (2012). When contrasting these results with the longer studies by

McAdamis (lasting five years) and Beecher & Sweeny (lasting eight years), the longer

studies had the greatest measurable success.

Another theme that emerged was the problematic and overwhelming workload

that differentiated instruction can put on a teacher (Valiandes et al., 2015; Joseph et al.,

2015; McAdamis, 2001; Danzi et al., 2008). Altintas & Ozdemir received qualitative

feedback from teachers that the preparation time required for differentiation was

difficult to manage. In an effort to combat this problem, Valiandes et al. provided a

support system for teachers online that allowed for continual support and collaboration.

Additional researchers such as Joseph et al. found that differentiation is time consuming

and difficult to cater to individual needs even though it does improve achievement.

Some of the studies with the greatest success ensured that teachers were supported

through both administration and time for teacher development (Beecher & Sweeny,

2008; McAdamis, 2001).

One way to address the burden that differentiated instruction places on teachers

is to use technology to ease the workload required to differentiate. A study looking at

software designed to help teachers differentiate for individual students by Cobb found that software can provide substantial increases in achievement (2010). Slavin et al. also found that software and internet-based learning tools can improve achievement while also making the task of differentiation less overwhelming for teachers (2008). The research also pointed to technology providing teachers greater time and flexibility to work with struggling students by providing enrichment for students who have already mastered the content (Heald, 2016).

The research compiled during this study revealed the potential long-term success that comes from a differentiated classroom, but also the challenges that differentiation can create. Many studies demonstrated improved student achievement and almost all reported greater student satisfaction and motivation when differentiated instruction was used in the classroom. While differentiation can be overwhelming for individual teachers to implement, this research has demonstrated that through proper administrative support, collaboration, and in some cases technology, differentiation can be attainable and beneficial to both teachers and students.

Limitations of the Research

The guiding question for this thesis is, "Which differentiation strategies are most likely to increase student achievement in the secondary Social Studies classroom?" Studies conducted specifically in the secondary Social Studies classroom were unavailable, but I was able to find literature for this thesis that was conducted in

classrooms of various ages and subjects that effectively demonstrate the results of implementing differentiated instruction. Most of the strategies that were researched in this thesis could be easily introduced into a Social Studies classroom. The only strategy that would have limitations within a Social Studies context would be specific software designed for increased literacy (such as Compass Learning). All other strategies such as differentiating according to learning style, Bloom's Taxonomy, Gardner's Multiple Intelligences, flexible grouping, tiered assignments, and curriculum compacting would all be well suited to a Social Studies classroom.

To locate literature for this thesis, database searches of ERIC, Academic Search Premier, EBSCO MegaFILE, JSTOR, ProQuest Education Journals, and Gale Literary Sources were used. Primary focus was given to studies that were published within the last ten years, with the exception of a few studies that examined older theories. For example, Kolb's theory regarding experiential learning was first published in 1984 and studies examining the theory began shortly thereafter. The majority of the studies included took place in the past ten years to maintain relevance to present challenges in education and other rapidly changing circumstances (as is the case with technology). Searches focused on studies that were peer-reviewed journals (most of which focus on education).

Some of the limitations of my research included access to the most current research regarding technology as a tool to aid teachers in providing differentiated instruction. Technology moves at such a rapid pace that to fully examine its impact on

differentiation it would be necessary to have access to the most recent research.

Research that was referenced technology in this thesis included articles published in

2008, 2012, and 2014, and while those are relatively recent publications technology

being used in the classroom has likely changed since they were published.

An additional limitation to my research was the number of long-term studies

that have been published that relate to differentiated instruction. As previously noted,

there seems to be a correlation between the duration of the study (how long

differentiated instruction was implemented in the classroom) and how successfully it

improves student achievement. The studies that had the greatest impact on student

achievement lasted five and eight years, while the studies that lasted one semester to

one year, had the weakest impact on student achievement. Many of the studies looking

at differentiated instruction do not cover a substantial length of time, despite many

researchers noting that this could possibly produce better results.

Implications for Future Research

Many of the studies that were examined in this thesis had a shared difficulty in

identifying which specific differentiation strategy was boosting academic achievement.

Differentiation is a multi-strategy approach that combines best practices to achieve a

goal. As defined by Koeze, it is "a framework used to implement the best practices in

teaching and learning that already exist and have been researched to be effective"

(2007). Consequently, most studies in this thesis implemented multiple differentiation

strategies when testing the overall success of differentiation. However, many

researchers were unable to pinpoint which best practice (or combination of best

practices) was responsible for greater academic success (Wright and Stokes, 2015;

Bosman and Schulze, 2018; Koeze, 2007). Many teachers reported that differentiation

was a considerable challenge to implement given the amount of work and time required

to construct differentiated lessons, or even entire curriculums (Valiandes et al., 2015;

Joseph et al., 2015; McAdamis, 2001; Danzi et al., 2008). If teachers knew which specific

practices were most effective, they could strategically implement differentiation in

order to provide greatest benefit to students while maximizing their limited resources.

