Effective Instructional Strategies in Sixth Grade Inclusion Mathematics Classrooms: The Effect of Active and Passive Engagement on Concept Learning and Opportunity to Learn

Christy Mikolaj

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EFFECTIVE INSTRUCTIONAL STRATEGIES IN SIXTH GRADE INCLUSION MATHEMATICS CLASSROOMS: THE EFFECT OF ACTIVE AND PASSIVE ENGAGEMENT ON CONCEPT LEARNING AND OPPORTUNITY TO LEARN

A Dissertation
Submitted to the School of Education

Duquesne University

In partial fulfillment of the requirements for the degree of Doctor of Education

By
Christy Mikolaj

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2019
EFFECTIVE INSTRUCTIONAL STRATEGIES IN SIXTH GRADE INCLUSION
MATHEMATICS CLASSROOMS: THE EFFECT OF ACTIVE AND PASSIVE ENGAGEMENT ON CONCEPT LEARNING AND OPPORTUNITY TO LEARN

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ABSTRACT

EFFECTIVE INSTRUCTIONAL STRATEGIES IN SIXTH GRADE INCLUSION MATHEMATICS CLASSROOMS: THE EFFECT OF ACTIVE AND PASSIVE ENGAGEMENT ON CONCEPT LEARNING

By

Christy Mikolaj

December 2019

Dissertation supervised by Dr. Launcelot Brown, Ph.D

The purpose of this mixed-method study focused on the effect of active engagement on opportunity to learn and concept learning among sixth grade special education students participating in the inclusion mathematical setting. By implementing two instructional strategies and using the theoretical frameworks of Vygotsky’s Social Constructivism and Erikson’s Stage of Psychosocial Development of Industry vs. Inferiority, findings showed there was a significant negative relationship between active engagement time during instruction and concept learning. The study showed students with identified needs within an inclusion mathematics setting increased concept learning in both instructional classrooms. Therefore, there was no difference in concept learning based on instructional strategy. Surveys indicated the majority of the special education students in the inclusion setting preferred teacher directed instruction. Based on the
findings of the study, recommendations for the future in the field of education would be to utilize a variety of instructional strategies within an inclusion classroom and not rely on a single method or instructional strategy for delivering instruction. In addition, understanding the academic needs and learning styles of special education students in the inclusion mathematics classroom is critical. By using a combination of instructional practices in daily instruction and teaching to the whole child, all students will be given the opportunity to learn and be given the supports needed in order to increase concept learning, academic achievement, and self-efficacy. Thus, special education learners within the inclusion setting for mathematics can develop psychological strengths which will carry into the later stages of human development.
DEDICATION

This research study and doctoral dissertation is dedicated to my grandmother, Eleanor Smith. She laid the foundation for strong, independent women in our family. Without this foundation, I would not be the woman I am today.
ACKNOWLEDGEMENT

The writing of this dissertation was made possible by the encouragement and support from the most important people in my life.

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for giving me the opportunity to work with you and enrich my knowledge of statistics.

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LIST OF ABBREVIATIONS

AET- Active Engagement Time
BOSS- Behavior of Students in School Tool
FAPE- Free Appropriate Public Education
IDEA- Individuals with Disabilities Education Act
IDI- Inclusion Definition Instrument
IEP- Individualized Education Plan
OTL- Opportunity to Learn
PET- Passive Engagement Time
PBL- Project-Based Learning
TDI- Teacher Directed Instruction
Chapter 1

Introduction

Excellence, equity, and effective are three words which are commonly defined in three separate domains. However, in an educational context the interconnectedness of these concepts form the crux of a mission for many districts. In a small, suburban upper-middle class district, excellence is being demonstrated through above-average state assessment scores, being identified as one of the top school districts in Pennsylvania, and being recognized with state awards for numerous years. These honors and acknowledgements portray to the community and other neighboring districts that this district must be receiving these recognitions due to the rigorous curriculum, instruction, and interactions which occur on a daily basis. The credits being given to the district paint the picture this district is excellent, provides equity to students since students are achieving high pass percentages for state assessments, and delivers curriculum and instruction through effective teaching practices.

Analysis of standardized state assessment scores in the subject area of mathematics, a content area in which many districts are encountering below state percentages for proficiency, supports the conclusion that this district is effectively educating students and increasing academic growth in learners. Using data from state standardized assessments over a three-year span, it is evident students are performing above the state average. In the 2015-2016 school year, 89% of the students in the middle school performed at advanced or proficient level. The following school year, 2016-2017, 82% of the students performed in the advanced and proficient category. Most recent data, 2017-2018, indicates 81% of the tested students were proficient or advanced. These
scores demonstrate a high proficiency rate among the student body. With these scores, it is perceived the majority of the students are receiving effective instruction and education in the area of mathematics.

Yet, when using disaggregated data, in particular analyzing the data of proficiency among special education students on the mathematics assessment, a different picture is painted. Using the same testing years, the following percentages of special education students demonstrating proficiency on state standardized assessments is documented: 18.4% proficiency/pass rate (2015-2016); 13.6% proficiency/pass rate (2016-2017); 35.3% proficiency/pass rate (2017-2018). Although the percentage in the 2017-2018 school year indicates an increase in proficiency by 21.7%, it must be noted only 12 students passed the mathematics assessment during the indicated school year. The data shows 22 students, or 64.7% of special education students, were rated as basic or below basic. Obviously, it becomes unambiguous there is a discrepancy among educational growth and equity among students within the district.

Further analysis of the data on the pass rates in mathematics among 6th grade IEP students indicate a significant decrease in pass rates. From 2005-2014, the pass rate of IEP 6th grade mathematics students ranged from 59.5% to 75%. In 2013-2014, the pass rate in mathematics among sixth grade special education students was at the highest with 75% proficiency. Then, in 2015-2016, a drastic reduction occurred. The pass rate for the special education sixth grade mathematics students went from 75% to 20.4%, a decrease of 54.6%. Moreover, the following two years (2016-2017 and 2017-2018) had a steady decline. The 2017-2018 school year had to lowest pass rate among sixth grade special education mathematics students with a pass percentage of 13.6%. 
To further signify an inequity of educational growth, particularly with students in the special education program, data from standardized mathematics assessments, under the category of Indicators of Closing the Achievement Gap among Historically Underperforming Students, can be offered. Achievement Gap, for the purpose of this study, is defined as the significant difference of academic performance between different groups and sub-groups of students. The purpose of the Achievement Gap among Historically Underperforming Students category specifically examines the academic and educational performance of students identified as special education, economically disadvantaged, and English Language Learners.

Under the Indicators of Closing the Achievement Gap among Historically Underperforming Students, disconcerting data exists. Data from the same years (2015-2016, 2016-2017, and 2017-2018) indicate a 0% rating for closing the achievement gap among students who historically underperform on the mathematics assessment. This rating of 0% further signifies the school is not making progress on closing the achievement gap among underperforming students within the six-year period as per state requirement.

Considering these data and being cognizant of the awards/recognitions this school has received due to above average proficiency ratings on standardized assessments, there is an unsettling contrast. The mean of the larger population is masking the mean of the smaller population of marginalized learners. In three years, there has been inconsistent progress in increasing academic outcomes in mathematics among a group of marginalized learners. In a school where 67% of special education students are being educated within the inclusion mathematics classroom setting, this data of inconsistency
frames an inequity among learners and an inequity in opportunity to learn among these students.

**Opportunity to Learn**

In order to identify why there has been a minimal increase in percentage of proficiency on state standardized assessments among underperforming students, it is essential to examine variables contributing to opportunity to learn among students within the inclusion setting.

Opportunity to learn (OTL) has three factors influencing student achievement. These variables include instructional time, content covered, and quality of instruction. When analyzing the setting for this study, allocated time/instructional time is one factor which is being met for students’ opportunity to learn. All mathematics teachers are allotted seventy-five minutes of uninterrupted instructional time on a daily basis. Additionally, the content being covered for mathematics is aligned to common core standards and students are exposed to mathematical content which is relevant to real world situations.

With these two pillars of opportunity to learn taking place in the daily mathematics classroom, the final factor of quality of instruction needs to be examined in further detail. In relation to the context of this study, most teachers have been observed using the instructional strategy of lecture and computation drill/practice as the central teaching strategy. Observations have indicated some teachers utilize lecturing for fifty to sixty minutes of the seventy-five-minute allocated time. Therefore, students in the inclusion mathematics classroom and regular education classroom are inactive and
deskbound for 67-80% of the instructional time. This percentage of being inactive indicates instructional strategies that are not conducive to middle school learners.

Eichorn (1968; 1977; 1983) in a study and The National Middle School Association’s publication of *This We Believe: Successful Schools for Young Adolescents* (2003) detailed characteristics of middle school learners. Based on these characteristics, there are a number of reasons why full direct instruction is not conducive to middle school students’ learning. The most salient reason is the attention span of middle schoolers. When discussing sixth graders, the attention span of these learners is ten to twelve minutes. As a percentage, 13-16% of time should be reserved for direct instruction. Direct instruction can be delivered in chunks, but should only encompass a 10-12-minute span in order for students to maintain focus and attention. Based on observations, inclusion mathematics students are being required to focus for 54-64% more time than what most middle school students are capable of sustaining.

Additional characteristics of middle schoolers, as noted in *This We Believe: Successful Schools for Younger Adolescents* (2003), involved physical traits. Middle school learners do experience growing pains during this time of development. Due to the children’s bones growing faster than muscles, middle school students have difficulty sitting for long periods of time. For this reason, many students sitting for a long period of time will begin to fidget in seats and move around. Furthermore, restlessness in middle school students increases due to the fluctuation of metabolism. This inability to sit stationary leads to students losing focus on academic instruction.

When discussing academic instruction, middle school learners generally learn best through active engagement. As indicated by the National Middle School
Association (2003) “since young adolescents learn best through engagement and interaction, learning strategies involve students in dialogue with teachers and with one another” (p. 23). This indicates there is a need for some teacher-centered instruction, but also the need for student-centered learning.

Further, cognitive-intellectual development of middle school learners suggests students would rather have active engagement in learning than passive engagement. A reason to incorporate more student-centered active engagement in learning centers around the cognitive-intellectual characteristic in which middle school learners often show a lack of interest in the traditional core subject areas. For middle school learners, the need to relate these standard core subjects to real life experiences and the world provides a more active engagement and desire for learning (Kong, Wong, & Lam, 2003).

In order to meet the needs of middle level learners, Eichorn (1983) raised the importance of middle school programs and curriculum taking into consideration the characteristics of middle level learners in order for that program to be effective. Eichorn (1983) noted specific traits of transescents, or middle level learners, including a want and need for given responsibility, a desire for knowledge and learning, and a longing for group interactions. In order to develop curriculum and instruction to meet these characteristics, Eichorn (1983) contends that middle level learners should be placed in groups to learn since having individualized instruction has not proven to be effective in the middle level years. Along with having students learn in groups, Eichorn (1983) further discussed the need for instructional methods to be varied. For delivery of instruction, it is imperative the instruction have a variety of activities and a change of pace in order to increase productivity among the middle level learners.
on instruction, Eichorn (1968; 1977) stated, “The traditional lecture-recitation method must give way to more appropriate methods” (p. 112). Included in these appropriate methods were seminars, self-directed learning, group activities and interaction, and opportunities for creativity.

Understanding the characteristics of middle level learners is crucial when developing curriculum and identifying effective teaching strategies for instructional delivery. It becomes evident instructional delivery needs to be engaging and allow the students to be active in learning.

**Theoretical Frameworks**

Providing students with a more active engagement environment for learning encompasses the learning theory of Social Constructivism (Vygotsky, 1962). Although Vygotsky contends the construction of knowledge is an individualized and internalized process, the actual learning itself is done as a collaborative and social process. Vygotsky’s Social Constructivist Theory implies learning is contextual and cannot be done in isolation. This theoretical framework supports this study in incorporating a more effective active engagement learning strategy, such as project-based learning. Project-based learning upholds the Vygotskian theory of Social Constructivism in that this particular instructional strategy provides a context in which opportunities for collaborative problem solving supports the individual to internalize conceptual knowledge and problem solving skills. The use of project-based learning as an instructional method allows opportunities for engagement in the instruction and provides an approach to make instruction valuable to the students.
In addition, the active engagement in learning centers around Erikson’s Psychosocial Developmental theory (1950). Erikson’s theory concentrates on eight specific developmental phases individuals encounter throughout life. During each of these levels, an individual is faced with challenges or external factors which influence the inner personality development of the individual. What impact these challenges have on a person’s psychosocial development is determined by reaction and resolution of these challenges. Erikson’s theory further indicates if these challenges are not met during the stages, negative impacts on psychosocial development will occur.

When examining instruction within a classroom, the delivery of instruction and the strategies used to deliver the content need to demonstrate to students that the instruction is valuable, especially within inclusion students. If inclusion students do not know the value of the instruction being presented, then these students often feel their contributions to the instruction and classroom discussion are not valuable. By not understanding the value of the instruction, inclusion students may feel a lack of competence and become disengaged in the instruction. This can then lead to students with identified needs in the inclusion settings developing a sense of inferiority.

For the purpose of this study, Erikson’s Stage Four- Industry vs Inferiority will be the focus. Children in this stage have a need to be productive, to learn, and to be recognized. During this stage, the need for social interaction is crucial in the development of adolescents. Through their engagement in learning, creation of projects, and completing tasks independently and within groups, students develop a sense of competence, pride, and accomplishment. This success increases the probability of students having an interest in learning. Therefore, project-based learning supports
Erikson’s theory by providing authentic, real world tasks that actively engage students in culturally valued learning. By incorporating a variety of strategies and processes for engaging with the problem or the concept, which project-based learning allows for, the opportunity for students with identified needs to socially compare themselves with the general education students may be minimized. Thus, a more equitable classroom will be produced and special education students can be given more opportunities to demonstrate the value of their contributions.

Recognizing theoretical frameworks which promote active learning and being familiar with the characteristics of middle level learners, it is observable the instructional delivery in the setting of this study is neither conducive to regular middle school students, nor to inclusion middle school learners. In the context of this study, students participating in the inclusion sixth grade mathematics classroom are performing below average on standardized assessments. In addition, daily observations have indicated the utilization of passive engagement instructional strategies, with more teacher directed learning. This type of instruction needs to be examined in order to conclude whether the quality of instruction ought to be transformed in order to increase achievement scores among the inclusion students. Therefore, the importance of this study is to identify which instructional strategy is more effective with increasing conceptual learning among inclusion students in the regular education mathematics setting.

To begin the evaluation of student achievement, this study will concentrate on concept learning within the classroom. Since standardized assessment content is based on concepts learned within the classroom, it is beneficial to begin examining the instructional strategies being utilized in order to teach the tested concepts.
Purpose of Study

The purpose of this study is to identify which instructional strategy, teacher directed instruction or project-based learning, supports the needs and is more effective in increasing conceptual learning among students identified with needs who participate in the regular education mathematics setting. Findings from this study will assist the researcher and stakeholders in developing mathematical instruction which is conducive to middle level learners, in particular those individuals have been identified with special education needs. In addition, students will benefit from the study by having instructional delivery meet academic needs along with increasing conceptual learning scores. By using instructional strategies, such as PBL which engage students with identified needs and all students in the instruction, an increase in conceptual learning scores is possible. By achieving success in learning through the higher concept learning scores, special education students become more motivated in the learning and begin to develop a stronger self-efficacy. This parallels Erikson’s Psychosocial Developmental Theory, in particular the Industry vs. Inferiority stage. If students are not engaged in learning, focus and attention to learning are diminished. Due to this, concept learning scores often decrease. This leads to special education students developing a negative sense of self-worth and doubts in academic ability. These students begin to lose confidence in themselves, develop a sense of failure, and become less industrious by refusing to try or do the work. When actively engaged in learning, through the use of an effective instructional strategy such as PBL, and when an increase in conceptual learning scores is produced, students identified with needs become more industrious and build a sense of belonging in the classroom. Those students who have been identified with needs and
whom are participating in the regular education will want to learn and will have developed confidence in order to undertake more challenging projects or assignments. Having more confidence and self-efficacy will allow the special education learners to develop psychological strengths which will then carry into the later stages of human development.

As students identified with needs who participate in the inclusion setting for math begin to develop the sense of confidence to solve math problems and feel a sense of accomplishment within the mathematics setting, concept scores and mathematical knowledge will increase. This increase in concept learning scores will then be transferred to the standardized assessments. Special education students will then be willing to take on the challenge of those math problems presented on the state standardized test. In the end, standardized test scores can begin to rise. With the increase in standardized test scores, the school district will see an increase in state profile scores. More importantly, the district will begin to ensure the marginalized learners are demonstrating growth in learning and that opportunity to learn is being giving to all learners.

In order to begin to ensure students are receiving opportunity to learn and being provided the most effective instructional delivery, the first component of the study is to determine the amount of active and passive engagement time occurring in the inclusion mathematics classroom. To begin this part of the study, it is important a clear description of the inclusion classroom is provided. In order to define inclusion for this particular study, the Inclusion Definition Instrument (IDI) (Rombach, 2009) was applied. The use of the IDI allows for distinct explanation of the inclusion settings being studied. This concrete description of the inclusion settings provides a contextual framework specific
for this study and reduces misinterpretations of the study. Data for the active and passive engagement time were collected in the two identified and defined inclusion classrooms. The traditional teacher directed instruction group utilized the method of lecture, with controlled individual and peer activities including independent practice, and working with peers on drill and practice problems. The treatment group using the instructional method of project-based learning (PBL) incorporated student centered learning, active learning, in the form of instruction through project based activities. Data collection for each group was collected using an adapted version of the Behavior of Students in School (BOSS) (Shapiro, 2011) data collection tool. Use of this tool allowed for a collective group data collection of active and passive engagement in the instruction and the types of instructional strategies delivered in the classroom. Active engagement, for the purpose of this study, was defined as the time students are engaged with learning and not listening to teacher led instruction. Active engagement allows for peer conversation, opportunities for questions, connections to real life, and time to work with the material being presented. In other words, active engagement signifies students are doing activities. Passive engagement, for the purpose of the study, was defined as students listening to teacher led instruction with no opportunity to connect with learning.

The second element of the study focused on conceptual learning among the inclusion students within the control and experimental groups. Data collection for the conceptual learning piece was collected through pretesting and formative assessments after each lesson. These assessment pieces will be in the form of a short quiz containing multiple choice and short answer explanation questions.
Finally, this study will establish whether inclusion students prefer a more active engagement teaching strategy or direct instruction. Students participating in both the experimental classroom using PBL and the control classroom using TDI will complete a survey created by the researcher. The survey will be based on Kong, Wong, and Lam’s (2003) Student Engagement in the Mathematics Classroom Scale. In particular, the survey for this study will be specific to the behavioral engagement of students in the mathematics classroom and concentrate on the subsection of attentiveness. The survey will also contain open-ended responses in regards to which form of instruction the students in the study preferred.

**Research Questions and Hypothesis**

In order to guide inquiry into possible approaches to improve the problem of practice of sixth grade inclusion mathematics students not achieving proficiency on standardized assessments and the setting of the study not closing the achievement gap for historically underperforming students, the following will be the central research questions:

1) To what extent do inclusion students engage in active and passive time in project-based learning and direct instruction?

2) What is the relationship between active engagement time and concept learning?

3) What is the difference in concept learning between students in teacher directed instruction mathematics classrooms and students in project-based learning mathematics classrooms?
4) Do inclusion students prefer direct instruction or project-based learning instruction?

At the end of the study, I expect the results for the first research question to demonstrate students have a higher percentage of active engagement time during project-based than in direct instruction. With more teacher directed instruction, I expect less active engagement time during instruction since the teacher is the facilitator of the learning. With project-based learning being a student centered instructional strategy which allows the students to be the facilitator of learning, my expectation would be the amount of active engagement time would be more than when there is the teacher directed instruction. My hypothesis for research question two would be a positive relationship between active engagement time and concept learning. As students are more engaged in the learning and have the opportunity to interact with the teacher and peers, the students’ attention and focus is increased, leading to more understanding of the concepts being taught. With less teacher directed instruction in a project-based classroom, I expect the results for research question number three to yield a higher increase in concept learning when project-based learning instruction is being utilized and students are more actively engaged during instructional time. Finally, my expectation for research question number four would be students would prefer project-based learning over direct instruction as project-based learning allows students opportunities to work with peers and be involved in the learning.

Conducting this study requires that background knowledge on major components of the research be acquired. Contextual information on inclusion, opportunity to learn, and project-based learning are in Chapter 2. The context and method of the study, in
addition to descriptions of the validity and reliability of the IDI Tool, BOSS behavior data collection tool, and surveys are outlined in Chapter 3. Results and analysis of the study are presented in Chapter 4. Finally, Chapter 5 discusses the findings in more detail and provides recommendations and future implications of the study and research. Chapter 5 also includes the limitations to the study and my future leadership agenda and growth based on the results of the study.
Chapter 2

Inclusion

Inclusion is a term used within the field of special education. Although there is no explicit law or policy for inclusion practices, there are federal laws and court cases mandating forms of appropriate placement procedures for special education students. One such act ensures districts examine inclusion practices in order to provide the least restrictive environment for students with special needs.

Just as there is no specific law regulating inclusion practices, there is no precise definition for the term inclusion. The special education term inclusion conveys a diverse number of definitions and meanings. Rombach (2009) states, “The term inclusion has often been misunderstood both in its definition and practice” (p. 2). Developing a specific definition of the term inclusion would eliminate misunderstandings of this educational placement practice.

In order to understand inclusion as a practice, it is important to provide contextual information on the federal laws and regulations, history of progression from exclusion to inclusion, definitions of inclusion, and the various models of inclusive practices.

Federal Law and Regulations

Inclusion does not possess an independent legal definition. Instead, two federal laws encompass inclusion. Taylor (2011) states, “Those legal notions are primarily grounded in two federal laws that prohibit discrimination against individuals with disabilities” (p. 48). The two federal laws to which Taylor refers is the Individuals with Disabilities Education Act (IDEA) and Section 504 of the Rehabilitation Act of 1973. In addition to these two laws, the Pennsylvania Supreme Court in Gaskin v Pennsylvania
Department of Education (2010) supported inclusion under Least Restrictive Environment (LRE).

According to federal law,

The Individuals with Disabilities Education Act (IDEA) is a law that makes available a free appropriate education to eligible children with disabilities throughout the nation and ensures special education and related services to those children. The law guaranteed access to a free appropriate public education (FAPE) in the least restrictive environment (LRE) to every child with a disability (20 U.S. Code Subchapter II- Part B Statute 1414).

This law protects the rights of individuals with disabilities and ensures every child is given the opportunity to participate in a free appropriate public education within the least restrictive environment. In terms of inclusion, the least restrictive environment would be the setting in which students with disabilities would be included within the regular education classroom with students not identified with special education needs. Taylor (2011), referring to the appropriate portion of the law, states, “Appropriate is a function of key components of equal access and maximum benefit” (p. 49). Based on the need of the students, some students would receive appropriate education in both the regular and special education settings.

In addition to IDEA, free appropriate public education (FAPE), which includes the decision of the inclusion placement, is protected by Section 504. Section 504 is a mandated federal law which is enforced by the U.S. Department of Education. The U.S. Department of Education, Office of Civil Rights (2010), Section 504 states:
No otherwise qualified individual with a disability in the United States…shall, solely by reason of her or his disability, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance…

Furthermore, in order to continue receiving federal monies, school districts, under Section 504, must provide free appropriate public education “to each qualified person with a disability which is in the school district’s jurisdiction, regardless of the nature or severity of the person’s disability” (U.S. Department of Education, Section 504). Section 504, along with IDEA, ensures the placement of a student with disabilities must meet the needs of the student and must include the least restrictive environment based on the student’s needs.

Both IDEA and Section 504 ensure that schools receiving federal financial assistance do not discriminate against students with disabilities. Each federal law guarantees students with disabilities are not denied free appropriate public education in the least restrictive environment. When determining the least restrictive environment, IDEA and Section 504 first begins with the consideration of appropriate placement in the regular education setting.

Supporting federal law and policy for least restrictive environment are numerous court cases dating back to 1972. In order to support equal education opportunities for students with disabilities, the ruling of Brown v. Board of Education, 347 U.S. 483 (1954) was used as the basis to support least restrictive environment and eliminate students with disabilities being separated from regular education peers. The ruling of the
Brown v. Board of Education Supreme Court case, stated by Chief Justice Earl Warren, supported this notion of not having students separated. Warren stated, “We conclude that in the field of public education the doctrine of ‘separate but equal’ has no place. Separate educational facilities are inherently unequal…” (Disability Justice, 2018, p. 2). Although this ruling set the precedent for African Americans to have equal rights for education, this ruling would later support other court cases which focused on least restrictive environment placements for students with disabilities.

The United States District Court for the Eastern District of Pennsylvania case Pennsylvania Association for Retarded Children (PARC) v Commonwealth of Pennsylvania (May 1972) declared “students with disabilities were entitled to a public-school education” (Gordon, 2006, p. 192). The ruling in this case supported the notion of all students having the opportunity to receive education in the public-school setting.

The verdict of the PARC v Commonwealth of Pennsylvania was a vital step for equal education for students with disabilities. As stated by Gordon (2006), “In doing so, the court was the first to recognize the rights of students with disabilities to an appropriate education. The ruling in this case foreshadowed the federal requirements for a free appropriate public education for students with disabilities” (p. 193). Because of this court case, federal legislation began to be established in order to provide the free appropriate public education (FAPE) to students.

Following the PARC v Pennsylvania (1972) case, Mills v Board of Education (1972) decreed all students should have access to a public education. In this case, seven African American students with disabilities were being denied a free appropriate public education. The court ruling included the following judgements and decrees (Mills):
1) That no child eligible for a publicly supported education in the District of Columbia public schools shall be excluded from a regular public school assignment by a Rule, policy, or practice of the Board of Education of the District of Columbia or its agents unless such child is provided (a) adequate alternative educational services suited to the child's needs, which may include special education or tuition grants, and (b) a constitutionally adequate prior hearing and periodic review of the child's status, progress, and the adequacy of any educational alternative.

2) The District of Columbia shall provide to each child of school age a free and suitable publicly-supported education regardless of the degree of the child's mental, physical or emotional disability or impairment. Furthermore, defendants shall not exclude any child resident in the District of Columbia from such publicly-supported education on the basis of a claim of insufficient resources (Mills v Board of Education, 1972).

These judgments reinforced the responsibilities and duties of public schools to include students with disabilities within the public-school setting. This inclusion of students within the public-school setting ensured segregation of students with disabilities did not occur. To maintain desegregation of students with disabilities, the court also held that excluding children with disabilities from the public-school system denied them equal protection” (p. 193). Mills v Board of Education (1972) furthermore declared public schools could not deny students with disabilities an appropriate educational service due to a lack of funding. Due to this decision, the regulations for federal funding would be developed in future federal laws.
Following the PARC v Pennsylvania (1972) and Mills v Board of Education (1972) court rulings, an additional twenty-seven federal court cases occurred involving the right of public education to all children. These cases, including PARC and Mills, laid the groundwork for federal laws to support free appropriate public education and least restrictive environment for all children with disabilities.

The first law enacted was in 1975 and was named the Education for all Handicapped Children Act, which would later be renamed the Individuals with Disabilities Education Act (IDEA). Nineteen years after the enactment of the federal law of IDEA and Section 504, students with disabilities continued to be deprived of free appropriate public education within the least restrictive environment. Resources needed by the students with disabilities were not being supplied. In addition, lack of teacher training on working with students with disabilities was not being provided by districts. The Public Interest Law Center (2018) indicated, “In the early 1990s, Pennsylvania had the second worst rate of inclusion of students with disabilities in regular education classrooms in the country- and when students were included, it was often without real support” (p.1 Introduction). Due to these inequities for students with disabilities and defiance of federal law, the landmark court case, Gaskin v Pennsylvania Department of Education (2010), was filed.

Pennsylvania Supreme Court Gaskin v. Pennsylvania Department of Education (2010) was a sixteen-year (1994-2010) class-action lawsuit filed by twelve families claiming Free Appropriate Public Education (FAPE) and Least Restrictive Environment (LRE) were not being honored by the Pennsylvania Department of Education (Elks, 2010, p. 2). The legal proceedings resulted in a Settlement Agreement (SA) on June 3, 2010. The Settlement Agreement “represented an agreement on behalf of PDE to implement a set of provisions designed to increase the number of students included in
regular education classrooms and the benefit they received from education in the least restrictive environment in Pennsylvania” (Gaskin Preface). The Gaskin case supported federal law IDEA and set forth compliance monitoring to ensure all school districts within Pennsylvania were placing students within the least restrictive learning environment.

The following provisions for least restrictive environment were provided in the Settlement Agreement of the Gaskin case:

(1) The IDEA and related case law, including Oberti v. Board of Education, 995 F.2d 1204 (3d Cir.1993), require special education students to be educated with students who do not have disabilities to the maximum extent appropriate.

(2) It is desirable that school districts increase their capacity to provide appropriate specially designed instruction, related services, supplementary aids and services and support to special education students placed in regular education classrooms (Gaskin, 389 F.Supp.2d 628, 2005).

Further provisions included in the Gaskin case for ensuring special education students receive free appropriate public education (FAPE) within the least restrictive environment included:

PDE agrees to require school districts to adhere strictly to the IDEA, and the case law construing that statute, when making decisions regarding the placement of students with disabilities. To meet this condition of the Settlement Agreement, the PDE will ensure: (1) students may not be removed from regular education classes simply because of the severity of their disabilities; (2) school districts have an obligation to provide students with disabilities, including
students with significant cognitive disabilities, specially designed instruction or other supplementary aids and services, if needed, to benefit from participating in a regular education classrooms; (3) before considering removal of a student with disabilities from a regular education classroom, the IEP team must first determine whether the goals in the student's IEP can be implemented in a regular education classroom with supplementary aids and services; and (4) school districts will consider the full range of supplementary aids and services, based on peer-reviewed research to the extent practicable, that can be utilized in regular education classrooms before contemplating removal of a student with disabilities from a regular classroom (Gaskin, 389 F.Supp.2d 628, 2005).

These provisions, agreed upon by the PDE, would ensure students with disabilities were not being segregated from or removed from the regular education classroom due to physical, emotional, behavioral, and social needs. The agreement mandated districts analyze the least restrictive environment for learning for students with disabilities by first examining whether the student would have needs met within the regular education classroom. By examining the regular education classroom first as the least restrictive environment, the number of students with special needs participating in an inclusion setting could be increased.

Pennsylvania Supreme Court Gaskin v. Pennsylvania Department of Education (2010) ruled school districts must comply with the federal law of IDEA, which includes least restrictive environment. Gordon (2006) states, “Indeed, IDEA does not use the term ‘inclusion,’ yet the dispute over full inclusion of students with disabilities into the general education classroom figures prominently in the policy debate regarding educational placement” (p. 190). Based on the federal laws and rulings in court cases, deciding the
appropriate placement for students with disabilities should begin with the consideration of full inclusion within the regular education setting.

The court cases laid a foundation for students with disabilities to be included within the neighboring school one would attend if not identified with a specific disability. These rulings aided in ending the long history of students with disabilities not being educated within the regular school.

**History of Inclusion**

Identification of individuals with disabilities has been occurring for over three centuries. Over the centuries, social equity for individuals with disabilities has been developed with individuals being included more in society and educational settings.

During the Pre-1800s, individuals with disabilities were excluded from society and educational environments. People identified with disabilities, either physical or mental, were believed to be outcasts of society. These individuals were thought to be incapable of learning and meeting expectations. Because of this, individuals with disabilities were often placed in asylums and hidden from public view.

In the late 1800s, institutionalization of individuals with sensory needs was occurring. Some schools were created for individuals who were blind or deaf. The American School for the Deaf was founded in 1817 and the Perkins School for the Blind was established in 1829. It was not until 1896 the first public school classroom for students with disabilities was opened in Rhode Island (Neuhaus, Smith, & Burgdorf, 2014, p. 4). Because of these specialized schools, individuals with disabilities were being given the opportunity to learn and be a part of society. Although, many individuals were still being excluded from educational settings.

Between 1900-1950, educating students with disabilities were restricted to being educated in segregated settings. Similar to African Americans being segregated in
society, students with special needs were also being segregated. During this time, students with disabilities were not being given free appropriate public education. Individuals with disabilities were continuing to be seen as not being capable of learning and were excluded from the public school. Specialized schools and centers for individuals with disabilities were being created. This continued the trend of hiding individuals with disabilities from society.

By the late 1950s to 1960s, the progression of moving towards inclusive practices for individuals with disabilities moved to categorization. With the landmark case of Brown v. Board of Education in 1954 declaring segregation within schools unconstitutional, families of students with disabilities began to produce lawsuits stating segregation of individuals with disabilities was unjust. Parents began demanding equal educational opportunities for those with disabilities. Also during this time, many acts and policies protecting the educational rights of individuals with disabilities were being passed. Slowly, students with disabilities were being integrated into the public-school setting.

Beginning in the 1970s, integration of students with disabilities into the public educational setting started. With segregation being declared unlawful, the focus moved to all students who were recently excluded and segregated, which included students with disabilities. Rodriguez and Garro-Gil (2015), with regard to public schools, define integration as the creation of “new spaces for the students with special needs so they could socialize with other non-disabled students” (p.1324). Bricker (1995) supports Rodriguez and Garro-Gil’s definition by asserting, the general usage of the term was to describe the systematic and careful combining of toddlers and pre-school-age children who had disabilities and those who did not into the same classroom setting, as opposed to the educational
practice of segregating children with disabilities into separate programs (p. 181). This integration of special education students into the public setting was executed in order to provide social benefits for students with disabilities. With integration, special education students would have the opportunity to interact with students without disabilities, yet these interactions often occurred in non-academic areas.

Progressing from integration, the term mainstreaming began being utilized. It was during the 1980s education settings, mainly public schools, began mainstreaming students with disabilities into the regular education setting. The Cambridge Dictionary defines mainstreaming as “the act of including people who have particular difficulties or needs in the same schools or places of work as everyone else” (2018). Rogers (1993) defined mainstreaming in an educational setting as, “the selective placement of special education students in one or more ‘regular’ education classes” (p. 2). Supporting Rogers’ definition of mainstreaming, Gordon (2006) indicated, “mainstreaming refers to integrating students with disabilities into the general education classroom for part of the day, specifically during non-academic periods, for social interaction” (p. 198). Although similar to the integration movement of the 1970s, mainstreaming advanced the movement of including students with disabilities not only in public schools, but into the regular education classrooms. This movement allowed students to not only socialize with non-disabled peers, but also to receive instruction within the regular education classroom for core academic subjects, expressive arts, lunch, physical education, and recess.

During the 1990’s the movement to full inclusion began and is still being implemented in present day. In order to support students with disabilities in the inclusion setting, support from either a special education teacher or a paraprofessional was being provided. For full inclusion, students with disabilities would participate with non-disabled peers in all academic and non-academic classes. Rogers (1993), when
discussing full inclusion indicates, “this term is primarily used to refer to the belief that instructional practices and technological supports are presently available to accommodate all students in the schools and classrooms they would otherwise attend if not disabled” (p. 3).

Placement in the inclusion setting is determined by whether the regular education instruction can meet the individualized goals of the students with disabilities. This determination falls within the least restrictive environment analysis of the interdisciplinary team. Gordon (2006) confirms, “While inclusion is a means to fulfill the LRE requirement, the law does not require it.” For the majority of the court proceedings which have occurred, the decision of placement for students with disabilities often centers on inclusion. In the present educational setting, the term inclusion has become the preferred term for placement of students with disabilities into the regular education classroom. Therefore, when determining the least restrictive environment for students with special education needs, the inclusion setting becomes the first option to examine. To make this determination of placement, one must understand the definition of inclusion.

**Definition of Inclusion**

With federal laws ensuring Free Appropriate Public Education (FAPE) and Least Restrictive Environment (LRE), the question that arises is why students with disabilities are being denied education in the regular education setting, if this setting is the appropriate placement for the student’s educational needs. Additionally, questions as to why court cases of least restrictive environment still continues to occur between families and school districts when federal laws regulate the procedures for placing students with needs into the appropriate educational placement continues to be posed. One reason for these continued lawsuits and discrepancies in educational placement is the confusion of
special education placement terms.

Bricker (1995) indicates “there appears to be a progression in the use of these terms, beginning with mainstreaming, moving to integration, and currently inclusion” (p. 181). Although these words hold a unique definition separate from the others, the words continue to be used interchangeably, especially when discussing least restrictive environment. Gordon (2006) states, “The LRE requirement is often confused with mainstreaming and/or inclusion. But the LRE is the mechanism through which the child’s individual needs are matched with a specific educational placement” (p. 198). One challenge with the federal laws supporting least restrictive environment is the absence of the terms integration, mainstreaming, inclusion, and full inclusion. In order to clarify the confusion between mainstreaming and inclusion, clear, consistent definitions must be used.

Rogers (1993) defined inclusion as, “the commitment to educate each child, to the maximum extent appropriate, in the school and classroom he or she would otherwise attend. It involves bringing the support services to the child rather than moving the child to the services” (p. 2). In support of Rogers (1993) definition, Gordon (2006) stated, “Inclusion is when students with disabilities attend regular classrooms for most of the day, usually with the homeroom being a general education classroom” (p. 198-199). For students in the inclusion setting, participation in non-academic classes and academic classes with non-disabled peers occurs.

The term inclusion has a broad definition and carries a variety of meanings based on the educational setting. Florian (2008) supports this statement by noting that,

Narrow conceptualizations have resulted in simply replacing the word ‘special’ with ‘inclusive’ and nothing much has been changed. On the other hand, there is a fear that the definition has become so broad that it is meaningless or worse, that
educationally important differences are being overlooked (p. 9).

Although the definition for inclusion is not concrete, it is important to understand inclusion maintains equity for students. By providing students with the supports needed to achieve a valuable education and shifting from the notion students with disabilities cannot maintain the high expectations of the regular education classroom, equity and equality will occur for students with disabilities.

Just as there is a variation of definitions of inclusion, depending on the school context, there are also numerous models of inclusion which can be implemented into an inclusion classroom.

**Models of Inclusion**

Within public schools, inclusion practices have various styles. In some districts, inclusion instruction merely means the special education teacher is present within the regular education classroom, and the regular education teacher is delivering the instruction. The special education teacher’s role is to monitor special education students and assist with independent work within the classroom. Outside of the regular education classroom, planning among the regular and special education teacher for future lessons is nonexistent. In this type of setting, the special education teacher performs similar duties as a paraprofessional. This type of inclusion setting is similar to the model of the Consulting Teacher Model in which the special education teacher is a consultant to the regular education teacher (Idol, 2006, p.78). These types of inclusion settings often do not utilize the resources available to the optimum level. Additionally, special education students can feel singled out since it becomes apparent the special education teacher is present in the classroom to only support them.

Other districts, have utilized an inclusion model which benefits all students in the
classroom. These districts have included the special education teacher within the general education classroom and have provided the general and special education teachers flexible plan time. With this type of schedule, general and special education teachers are able to meet on a consistent basis and plan lessons. When instruction is being delivered, classrooms with the inclusion model who are using all available resources, can be observed having the regular and special education teacher co-teaching lessons. In this model, called the Cooperative Teacher Model by Idol (2006), both teachers are presenting and monitoring instruction. During this type of inclusion model, differentiation for all students is provided since two teachers are present in the classroom. Having two teachers allows for more flexible grouping, center work, and customized instruction. With the ability to provide a more customized learning environment, special education students can have the supports and services needed and still maintain involvement with students without disabilities. In this type of environment, students with disabilities can have a sense of belonging in the classroom because both teachers are assisting all students. The special education teacher, in this setting, is not considered being in the classroom only for students with special needs.

A third approach to inclusion utilizes the paraprofessionals as the support. Idol (2006) designates this model as the Instructional Assistants Model (p. 78). Within this inclusion model, the paraprofessional assumes the role of support and is included in the regular education classroom with students with special needs. Accommodations, modifications, and progress monitoring are delivered by the paraprofessional. For some schools, this model is beneficial to support students in science and social studies. Since many special education teachers cannot be in every classroom where the special needs
students are being instructed, many schools with inclusive settings want special education teachers to be in the cooperative teacher model for English Language Arts and Mathematics. One reason for this is due to the fact that these subject areas are assessed at the state level. Due to time constraints in the daily schedule, supporting students in science and social studies, for either reading comprehension, written expression or behaviors, is necessary. For this reason, having the Instructional Assistants Model utilized provides the support special education students need in the regular education classrooms.

In order to distinguish which model should be employed, it is important to examine the needs of the special education student who will be participating in the inclusion setting and identifying the level of support the students will need in order to be successful. For students who may need minimal support, the Instructional Assistants Model could be effective. On the other hand, students who may require maximum in-class support may benefit from the Cooperative Teacher Model. Whichever model is chosen; the overall concern is the equity for special education students in the regular education classroom.

**Opportunity to Learn**

Federal and state laws have protected the educational rights of students with disabilities. Not only have these laws sanctioned students with disabilities be educated within their residential district, but also these laws have increased the number of students with disabilities participating in the regular education classrooms and instruction. The U.S. Department of Education, National Education Statistics (2016) indicated 61.8% of students with disabilities were being educated within the regular education classroom.
80% or more within a typical school day. With the participation in the regular education classroom, students with disabilities are expected to master the same content as students without disabilities. Additionally, students with disabilities are required to partake in the same standardized state assessments as the students without disabilities. Blank and Smithson (2014) state,

> Across all states the average rate of participation was 96 percent of students with disabilities tested in the regular assessment programs. However, only 36 percent of these students’ scores on the state assessments met their state-defined proficiency level (p. 135).

These data indicate students with disabilities are not achieving proficient scores on state assessments and are not performing at the same rate as students without disabilities. Due to this low percentage of students with disabilities meeting proficiency, it is important that school districts examine what content is being delivered to students (both regular and special education students) and how effective is the instructional delivery of the content.

In order to understand opportunity to learn (OTL), a definition will be provided. Following the definition, a brief history will be provided. Concluding the history of OTL, rationales for why districts should measure OTL within the schools will be discussed. Finally, a discussion on students with disabilities and the relationship to OTL will conclude the OTL section.

**Opportunity to Learn Definition**

When establishing the content students will learn, states and districts implement academic standards. These standards provide an outline of the content to be covered in each grade level and for each subject level. At the end of each grade, students are
expected to be able to understand the content and meet specific criteria. How the students access this information is based on the daily curriculum being provided and teacher instructional practices. Having standards to guide curriculum provides a solid framework for educators of what to teach. Yet, to ensure all students have an equal opportunity to meet these expectations, a policy or standard had to be developed. The standard developed was the opportunity to learn standards.

Elmore and Fuhrman (1995) define opportunity standards as “a set of conditions that schools, districts, and states must meet in order to ensure students an equal opportunity to meet expectations for their performance” (p. 1). Making a similar claim, Elliott and Bartlett (2016) define OTL as the “inputs and processes within a school context necessary for producing student achievement of intended outcomes” (p. 1). OTL focuses on ensuring students have the chance to learn the expected content and be able to demonstrate the understanding of the concept. Additionally, OTL concentrates on equal educational opportunities for all students.

OTL focuses on educational processes. Stevens (1996) states, “Opportunity to learn benefits all students by providing information about how to improve the academic achievement of students, especially poor and minority students” (p. 3). OTL not only focuses on instructional content, but also the manner in which instruction is being delivered in order to provide students with resources, differentiation, and active engagement in learning. In order to increase academic achievement, instructional components need to be identified, observed, and analyzed.

Observable traditional pedagogical approaches teachers have adopted within the classroom include a more teacher directed instructional component which includes
lecture, drill and practice, passive engagement time among students, and memorization of rote facts. These practices are not taking into account the general focus of OTL or the needs of students, therefore resulting in below average academic achievement.

Research studies have supported that the instructional actions of teachers have a significant impact on the academic achievement of students. Elliott and Bartlett (2016) discuss OTL as having “three primary dimensions embodied in the actions of classroom teachers- instructional time, instructional content covered, and instructional quality” (p. 9). Instructional time includes the amount of time being provided to educators to deliver instruction. In addition, instructional time incorporates the amount of time students are engaged in active learning. The instructional content covered are the topics of the curriculum being taught and the information being provided to the students. Finally, instructional quality refers to how effective the teaching strategies are and how engaged students are within the lesson.

OTL standards ensure all students, with or without disabilities, are given the equal chance to learn the expected content, usually as identified as core standards in each subject area. By using OTL standards, districts have the ability to monitor how effective instructional delivery, curriculum, and instructional time is within schools.

OTL is not a new concept in the educational field. For decades, researchers such as Carroll (1963), Husén (1967), Stevens (1996), and Schmidt and Maier (2009) have been examining the components which organize OTL. In order to understand the meaning of opportunity to learn, a brief history will be discussed.

**History of Opportunity to Learn**

During the late 19\textsuperscript{th} century and into the early 20\textsuperscript{th} century, the focus of equality
for all students was financially based. States aimed to analyze the funding of districts and created foundational programs, which were to supplement the tax monies collected by the school district in order to support students in impoverished areas. In addition, levies on taxes were implemented by the states in order to eliminate the discrepancies between the low socio-economic school districts and the more affluent districts. Unfortunately, these programs and funds did not lessen or eliminate the disparity between the districts. Elmore and Fuhrman (1995) state, “Foundation levels had not kept up with the rising cost while wealthier school systems increased spending through local taxation” (p.5). As a matter of fact, in the 1960s and 1970s, the disparity between the districts actually increased.