Further research surrounding differentiation should have procedures in place to identify

which specific strategy produces a positive effect on student achievement.

In addition to the challenge of identifying the effectiveness of specific strategies,

another challenge in many of these studies was time constraints. Many researchers

were only able to implement differentiation over a period of time that was less than one

year (Haelermans et al., 2012; Scott, 2012; Valiandes et al., 2015). In each of these

studies, the researchers all speculated that had they continued the study they may have

had more significant results. The few studies that looked at long-term differentiation

practices had experienced great success in boosting student achievement (Beecher &

Sweeny, 2008; McAdamis, 2001). For future research, it would benefit educators to look

at the impact of differentiation over greater lengths of time and answer the questions of

why does it appear that differentiation takes greater effect over long-term

implementation and how does a teacher effectively implement differentiation in the short and long-term?

Implications for Professional Application

This body of research contains important implications for educators as it provides a number of differentiation strategies that improve student achievement and satisfaction. Differentiation is a framework that includes many different best practices that work together to improve student achievement.

The first mode of differentiation examined was learning styles, and while they often produce conflicting quantitative data regarding student achievement, they have been shown to provide a consistent increase in student satisfaction. While some studies showed no academic benefit to learning styles (Hussman & O'Loughlin, 2019; Leite et al., 2009; Manolis et al., 2013; McNeal & Dwyer, 1999), some did show improvement to student achievement (Abdulwahed & Nagy, 2009; Englander et al., 2013; Wright & Stokes, 2015). Almost all studies that measured qualitative data, however, found increased student satisfaction and appreciation for learning. If we can be sure that learning styles will increase intrinsic motivation within students while possibly also increasing academic achievement, it would be beneficial to begin implementing pre-assessments at the start of the year to determine students preferred style. Being aware of the students' learning styles can be beneficial both for the student and the instructor. Teachers can vary their instruction with learning styles in mind with minimal effort and

can make their classrooms feel more inclusive and foster greater appreciation for learning among their students.

The second differentiation strategy examined was differentiating according to Bloom's Taxonomy and Gardner's Multiple Intelligences. The data that researchers have collected relating to these strategies is overwhelmingly positive and reliably demonstrates an increase in student achievement (Altintas & Ozdemir, 2015; Francis, 2012). Additionally, teachers responded positively to using these theories in the classroom, reporting that they equipped them to cater more effectively to students' strengths and to better differentiate their content to meet the needs of children (Noble, 2004). The drawback of using Bloom's taxonomy and Gardener's Multiple Intelligences is that many teachers have found that implementing the rubric that is often required of these strategies and the multi-faceted lessons can be time consuming. This is one strategy that would require sufficient administrative support as well as colleague collaboration to effectively implement. However, if teachers can utilize a theory in their classroom that consistently increases student achievement as well as their joy and pride in their work, it is an excellent strategy to begin utilizing in the classroom.

According to the results of a study by Beecher & Sweeny, one of the most impactful differentiation strategies is enrichment (2008). Enrichment was at the heart of an under-performing elementary school's improvement plan and the results showed a remarkable improvement in student performance. In addition to enrichment, flexible grouping, tiered activities, and parent/community involvement were also built into the

plan to turn the school around. The results of this study had the greatest impact on student achievement and all of these strategies should be implemented as much as possible in the classroom. While these strategies can be time consuming to use, they are certainly attainable in a school where collaboration is valued. Enrichment takes time and effort, but if colleagues collaborate and support one another, it can be attainable and reap great rewards.

Another study conducted by Koeze produced significant improvements in academic achievement and the differentiation strategies used included greater choice, learning styles, and a pre-assessment. Koeze specifically noted that the pre-assessments were critical in order to plan effective differentiated instruction and that within those classrooms, students had a better learning experience, and were more excited about their work (2007).

From this literature review, the most reliably impactful differentiation strategies include Bloom's Taxonomy and Gardener's Multiple Intelligences theory, enrichment, tiered assignments, flexible grouping, and pre-assessments. These strategies are all proven to be effective, both on academic achievement, but also in boosting student's intrinsic motivation and satisfaction. While it would be difficult for a teacher to implement all of these strategies at once, educators can work together to make consistent progress toward a differentiated classroom where all students are meeting their full potential.

Conclusion

The guiding question for this thesis is, "Which differentiation strategies are most likely to increase student achievement in the secondary Social Studies classroom?" This literature review examined a number of different strategies for differentiation including teaching according to learning styles, Bloom's Taxonomy and Gardner's Multiple Intelligences theory, curriculum enrichment, tiered assignments, flexible grouping, and using technology to differentiate. According to the research collected, the only strategy that did not demonstrate consistent positive effects on student achievement was differentiating according to learning styles. Conversely, the greatest improvement in academic achievement and student satisfaction came from utilizing Bloom's Taxonomy and Gardner's Multiple Intelligences theory, curriculum enrichment, tiered assignments, flexible grouping and using technology. These strategies provide consistent positive outcomes and give teachers a reliable set of tools to utilize when creating a differentiated classroom.

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