Due to the increase in financial disparity among districts, even after programs and taxes were levied in an effort to equalize spending, many states embraced the emerging doctrine of fiscal neutrality (Elmore & Fuhrman, 1995). This doctrine attempted to lessen the discrepancies between the wealthier and poorer school districts by allowing for flexibility in spending. The basis of this doctrine was not focused on spending equalization. However, a result of this doctrine started a focus on the relationship between funding and student achievement. In the 1970’s, there was no clear evidence of which programs in schools were important to fund, as demonstrated by an inadequate relationship between school expenditures and academic achievement among students.

Also during this time of “fiscal neutrality,” a realization occurred that there was a need to define equal opportunity. States began to examine desegregation of schools and situations where special education students were not given the same opportunity to
participate in local educational services. An outcome of this was more programs initiated by the states in order to support students with special education needs.

In the early 1980’s, the states’ financial focus began to shift to a different area. At this time, states had developed a type of control over schools and districts. The input from the state on how to allocate monies and control of state funding permitted the states to have a critical role in education. Due to this, the states began to have an influence on other aspects of education and schooling. Through monitoring and accreditation systems, the states began to assess district compliance by visiting schools and analyzing records submitted to the state (Elmore & Fuhrman, 1995, p. 5). With prior school years showing a weak relationship between funding and achievement, the states’ tracking system led to a more demanding standard based framework for districts and schools. The focus was now shifting from funding to student achievement.

Schools and districts at this time followed curriculum standards, yet these standards were minimal. States began to require standards which were more comprehensive. They even began to give guidelines on course requirements being provided to students, the number of courses students were expected to take, and a guideline of competences students must possess in order to graduate. Additionally, states developed a required set of skills prospecting teachers would need for teacher certification. These demands and mandated requirements represented an increase in state influence.

In 1983, *A Nation at Risk* report was presented by the U.S. Department of Education. Within this report, the U.S. Department of Education administration proclaimed the educational system was failing American students. The report stated
students were failing, more Americans were illiterate, and teachers did not have the comprehensive education to educate the youth of America. This report sent the nation into a panic, as the educational administration declared other countries would begin to surpass our American students in areas in which students previously excelled. Because of this concern for paucity of progress among American students, the federal and state governments demanded states to begin developing more rigorous academic standards for students.

New content standards and procedures on how to assess student achievement began to emerge. During the 1990’s, the Clinton administration passed Goals 2000, a policy that emphasized national educational standards. By developing national educational standards, the state and national educational administration could begin to hold districts and schools accountable for the academics being presented to students. The new national standards would provide a sequential order to curriculum content and address the concepts students should master at the end of each grade. Three types of standards were developed: performance standards, content standards, and opportunity to learn standards.

Performance standards focused on the expected results schools are to make on national and/or state assessments. Content standards provided the detailed content students should be engaged in, for each grade level, while in the classroom. The third set of standards, opportunity to learn standards, were “conditions schools/districts must meet to ensure all students are given equal opportunity to meet expectations embodied in performance’ (Elmore & Fuhrman, 1995, p. 1). Development of these standards was to focus on equity for all students. National and state educational administrations wanted to
ensure all students were being held to the same high-level rigorous expectations. This expectation of equity, however, caused a debate among political parties. Just as the focus in education shifted from financial equality to Standards-based equality, the new focus was now the equality of opportunity to learn for all students.

During 1994, the Elementary and Secondary Educational Act (ESEA) was reexamined and reauthorized. Government at the time felt the new national standards, being more rigorous and with the expectation of having all students achieve these standards, were unequal and provided inequity to certain students. In particular, the opponents of the arduous standards focused on students in lower socio-economic schools and on students with disabilities. The basis for the debate of inequality and inequity for these students was in conjunction with the varying opportunities to learn these students had in different districts and in classrooms. Teachers, mainly special education teachers, felt the standards driven curriculum was too challenging for students with disabilities. Due to this, some teachers of students with disabilities continued to deliver functional curriculum (money skills, telling time) instead of the state grade level standards. This nonalignment to the state standards thus produced below average scores on state assessments.

In the late 1990s, research began to investigate OTL on core academic subjects. Teacher surveys and data collection tools were being designed in order to analyze class instructional practices and the relationship to state standardized assessments. Nolet and McLaughlin (2005) emphasized the importance of instruction aligned to standards by stating:

Standards-driven reform has an overriding goal of achieving higher levels of
student achievement in subject matter content among all students. Thus, students
with disabilities more than ever before need to have access to the demanding
standards-based curriculum and instruction (p. 6).

The research reinforced the need to ensure students with disabilities were given the same
opportunities to learn the expected content and have positive achievement.

To ensure every student had an equal opportunity to learn and succeed
academically, additional acts were passed. In 2001, the No Child Left Behind Act
(NCLB) was passed. Public Law 107-110 (January 8, 2002) stated, “The purpose of this
title was to ensure that all children have a fair, equal, and significant opportunity to
obtain a high-quality education and reach, at a minimum, proficiency on challenging state
academic achievement standards and state academic assessments” (p. 15). This act also
mandated that states align instructional materials and curriculum to state academic
standards in order for student progress to be measured (Public Law 107-110, January 8,
2002, p. 15-16). A major expectation of the Act was that all students would be proficient
in the intended curriculum developed by the state. The assumption was the curriculum
delivered by the educators was aligned to the state standards.

However, research into the next decade indicated curriculum was not being
aligned to state standards. As assessment scores among students with disabilities began
to decrease, researchers continued to focus on the need for exposure to curriculum
aligned to state standards in order to increase equality and equity in learning for all
students. Kurz, Elliott, Wehby, and Smithson (2010) asserted:

By virtue of being administered the same assessments, students with disabilities
have to be afforded the same opportunity to learn the content they are expected to
know on these tests, regardless of where they receive their instructional content. Failure to provide this opportunity undermines educational equity and the validity of test score interpretations (p. 133).

Kurtz and Elliott (2013), furthered the research on OTL and found effect sizes above .50 in differences related to Time on Standards and Content Coverage among the general education teachers and special education teachers (p. 2). In addition, the study also indicated special education teachers who were teaching academic content in the special education classroom delivered less instructional time and less exposure to state standards (p. 3). In relation to this finding, the research also revealed students with disabilities in the inclusion classroom, as compared to the whole class, received decreased time being instructed on standards, had an increase of non-instructional time, and overall less exposure to content coverage (Kurtz & Elliott, 2013, p.3). This research indicated that the curriculum special education students were being instructed on, whether in the special education classroom or inclusion classroom, often did not cover the content and standards. These findings provided the evidence supporting the need for improving instruction and ensuring students with disabilities are being delivered the same standards-based instruction as students without disabilities.

However, gaps in academic achievement between subgroups of students, in particular students with disabilities, continued to be reported. In 2015, the Federal government changed the No Child Left Behind Act and created Every Student Succeeds Act (ESSA). This act continued to hold districts and schools accountable for the academic achievement of all students. Within the guidelines of ESSA, districts and schools have more flexibility and input on the indicators being analyzed in order to
determine whether districts are successfully meeting the requirements of the act.

An overarching commonality among all of the acts passed since the early 19th century is the requirement for schools and districts to align curriculum to a defined set of standards. Having common academic standards for all students allows the states and federal government to monitor student academic achievement. Although the consistency of the standards among all grade levels and districts is present, the OTL at a level that meets these standards is not consistent among student groups. For this reason, districts and schools need to utilize tools to analyze OTL among students with and without disabilities.

Factors Related to Opportunity to Learn

In order to collect data and analyze opportunity to learn, factors pertaining to opportunity to learn frameworks need to be identified. Through decades of studies, researchers have been able to identify three major factors which contribute to students’ opportunity to learn. These three factors include time, content covered, and quality of instruction.

Allocated and Instructional Time. Carroll (1963), as cited by Elliott and Bartlett (2016), posited that the first factor that must be addressed with regard to ensuring OTL for students is time allocated to instruction (p. 2). Allocated time is defined as the time granted to teachers for instructional practices and teaching. Elliott and Bartlett (2016) state teachers in the United States are given 8,100 minutes per year of allocated time in the subject areas of mathematics and language arts (p. 2). Although this may appear to be a considerable amount of time, only 81% of this time is used as instructional time (Elliott & Bartlett, 2016, p. 2). This percentage indicates students are getting less
instructional time than one might assume based on the allocated time.

Having time taken away from the allocated time for instructional practices reduces the learning opportunities for students. Studies began to focus on time as a factor for student achievement starting in the early 1960s. One of first reviews of studies on allocated teaching time was conducted by Frederick and Walberg (1980) who examined studies from various researchers (Hendrickson, 1979; Arlin & Roth, 1978; and Bloom, 1976) and found a moderate and persistent connection between the time spent on the content in the classroom and achievement results. Among the studies reviewed, Sanderson (1976) and Epstein and McPartland (1976) found correlations ranging from .13 and .59 which indicated the relationship between time spent on content and achievement results.

Elliot and Bartlett (2016) referenced the meta-analysis conducted by Scheerens and Bosker (1997). The meta-analysis examined 21 studies with a replication of 56 times across studies. The study reported an average Cohen’s d effect size of .39 which represents a moderate overall effect of allocated time on learning.

Continuing into the current decade, additional time factors which have been researched include instructional time, time students are engaged in instruction, and academic learning time. Kurz, Talapata and Roach (2012) investigated the relationship between time and achievement. They found that when students received “more instructionally sensitive and student-oriented indicators such as instructional time, engaged time, and academic learning time” (p.43), their achievement scores improved. For this study, Kurz et al, defined instructional time as the time actually used for instruction out of the allocated time, engagement time as the time students are engaged
out of the instructional time, and academic learning time as the time when students are achieving at a high rate of success out of the total engaged time. The factor of time continues to be a major component in the OTL framework. However, researchers continued to look deeper into factors that create or impede OTL, thus other variables emerged.

Researchers continued to study time and other variables which impacted OTL and student achievement. Beginning with Stevens (1996), the first comprehensive conceptual framework of OTL was developed. Stevens (1996) brought together four elements: content coverage, content exposure (i.e., time on task), content emphasis (i.e., emphasis of cognitive process), and quality of instructional delivery (i.e., emphasis on instructional practices) (p.5) as the pillars of OTL framework. For the first time in the research on OTL, a framework with specific variables was being provided and could be analyzed to determine the opportunity to learn experiences. Along with providing the first framework for OTL, Stevens (1996) also described OTL in terms of teacher effect, with each variable relying on what, when, and how the teacher instructs. Therefore, in order to effectively analyze a school’s or district’s OTL experiences, the different variables in the OTL framework need to be discussed.

**Content Covered.** Stevens’ (1996) framework provides schools and districts with the template to evaluate the curriculum and content being delivered to students. When examining the content covered during instructional time, schools and districts analyze the relationship between what is taught and what is tested. Educators in the schools and districts must be able to identify the fundamental skills or concepts which need to be taught in order for students to master the grade level standards.
Research has shown that there is an overlap, or content overlap, of the enacted curriculum and the assessed curriculum (Elliott & Bartlett, 2016, p. 5). In order to further analyze student OTL, researchers began focusing on the content objectives being taught instead of the content being assessed. Elliott and Bartlett (2016), in a review of multiple studies (Jenkins & Pany, 1978; Gamoran, Porter, Smithson, & White, 1997; and Scheerens & Bosker, 1997) came to the consensus that, “the more appropriate content-based indicator of OTL is a teacher’s content coverage of the general education standards rather than the assessed curriculum” (p. 6). From these studies, it can be concluded when examining content covered through instruction in order to assess OTL among students, the curriculum to evaluate is the state standards or standards the district is utilizing. Analyzing the content being covered is important in examining OTL and student achievement. Thus, an analysis of the district or school content coverage is one framework to consider when examining student opportunity to learn in a school or district. Another element which must be considered is that of content exposure.

**Content Exposure.** Content exposure is reliant on the available time provided to teachers to teach the content. Content exposure is measured by the amount of time or the exposure given to students on a specific subject area. In other words, content exposure is the extent and depth to which students are taught the subject matter, or opportunities are created for students to engage in the subject matter. Content exposure focuses on the educator or teacher and the management of instructional time.

Content exposure is dependent on reducing classroom disruptions. Teachers need to be able to manage the instructional time allotted and provide a variety of in-depth learning experiences. A way to manage instructional time is by decreasing off-task
behaviors, or by reducing down time or unstructured time during the instructional time.

In order to evaluate opportunity to learn using the framework of content exposure, one piece of data collection would be identifying the amount of unstructured time during an instructional lesson. If the instruction is not engaging students or time is not being used effectively in class, students will lose focus on the content.

To remedy unstructured time one needs to reduce the number of interruptions during an instructional period. This could be done by collecting homework or taking attendance immediately at the beginning of class. Another way to avoid interruptions is an administrator’s role in which assemblies, activities, or announcements are not scheduled during instructional time. By reducing the interruptions in class, more of the allocated instructional time can be used to expose students to the content. With distractions and interruptions being reduced or eliminated from the instructional time, teachers can focus on using teaching strategies which will engage the learners.

**Content Emphasis.** Deciding the teaching strategies to utilize when delivering content and exposing learners to content is another influential variable in the opportunity to learn framework. Content emphasis relies on the teacher or instructor. It is during this framework decisions on which content from the curriculum to emphasize are made.

In addition, some research has included the aspect of the teacher determining the most appropriate teaching practice to employ in order to deliver instruction as part of the content emphasis. An example of how to implement effective content emphasis in order to achieve student OTL is stated by Stevens (1996), “A commitment to the concept that, ‘All children can learn’ should influence teachers to use teaching strategies that include all of the students in their classrooms. Teachers need to know the effects of using
cooperative and group learning” (p. 9). In this regard, Stevens is indicating instruction to be student centered with students being engaged in the learning of the content.

Through analyzing the research on content emphasis in OTL, an in-depth examination or research studies are lacking. Many research studies do not elaborate on the definition or what necessitates content emphasis. Stevens (1996) expressed implementation of effective content emphasis could be done by utilizing cooperative and group work but emphasizing content in this manner could also be included in the quality of instruction factor of OTL. The content emphasis framework overlaps other pillars of the OTL framework. Reasons for this could be due to studies tending to focus on the other frameworks of content coverage, content exposure, and instructional quality of opportunity to learn.

**Quality of Instruction.** The factor of quality of instruction in order to assess student opportunity to learn concentrates on the instructional practices being utilized within the classroom. Quality of instruction encompasses multiple instructional practices which affect student achievement, including lesson coherency, feedback to students, reinforcement, instructional resources, and instructional grouping sizes.

To begin with effective quality of instruction, teacher lessons must be coherent. Alkin, et al. (1990), as cited by Stevens (1996), provide a definition of coherent lessons. They explain, “Coherence means that the objectives of the lesson are identified in advance, skills presented are related to the lesson’s objectives, and the lesson’s activities match the lesson’s objectives” (p. 9). In order for instruction to be of quality, the teacher’s preparation in identifying the objectives and the sequence of the lesson is crucial. Once the objectives of the lesson are identified, the teacher’s next action is to
identify what type of instructional strategy is going to be used for the delivery of the lesson.

Since there is pressure to cover content for standardized assessments, current instructional strategies utilized in the classroom incorporate evidence-based practices which include direct instruction, grouping by instructional levels, and guided feedback (Elliot & Bartlett, 2016). Although these instructional practices have allowed for producing high achievement scores on state standardized assessments among general education students, high achievement results for marginalized learners is often not occurring, nor is the achievement gap being closed among these marginalized learners. Research has shown that quality of instruction has an effect on student achievement. A review of research studies from Kurz (2011), as cited by Elliott and Bartlett (2016), indicate effect sizes between .43 and 1.17 for the indices of instructional strategies and student sample populations. These effect sizes in Kurz’s study indicate a moderate to very large effect when analyzing the effect of instructional strategies on student opportunity to learn.

In addition, with a percentage of teacher evaluations including the results of student achievement on state assessments, many teachers feel an approach other than direct instruction will not deliver the concepts and information students need in order to be prepared for the testing. Because of this, not all students, in particular students with special education needs or marginalized learners, are achieving academic success or being given an equal opportunity to succeed in academics.

**Rationale for OTL Standards**

Presently, there are no mandated requirements for school districts to examine
opportunity to learn standards. However, there are many rationales for why examining OTL in a school is necessary. A fundamental rationale for examining OTL is the opportunity to provide feedback to teachers about instructional delivery. Through feedback, teachers are able to be presented with strategies to change instruction including higher order questioning skills, differentiation, learner centered lessons, and varying grouping formats. In addition, OTL not only focuses on making changes in instruction, but also on monitoring these changes in order to analyze whether the changes have been effective.

The pragmatic rationale for OTL coincides with the fundamental rationale. The pragmatic rationale ensures the focus is on what is being measured, whether it be quality of instruction, content exposure, content emphasis, or content covered. Far too often in schools, multiple initiatives are being delivered. However, many of these initiatives are not being measured to determine effectiveness. With OTL, the emphasis is on teacher effect on student achievement. Therefore, measuring teacher effectiveness through the lens of instructional delivery, content emphasis, and content covered is a central component of OTL. Through this analysis, it is possible to identify which changes need to occur, and the particular areas in which the changes need to occur.

When discussing the empirical rationale for OTL, it is important to understand this rationale stems from special education research. Within the empirical rationale, studies and evidence have found the following in special education classrooms: limited use of allocated instructional time, decrease in the exposure to content aligned to standards, evidenced based instructional practices not being used consistently, and instruction which demonstrates poor quality (Elliott & Bartlett, 2016, p. 9). Due to these
inconsistencies with instruction in the special education classrooms, students with disabilities are at a disadvantage when being exposed to grade level content and effective teaching strategies. This demonstrates a socially unjust opportunity for students with disabilities to be given an equal opportunity for student achievement. OTL needs to be measured in order to validate the conclusions drawn from standardized state assessment scores and validate the need for improvements on standards-based driven instruction (Elliott & Bartlett, 2016, p. 9). The validity of state assessment scores or standardized testing scores becomes compromised when all students are not being given an equal opportunity to be exposed to and learn the state core standards.

A legal rationale for OTL then arises from the empirical rationale. Although there are no federal or state policies or laws requiring schools to adhere to OTL standards, there are legislative acts which have made it important and pertinent for districts and schools to examine OTL standards. These acts include: IDEA (1990, 1997), IDEA Improvement Act 2004, No Child Left Behind Act 2001, and Every Student Succeeds Act 2015. The basis of these legislative acts is to ensure all students, either with or without a disability, are given an equal opportunity to learn the same content as students in another school or district. These acts hold schools and districts accountable for student success. In regards to social justice, these acts ensure all students, regardless of disability, race, or socio-economic status, are being provided the opportunity to learn in order to achieve student success.

**OTL with Inclusion of Students with Disabilities**

Opportunity to Learn, from a legal and empirical rationale, supports inclusion of students with disabilities into the regular education classroom due to students with
disabilities having a better opportunity to be exposed to standard aligned curriculum and more effective teaching strategies within the general education classroom setting.

Research has indicated students being educated in a special education classroom often do not have the opportunity to be exposed to the same grade level instruction as those students in the regular education classroom. Blank and Smithson (2014) support this statement by asserting, “Education policy researchers have noted that students with disabilities have historically had limited access to challenging curriculum, instruction, and assessment” (p. 136). Some schools often utilize an alternative program or curriculum in the resource setting which does not align core content standards. For example, Blank and Smithson (2014) found that general education teachers of mathematics were more likely to have their instruction aligned to the common core standards than special education mathematics teachers. These findings lend support to the push for students with disabilities to be included in the regular education setting for instruction since special education students will be exposed to the content of common core standards and to the content being covered on the standardized tests compared to instruction in the resource setting. Furthermore, Blank and Smithson (2014) have found that “schools with higher proportions of students with disabilities spending more time in general education classrooms tend to have higher math achievement scores” (p.142).

Based on the above cited research, one can argue that there is a positive impact on student achievement when content is aligned to standards. When students are instructed in a resource setting, the main focus of instruction for mathematics is performing steps to compute problems and preparing for tests. However, instruction in the regular education setting emphasizes problem solving and analytical skills which are requirements of the
common core standards. Since students in the special education setting are not exposed to these higher order mathematics skills, achievement scores among special education students tend to be in the below average range. When students with disabilities are included in the general education classroom for instruction, exposure to standard aligned curriculum is occurring.

In addition, in comparing special and regular education classes, Blank and Smithson (2014) have concluded, “that opportunity to learn, classroom activities and inclusion policies contribute to student performance to some degree” (p. 144). The research has indicated having instructional content aligned to standards is only one factor of opportunity to learn. Instructional practices within the classroom is another key component of opportunity to learn and student achievement. “To provide OTL, a teacher must dedicate instructional time to covering content prescribed by the intended curriculum using pedagogical approaches that address a range of cognitive processes, instructional practices, and grouping formats” (Elliott & Bartlett, 2016, p. 4). In order to increase student achievement and provide an equal opportunity to learn concepts, teachers must use effective teaching strategies which are developmentally appropriate and conducive to the learners’ strengths and needs. Yet, social injustice continues to occur within the inclusion setting among students with disabilities. Some teachers in the regular education setting lower expectations for inclusion students. In addition, the regular education teacher’s instructional strategies neither actively engage learners, nor provide differentiation.

Opportunity to learn focuses on all students by ensuring every student is given an equal opportunity to achieve academic success. Stevens (1996) states, “the alternative to
not investigating OTL variables is acceptance of the status quo in educating diverse populations of students” (p. 11). In this regards, Stevens is referring to the status quo of the typical classroom routine: review homework, provide direct instruction, complete practice problems/activities, and assign homework. For this reason, more effective instructional practices need to be implemented within the inclusion settings. Including students with disabilities within the regular education setting is just a minimal portion of providing opportunity to learn. The more challenging piece of providing OTL for students with disabilities in the inclusion setting is providing engaging instruction.

**Academic Engagement**

As defined by Newmann, Wehlage, and Lamborn (1992), student academic achievement is “the student’s psychological investment in and effort directed toward learning, understanding, or mastering the knowledge, skills, or crafts that academic work is intended to promote” (p. 12). The researchers elaborated on the definition by indicating student engagement does not mean completing a series of predetermined assigned tasks in order to achieve a certain grade. They posit that academic engagement occurs when learners are able to “own” the learning and work presented. Marks (2000) acknowledges the critical importance of engagement to student success. The researcher states, “engagement is an important facet of students’ school experience because of its logical relationship to achievement and to optimal human development” (p. 155). In order for students to grow intellectually, an investment in learning must occur. This investment is supported when academic engagement allows students to be active in learning, have ownership in building knowledge, and develop a focused attention on learning.
Finn (1989, 1993) and Connel and Wellborn (1991) expanded student academic engagement into three categories: cognitive, affective, and behavioral. Cognitive engagement includes problem solving skills, independent and dependent work patterns, and the preference of choosing more challenging work over easy work. Kong, Wong, and Lam (2003) identified three levels of cognitive engagement. Surface strategy, which includes memorizing and drill and practice. Deep strategy cognitive engagement comprises the abilities to understand questions, summarize learning, and the connection of new and old knowledge. The final aspect of cognitive engagement is reliance and the act of depending on others (teachers or parents) for knowledge. The second facet of engagement is affective engagement, which incorporates the sense of belonging students have within a classroom. Kong, Wong, and Lam (2003) expanded on affective engagement to include the emotional feelings, such as anxiety and frustration, interest in learning, and the emphasis of achievement among learners. The final component of engagement is behavioral engagement, which includes class participation, on and off-task behaviors, and involvement in learning. Furthering the dimensions of behavioral engagement, Kong, Wong, and Lam (2003) identified three components: attentiveness, diligence, and time spent. In order for students to achieve academic success and intellectual development, all three levels of engagement need to be considered when developing curriculum.

Kong, Wong, and Lam (2003) indicate students’ interaction and engagement with the curriculum are vital components of classroom instruction. The researchers extend the idea of student engagement with curriculum by stating, “student involvement in the curriculum may be as important, if not more important than the epistemological
consideration in the design of school curriculum” (pp. 16-17). Allowing students to actively participate in instruction and engage in learning permits the students to have a sense of ownership in their knowledge. Within instruction, students need to be able ask questions and participate in learning. Paralleling Vygotsky (1962) Social Constructivist theory, in which learning is done collaboratively and occurs through socialization, Marks (2000) upholds the importance of active learning and engagement in order to foster academic achievement. The researcher states, “Through the process of socialization, they learn to concentrate on tasks. Cognitively challenging tasks and verbal interactions around these activities promote their intellectual development” (p. 155). Engagement in learning contributes to the overall development of a student. To support the need for engagement in curriculum and instruction, Kong, Wong, and Lam (2003) found correlations among the areas of cognitive, affective, and behavioral engagement.

Kong, Wong, and Lam’s (2003) study focused on four Grade 5 mathematics classrooms with each classroom being in a different school in Shanghai. Each class was observed for two weeks, with eight students total, two students in each class, being observed on nine types of mathematical behaviors: (a) answering the teacher’s questions, (b) asking the teacher questions, (c) listening to the teacher’s exposition, (d) reading textbooks, (e) discussing with classmates, (f) doing exercises, (g) doing other tasks assigned by the teacher, (h) irrelevant behaviors (looking out the window), and (i) others (preparing for the start of the lesson). In addition to the interviews of the eight students being conducted after the observations, a total of 20 other students, five students from each class, were interviewed. The 28 students comprised nine with high academic standards, ten with medium academic standards, and nine with low academic standards.
All students were interviewed individually. In addition, these numbers do include the eight students that were observed. The interviews were conducted to retrieve information on how the students viewed classroom learning and the involvement students have in learning math.

Results of the interviews identified dimensions of each of the three levels of engagement: affective, cognitive, and behavioral. For the affective engagement, levels of interest, achievement orientation, anxiety, and frustration were identified through the interview results. Interest was defined as the interest in learning mathematics, in particular how mathematics is applied to the real world. Achievement orientation focused on students putting forth effort to achieve good grades in mathematics. The anxiety level noted the anxiety students felt during mathematic lessons and tests. Most notably, students stated the nervousness felt affected the learning of mathematics. The final level of cognitive engagement was frustration. Although many students indicated an interest in learning mathematics, some students expressed being uninterested in learning new mathematics and were bored with doing mathematical exercises.

Three dimensions of cognitive engagement were identified. These included surface strategy, deep strategy, and reliance. Subcategories of surface strategy included memorization, practicing, and taking tests. Deep strategy included the components of understanding a question or questions, being able to summarize the learning, and connecting the new mathematical concepts to previous concepts. The final subcomponent of cognitive engagement was reliance, which means relying on parents or teachers to provide mathematical instruction or to complete problems the same way the teacher instructs.

The final level of engagement is behavioral for which three dimensions were
identified. These are attentiveness, diligence, and time. Attentiveness focused on actively listening and participating in instruction and putting forth effort to learn the new concepts. Diligence referred to students being willing to try when concepts became challenging and making corrections when errors are made. Finally, time which emphasizes the amount of time spent on math homework and time spent out of school learning mathematics.

Results of the classroom observations indicated students were engaged more in listening to teacher’s exposition (2.5 hours to 3.0 hours) and doing exercises (2.5-3.0 hours). Having discussions with classmates (0.2-0.5 hours) and asking the teacher questions (0-1 hour) were documented with the least number of hours occurring during the observations. Behavioral observations also indicated a diverse range of attention, concentration span, and the amount of involvement in learning among the students. Additionally, students who demonstrated higher engagement in learning were more conscientious and actively engaged in doing the work presented.

When analyzing the data garnered from the engagement instrument, the researchers found correlations among the three dimensions of engagement. Results showed student behavioral engagement had a close relationship with cognitive and affective engagements. Three of the behavioral levels, attentiveness, diligence, and time spent on homework were statistically significant to cognitive engagement. Attentiveness was statistically significant \((r=0.16; p<0.01)\) to the cognitive engagement of surface strategy (memorizing, practicing). Attentiveness related to deep strategy (understanding, summarizing, connecting knowledge) with a moderate relationship of \(r=0.38; p<0.01\). Finally, attentiveness was moderately related \((r=0.16; p<0.01)\) to reliance (students
relying on teachers and parents. A moderate relationship between attentiveness and frustration was also present with \( r=0.16; p<0.01 \). Other correlations include diligence to interest \( (r=0.30; p<0.01) \) and achievement orientation \( (r=0.30; p<0.01) \). A negative correlation between diligence and frustration was present \( (r=-0.17; p<0.01) \). Overall, results indicated affective and cognitive engagement could be demonstrated in behavior, in particular a student’s willingness to follow instructions given by the teacher and to work through problems and tasks assigned by the teacher. Additionally, the results indicate the impact attentiveness has on cognitive engagement and learning. These levels of engagement further impact student learning, as noted by the conclusion from the researchers that disengagement would lead students away from learning.

Academic engagement is often affected by the delivery of instruction and the use of instructional work that is authentic. Marks (2000) identified authentic instructional work as an indicator of engagement, especially among middle school students. The purpose of Marks (2000) study was to examine the engagement of students in elementary, middle, and high school in regards to the concepts of support, authentic instruction, and earlier experiences within school. The quantitative study included completion of surveys, with a 96% response rate, by 3,660 students from 24 schools which were part of the Center on the Organization and Restructuring of schools during the 1991-1994 study. The sample for Marks (2000) study included students in grades 5, 8, and 10 from each of the identified 24 schools. The study was specific to three mathematics classes and three social studies classes. The dependent variable for the study was student engagement and the independent variables included gender, sex, race, ethnicity, social economic status, and prior achievement.
Highlighting the results of the authentic instructional work within middle schools, Marks (2000) concluded “authentic instructional work is a powerful contributor to engagement for elementary, middle, and high school students” (p. 169). As students progressed through grade levels, the effect of authentic instructional work on engagement increased, specifically middle school .40, p<.001 on the Three-Level HLM Analysis. Findings also concluded an indirect effect mathematics had on engagement due to a positive relationship to deliver authentic work. Overall, Marks (2000) asserted a restructuring of instructional delivery and work is needed in order to increase student engagement.

Both studies support the importance of student engagement within instructional practices. Without engagement, students, in particular marginalized learners, can become disengaged in instruction and learning.

**Academic Disengagement Effect on Academic Self-Esteem**

Disengagement in classroom instruction has become an ongoing concern in education. Newmann, Wehlage, and Lamborn (1992) noted students often described disengagement occurring in school because the concepts and skills being taught did not relate to the real world. Students often do not engage in learning or put forth effort in learning since the knowledge learned only resonates with achieving grades in school.

Kong, Wong, and Lam (2003) affirm this position, in particular within mathematic classrooms, with statements from students indicating being “tired of mathematics” and “there are too many exercises; they’re very boring” (p. 10). This disengagement in mathematical instruction, as noted by Kong, Wong, and Lam (2003), has become a significant issue, especially since mathematics is a required subject for all
students. In addition, the researchers have indicated disengagement in mathematics often occurs as the perception of understanding mathematics skills is inborn, either one is good at math or one is not.

Furthermore, as students of all ability levels express disengagement with mathematics, inclusion students in the regular education curriculum often perceive instruction as being repetitive, impractical and unreasonable (Kurz, Talapatra, & Roach, 2012). Students with disabilities being included within the regular education curriculum often demonstrate a desire to learn but internally struggle with the self-belief of being able to succeed in the classroom. Supporting this statement is a study conducted by Montague and Applegate (1993).

Subjects for the Montague and Applegate (1993) study included randomly selected students in Grades 6, 7, and 8 from 20 elementary and junior high schools within a southeastern metropolitan school district. A total of 90 students were identified each representing a different academic competence. Categories of academic competence included gifted students, average achieving students, and students with learning disabilities. Mathematical achievement tests and reasoning assessments were administered to the subjects over two 55-minute class periods. A two-part structured interview was conducted with the first part including 17 questions on a 5-point scale relating to perception of overall mathematical achievement and the second section containing 3 open ended questions addressing knowledge of problem-solving strategies in mathematics.

In order to analyze the perception of mathematical performance variable, the researchers used the Tukey’s procedure. The results indicated students with learning
disabilities had a significant unfavorable perception ($p<.01$) of their math performance than average achieving students and gifted students. The researchers examined the characteristics of problem solving skills among middle school students with learning disabilities and found these students have a positive outlook on learning math and understand the importance of being able to apply problem solving skills within the real world. However, these students often rated themselves poorly when discussing their ability to do math and perform well in mathematical instruction. The study also indicated students with learning disabilities demonstrated basic computation skills, however the skills with problem solving were ineffective. Recommendations from the researchers suggest a need to utilize a variety of instructional strategies in order to provide students with cognitive and metacognitive strategies in order to increase problem-solving skills.

Even though inclusion students have the skills and intellect to understand the general education curriculum, as noted by computational ability (Montague & Applegate, 1993), the way the instruction is delivered creates a demoralizing effect on the inclusion students. The lack of engagement can lead these students to see themselves as incapable of doing the math. Students then develop low academic self-esteem in mathematics and the feeling of not having the ability to succeed in the regular education curriculum.

In Marks (2000) study, the researcher affirmed “the magnitude of the negative effect for alienation among middle school students is significantly greater than for elementary or high school students” (p. 171). Middle school students who feel isolated within the classroom due to academic inabilities or low academic self-esteem often demonstrate below average levels of academic achievement.

The lack of engagement and low academic self-esteem can lead to acting out
behaviors which can be identified as disruptive or inattentiveness. When these inattentive or acting out behaviors are occurring, teachers often lower the academic expectations for these students. Teachers can generate a perception that these students are not capable of learning. In order to reduce these teacher notions, it is necessary for the classroom to be a safe environment in which students, especially inclusion students, feel comfortable making mistakes and receiving feedback on correcting these mistakes. Furthermore, the instructional strategies need to be engaging in order to increase academic achievement and OTL for students.

Finn (1989) indicated “classroom arrangements and teaching practice must be organized so that even students with little self-motivation are required to become actively involved” (p. 132). In order to increase OTL for students in the inclusion setting and to provide academic engagement, it is critical for instructional delivery to be modified and changed to meet the needs of the inclusion students and all students. When providing OTL, adequate instructional time is needed in order for the teacher to cover the concepts mandated by state standards. In order to deliver these concepts, the teaching strategies utilized within the classroom setting must focus on the diverse cognitive abilities and needs of all learners, provide a variety of instructional approaches, and incorporate opportunities for different grouping structures (individual work, partner work, or cooperative group) (Elliott & Bartlett, 2016, p.4). One effective instructional practice which could be implemented into an inclusion classroom in order to provide OTL for all students is project-based learning (PBL).

Lawrence-Brown (2004) supports PBL as an effective instructional practice by stating that it “provides a motivating, authentic, real-life context for all students to learn
academic content, and it allows students to see and apply interdisciplinary connections” (p. 53). By providing a learning environment in which the concepts connect to other subject areas and to the real world, students become more engaged in learning.

**Project-Based Learning and Theoretical Framework**

Use of the PBL model actually began in Canada and was utilized to train students in the medical field. However, the basis of PBL dates back to Confucius and Aristotle with the basic idea that in order to learn, individuals must be doing. Adding to this idea was Socrates, for whom the focus of learning relied on opportunities for questioning and increasing critical thinking skills. During the twentieth century, John Dewey specified that learning is done through experience and must also be related to student interest. Building on this notion was Maria Montessori who established programs in which the structure focused on students learning by experience in order to produce problem solving skills.

Each of these philosophers and theorists had the similar understanding in which learning occurred through experience or by doing. Hence, the definition of PBL incorporates these ideas. Echoing definitions from Thomas (2000) and Bell (2010), an operationalized definition of PBL in terms of this research is defined as an instructional approach in which students are actively engaged in learning with the teacher being a facilitator and guiding the students to construct learning. In the PBL approach, students learn concepts rooted in real world application and develop content skills by completing some type of project. Due to the student-centered approach to learning and the conception that students learn by doing, PBL is rooted in the theoretical framework of Piaget’s Constructivist Learning Theory and Vygotsky’s Social Constructivist Learning.
Constructivist Learning Theory can be observed in PBL instruction in that students are actively engaged in learning and develop learning through experience and doing. Unlike traditional classrooms in which direct instruction is delivered and students memorize facts, classrooms incorporating the constructivist learning theory have students solving problems, developing conclusions, and answering questions which arise through investigative processes. This type of learning allows the students to take ownership of the learning. In a constructivist classroom, PBL can be an individual experience or a collaborative experience.

Vygotsky, the founder of the Social Constructivist Learning Theory, claimed learners develop knowledge independently and internally, but stressed social interaction was a foundation for learning. Additionally, Social Constructivist Learning Theory mimics Constructivist Learning Theory in that learning is contextual and cannot be done by teaching isolated facts. Instruction needs to be engaging for learners, and the learners should be active in learning. PBL incorporates Social Constructivist Learning Theory by having students work collaboratively to solve a problem or to form an understanding of a concept. By having the students have an active part in learning, the instruction becomes more valuable to the student. In return, the student feels more competent and begins to minimize the social comparisons to the other students in the class.

The foundation pieces of PBL (socialization, engagement, active learning) not only incorporate Vygotsky’s learning theories, but also include core aspects of Erikson’s Developmental Theory. In particular, PBL is embedded in Stage Four - Industry vs. Inferiority - of Erikson’s Developmental Theory. Stage Four of the theory
focuses on learners ages six to puberty. During this time of development, socialization and the experiences at school have a major impact on children’s lives and learning. Within this stage, children strive to have a sense of accomplishment and a feeling of self-worth. Children want to be engaged in doing, completing projects/work/tasks in order to develop a sense of pride. It is during this developmental time students want to show the teacher what they can do. Erikson’s Industry vs. Inferiority theory promotes the notion students will become more industrious when engagement in learning is occurring and completion of tasks/projects occurs. Alternatively, inferiority ensues when students are less engaged in the learning and are provided with limited opportunities to develop learning through experience. Students often begin to compare their intelligence and contributions to the classroom to the other students. It is during this time students feel a sense of being incompetent and become disengaged in learning. This disengagement can lead to acting out behaviors or work refusal.

PBL focuses on the whole child by including not only academic learning but also social and emotional learning. Because of learning being engaging and student-centered, PBL increases a child’s self-worth and provides a sense of pride. Researchers (Katz & Chard, 1992; Filippatou & Kaldi’s, 2010; Koparan & Guven, 2014; Cervantes, Hemmer, & Kouzekanni, 2015) have confirmed PBL translates into notable academic gains.

**Advantages of Project-Based Learning**

Numerous studies have concluded PBL as having a positive effect on students’ learning. Katz and Chard (1992) concluded PBL accomplishes four specific goals: attainment of knowledge, development of social and academic skills, establishment of dispositions, and instilling positivity into children as learners. When these goals are
achieved in the PBL classroom, learners begin to develop a sense of belonging within the group setting and a sense of self-worth.

Supporting Katz and Chard’s (1992) study are multiple studies focusing on PBL and academic growth in students. Koparan and Guven (2014) conducted a quasi-experimental comparative study on eighth grade students’ attitudes towards statistics. In this study, the researchers sought to determine if the use of project-based learning had a positive impact on students’ attitudes towards statistics. The study was conducted in two different classes in an urban middle school in Trabzon city of Turkey. Thirty-five of the students were in a control group, with instruction based on student textbooks and traditional teaching approaches. Thirty-five students, grouped heterogeneously, were in the experimental group which incorporated project-based learning projects related to real life situations which were familiar to the students. Instruction within the two groups occurred for one month.

Using a Likert-type scale survey, data was collected and analyzed using the Rasch measurement techniques and the Winsteps 3.72 computer program in order to compare the performance of the control group (textbook group) and experimental group (project-based learning instruction). Results of the study indicated a significant difference in attitude between the control and intervention group. The results showed project-based learning was more effective in developing positive student attitudes towards learning statistics than the instruction that was delivered utilizing textbooks. Pre-test scores on the survey showed no significant difference with attitude towards statistics between the two groups. Pre-test averages were close with the intervention group average of .51 and the control group average of .55. T-test results, $t(68) = -0.336$, $p < .05$, indicated no difference
between the attitude towards statistics among the two groups. Post-test scores on the survey demonstrated the experimental group had a positive attitude towards statistics than the control group. Measures of the intervention group, project-based learning being implemented, showed the pretest average was .51 (SD=.64) and the post-test average score was 1.18 (SD=.87). The dependent t-test indicated the difference was a significant change in attitude towards statistics for the intervention group from the pre-test to post-test ($t(34) = -3.553$, p< .05). For the control group, those students participating in the traditional teaching method with use of textbooks, the average score on the pretest was .55 (SD=.46) and the post-test average score was .57 (SD=.55). The dependent t-test indicated there was not a significant difference a significant difference, $t(34) = -.163$; p>.05. The data results indicated there was no change in attitude towards statistics for the traditional teaching methods with textbook use did not effect a change in the traditional group from pre-test to post-test. The researchers of this study concluded the project-based learning approach, not the traditional textbook instruction be recommended for teaching statistics within mathematics classes.

Another study supporting PBL and the advantages was Cervantes, Hemmer, and Kouzekanni (2015). The purpose of the study was to examine and explore how a redesign of instruction utilizing project-based learning impacted mathematics and reading achievement in a South Texas middle school. The study focused on seventh and eighth grade minority students in an urban school district. The group comprised of 87 7th grade students and 84 8th grade students, attending a magnet school that utilized project based learning. The comparison group of 140 7th grade students and 150 8th grade students, attended a different middle school that did not incorporate project-based instruction in its
teaching. Data were retrieved from the 2012 State of Texas Assessments of Academic Readiness (STARR) student achievement scores for mathematics and reading. Proportions of answers correct were used to measure the reporting categories on the STARR. Data were transferred into the Statistical Package for Social Sciences (SPSS) in order to analyze and manipulate the data. Proportions of the total number of test questions answered correctly to the total number of questions in each category measured student achievement in mathematics and reading sections. To summarize and organize the data, descriptive statistics, multivariate analysis of variance (MANOVA) and multivariate analysis of covariance (MANCOVA) were used to test the hypothesis that the PBL group will outperform the non-PBL group on outcome measures of reading and mathematics.

Results of the study concluded that project-based learning had a positive impact on academic achievement based on the 7th and 8th grade STARR outcomes in reading and mathematics. MANCOVA scores indicated statistically significant mean differences between the two groups. Seventh grade students in the project-based learning group outperformed the non-project based learning group in all reading and mathematics categories. Eighth grade students in the project-based learning group outperformed the non-project based group in the three categories of reading and the Geometry and Spatial Reasoning category of mathematics. Based on these findings, the authors concluded that project-based learning could be effective with the demands of standards-based reform and accountability.

Based on the findings of this study, the authors concluded that the role of the teacher and the learning environment need to move towards a more student-centered
instructional setting. Teachers’ roles require a shift from leader of instruction and having all control to being a coach or facilitator of the classroom and guiding students through learning. Instruction and assessments need to be redesigned by presenting students with real-world problems which need to be solved. Learning environments must provide for collaboration, creativity, teamwork, problem-solving, and decision-making skills.

Not only have these recent studies shown that PBL has a positive impact on students’ academic achievement in the mathematics classroom, these studies also indicate PBL aligns with standards-based learning. To further support PBL being an effective instructional approach in the regular education classroom, studies have been conducted and have shown PBL having an impact on the learning of students with learning difficulties.

Filippatou and Kaldi (2010) conducted a mixed methods study that examined academic achievement and attitudes towards learning in students with learning difficulties when PBL was implemented. The study focused particularly on the effectiveness of PBL for students with learning difficulties, in a primary school setting, and the academic performance and attitudes towards self-efficacy and task value within environmental studies, group work, and teaching methods. Participants in the study included twenty-four fourth grade students (19 boys and 5 girls) with learning difficulties from six mainstreamed mixed ability classes in the cities of Volos, Lamia, and Athens. Three of the twenty-four students were identified in need of special education, while the others were identified having learning difficulties by standardized teacher questionnaires and standardized screening software for learning skills and weaknesses. Data were collected for eight weeks using a mixed-methods approach. Instruments for data
collection included standardized learning difficulties screening test, knowledge tests, attitude scale, semi-structured interviews, and classroom observations.

The quantitative results from the Knowledge Test and Attitude Scale outcomes indicated students with learning difficulties achieved a significant increase in scores on the knowledge test after the project was completed. These students with learning difficulties also demonstrated a significant change in attitude in response to self-efficacy, task value, group work, traditional teaching, and experiential learning. Qualitative results concluded that all students affirmed the project-based learning project assisted them with learning better and helped them retain information about the project topic.

The results from this particular study indicate that project-based learning allows for a multi-sensory approach which is beneficial to students with learning difficulties. The study showed an improvement in attitudes among students with learning difficulties towards academic performance, motivation, cooperative learning, social acceptance, and engagement in the learning process.

Thus far, the studies cited in this chapter indicate that the instructional strategy of PBL has many advantages in regards to academic achievement and social/emotional learning. The researchers have shown that PBL is effective not only for regular education students, but also for students with learning disabilities and marginalized students. Additional investigations have supported the positive impact PBL has on student academic achievement and self-worth in the classroom. However, it must be noted that there are challenges to implementing PBL in the classroom.

**Challenges of Project-Based Learning**

With regard to PBL, a number of challenges have been identified. Tamim and
Grant (2013) posit that one challenge to implementing the constructivist framework into the classroom centers around teachers. Implementation of PBL requires that they become facilitators within the classroom and create a student-centered learning environment which can be arduous to some teachers. Moving from a teacher-led instructional approach in which the teacher is in “control” of the learning to learners guiding the learning deters some teachers from implementing PBL.

Thomas (2000) in a review of research of project-based learning argued that another challenge teachers encounter with PBL is time. Projects implemented in the classroom may take a considerable amount of time. The extended time spent on projects deters from the strict requirements on curriculum coverage for standardized assessments.

When discussing curriculum coverage for standardized assessments, the issue of assessing PBL also becomes a challenge. Both Thomas (2000) and Tamim and Grant (2013) found teachers to have a lack of understanding when assessing PBL projects. Tamim and Grant (2013) concluded that assessing PBL projects is a comprehensive skill which incorporates the assessment of cognitive understanding, cooperative group skills, independent work skills, and metacognitive skills. Teachers often want to grade strictly for academic understanding, as expertise in grading is in this area. Hence, grading social skills, such as cooperative group work and work responsibility, becomes a novice area for teachers.

A final challenge which has been identified in studies is classroom management. Creating a classroom environment which supports student-centered learning and the independence of students to guide learning is critical. For some teachers, the structure of PBL learning can be overwhelming as the classroom in becoming actively productive can
reflect a sense of chaos.

These challenges provide an overview of the key challenges educators face when implementing PBL or choosing to implement PBL. Although challenges arise for implementation of any new instructional strategy or approach to teaching, there are options available to decrease the anxiety involved with the implementation of a novel approach, and so, help to overcome challenges. Professional development for teachers is one way to lessen the anxiety of implementing PBL. Along with professional development, providing opportunities for teachers to observe PBL being implemented in a classroom is another way to lessen the challenges of PBL implementation. Finally, having a supportive administrative staff with experience in PBL can alleviate some of the anxiety/stress teachers face when utilizing PBL in the classroom.

Summary

Even though challenges are presented when implementing the instructional strategy of PBL, the positive benefits of PBL instruction outweigh the challenges. Bell (2010) contends PBL provides 21st Century skills learners will need for the future including independence skills, collaboration/social skills, intrinsic motivation, real-world connections, technology skills, critical thinking skills, and organizational skills. These skills develop when students are engaged in the learning and have a sense of ownership of learning.

Stevens (1996) states, “teachers should assign tasks to students that involve cooperative learning, have more than one right answer, use their prior knowledge and experiences, and have real meaning in their lives” (p. 7). PBL instruction not only encompasses these types of tasks, but PBL also increases students’ OTL. Therefore, PBL
demonstrates to be an effective instructional strategy to be utilized in the classroom.
Chapter 3

Methodology

This chapter presents the methodology used in conducting this study. Information about the context and the setting, participants of the study, and methods will be outlined. A discussion on how the data will be analyzed will be provided. Results of the study will be presented in Chapter 4.

Purpose of Study and Research Questions

The purpose of this research study is to identify which instructional strategy, teacher directed instruction (TDI) or project-based learning (PBL), is more effective with increasing conceptual learning among sixth grade inclusion students in the regular education mathematics setting. The purpose of the study is threefold. The first component of the study centers on the first research question: ‘To what extent do inclusion students engage in active and passive time in project-based learning and direct instruction?’ Using the adapted version of the BOSS instrument, engagement time during instructional delivery was recorded for the traditional TDI group and the PBL group. Kong, Wong, and Lam (2003) indicated students’ interaction and engagement with the curriculum is a vital piece of classroom instruction, and students need to actively participate in instruction and engage in learning in order to have a sense of ownership in their knowledge. This parallels the work of Vygotsy’s Social Constructivism Theory, in which learning is done collaboratively and occurs through socialization.

Elliott and Bartlett (2016) indicated teachers must use effective teaching strategies which are developmentally appropriate and conducive to the learners’ strengths and needs in order to increase academic achievement. As students are given the opportunity
to engage in the learning and learn by working with peers, it is expected conceptual learning will increase. In order to provide results for the second research question, ‘What is the relationship between active engagement time and concept learning?’, and the third research question, ‘What is the difference in concept learning between students in teacher directed instruction mathematics classrooms and students in project-based learning mathematics classrooms?’ the second element of this study therefore focuses on mathematical conceptual learning among sixth grade inclusions students within the traditional teacher directed instruction group and in the treatment grouping PBL. The traditional TDI group serves as the control group and is taught using teacher centered instructional delivery. Components of this instructional strategy will include teacher lecture, note taking, individual seat work, and minimal opportunities for partner or group work. Students in the treatment group will have opportunities to be active in learning through the use of partner or group activities, hands-on experiences which will allow students to explore the mathematical concepts being presented, repetition of skills through activities, and chances to pose questions in order to drive learning. Data will be analyzed to determine if concept learning increased more from pretest to posttest scores on each daily concept lesson in either the traditional TDI group or the treatment group using the instructional method of PBL.

By examining the two instructional strategies to determine which one is more effective for increasing concept learning scores for inclusion mathematic students, teachers will be able to design instruction which best supports the strengths and needs of the students identified with special learning needs. However, it would not be beneficial to solely make recommendations or changes to instructional delivery without the input
from the students themselves. Thus, it is critical to establish whether inclusion students prefer a more active engagement learning environment or a learning environment in which teacher directed instruction is utilized. In order to collect data for the final research question, ‘Do inclusion students prefer direct instruction or project-based learning?’, a student survey was conducted to allow students to provide a voice to the learning environment.

**Research Design**

This is an action research study that utilized a transformative mixed-method approach in order to determine whether social equity, based on opportunity to learn, is being provided to marginalized learners. Data used for the study was data normally collected during instructional time. The data for the study employed both quantitative and qualitative data. This study is a non-equivalent quasi-experimental design due to hypotheses being tested through manipulating conditions that impact the outcomes, a control group being present in order to compare results to an experimental group receiving a treatment (implementation of PBL which is student centered), and students not being randomly assigned. Participants are part of an assigned classroom and are part of the researcher’s caseload.

**Sample Selection**

Since the study took place in an education setting, in which the researcher is a co-teacher in an inclusion setting and delivers instruction on a daily basis, the subjects used for this study were those students on the standard caseload of the researcher. The sample for this study was comprised of students who either have a learning or emotional diagnosis and have been identified as having a need for special education services. The
participants of this study were sixth grade students within two mathematical classrooms. The students were divided into two groups, traditional TDI group (control group) and treatment group using the instructional method of PBL (experimental group). The traditional TDI group consisted of six sixth grade students who were taught through traditional direct instruction. The treatment group who used the instructional method of PBL consisted of four sixth grade students who received the PBL intervention.

**Context of Study**

As stated in Chapter 2, the term inclusion does not have a definitive definition. There are many arrangements to implement inclusion within a classroom. Because of this, studies involving inclusion classrooms cannot be compared to each other due to the inclusion settings being dissimilar. Strategies or instructional delivery which are effective in one inclusion setting may not be effective in another due to the difference in the inclusion format. Therefore, it is pertinent to provide a clear definition of the inclusion setting for this study. To provide a comprehensive definition, the Inclusion Definition Instrument (IDI) was applied. Rombach (2009) developed and defined the IDI as “providing researchers and readers of studies on inclusion a method of identifying the variables of inclusion so studies can be understood, linked, and synthesized to better comprehend the complex nature of inclusive education practices” (p. 8). The IDI identifies three components which are necessary to define an inclusion setting: classroom demographics component, teacher attributes component, and support staff attributes component.

Classroom demographics describes the grade level, total number of students in the inclusion classroom, and total number of students with and without disabilities. Included
in the classroom demographics would be information on the disabilities the special education students have been identified with and the percentage of time students with disabilities participate with peers without disabilities.

Teacher attributes include the regular and special education teacher’s educational background, years teaching in inclusive practices, training received on inclusive practices, and the time allocated each week for collaboration and planning of inclusive lessons.

The final component, support staff attributes, discusses the years of experience the support staff has with working in general and inclusive education classrooms. Additionally, details of prior training received and percentage of the school hours working in the inclusion setting is given. Finally, information on the amount of time for collaboration with the regular and special education teachers is indicated.

Using the IDI, the following definition has been established for this particular study.

**Classroom Demographic Attributes**

Since the study was conducted within two classrooms, the components of each classroom are reported. Classrooms are identified as Traditional TDI Group and Treatment Group Using the Instructional Method of PBL.

**Traditional TDI Group**: The traditional TDI classroom contained 29 sixth grade students, ages 11-12 years old. Among the 29 students, 23 students were not identified as having special education needs and six students were identified as having a need for special education. The nature of the disabilities could be identified as mild, due to the following diagnoses: Four of the six special education students were identified as in need
of learning support, while the other two special education students were identified as in need of emotional support. Of these six special education students, three had a positive behavior support plan. In addition, three of the six students had standard aligned mathematical goals within the IEP. All six students participated in the inclusive setting and regular education curriculum for 100% of the school day.

**Treatment Group Using Instructional Method of PBL:** Within the treatment group using PBL, there was a total of 21 sixth grade students. Student ages ranged from 11-12 years old. Among the 21 students, four students received special education services. The nature of the disabilities were identified as mild, as all four students had a diagnosis of learning support, with no students having a positive behavior support. Of the four students, only one student had standard aligned mathematical goals within the IEP. All four special needs students participated in the inclusive setting and regular education curriculum for 100% of the school day.

**General Educator’s Attributes**

**Traditional TDI Classroom:** The teacher within the traditional TDI classroom has 19 years of experience teaching in the general education classroom, 15 years of which had been in the inclusive education classroom. The teacher had previous training in inclusive education through graduate courses in the MAT program at a local university. The amount of time allocated for planning with other staff involved in inclusive classroom instruction is between 1-1.5 hours per week. Planning and collaboration included sharing of lesson plans, strategies, communication about individual students, and plans for individual students.
Treatment Group Using Instructional Method of PBL: For the treatment group using the instructional method of PBL, the general education teacher has 15 years of teaching experience with six years of teaching in the inclusive education classroom. Previous training in inclusive education was completed through a graduate level program at a local university. The time allotted for planning with other staff involved in classroom instruction was about one hour per week. Due to lack of common planning time for the regular and special education teacher, collaboration included sharing of lesson plans, communication about individual students, and daily updates on student progress.

Special Educator’s Attributes

The special education teacher for this study has 20 years of experience teaching in special education classrooms, with 15 years teaching in inclusive education classrooms. The special education teacher has had prior training in inclusive education through undergraduate and graduate programs at a local university. She has had additional training through professional development within the school district and through attending workshops and conferences on inclusive practices. The amount of time per week allocated for planning with the control and experimental teachers involved in the inclusion classroom instruction was 1-1.5 hours per teacher. Common planning time was not allocated for the regular and special education teachers throughout the school day. Therefore, collaboration and planning was done through sharing of lesson plans, communication via email or brief 5-10 minute talks daily about student needs, student progress, instructional strategies, and review of accommodations/modifications for each individual special education student.
The special educator does have support staff which she works with and supervises on a daily basis. However, for the purposes of this study, there are no support staff attributes to disclose due to support staff not being scheduled within the sixth grade inclusion mathematics classrooms.

**Time Period of Study and Lessons Delivered**

This study was completed over a four day period. Both the traditional TDI group and treatment group using the instructional method of PBL delivered instruction on the same mathematical concepts. There were four different concepts being instructed on during the four day observation. Each day, the same concept lesson was delivered in order to ensure consistency. The traditional TDI group continued to utilize the same delivery of instruction which occurs on a daily basis. Observations have indicated the instruction within this classroom is consistent with teacher directed instruction, lecture, note taking, guided practice, and independent practice. Within the treatment group using the instructional method of PBL, a student centered approach to instructional delivery was carried out. PBL was considered the treatment since the traditional teacher directed instruction is regularly implemented in the experimental context on a daily basis. Lessons for the experimental classroom were developed by the regular and special education teacher.

The following information contains the objective of the daily instructional delivery. Detailed lesson plans for each day can be found in Appendix A. For day one of the study, the lesson focused on the concept of perimeter with the learning objective stating students would be able to select and use appropriate units, tools, and/or formulas to measure and solve problems involving the perimeter of regular and irregular polygons.
The second day of the study had instruction concentrating on the concept of area with the learning objective focusing on students finding the area of rectangles and irregular figures. On the third day of the study, concept learning emphasized area of parallelograms and triangles. Students would be able to develop and use the formulas for the areas of parallelograms and triangles. For the final day of the study, the content would apply analysis of solid figures and instructional delivery will allow students to be able to classify polyhedrons and identify vertices, faces, and edges. In addition, students would be able to identify the polyhedron from its net and be able to draw or construct the top, side, and front views of the polyhedron.

**Instruments Used for Study**

For the purpose of this study, four instruments were utilized in order to collect and analyze data. The following information contains information about the specific instrument and the validity or reliability of the instruments. Those instruments provided in this study are found in the appendix.

**Inclusion Definition Tool**

The first instrument to be used for this study was Rombach’s (2009) Inclusion Definition Instrument (IDI) (Appendix B). This instrument was applied to the study in order to contextually define the term inclusion and identify the specific characteristics of the inclusion model which was used for the study. Data generated from this instrument included classroom demographic attributes, including grade level, number of students within the inclusive classroom, number of students with/without disabilities, nature of severities, and percentage of time students with disabilities participate in the inclusion classroom. Additional data collected from this instrument included the teacher’s
attributes which includes information pertaining to the regular and special education teachers, including years of experience in teaching, number of years teaching in an inclusion setting, participation in inclusion training, and the time provided to the regular and special education teachers to meet in order to plan lessons.

Although no validity or reliability tests have been performed on the IDI tool, it is the first comprehensive instrument which depicts an outline of creating a contextual definition for inclusion. Since inclusion takes on many forms and styles, this specific instrument allows this study and other inclusion studies to be duplicated to better understand whether the results of an inclusion study are effective.

**Observation Tool**

For the classroom observations, the researcher used an adapted version of the Behavior of Students in School (BOSS) observation coding system. This observation tool is used to systematically observe and assess passive and active academic behaviors of students in the classroom in real time using behavioral codes. Observations are conducted at 15-60 second intervals for at least a 15 minute period. An additional distinctive feature of the BOSS tool is the presence of a teacher directed measure. This specific measure allows for calculating the amount of time the teacher is delivering direct instruction (TDI). TDI would include the teacher instructing the entire class through lecture, showing/modeling academic material on the board/promethean board, and/or the teacher working individually with one student. The calculated amount of time can then be converted into a percentage of time the teacher is providing teacher centered instructional delivery.
Since this tool is designed and used to observe a single student’s behaviors compared to a randomly selected peer in order to estimate on and off task behaviors, an adapted version of the observation instrument was utilized. This adapted version of the observation tool would be used to gather data about the amount of time teacher directed instruction was being delivered and provided the total amount of time students were actively and passively engaged in learning. By using the BOSS observation instrument, the expected predicted results would be more teacher directed instruction would indicate less student active engagement time within the daily instruction. In contrast, with the treatment team using the instructional method of PBL, the expected results would indicate less teacher directed instruction and more active student engagement time.

Although specific reliability and validity is limited, the BOSS observation tool has been reviewed and utilized in studies. Research by Ota and DuPaul (2002) utilized the BOSS tool and found total interobserver agreement to be between 90-100% over a repeated measurement of participants. Volpe, DiPerna, Hintze, and Shapiro (2005) similarly found consistently high interobserver agreement, between 90-100%, with use of this instrument. Furthermore, Dupaul et al. (2004) used an adapted version of the BOSS tool in a research study and found occurrence, nonoccurrence, and total agreement among the mean percentages of behavioral categories and two subject areas observed (mathematics and reading) ranging from 91.5% to 99.27% (M=96.56; S.D.=2.32). In addition, DuPaul et al. (2004) found “the Mean Kappa coefficient ranged from .93 to .98 (M=.95; S.D.=.02)” (p. 292). Overall, studies which have used an adapted version of the BOSS tool or reviewed systematic direct observation tools have indicated the BOSS tool is an effective tool for measuring student engagement during instructional time.
Concept Learning Instrument

In order to assess concept learning, the instruments utilized and administered to the students were pretest and posttests in the form of curriculum aligned assessments from the mathematics program implemented in the district. This type of instrument, known as a quick check to students, is a short formative assessment teachers implement on a daily basis to gain the baseline understanding of a mathematical concept students possess prior to the lesson and the final understanding of the concept once instruction has been delivered. Analysis of the quantitative data from the pre and post assessments was used to determine concept learning among the inclusion students. An increase in raw scores from the pretest to the posttest indicates conceptual learning of the concepts taught during the instruction time. A decrease in raw scores or no increase would indicate students did not demonstrate conceptual learning of the concepts.

The validity of the pretest and posttest assessments on concept learning is noted by the assessments being aligned to common core standards and the National Council of Teachers of Mathematics (NCTM) central points. The concepts taught during this study are standard content concepts implemented for sixth grade curriculum.

Survey Instrument

The final instrument which was used for collecting data in this study was developed using a portion of Kong, Wong, and Lam’s (2003) Student Engagement in Mathematics Classroom Scale. This adapted instrument, in the form of a survey (Appendix C), includes six questions pertaining to students’ attentiveness in mathematics class. This survey is a self-reflective type of survey in which students reflected on daily attention and focus when delivery of instruction was occurring. Data from this
instrument, which was collected during normal educational practices, used a 5-point Likert-type scale with responses ranging from strongly disagree (rating of 1) to strongly agree (rating of 5).

Kong, Wong, and Lam (2003) conducted a study in order to produce an instrument that would measure engagement in the subject area of mathematics. The validation of the instrument created was done by pretesting the instrument twice among a total of 299 Grade 5 students. Revisions were made to the instrument and it was then given to 546 (272 males, 274 females) grade 5 students in five different schools.

Using Cronbach Alpha Reliability Index of the Subscales of the Student Engagement in the Mathematics Classroom Scale a high internal consistency reliability was noted with Cronbach Alpha = .86 for the subscale. In assessing goodness-of-fit, they ran the Tucker-Lewis Index (TLI) and Adjusted Goodness of Fit Index (AGFI). These tests reported satisfactory goodness of fit indices for the Behavioral Engagement subscale (AGFI= 0.90; TLI= 0.92). The results of these tests indicate the instrument is a valid instrument to use to determine the relationship between student engagement and learning outcomes.

In addition to the Likert-scale questions on attentiveness, a second teacher created section of the survey was developed to include four open ended questions. These survey questions focused on students’ preference to teacher directed instruction or hands-on instruction, how to improve the enjoyment of learning mathematics, and how to improve the enjoyment of learning mathematics. With the standard teaching practice of having students provide input into the learning environment and reflect on which instructional
practices meet individual needs, the open-ended section of the survey can be noted as a valid tool in order to examine common themes or thoughts among students.

Collection of Data and Method of Data Analysis

With an overview of the instruments utilized in the study being provided, details of how data was collected using these instruments and the method of analysis for each portion of data collection is needed. The following information is presented by the type of data collected and how the data was used to answer each research question.

Quantitative Data Collection and Method of Analysis

First Research Question Data Collection and Method of Analysis

In order to answer the first research question, ‘To what extent do inclusion students engage in active and passive time in project-based learning and direct instruction?’ quantitative data was collected through observations of instructional strategies within the two inclusion mathematics classrooms. By having a control group of traditional teaching methods (lecture, note taking, guided practice, independent practice) and an experimental group utilizing PBL teaching strategy, data can be collected to identify the percentage of active and passive student engagement time during instruction. For purposes of the study, active student engagement time was identified as teacher asking questions during instructional time in order to gain student participation, taking notes, working with peers to complete practice problems, working with the teacher in small groups in guided practice/independent practice problems, engaging in mathematical activities such as games/projects, and discussing mathematical concepts with peers/problem solving. Passive engagement was defined as students listening to a
lecture, looking at the board, following along on a worksheet and/or in the textbook, completing independent work.

Within the school where the study is being conducted, all core subjects are allocated 75-minutes of instructional time on a daily basis. The researcher used the adapted BOSS observation instrument to collect three 15-minute time interval samples, with observations occurring every minute, in order to collect the number of minutes students were actively and passively engaged in instructional delivery. Ten minute intervals were placed in between the 15-minute intervals of data collection. This observation process produced 45 observations codes for each of the four days of the study. At the end of each day’s observation, the researcher calculated the percentage of time students were actively and passively engaged in instruction. The number of minutes of active engagement time was divided by the total number of observation minutes (45 minutes) in order to yield a percentage of active engagement time. To calculate the percentage of passive engagement time, the total number of passive engagement minutes was divided by the total number of observational minutes (45 minutes).

In order to represent this data, a double bar graph using Excel will be presented in Chapter 4 to illustrate the total amount of active engagement time on a daily basis in the traditional TDI group and the treatment group using the instructional strategy of PBL. Information presented in this double bar graph will indicate the total percentage of time students are actively engaged in mathematical instruction and will indicate which instructional strategy permits for more active engagement in learning.
Second Research Question Data Collection and Method of Analysis

The second research question, ‘What is the relationship between active engagement time and concept learning?’ would consist of pretest and posttest measures for each lesson during this study. Prior to daily observations in both classes, a pretest was administered to the students in order to gain a baseline of the students’ understanding of the new mathematical concept. For the posttest, or formative assessment, the same assessment was used at the end of each lesson. This allowed the same format of assessment to be given to the students and permitted a comparison of the first and second raw scores. These preexisting multiple choice and short answer pretests were provided from the current curriculum being used within the mathematics program. Since these assessments are used on daily basis, the students are familiar with the format of these assessments.

In order to analyze the data, the researcher graded each pretest and posttest and documented each coded students’ score for the pretest and posttest. Using SPSS, the researcher inputted the codes of each student and identified the student as either 1= PBL group or 2= TDI group. Individual student pretest and posttest scores for each of the four days of instruction and the percentage of active engagement time was documented into SPSS. Finally, the overall increase change from pretest to posttest was calculated. This provided 15 sets of data for the treatment group using the PBL method of instruction and 24 sets of data for the traditional group using TDI instruction. It must be noted that one student within the treatment group using PBL method of instruction had a difficult day during the study. Because of the challenges this student was facing on day four, a significant decrease between pretest and posttest occurred. This decrease significantly
affected the PBL group’s mean scores. Therefore, this student’s score was eliminated from the data, hence providing 15 sets of data for the treatment group instead of 16 sets of data.

Analysis of the quantitative data from the pretests and posttest assessments determined concept learning among inclusion students. To determine whether there was a relationship between AET and conceptual learning, the Pearson ($r$) two-tailed correlation test was completed using the SPSS Statistics software. A positive correlation or relationship between active engagement time and concept learning would yield a significance close to positive one. A significance not close to one or negative would indicate there is no correlation between AET and concept learning.

Using the same data inputted into SPSS, additional Pearson ($r$) correlation tests were ran in order to determine if there was a relationship between the students in the PBL group and their pretest and posttest scores, a relationship between students in the TDI group and their pretest and posttest scores, and a relationship between all students within the study and the pretest and posttest scores. It must be noted the one student’s data from day four within the PBL group was still omitted from the data set due to challenges the student encountered that particular day.

By using the Pearson ($r$) correlation tests, with all tests ran at the 95% confidence level, the researcher was able to calculate whether there was a significance between pretest and posttest scores and evaluate whether the amount of active engagement in instruction had an impact on concept learning. If there was a significant correlation between pretest and posttest scores among students in the classroom with the greatest
percentage of active engagement, then there would be a relationship between concept
learning and active engagement in the classroom.

**Third Research Question Data Collection and Method of Analysis**

To answer the third research question, *‘What is the difference in concept learning between students in teacher directed instruction mathematics classrooms and students in project-based learning mathematics classrooms?’*, the researcher used the data which was inputted into SPSS for research question two. Again, the data for one student within the PBL group on day four was omitted due to challenges on that particular day.

To determine whether there was a difference in concept learning between the students in the TDI and PBL mathematics classroom, the researcher utilized the SPSS Case Summaries tool to calculate the mean for the pretest and posttest for both the TDI group and the PBL group. The researcher then calculated the mean increase from the pretest to the posttest for the PBL group and the TDI group. In addition, the researcher calculated the mean difference between the two groups for the pretest and the mean difference between the two groups for the posttest. This method was conducted twice, using two sets of data. For the first set of data, the scores from the student in the PBL group who had a decrease in change from the pretest to the posttest on day four was used in the Case Summaries tool. The second set of data omitted the scores from the student in the PBL group who demonstrated a decrease in change from the pretest to the posttest.

Additionally, Independent *t*-test for Equality of Means, at a confidence level of 95%, was used in order to show whether there was a significant difference on pretests and a significant difference on posttests for both groups when combined together. For the
Independent *t*-tests, all students were included in the test and the variables tested were the pretest scores and the posttest scores.

Since the Case Summaries calculated the group mean for the PBL participants and the group mean for the TDI students, the researcher deemed it important to also display the individual students’ increase from pretest to posttest for each day of the study. Within the field of special education, the emphasis is on examining individual student’s progress, hence the individualized education plan being developed to support students with identified needs. Therefore, the researcher used Microsoft Excel to create double line graphs for each student. These double-line graphs indicated the pretest percentage and posttest percentage for each of the four days of instruction. The double-line graph allowed the researcher to analyze which students demonstrated a more significant growth in concept learning. From this analysis, the researcher will be able to indicate which instructional strategy had an impact on student concept learning.

**Fourth Research Question Data Collection and Method of Analysis**

The final research question contained both quantitative and qualitative data collection. Quantitative data included results of a structured student survey (Appendix C). The first portion of the survey questions followed the Kong, Wong, and Lam (2003) Student Engagement in the Mathematics Classroom Scale. Data collected from the surveys assisted the researcher in identifying the attentiveness of the students during instructional delivery, based on a self-scoring behavioral engagement rating scale. Using a Likert-type scale measure of 1-5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree, students self-assessed their individual attentiveness being displayed during mathematical instruction.
Surveys were completed individually and took 10-15 minutes to complete. Due to the needs of the students, it was necessary for the researcher to provide a short explanation of what the question was asking. The same explanation was provided to each student in order to maintain consistency and avoid misleading information being provided to the students.

At the end of the survey administration, the researcher calculated the mean responses of the Likert scale questions. For the purpose of this study, the researcher analyzed the means of survey question number two, ‘I take an active part in class discussion,’ and survey question number six, ‘I always take part in the discussion in mathematics class.’ The mean responses of these two specific questions identified how the special education students perceived their individual active engagement in the mathematics classroom.

**Qualitative Data Collection and Method of Analysis**

The final piece of data for this study, the qualitative data, was provided from the second portion of the student surveys (Appendix C) administered in the previous section. In order to answer the fourth research question, ‘Do inclusion students prefer direct instruction or project-based learning?’ the researcher used the student responses from the open-ended questions. These open-ended questions were created by the researcher and focused on students’ preferences to math instruction, parts of math that were enjoyable, ways to make math more enjoyable, and ways to help individuals learn more in math. For the purpose of this study, and to answer research question number four, the first open-ended question, ‘Do you prefer to learn by having the teacher lecture or by
having hands-on activities? Explain why you prefer this way of learning,’ and What can be done to make you learn more during mathematics lessons?’ was analyzed.

Analysis of the statements from the students on these two particular questions allowed for the discovery of common themes or thoughts among the students. Upon completion of administering the survey, the researcher used in-vivo coding. In-vivo coding allowed the researcher to use the participants’ own words to identify common words or phrases among the responses of the ten students. From this, the researcher identified the students’ preferred method of instructional delivery and reasons why this method is preferred. Based on responses, a calculated percentage will be completed of those students who prefer teacher directed instruction and those that prefer project-based learning. Using in-vivo coding and the participants own words, the researcher identified what could be done within the classroom in order to make the students learn more. This analysis allowed the researcher to conclude which instructional strategy would be more effective in an inclusion mathematics classroom.

**Conclusion**

Data collection for this study occurred within four instructional periods over four consecutive days within two inclusion sixth grade mathematics classrooms. The two classrooms included a control group, traditional teacher directed instruction classroom, and an experimental group, treatment group which used PBL. Quantitative data was collected through the process of instructional observations, pretest and posttest scores on daily concepts, and a self-assessing structured survey using Likert scale questions. Qualitative data was gathered using open-ended survey questions in which students identified which instructional style was the preferred method of learning and ways to help
the students learn more in the mathematics classroom. A description of findings from the data collection will be presented and discussed in Chapter 4. In Chapter 5, interpretations and recommended actions based on the results will be provided.
Chapter 4

This chapter presents on results of analysis of the data collected for this study. Data was collected in order to identify which instructional strategy, teacher directed instruction or project-based learning, was more effective with increasing conceptual learning among inclusion students in the regular education sixth grade mathematics setting. Two sixth grade inclusion classrooms formed the context of this study. One inclusion classroom was the control group, identified as traditional teacher directed instruction group. The second sixth grade inclusion classroom was categorized as the treatment group using the instructional method of project-based learning. The first component of the study centered on the amount of active and passive engagement time occurring in the two identified inclusion sixth grade mathematics classrooms. The second element of the study was to determine whether a relationship exists between active engagement time and concept learning. In addition, the researcher was also examining the difference in concept learning between inclusion students in a teacher directed instruction mathematics classroom and students in a project-based learning instructional classroom. For the final portion of the study, data was collected to determine which instructional method inclusion students preferred when learning sixth grade mathematics and how to help them learn more in the mathematics inclusion classroom.

The following are the findings and analysis of the data collected for this study. For each research question, graphs or charts are provided in order to illustrate the findings, and analysis of each graph or chart will be presented under the figures. Also presented is a discussion on whether the hypotheses and expected results were achieved.
Research Question One - Findings and Analysis

Research Question #1: To what extent do inclusion students engage in active and passive time in project-based learning instruction and direct instruction?

Hypothesis: There is more active engagement time in project-based learning instruction than in direct instruction.

Null Hypothesis: There is no difference in the engagement time in project-based learning instruction and direct instruction. Students in both TDI and PBL will have similar engagement time.

In order to gather information for research question number one, quantitative data was collected through classroom observations using the adapted BOSS observation tool. Each observation produced 45 minutes of real time data of active engagement, passive engagement, and teacher directed instruction minutes. For this research question, the total number of active engagement minutes was divided by the total number of observation minutes (45 minutes) to produce the percentage of time students were actively engaged in instruction. For purposes of this study, active engagement was defined as: teacher asking questions during instructional time in order to gain student participation, taking notes, working with peers to complete practice problems, working with the teacher in small groups in guided practice/independent practice problems, engaging in mathematical activities such as games/projects, and discussing mathematical concepts with peers/problem solving. Passive engagement time was characterized by students listening to a lecture, looking at the board, following along on a worksheet and/or in the textbook, and completing independent work.
The following double bar graph (Figure 1) indicates the percentage of time students were actively engaged in instruction on each day of instruction for each of the two classrooms, the traditional teacher directed instruction classroom and the treatment group using the instructional strategy of project-based learning.

![Percentage of Active Engagement Time](image)

**Figure 1: Percentage of active engagement time in TDI and PBL instruction**

When analyzing the data to determine to what extent students engage in active and passive engagement time within the traditional teacher directed instructed classroom and the project-based learning instructional classroom, the data showed students participate more in active engagement time within the PBL instruction classroom. Day one of instruction indicated students were actively engaged in instruction 20% more of the time in the PBL classroom as compared to the TDI classroom. Based on the percentages, students in the TDI classroom were passively engaged 36% of the time compared to students being passively engaged in instruction 16% of the time in the PBL
instruction. Although there was a decrease in the percentage of active engagement time for the PBL classroom on day two, students continued to be more actively engaged in instruction within the PBL classroom. In addition, there was a 25% difference in the amount of active engagement time between the traditional TDI classroom and the PBL instructional classroom. On this particular day, the TDI indicated 58% of the instructional time had students passively engaged, whereas the PBL classroom had students 33% passively engaged with the instruction. Although day two was the lowest percentage of active engagement time for the PBL classroom, the data continued to demonstrate more active engagement time in the PBL classroom with 67% of the instructional time being actively engaged and 31% of the time students were passively engaged on the third instructional day. The TDI classroom continued to demonstrate less active engagement time as noted by the 40% active engagement time. Based on the data, students were passively engaged in instruction 60% of the time during the instructional period in the TDI group. Finally, the graph indicates the highest percentage of active engagement time within the PBL classroom was demonstrated on day four of the data collection. On this particular day, students were actively engaged in instruction 40% more of the time when compared to the traditional TDI classroom. Day four data results indicated passive engagement time in the traditional teacher directed instruction classroom was at 51%, while 11% of the time was passively engaged in the PBL instruction classroom. Overall, the data concluded the active engagement in instruction within the PBL instruction classroom was on average 28.5% more than the active engagement time in the traditional TDI classroom.
Results from the data collection and findings for the first research question confirm the expected result of students receiving TDI had a lower percentage of active engagement time during instruction compared to PBL instruction. As expected, less active engagement time was demonstrated in the TDI classroom due to the teacher being the facilitator of the instruction. Since PBL instruction is a student-centered instructional strategy, the students became the facilitators of learning in the PBL classroom, and therefore had more active engagement in the learning.

**Research Question Two- Findings and Analysis**

Researchers Question #2- What is the relationship between active engagement time and concept learning?

Hypothesis: There is a positive relationship between active engagement time and concept learning.

Null Hypothesis: There is no relationship between active engagement time and concept learning.

Data for the second research question was collected through the use of pretests and posttests. Prior to each daily lesson, students were administered a pretest to provide a baseline score and percentage of students’ understanding of the new concept. At the end of each daily lesson, students were administered a posttest to determine overall concept learning after instructional delivery was presented. Each students’ pretest score and posttest score for the four days was entered into SPSS. In order to represent each student, a code of two letters was given. Groups were identified as 1= PBL group and 2= TDI group. Each students’ pretest score, posttest score, and increase of change was entered into the SPSS system. The scores and increase of change were calculated as a
percentage. It must be noted one student’s increase of change score from the PBL group was omitted due to a significant decrease from the pretest score to the posttest score on one instructional period. The increase of change score from day four for this student was marked as a zero instead of a decrease in change score from the data set due to challenges the student faced that particular day.

The Pearson (r) correlation test was utilized in order to produce results to answer the second research question of whether there was a relationship between active engagement time and concept learning. The test was run using the 95% confidence level. Table 1 displays the results of the correlation test.

| Table 1 | Correlation between posttest percentages and active engagement time |
|---------|-----------------------------|-----------------------------|
|         | Posttest Percentage | Active Engagement Time |
| Posttest Percentage | Pearson Correlation | 1 | -.399 |
| Sig. (2-tailed) | .011 |
| N | 40 | 40 |
| Active Engagement Time | Pearson Correlation | -.399 | 1 |
| Sig. (2-tailed) | .011 |
| N | 40 | 40 |

Based on the findings of the Pearson Correlation test, the data indicate there is a significant negative relationship between active engagement time and posttest percentages (r(40)= -.399, p=.011). Based on the r-value of -.399, this relationship would be considered moderate. Since the r-value is negative, the results indicate that as active engagement time increases, posttest percentages decreased.

The researcher then ran additional Pearson (r) correlation tests to determine the relationship between pretest and posttest for the PBL students, for the TDI students, and for all students participating in the study. These additional correlation tests were run to
see if there was a correlation between the pretest and posttest. If there was a significant correlation, then the researcher could assume the instructional method used in that particular classroom and the amount of active engagement time within that setting had an effect on the concept learning. The following are the tables and analyses for the three Pearson (r) correlation tests which were ran. All correlations were run at the 95% confidence level.

**Table 2**

*Correlation between pretest and posttest in treatment group using PBL*

<table>
<thead>
<tr>
<th></th>
<th>Pretest</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td>Pearson Correlation</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.946</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Posttest</td>
<td>Pearson Correlation</td>
<td>.018</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.946</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>

When running the data in SPSS for the correlation between pretest and posttest in the treatment group using PBL method of instruction, it must be noted one student’s increase change from pretest to posttest was marked as zero percent increase due to a significant decrease in the pretest to the posttest score. This zero percent increase of data occurred on day four and was due to the student having challenges that particular day. Data from the correlation test indicated an overall change that was not significant \( r(16)= .018, p=.946 \) between the pretest and the posttest for the treatment group using the PBL method of instruction. Additionally, the data from the PBL group indicated five scores which had no change from the pretest to the posttest and effected the overall scores of the group. Previous data indicated the PBL group had a greater amount of active engagement time as compared to the TDI group. Based on this correlation, the PBL group which had the greater active engagement time did not have a significant correlation between the pretest
and posttest. Therefore, the data suggest that the amount of active engagement time does not have an effect on concept learning.

The next Pearson ($r$) correlation test ran was to identify whether a correlation existed between the pretest and posttest for the traditional group using TDI. The correlation test was run at the 95% confidence level and yielded the following results.

**Table 3**
*Correlation between pretest and posttest in traditional group using TDI*

<table>
<thead>
<tr>
<th></th>
<th>Pretest</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pretest</strong></td>
<td>Pearson Correlation</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.017</td>
</tr>
<tr>
<td><strong>Posttest</strong></td>
<td>Pearson Correlation</td>
<td>.483</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.017</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>24</td>
</tr>
</tbody>
</table>

Based on results from the Pearson ($r$) correlation between pretest and posttest increase in the traditional group using TDI, the data produced a significant positive correlation of moderate relationship ($r(24)=.483, p=.017$) between the pretest and posttest percentages in the TDI group. Data from the TDI group did indicate some students in the traditional TDI group had a full score on the pretest, which left no room for increase. Previous data from the study indicated the TDI group had a smaller amount of active engagement time for each of the four days compared to the active engagement time percentages of the PBL group. Based on the data from the Pearson ($r$) correlation test, the researcher could conclude a lower percentage of active engagement time during instruction had a positive correlation on concept learning.

The final Pearson ($r$) correlation test conducted was between pretest and posttest increase among all students within the study. At a 95% confidence level, the following results occurred.
Table 4

<table>
<thead>
<tr>
<th></th>
<th>Pretest</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest Pearson</td>
<td>1</td>
<td>.388</td>
</tr>
<tr>
<td>Correlation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.013</td>
</tr>
<tr>
<td>N</td>
<td>40</td>
<td>40</td>
</tr>
</tbody>
</table>

As noted earlier in the study, one student’s increase score on day four was marked as zero increase due to a significant decrease in percentage from the pretest to the posttest because of behavioral challenges the student was having that day. Results from the Pearson ($r$) correlation test between pretest and posttest increase among all students revealed a positive significant correlation ($r(40) = .388$, $p = .013$) of moderate relationship. Analysis from this data indicates there was an overall increase for all students from the pretest to the posttest. When analyzing the data to answer research question two, the data from this correlation test indicates the amount of engagement time did not have an effect on concept learning since all students made an increase from the pretest to the posttest.

Prior to collecting data, the expected outcome for the second research question, “What is the relationship between active engagement time and concept learning?,” was a positive relationship between active engagement time and concept learning would occur. As students were more engaged in the learning and had the opportunity to interact with the teacher and peers, it was hypothesized the students’ attention and focus would increase, leading to an increase in understanding the concepts being taught. Based on the results of the study, this hypothesis would be rejected as the Pearson ($r$) correlation test indicated there was no relationship between active engagement time and concept
learning. Correlation results from the pretest to posttest increase in percentage did indicated the students in the treatment group using PBL method of instruction did not have a significant correlation between the two tests. On the contrary, the traditional group using TDI did have a significant correlation between the pretest and posttest increase in percentage. Finally, when comparing the pretest and posttest increase in percentage for all students, there was a significant positive correlation. This data continues to support that active engagement time does not have an effect on concept learning.

**Research Question Three- Findings and Analysis**

Research Question #3: What is the difference in concept learning between students in teacher directed instruction mathematics classroom and students in project-based learning mathematics classroom?

Hypothesis: Students in project-based learning mathematics classroom would have a higher increase in concept learning than those students in the teacher directed instruction mathematics classroom.

Null Hypothesis: There is no difference in concept learning between students in teacher directed instruction mathematics classroom and students in project-based learning mathematics classrooms.

In order to determine whether there was a difference in concept learning between students in the traditional teacher directed instruction classroom and the treatment group using PBL method of instruction, Case Summaries in the SPSS statistics software program was utilized. By using the Case Summaries, the researcher was able to find the difference of the means between the posttest and pretest for the TDI group and the PBL
group in order to determine whether an increase in means for each group occurred between the two tests. In addition, the researcher calculated the difference between the TDI and PBL pretest means and the difference between the TDI and PBL posttest means to distinguish the mean difference between the two groups.

In the original data set, all students were included and there demonstrated an inherent difference between PBL and TDI. Using all student data, the PBL group demonstrated a pretest mean of 36.5625 and a posttest mean of 59.375. This showed a mean increase of 22.8125. For the TDI group, with all students’ scores being included, the pretest mean was 51.2500 and the posttest mean was 78.333. This showed a mean increase of 27.083 from the pretest to the posttest. Overall, both groups had an increase in their means from the pretest to the posttest with the TDI group having a greater increase by 4.2705 points. The researcher further calculated the mean point difference between the TDI and the PBL pretest and the TDI and PBL posttest. The point difference for the pretest between the two groups calculated to be 14.6875 and the point difference for the posttest between the two groups was 18.958. When analyzing this data, it must be noted there was an inherent difference between the groups with the TDI pretest mean already being higher than the PBL group.

When including all students in the data, the inherent difference between the PBL group mean increase from the pretest to the posttest and the TDI group mean increase from the pretest to the posttest is demonstrated. This difference is related to the significant decrease on one pretest to posttest score for one student, who was demonstrating nonconforming behaviors, within the PBL group on instructional period day four. Because of the decrease in score, the mean for the PBL group decreased.
Therefore, the researcher then conducted the same Case Summaries test but with this student’s scores omitted. Table 5 illustrated the Case Summary data and the mean point difference from the pretest to the posttest for the PBL and TDI group with one student removed from the PBL group.

Table 5
Case summary of means with one student removed from PBL group

<table>
<thead>
<tr>
<th>Group</th>
<th>Pretest Mean with One Student Removed from PBL Group</th>
<th>Posttest Mean with One Student Removed from PBL Group</th>
<th>Mean Point Difference Pretest to Posttest with One Student Removed from PBL Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBL</td>
<td>35.667</td>
<td>63.33</td>
<td>27.663</td>
</tr>
<tr>
<td>TDI</td>
<td>51.2500</td>
<td>78.333</td>
<td>27.083</td>
</tr>
</tbody>
</table>

Data from Table 5 Case Summary Means with one student removed from PBL group indicated both groups had an increase in their mean score from the pretest to the posttest. The treatment group using the PBL method of instruction had a mean increase from the pretest to the posttest of 27.663. The TDI group also demonstrated a mean increase from the pretest to the posttest of 27.083. Overall, both groups had an increase in their means from the pretest to the posttest with the PBL group having a greater increase by 0.58 points. The researcher further calculated the mean point difference between the TDI and the PBL pretest and the TDI and PBL posttest. The point difference for the pretest between the two groups calculated to be 15.583 and the point difference for the posttest between the two groups was 15. With the one student’s score from the PBL group removed, the mean point difference from pretest to posttest was higher for the PBL group. However, when analyzing this data, it must be noted there was an inherent difference between the groups with the TDI pretest mean already being higher than the
PBL group. Since both groups demonstrated an increase in their means from pretest to posttest, of interest is whether the increase in means is significant for both groups.

To further research the data to see if there was a difference in concept learning between TDI or PBL, the researcher ran Independent Samples Test (t-test) for the pretests and the posttests between the two groups. The t-test for Equality of Means was used in order to determine if there was a difference among the means of the treatment group using PBL and the traditional group using TDI. This t-test was run at the 95% confidence level. The following data resulted for the pretest.

**Table 6**

*T-test for equality of means for pretest between the TDI and PBL groups*

<table>
<thead>
<tr>
<th>t-test for Equality of Means</th>
<th>T</th>
<th>Df</th>
<th>Sig. (2-tailed)</th>
<th>Mean Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td>-1.780</td>
<td>38</td>
<td>.083</td>
<td>-31.39522</td>
</tr>
</tbody>
</table>

Data from the t-test for Equality of Means for the pretest between the two groups indicated the mean of the PBL group was less than the mean of the TDI group (Table 5). Despite the mean difference, analysis of the data shows that this difference was not significant \( t(38) = -1.780, p = .083 \).

The second t-test for Equality of Means was used in order to determine whether there was a difference between the posttest means of the PBL group and the TDI group. The independent t-test was run at the 95% confidence level. Table 7 outlines the result of this independent t-test.
Table 7
*T-test for equality of means for posttest between TDI and PBL*

<table>
<thead>
<tr>
<th>t-test for Equality of Means</th>
<th>T</th>
<th>Df</th>
<th>Sig. (2-tailed)</th>
<th>Mean Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posttest Equal variances assumed</td>
<td>-2.144</td>
<td>37</td>
<td>.039</td>
<td>-15.0000</td>
</tr>
</tbody>
</table>

The Independent Samples test $t$-test for Equality of Means for posttest between the groups revealed there was a significant difference between the means of the posttest scores for the PBL group and the TDI group $t(37) = -2.144, p = .039$.

A final Independent Samples $t$-test for Equality of Means was run. For this specific $t$-test, the comparison between the PBL group and TDI group on the change score was completed. Group Statistics are presented in Table 8 followed by the results of the Independent Samples $t$-test, which was run at the 95% confidence level.

Table 8
*Group statistics for change increase of score in PBL and TDI classroom*

<table>
<thead>
<tr>
<th>Students</th>
<th>N</th>
<th>Change Increase</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChangeInc</td>
<td>PBL</td>
<td>15</td>
<td>27.6667</td>
<td>26.04026</td>
</tr>
<tr>
<td>TDI</td>
<td>24</td>
<td>27.0833</td>
<td>26.24784</td>
<td>5.35782</td>
</tr>
</tbody>
</table>
Table 9
T-test for equality of means for change increase score among PBL and TDI group

<table>
<thead>
<tr>
<th>t-test for Equality of Means</th>
<th>T</th>
<th>Df</th>
<th>Sig. (2-tailed)</th>
<th>Mean Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChangeInc</td>
<td>.068</td>
<td>37</td>
<td>.946</td>
<td>-18.95833</td>
</tr>
</tbody>
</table>

This analysis of the change increase of score had one student’s score not included in the analysis because of a nonconforming behavior on a particular day. Results from the Independent t-test for Equality of Means in which the experimental classroom of using PBL and the control classroom using TDI’s were compared on the change score (increase in score) indicated no significant difference in change from pretest to posttest between the groups, \( t(37) = .068, p = .946 \).

Based on the Case Summary Means and Independent t-test for Equality of Means tests conducted between the treatment group using PBL and the traditional group using TDI, the researcher can conclude both groups did have an increase in points overall from the pretest to the posttest. However, the traditional group using TDI method of instruction had produced higher scores on the pretest when compared to the treatment group using PBL. The results indicated that while the mean scores for both groups increased from the pretest to the posttest, the mean change was not significantly different when comparing the groups.

The Case Summary of Means test and the Independent t-test of Equality of Means test was run by using students’ scores in the PBL group and the TDI group. As noted, one student’s score was omitted due to nonconforming behaviors. These tests concluded
results that were based on nine of ten special education students within the study. However, when discussing the special education aspect of learning, the crux of concept learning is always determined by looking at individual growth. Therefore, single subject research and analyzing individual student growth is more beneficial in order to determine which instructional strategy was more effective on student concept learning.

By using Microsoft Excel to create double line graphs for each student, concept learning growth was represented for each student in the study. These double-line graphs indicated the pretest percentage and posttest percentage for each of the four days of instruction. The double-line graphs have allowed analysis of which students demonstrated a more significant growth in concept learning. From this analysis, an indication of which instructional strategy had more of an impact on student concept learning could be determined.

In order to represent single subject research data, the following are double line graphs representing pretest and posttest scores for the four days of instruction for this study for each student. Those students in the traditional teacher directed instruction classroom will be represented first.
Figure 2. Student 1 in teacher directed instruction classroom. This figure represents pretest and posttest scores over four instructional days.

Student one was a student in the teacher directed instruction classroom. Student one was identified as learning support and did not have a mathematics goal in the IEP. Based on the results of the data, student one demonstrated individual growth on concept learning three of the four days of instruction. One of the days of instruction, student one remained consistent with the score on the pretest and posttest. The greatest percentage of concept growth for student one occurred on day one, with an increase of 40% from the pretest to the posttest. Both days three and four, the student achieved a 25% increase in concept learning growth from the pretest to the posttest. Using the data for student one, an increase in concept learning occurred within the teacher directed instruction classroom.
Figure 3. Student 2 in teacher directed instruction classroom. This figure represents pretest and posttest scores over four instructional days.

Student two participated in the teacher directed instruction classroom. This student was identified as learning support and had a mathematics goal within the IEP. Based on the results of the double line graph, student two had an increase in concept learning and demonstrated growth in learning for each of the four days of instruction. The largest increase of concept growth was on day two, with an increase of 75% from the pretest to the posttest. The smallest amount of growth was seen on day three with a 25% increase. Data from this double line graph indicates student two had personal growth in concept learning while being instructed in the teacher directed instruction classroom.
Figure 4. Student 3 in teacher directed instruction classroom. This figure represents pretest and posttest scores over four instructional days.

Student three was identified as a learning support student and did not have a mathematics goal within the IEP. Based on the results of the double line, student three indicated growth in concept learning on two of the four days. The largest percentage of growth occurred on day four with a 25% increase in concept learning from the pretest to the posttest. Student two did remain consistent with 100% accuracy for concept learning on day two. On day three, the student demonstrated a decrease of 25% in concept learning. Data indicates student three did demonstrate an increase in concept learning for two of the four days of instruction. However there was a decrease in concept learning for student three.
Student four who participated in the traditional teacher directed instruction classroom was identified as emotional support and did have a mathematics goal within the IEP. Based on the results of the double-line graph, student four demonstrated growth in concept learning over the four days of instruction. The highest percentage of concept learning growth occurred on day two in which a 100% increase in concept learning occurred. Days three and four indicated the smallest increase in concept learning with both days indicating 25% growth from the pretest to the posttest.
Figure 6. Student 5 in teacher directed instruction classroom. This figure represents pretest and posttest scores over four instructional days.

Student five who participated in the traditional teacher directed instruction classroom was identified as learning support and did not have a mathematics goal within the IEP. Results from the data indicate student five showed growth in concept learning on two of the four days of instruction. The other two days of instruction, the student remained consistent with pretest and posttest scores. Student five demonstrated the highest increase of concept learning on day one with a 40% increase between the pretest and the posttest. The smallest increase of concept learning occurred on day three and was calculated as a 25% increase. On day two, the student maintained 100% understanding of the concept. However, on day four the student maintained the same score on the pretest and posttest but the concept learning score was minimal at 25%.
Figure 7. Student 6 in teacher directed instruction classroom. This figure represents pretest and posttest scores over four instructional days.

Student six participated in the traditional teacher directed instruction classroom. Student six was identified as Emotional Support and did have a mathematics goal within the IEP. Based on the results of the data, student six showed an increase in concept learning on three of the four days of instruction. The largest increase in concept learning was on day two with a 50% increase from the pretest to the posttest. A small increase in concept learning was noted on day one with a 20% increase from the pretest to the posttest percentage. On day three, student six maintained a consistent score from the pretest to the posttest, however, the score was minimal at 25%.

Overall, all students in the traditional teacher directed instruction classroom demonstrated concept learning growth for at least two of the four days of instruction. Two of the students, student two and student four, exhibited concept learning growth for all four days of instruction during the study. Students one and six showed growth among concept learning for three of the four days of instruction. Students three and five demonstrated concept growth for two of the four instructional days. Three of the students
maintained a consistent score on the pretest and the posttest for one of the instructional days. Finally, only one student displayed a decrease in concept learning for one of the instructional days.

The following double-line graphs represent the concept learning growth per student within the treatment group using PBL method of instruction.

![Graph](image)

*Figure 8. Student 1 in treatment group using PBL method of instruction classroom. This figure represents pretest and posttest scores over four instructional days.*

Student one in the treatment group using PBL method of instruction was identified as learning support and did not have a mathematics goal within the IEP. Based on the results of the data, student one demonstrated growth in concept learning on three of the four instructional days. For one day, day one, the student remained consistent with a 40% score on both the pretest and posttest. On day two, this student showed the greatest increase in concept learning growth as indicated by the 50% increase from the pretest to the posttest. For days three and four, student one in the treatment group using PBL method of instruction achieved concept learning growth with a 25% increase on both days.
Figure 9. Student 2 in treatment group using PBL method of instruction classroom. This figure represents pretest and posttest scores over four instructional days.

Student two in the treatment group using PBL method of instruction was identified as learning support and did not have a mathematical goal in the IEP. Data from the study indicates student two achieved an increase in concept learning growth for one of the four days of instruction. The remaining three days resulted in a consistent score on the pretest and posttest and a decrease in score from the pretest to the posttest. Student two displayed a significant decrease in concept learning on day four with a decrease of 50% from the pretest to the posttest. The smallest increase in concept learning occurred on day two as noted by the 25% increase from the pretest percentage to the posttest percentage. Of the two days in which a consistent score was achieved, day one indicated a minimal concept learning percentage with 40% on both the pretest and posttest.
Student three who participated in the treatment group using PBL method of instruction was identified as learning support and did not have a mathematics goal within the IEP. Data indicates student three presented an increase in concept learning on three of the four days of instruction. The remaining day of instruction, day one, indicated a consistent score on the pretest and posttest with a score of 60%. Student three had the greatest increase in concept learning on days two and four with both days having a 75% increase in concept learning. The smallest increase in concept learning was on day three with a 50% increase.
Figure 11. Student 4 in treatment group using PBL method of instruction classroom. This figure represents pretest and posttest scores over four instructional days.

The final student in the treatment group using PBL method of instruction was identified as learning support and did have a mathematics goal in the IEP. Data on the achievement of student four indicates an increase in concept learning growth on three of the four instructional days. The remaining day, day three, showed a consistent score between the pretest and the posttest. Student four displayed the highest increase of concept learning on day one with a 40% increase. On days two and four, the student achieved an increase of 25% from the pretest to the posttest.

Overall data from the individual students from the treatment group using PBL method of instruction presented all students achieving growth on concept learning for at least two of the four days of instruction. Three students, students one, three, and four, demonstrated concept learning growth on three of the four instructional days. Data from the treatment group further indicated all four of the students had one day in which the pretest and posttest scores remained the same, meaning students achieved the same score
on the pretest and the posttest for a particular concept that was taught. One student, student two, had two days of identical scores on the pretest and posttest.

**Conclusion of Data**

Data from both inclusion groups revealed concept learning increased among individuals in both settings. Individual students in the traditional TDI classroom presented at least two of the four instructional periods with an increase in concept learning. Among those individual students, two students increased in concept learning growth for all four days of instruction. Two students in the traditional TDI classroom showed growth in concept learning on three of the four days. For the treatment group using PBL method of instruction, all students had an increase in concept learning for at least two of the four days of instruction. Within the treatment group, three of the four students had three days of concept learning growth. Consistent scores between the pretest and posttest were revealed in the traditional TDI classroom and treatment group using PBL with a total of eight students having consistent scores for at least one period of instruction. Finally, the data illustrated two students had a decrease in concept learning on one period of instruction of the study.

Since all students demonstrated individual growth on concept learning on at least two or more periods of instructional time, data would indicate there is no difference in concept learning among students in teacher directed instruction mathematics classrooms and project-based learning mathematics classrooms.

**Research Question Four- Findings and Analysis**

Research Question #4: Do inclusion students prefer direct instruction or project-based learning instruction?
Hypothesis: Students prefer project-based learning instruction over direct instruction.

Data for research question four included both quantitative and qualitative data. For the quantitative data, data was collected through the student survey (Appendix C) created using Kong, Wong, and Lam (2003) research in student attentiveness in mathematics. In order to identify the attentiveness of the students during instructional delivery, a self-scoring behavioral engagement rating scale was used. Using a Likert-type scale measure of 1-5, with 1= Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree, and 5= Strongly Agree, students self-assessed individual attentiveness being displayed during mathematical instruction. At the end of the survey administration, the mean responses for each question was calculated. For the purpose of this study, the researcher specifically examined the mean scores of two specific survey questions. In particular, the means of survey question number two, “I take an active part in class discussion,” and survey question number six, “I always take part in the discussion in mathematics class” were analyzed and will be reported. The mean responses of these two specific questions identified how the special education students perceived their individual active engagement in the mathematics classroom.

It must be noted that of the ten participants in this study, only nine students completed the survey. One student was absent for a period of time and did not complete the survey. Results from the survey are based on nine student responses.

Quantitative data from the surveys indicated the two questions which were the focus of this study had the lowest mean score as compared to the other four questions. For question two, “I take an active part in class discussion”, the mean score was 3.9 out of 5. Three of the nine students indicated a score of 5, strongly agree, for this question
while four of the nine students gave a score of 3, neutral. For question number six, “I always take part in the discussion in mathematics class,” the mean score was 3.8 out of 5. Two of the nine students displayed a score of 5, strongly agree, while four of the nine students indicated a score of 3, neutral. Based on these mean scores, students with identified needs who were part of the study demonstrated they tend to lean towards being more actively engaged in discussions while instruction is occurring.

The final piece of data for this study, the qualitative data, was gathered from the second portion of the student surveys (Appendix C). In order to answer the fourth research question, “Do inclusion students prefer direct instruction or project-based learning?” the researcher analyzed the student responses from the researcher created open-ended questions which focused on students’ preferences to math instruction, including parts of math that are enjoyable, ways to make math more enjoyable, and ways to help individuals learn more in math. For the purpose of this study, and to answer research question number four, the first open-ended question, “Do you prefer to learn by having the teacher lecture or by having hands-on activities? Explain why you prefer this way of learning.” was analyzed.

Analysis of the first question, Do you prefer to learn by having the teacher lecture or by having hands-on activities yielded 67% of the inclusion students indicating the preference for learning was teacher lecture. Only 33% of the students chose hands-on activities as the preference for learning. Common themes that emerged from the students choosing teacher lecture as the preferred method of learning included needing to have details in order to know what to do, focus better when teacher is instructing, and understand concepts better when teacher gives instruction. The themes displayed among
the students who chose hands-on activities for learning included learning is more fun, gets attention, and difficulty listening during lecture. Based on the data, the hypothesis for research question four was not supported. Students demonstrated a preference of learning through teacher lecture instead of hands-on activities.

Findings and results for each of the four research questions was presented in this chapter. In Chapter 5, discussions of results for each of the four research questions is provided. Additionally, how the results of this study can contribute to the field of educational leadership and recommendations and implications for educational leadership for social justice is discussed. Limitations to this study are noted in chapter 5. The conclusion of chapter 5 focuses on the implications for leadership agenda and growth.
Chapter 5

Purpose of Study

The purpose of this study is to identify which instructional strategy, teacher directed instruction or project-based learning instruction, is more effective on increasing conceptual learning among students who have been identified with special education needs and who participate in the regular education sixth grade mathematics setting. Additionally, the study was implemented to determine whether or not an opportunity of an increase in active engagement learning would lead to improvement in concept learning in sixth grade inclusion students. Fisher et al. (1980) indicated within the classroom where instruction is being delivered, student engagement in the instruction can range from between 50-90%. This variability in engagement can have an effect on learning and achievement. Supporting this is Kurz, Talapatra, and Roach (2012) in which the researchers stated, “when students are unengaged and lack motivation, their actual level of achievement is underestimated” (p. 46). By observing active engagement time in instruction, analyzing pretest and posttest scores for each individual student, and by gathering the students’ preference on the instructional style of learning they prefer, conclusions on which instructional strategy would be conducive to students with identified needs who participate in the inclusion mathematics setting can be drawn. These conclusions will allow the stakeholders in the context of this study to develop mathematical instruction which will be conducive to middle level learners, in particular those students with identified needs.

Specifically the research sought to determine the effectiveness of the instructional delivery provided to students with identified needs who participate in the sixth grade
inclusion mathematics classroom. The study utilized a mixed-method approach that allowed for active and passive engagement observations, pretest and posttest measures to be examined, and student self-assessment surveys to be administered in order to collect data for the following research questions:

1) To what extent do inclusion students engage in active and passive time in project-based learning and direct instruction?

2) What is the relationship between active engagement time and concept learning?

3) What is the difference in concept learning between students in teacher directed instruction mathematics classes and students in project-based learning mathematics classes?

4) Do inclusion students prefer direct instruction or project-based learning?

Results of the study, as noted in Chapter 4, indicated students do engage in active engagement more in PBL instruction than in TDI instruction. Although, findings showed there was a significant negative correlation with a moderate relationship between active engagement time and concept learning when analyzing the data of each group. However, when analyzing the data for each student, data did reveal all students, regardless of which instructional strategy was being utilized, demonstrated an increase in scores from pretest to posttest on at least two or more days of instruction. Finally, the results of the student survey indicated special needs students were neutral, or not having a strong preference for active engagement in instruction. Overall, a larger percentage of students preferred teacher directed instruction over project-based learning instruction.
The following is a more detailed discussion of findings from the study. In addition, recommendations, implications, and limitations will be discussed.

**Discussion of the Findings**

In this section, each research question will be noted and the findings from the study will be provided. In addition to the findings, a discussion and interpretation of the data will be given.

**Findings on Research Question One**

Research question one, ‘To what extent do inclusion students engage in active and passive time in project-based learning and teacher directed instruction?’ yielded findings that indicated students in the PBL classroom were more actively engaged than those students in the TDI classroom (see Figure 1). Over the four occasions of instruction, students in the PBL classroom were actively engaged an average of 28.5% more of the time than those of the time in the TDI classroom. Students in the PBL classroom were observed being actively engaged in instruction as noted by discovery learning in peer groups, peer discussions, using projects or activities to guide learning, and asking questions during instructional time or cooperative group work. On the contrary, students in the TDI classroom were observed being actively engaged by answering teacher questions during instruction, copying notes provided by the teacher, and working with a peer on independent group work.

Although PBL instruction incorporates a higher percentage of active engagement, a guideline to follow would be to not form the notion that TDI does not contain a comparable amount of active engagement time. Some practitioners in education may view TDI instruction as passive engagement for students based on the structure of TDI.
Yet, it is possible to include active engagement within this teaching strategy. For example in this study, the TDI teacher asked critical thinking questions during lecture, allowed students to discuss or debate when conflicting answers occur, permitted students to define mathematical terms before giving a definition, and gave students time to work with peers. The last strategy is especially significant to students with identified needs, as giving time to work with peers allowed students to learn from their peers. Vygotsky’s social constructivism provides the theoretical foundation for this strategy in which students form ideas and learn concepts when interactions between peers or the teacher occurs. By simply incorporating a portion of interaction between students, internalization of knowledge can be formed which will allow students to become more actively engaged in instruction.

Findings on Research Question Two

*What is the relationship between active engagement time and concept learning?*

Results from the study indicated there was a significant negative relationship between active engagement time and concept learning (See Table 1). The students who engaged in more active time over the course of the lessons, showed a decrease in concept learning from pretest to posttest. Further tests, the Pearson ($r$) correlation tests, showed there was a significant correlation between the pretest and posttest scores for the TDI group ($r(24)=.483, p=.017$), but there was no significant correlation between the pretest and posttest scores for the PBL group ($r(16)=.018, p=.946$). Overall, when analyzing each students’ progress individually, all students had an increase in scores from the pretest to posttest. This suggested that the increased engagement time that is built in as an element of PBL did not have an effect on concept learning.
For purposes of this study, the observation of active engagement time occurred as a group measure and focused on opportunities for active engagement in instructional delivery. By observing the instructional delivery in order to calculate active engagement time, this limits engagement time opportunity to only that which is provided during the delivery. It is only indicated there was an opportunity for active engagement in instruction. However, data calculated from the self-rating survey, which was administered to the students in this study, indicated a mean response of 3.8 and 3.9, when students were asked about their engagement in class discussions and instruction. This rating suggested students with identified needs lean towards being more actively engaged in the instruction. Therefore, in terms of action steps for this particular research question, it would be beneficial to look at individual student’s active engagement time with regards to concept learning.

Before examining individual active engagement time and concept learning, educators need to produce safe classroom environments that encourage students to participate, learn from mistakes, and to take risks when challenges are presented. This parallels Vygotsky’s theory on learning in which students need to understand and value the concepts being taught. Each student needs to know the value of learning and become vested in their learning. Without this type of environment, students will not take an active part in learning and will refrain from participating. As stated by Featherstone et al (2011), “Participation turns out to be a crucial word here: students do not learn unless they contribute actively” (p. 29). Simply providing opportunities for active engagement will not lead to all students participating. When looking at the impact of active engagement time on concept learning, it is important to instruct students, especially those
students with identified needs, on how to engage and actively participate in instruction.

Strategies to foster active participation in class would include discussion of various ways to problem solve instead of one specific one to find an answer, allow students to discuss mistakes and talk with peers on other solutions, permit students to discuss what has been learned by working with their peers, and create an environment that fosters improvement instead of completion of work (Meyer, Turner, & Spencer, 1997).

**Findings on Research Question Three**

*What is the difference in concept learning between students in teacher directed instruction mathematics classrooms and students in project-based learning mathematics classrooms?*

In order to identify whether there was a difference in concept learning among students in the project-based learning classroom and the teacher directed instructed classroom, the researcher ran Case Summaries in SPSS to report the means of the pretests and posttests for the PBL group and means of the pretest and posttest of the TDI group. The following data was ran using all students’ scores who were part of the study. By subtracting the means of pretest from the posttest of the PBL group, the PBL group demonstrated a mean increase of 22.85 points. Using the same calculation, the TDI group showed 27.083 mean point increase. The researcher did note the traditional TDI group’s pretest scores were inherently different from the treatment group using PBL method of instruction in that the TDI group’s pretest scores were higher with a 14.68 point difference. Based on these data, there was no difference between concept learning in the PBL classroom and the TDI classroom as both groups demonstrated an increase in their scores.
However, due to one student’s score on day four in the PBL group having a
decrease from the pretest to the posttest due to nonconforming behavior, the researcher
removed this particular student’s scores and reran the Case Summaries in SPSS. With
this student’s score removed from the PBL data, the PBL group demonstrated a mean
point difference of 27.663, which was a 4.8505 increase from when the student was
included. The mean point difference of the PBL group and the TDI group then became
15 which was a 3.958 increase from when the student was included. When removing the
one student’s scores from the PBL group, the PBL group demonstrated a slight increase
in mean point difference over the TDI group.

Additional independent t-tests were run in order to identify whether there was a
difference in concept learning among the PBL group and the TDI group. Using the t-test
for Equality of Means, the mean for all students on the pretest indicated there was no
significant difference between the two groups, $t(37) = -1.780, p = .083$. When running the
same tests for the posttests, the Independent t-test for Equality of Means yielded $t(37) =
-2.144, p = .039$. When the independent t-test comparing the PBL group and the TDI
groups change score (increase of score) was completed, the data indicated there was no
significant difference in change from the pretest to the posttest between the groups
($t(37) = .068, p = .946$).

Although the comparison of increase scores and means among the groups
indicated no significant difference in change from pretest to posttest, it was necessary to
examine each individual students’ score from the pretest to the posttest for each of the
four periods of instruction. Since special education progress is measured based on an
individual student’s progress and not based on a group’s progress, the individual
representation of each student’s increase on the pretest to the posttest was important to
determine whether all students demonstrated learning of the particular concept that was
taught. Data from the study indicated all students in the two classrooms demonstrated an
increase in concept learning for at least two of the four instructional periods (See figures
2-11 in Chapter 4). For two of the four instructional periods, students in the TDI
classroom demonstrated an increase in concept learning. Among those students in the
traditional TDI classroom, two students increased in concept learning growth for all four
days of instruction. Two students in the traditional TDI classroom showed growth in
concept learning on three of the four days. For the treatment group using PBL method of
instruction, all students had an increase in concept learning for at least two of the four
instructional periods. Within the treatment group, three of the four students showed an
increase in concept learning on three of the four testing occasions. For at least one period
of testing instruction, there was no change in scores between the pretest and posttest for
eight students. As the data indicate, on one testing occasion, two students registered a
decrease in their scores on the posttest.

Results from this study indicate concept learning occurred in both classrooms,
regardless of the instructional strategy that was being implemented. By being included in
the general education classroom and being exposed to Standards-based curriculum,
inclusion students have more opportunity to learn. This finding is supported by
Lawrence-Brown (2004), Elliott and Bartlett (2016) and Blank and Smithson (2014) who,
in their research found that when students with disabilities are included in the general
education classroom, math achievement scores tend to be higher. Even though all
students did not demonstrate an increase in concept learning on all four instructional
periods, the exposure to the content and concepts has allowed the students to form a basis of knowledge that will support them in the next phase of math concepts.

With reference to the findings of this study, as a school practitioner, it is important to understand there is more than one instructional strategy to use in order to produce concept learning. The treatment group using PBL method of instruction permitted students to have authentic instruction which was based on real-life scenarios and to have hands-on learning activities to guide learning. Yet, the traditional TDI group demonstrated increase in concept learning simply by being asked questions during teacher lecture and having the opportunity to work with a peer on completing practice problems.

**Findings of Research Question Four**

Do inclusion students prefer direct instruction or project-based learning instruction?

Findings from the qualitative data for research question four concluded students in the traditional TDI group and the treatment group using the PBL method of instruction preferred direct instruction over project-based learning. Of the nine students surveyed, 67% of the students preferred direct instruction. Students who chose direct instruction stated teacher instruction allowed them to know what to do and provided them with details on how to solve math problems. Being able to focus, stay on-task, and learn from the teacher so a mistake isn’t made or the problem is solved in the wrong way were additional reasons students preferred TDI. The opposite reasons were given for those students who preferred PBL. Of the 33% of the students choosing PBL, students stated being in lecture or TDI makes it hard to listen and focus. Students whose preference was PBL also indicated PBL allows for learning to be easier and it is more fun. These results
were not what I expected, as I thought students would prefer PBL over TDI for the reason of not being able to focus while the teacher is talking. Furthermore, the results contradict Kong, Wong, and Lam (2003) study in which students who were surveyed indicated listening to teachers and doing math exercises was boring. Based on the survey results, students with identified needs in the inclusion setting felt the opposite in that having teachers instruct and doing problems was more beneficial to learning.

It is appropriate that special education students participating in the inclusion mathematics classroom would choose TDI over PBL due to the structure of the class. Special education students often prefer a highly structured classroom environment which maintains a routine and consistency. In the TDI classroom for this study, the classroom environment incorporates all of these aspects. Each daily routine is consistent and all students know what is expected and what will occur in the classroom. When in a PBL classroom, the structure can be inconsistent and can become noisy. For students with identified needs, these external stimuli can lead to a decrease in focus and an increase in disengagement in learning.

Even though students preferred TDI over PBL instruction, educators need to understand the benefits PBL. Filippatou and Kaldi (2010) assert students with learning needs who participate in PBL can increase academic achievement, self-efficacy, and cooperative group skills. For this reason, strategies for developing instruction should focus on both instructional strategies.

**Conclusions of Findings**

The results of the data collected for this study indicated the instructional strategy of PBL does produce more active engagement than TDI instruction. Although there was
a greater percentage of active engagement in PBL, TDI instruction did incorporate aspects of active engagement. From the observations, active engagement looked different in the two classrooms with the PBL group being given more time to work collaboratively and work on a project pertaining to real life experience. For the TDI group, active engagement time differed in style with the teacher asking questions to promote participation and students being given time to work with partners on practice problems.

When analyzing whether there was a relationship between active engagement time and concept learning, the results of the data yielded a significant negative relationship. It was concluded as active engagement time increased in the classroom, students concept learning scores decreased. With a significant negative relationship between active engagement time and concept learning, data were collected to analyze whether there was a difference in concept learning between students in the TDI mathematics class and the PBL classroom. Results of the data from the Case Summaries mean test indicated there was not a significant correlation between pretest and posttest scores for the PBL group. On the other hand, the TDI group did yield a significant correlation between the pretest and posttest. The final Case Summaries test was run using all students within the study and the results indicated there was a significant positive correlation on the pretest and posttest. Additional Independent t-tests for Equality of Means supported the final Case Summaries test in that there was a significant difference on the posttest when all students were selected for the group. The Independent t-test of Equality of Means further supported there was no significant difference for the pretest scores between the two groups. Based on the data, the traditional group using
TDI demonstrated a higher difference in concept learning when compared to the treatment group using PBL. However, the traditional TDI group started with higher pretest scores. Which suggested that the group might have been more advanced with regard to mathematical concepts. If this was the case, then it would be expected that they would demonstrate a greater gain in scores from pretest to posttest, and to differ significantly from the PBL group on the posttest.

For the previous analysis, group data was utilized to determine if there was a difference in concept learning among the TDI and PBL classrooms. However, in the special education field it is critical to examine the individual growth of each student with special needs. Therefore, it was important to provide individual student percentages on the pretests and posttests in order to indicate the growth among each student in the study. All students in the study demonstrated concept learning for at least two of the four days of the study. There were only two incidents in a decrease in concept learning over the four day study. Finally, eight of the ten students had maintained no change in score from the pretest to the posttest for at least one of the instructional days. Overall, concept learning did occur among all students in the study in both the TDI group and the PBL group.

The final findings of the study indicated students preferred the TDI classroom over the PBL classroom. Students indicated they preferred TDI because it allowed them to understand how to solve the math problems better, provided more opportunity to focus on instruction, and allowed them to learn more details.
**Contributions to the Field of Educational Leadership**

Results of this study have indicated both TDI instruction and PBL instruction can be an effective instructional strategy in inclusion mathematics classrooms. Both instructional strategies allow for some type of active engagement in learning and have demonstrated concept learning among students. Yet, students identified with special education needs continue to demonstrate below proficiency scores on state standardized assessments even though results on summative and formative assessments in the classroom indicate students have mastered the concept. With this discrepancy, it is obvious there are improvements that need to be made in order to provide inclusion mathematics students with more proficiency, not only on state assessments, but also in everyday concept learning. However, before an increase in proficiency occurs on state assessments, it is imperative to observe and evaluate the instruction occurring in the inclusion classrooms.

One way to improve concept learning among inclusion students within the mathematics classroom is to provide professional development on inclusion strategies and effective instructional strategies. Many regular education teachers do not have a background in the field of special education. Most training on inclusion strategies and special education needs are provided in three hour workshops on a given in-service day annually. In order to completely understand inclusion practices, more formal training needs to occur for the general education teachers. Likewise, professional development needs to occur on instructional strategies to utilize in the classroom.

Teacher directed instruction has become a highly utilized instructional
strategy since teacher evaluations are now based on standardized assessment scores. Having to cover a calendar of topics in a given amount of time has led teachers to become the facilitator of instruction and bypass interactive or group activities during instructional time. If given formal professional development training on effective instructional strategies, teachers can begin to see how other strategies incorporate the standards and curriculum that need to be learned. Formal professional development on instructional strategies would also allow teachers to clarify preconceived notions about certain instructional strategies. For example, one myth about PBL instruction is that the teacher must not engage in direct instruction and should allow the students to take the lead in learning. This myth is simply not true, as the teacher plays an important role in PBL instruction. The role of the teacher in PBL instruction is to become the facilitator of the learning. Through careful planning and preparation, the teacher’s role is to ensure the curriculum standards are being learned through the PBL process. By providing professional development to teachers on a variety of instructional strategies, commitment to nontraditional teaching practices can occur.

With regards to the use of PBL in the classroom, many researchers have identified PBL as an effective strategy which increases concept learning among students with identified needs. However, based on the results of this study, PBL did not produce significant concept learning scores among the inclusion students within the study. Reasons for PBL to not be effective when solely used in instruction includes special education students needing a structured environment with daily consistent routines. Students with identified needs rely on consistency in schedules and learning. The review and repetition of teacher directed instruction allows the special education inclusion
students to be exposed to concepts and understand how the concepts build upon each other. Additionally, using PBL instruction incorporates additional stimuli to the environment, which could have a negative effect on special education students’ focus and concentration. By understanding each individual inclusion student, the teacher will be able to provide a safe environment in which all students can engage in learning.

Creating the classroom environment conducive for optimum learning with students with identified needs, the special education teacher needs to work closely with the general education teacher in order to develop lessons which utilize effective teaching practices. As planning for instruction occurs between the regular and special education teacher, it is crucial to remember one teaching strategy does not work for the entire classroom of learners. Students with identified needs often learn in a variety of ways. What works for one student may not work for the other. Therefore, allowing for differentiation in instructional strategies and delivery of instruction is another improvement which needs to be made in inclusive instructional delivery. In order to plan differentiated instruction in the inclusion setting, the administrator in the building must provide regular and special education teachers common planning time to prepare lessons. Opportunities to plan lessons, analyze data, and discuss observations within the classroom is imperative to student concept learning and providing a learning environment which is conducive to inclusion students.

Based on the results of this study, it is important focus on the individual special education student within an inclusion classroom. The major part of special education instruction and progress monitoring is the growth individual students make on IEP goals and concept learning in the classroom. When analyzing concept learning in the inclusion
classroom, regular and special education teachers need to evaluate the growth of each student and not evaluate the academic growth of special education students as a cumulative group.

In order to increase concept learning, which then could lead to an increase in proficiency on state assessments, potential solutions would be to analyze the instruction occurring within the inclusion classrooms, provide professional development on inclusion and teaching strategies, and to allow regular and special education teachers common planning time to prepare lessons that would meet the learning styles of the students with identified needs who are participating in the inclusion setting.

**Recommendations and Implications for Educational Leadership for Social Justice**

The concern that lead to conducting this study was the lack of progress with students with special needs on state standardized assessments. In order to do this, it was essential to first examine variables contributing to opportunity to learn among students within the inclusion setting and evaluate effective instructional strategies which could be utilized in sixth grade inclusion mathematics classes.

Before beginning to prepare instruction for inclusion mathematics settings, regular and special education teacher must realize special education students placed in inclusion settings often come with a sense of failure and lack self-efficacy. Lawrence-Brown (2004) contends these students with disabilities often have the knowledge and skills to learn the concepts being taught, but they often cannot learn because of the way it is being taught. Furthermore, he states, “a pattern of failure over time causes these students to gradually lose faith in themselves as learner, another powerful barrier to their success” (p. 40). This sense of failure in special education students can then lead to
acting out behaviors in class or to students refusing to do assignments and work. When this occurs, regular education teachers will often perceive the special education student as unmotivated or not able to learn.

The perception that students with identified needs are not able to learn the content, leads educators to lower opportunities to learn and expectations for those students. At that moment, social injustice occurs as special education students are not being given the same educational opportunities to learn as the students without disabilities. Brophy (1983), Lawrence-Brown (2004) and Kurz, Talapatra, and Roach (2012) contend lowering the expectations and opportunity to learn for special education students has a negative effect on academic achievement and OTL. Brophy (1983) asserts in order to increase OTL and student performance, students need to be engaged in curriculum and have an instructional setting which is supportive and provides high expectations. In order to support the students in overcoming a sense of failure, the regular and special education teachers need to understand that one approach to delivering instruction may not be effective to concept learning among students in inclusion settings.

Based on the findings of this study, recommendations for educational leadership to ensure equal opportunities to learn for students with identified needs in the inclusion mathematics classrooms would be for educators to begin delivering instruction that incorporates a variety of instructional strategies. Lawrence-Brown (2004) supports this recommendation by asserting, “responsible pedagogy no longer allows us to teach as if students all learned in one way, and at the same pace. If we are to maximize achievement of general education standards, we must increase our efforts to differentiate instruction” (p. 36). Results of this study suggest a way to differentiate instruction would be to
incorporate a combination of TDI and PBL instruction within the inclusion mathematics setting. Filippatou and Kaldi (2010) support TDI instruction as one means of instruction for students with disabilities. They are arguing that students with learning needs often have difficulties with using cognitive and metacognitive strategies. Because of this, more direct instruction maybe necessary in order to teach how to use the cognitive strategies and increase concept learning. Yet, the researchers also supported PBL learning as a way to increase engagement in learning among students with special education needs. Incorporating PBL instruction has been proven effective in increasing academic learning among students with identified needs and students without identified needs. PBL instruction allows students to collaborate and learn from each other. Featherstone et al (2011) support this statement of collaboration increasing learning by affirming, “heterogeneous groups provide opportunities for children who are confused about a topic to learn from others who understand it better” (p. 35). Using the theoretical framework of Vygotsky’s social constructivism, children learn by being active in their learning and through socialization, either by the support of a peer or a teacher. Giving students opportunities to partake in cooperative learning in turn promotes self-efficacy in students with special education needs.

Incorporating a variety of instructional strategies into the inclusion mathematics classroom is one recommendation for increasing social justice and OTL among students with identified needs. As the needs of the special education learners are met within the inclusion classroom, the sense of failure often felt by students with needs can begin to be eliminated. When instruction in the inclusion mathematics classroom allows students with needs to have a sense of accomplishment and achievement, self-efficacy will be
increased. Students will begin to develop a positive mindset about their abilities to do math and will become engaged in learning. This engagement will continue to increase concept learning and achievement, and the students will want to take on more challenging risks within the mathematics classroom. By accomplishing more challenging problems and seeing the capabilities in oneself, self-efficacy in students with educational needs increases, and they will begin to become more industrious in the classroom. With reference to Erikson’s theoretical framework becoming more industrious and less inferior will allow students with disabilities in the inclusion setting to develop knowledge, determination, and motivation.

Before focusing on overall proficiency of special education students on standardized assessments, it is essential to examine the pillars of OTL and evaluate the teaching strategies being used within inclusion classrooms. Additionally, it is necessary to ensure the instructional strategies being used are conducive to students with identified needs in order to ensure the sense of failure decreases and self-efficacy increases.

Limitations

This study did have several limitations. The first limitation would be the small sample size, N=10. Since the students were on the researcher’s caseload, the number of students to be observed was limited. Another limitation to the study was the level of mathematical need of the selected students. Some students had mathematics goals within the IEP, while others demonstrated higher mathematics skills that did not require a mathematics goal. Due to the limitation of convenient sampling and being in an educational setting, students were already assigned to classrooms. This led to another limitation in regards to classroom culture.
Another limitation would be the duration of the study with only four lessons being implemented. Learning is a process that takes time, therefore, only having four instruction periods of instruction limited the amount of concept learning that could occur. Basing learning on only four lessons does not accurately portray an individual student’s learning of concepts, especially when concepts in mathematics build upon each other. Another limitation to the study was the pretest and posttest being the same. By using the same assessment measure for pretests and posttests, a limitation to the study could be students remembering answers marked from the pretest and simply marking the same answer on the posttest.

A limitation to this study was in the data collection of active engagement time in order to determine if a relationship between active engagement time and concept learning existed. For this study, active engagement time was collected as a group observation based on the instructional delivery providing students with an opportunity to engage actively in the lesson. This was a limit to the study because the group active engagement time had to be compared to the group mean percentage of increase or decrease in concept learning. Using a group engagement time did not allow for looking at individual concept learning scores in relation to active engagement. Instead of collecting data as a collective group, it would have been more effective to collect active engagement time data on each individual student and then compare it to individual concept learning scores.

In regards to collecting data on active engagement time and passive engagement time, the final limitation of the study could be the definition of passive engagement time. As identified for the study, one definition of passive engagement time was listening to the teacher (teacher directed instruction). However, listening to the teacher can be
demonstrated as active engagement time as the student is engaging in the action of listening. In the future, the researcher would utilize a more concrete definition of passive engagement time which can be observed, such as off task behaviors of looking around the room, playing with items in/on desk, and drawing/doodling during teacher directed instruction. These actions would be more observable and would demonstrate the student being passively engaged in learning and in the instruction.

**Implications for Leadership Agenda and Growth**

When conducting the study to evaluate instructional strategies and the effect of active engagement on concept learning and OTL, several key lessons were learned. One key lesson learned was it is more effective to look at individual special education students participating in inclusion mathematics classrooms instead of examining the entire group of inclusion students. Students with IEPs have individualized academic goals and different needs when it comes to learning. Therefore, when measuring factors which effect concept learning, such as instructional strategies and active engagement, it is important to collect and analyze data for each individual student within an inclusion classroom. Individual concept learning growth and individual data on active engagement would indicate which instructional strategy would be more effective in the inclusion classroom.

During the study, I began to learn about teachers’ feelings about implementing PBL into the classroom and the hesitation to change the instructional strategies currently being implemented in their classrooms. One of the main hesitations for not implementing more PBL instruction or activities into the classroom was the specific criteria and deadlines mathematics teachers are given on the topics that need to be covered. Even
though mathematics teachers have 75-minute instructional blocks, the activities in which they can incorporate into the classroom is limited due to the calendar of topics that needs to be covered before PSSA assessments are administered. Additionally, the calendar of topics to be covered must remain consistent among all sixth grade math teachers in that all teachers should be covering the same lesson within a day of each other. Through this, I learned the value of real world application to math and cooperative learning to promote social growth which could be more intentionally reflected in the mathematics curriculum. Unfortunately, our mathematics curriculum, like in all schools in Pennsylvania, is being driven by state assessments.

When evaluating our sixth grade mathematics curriculum, for both regular education curriculum and special education curriculum, I realized the curriculum being used in the resource mathematics setting was not aligned to sixth grade state standards. The curriculum being used in the special education mathematics setting focuses on basic facts and computation skills. This definitely has an impact on concept learning and proficiency achievement on the state standardized assessments due to the fact students in the special education mathematics setting are not being exposed to the standard sixth grade mathematics curriculum.

Students in the general education mathematics setting and those students with needs in the inclusion mathematics settings were being delivered instruction which aligns to mathematics standards. All of the summative and formative assessments being used are aligned to the core standards. However, when collaborating with the stakeholders of the study, it was agreed the assessments for pretests and posttests need to be different.
Along with this, stakeholders agreed there needs to be a variety of formats for summative and formative assessments in order to evaluate mastery learning.

With all of these lessons learned, my leadership agenda would be to continue to collaborate with regular education teachers and develop mathematics lessons for inclusion settings which incorporate a variety of instructional strategies. In addition to creating lessons with the regular education teachers, the next level of work for me would be to train teachers on PBL and inclusion practices. Finally, I would like to examine the special education mathematics curriculum more closely and collaborate with stakeholders on how to align the content to state standards. This would require more reading on mathematics standards and how to align a curriculum to standards using supplemental resources. In addition, I would need to gather individual standardized assessment data on students participating in the special education mathematics curriculum to determine the level of proficiency the students are achieving on the state assessments.

**Conclusion of Study**

This mixed-method study focused on the effect of active engagement on opportunity to learn and concept learning among sixth grade special education students participating in the inclusion mathematical setting. By implementing two instructional strategies and using the theoretical frameworks of Vygotsky’s social constructivism and Erikson’s Stages of Psychosocial Development, findings indicated that there was a significant negative relationship between active engagement and concept learning. Although a higher percentage of active engagement was found in the treatment group using PBL method of instruction, active engagement was also observed in the traditional TDI group. However, active engagement looked different in the two classrooms. Results
of the study concluded students with identified needs increased concept learning in the traditional TDI classroom and in the treatment group using PBL. Therefore, there was no difference in concept learning based on instructional strategy. When surveyed about which instructional strategy was preferred, a surprising result indicated the majority of the special education students in the inclusion setting preferred TDI. Based on the findings of the study, recommendations for future for the field of education would be to use a variety of instructional strategies within an inclusion classroom and not rely on one way of delivering instruction. Conclusions drawn from the results also indicated the environment in which special education students learn needs to be structured and contain routine processes on a daily basis. By using a combination of instructional practices in daily instruction, all students will be given the opportunity to engage in learning and be given the supports needed in order to increase concept learning, academic achievement, and self-efficacy.
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National Association of State Directors of Special Education. (1994). *Summary of*

National Middle School Association. (2003). This we believe: Successful schools for Young adolescents. Westerville, OH.


Stevens, F. I. (1996). The need to expand the opportunity to learn conceptual framework: Should students, parents, and school resources be included?.

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Appendix A

Treatment Group Using PBL Method of Instruction- Day 1

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>CLASS</th>
<th>GRADE</th>
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<tbody>
<tr>
<td>Mathematics</td>
<td>Inclusion Class</td>
<td>6</td>
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**LESSON**
Perimeter of Regular and Irregular Polygons

**PROJECT MATERIALS**
Teacher and students will use the resources from the Scott-Foresman-Addison Wesley-Pearson enVisionMath Common Core Mathematics Series
Project materials can be located and purchased at the following website: https://www.tes.com/teaching-resource/area-and-perimeter-project-based-learning-in-math-11551951

**PHASES**

<table>
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<tr>
<th>PHASES</th>
<th>TEACHER GUIDE</th>
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<tbody>
<tr>
<td>OBJECTIVE</td>
<td>Students select and use appropriate units, tools, and/or formulas to measure and solve problems involving the perimeter of regular and irregular polygons.</td>
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</tbody>
</table>
| COMMON CORE STANDARDS | 6.EE.2.c- Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order

6.EE.7- Solve real-world and mathematical problems by writing and solving equations of the form x + z= q and px=q |
<p>| ESSENTIAL UNDERSTANDING | Students will understand the distance around a figure is the its perimeter. Through group discussion and class discussion, the students will understand formulas exist for finding the perimeter of some polygons and some formulas may be represented in more than one way. |</p>
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<thead>
<tr>
<th>PHASES</th>
<th>TEACHER GUIDE</th>
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</table>
| **FORMULAS TO UNDERSTAND** | Perimeter of Rectangle: P = 2l \times 2w  
Perimeter of Equilateral Triangle: P = 3s  
Perimeter of Square: P = 4s  
Perimeter of Regular Pentagon: P = 5s |
| **PRETEST** | 1) Students will take the Quick Check 17-1 (Handout 1 - Day 1) pretest during morning homeroom.  
2) Teacher will collect pretest when students are finished. This will be baseline data. |
| **WARM-UP (10-15 MINUTES)** | 1) Ask students: Where in everyday life or in the real world would you need to find the distance around a shape? Students should discuss finding distance around a room for a border, putting a fence around a garden  
2) Pass out grid paper. Have the students draw a rectangle 6 units in length and 4 units in width.  
3) Group students into groups of two or three.  
4) Instruct the students to find the perimeter of the rectangle. As students find the perimeter, have the groups brainstorm the definition of perimeter and write down clue words when finding perimeter. Teacher circulates room as students complete this task.  
5) Give students 3-4 minutes to complete the above task. After time is up, have groups of students come to the front of the room to present how the perimeter was found and to give definition of perimeter. Ask for other volunteers to come to the front to present their information. Ensure the groups are writing their definitions of the term perimeter on the board.  
6) Have the students identify the key words in all of the given definitions. From the key words, provide the students with a definition of perimeter using their terms.  
7) Review with the students the process of finding the perimeter of the rectangle, using the group examples.  
8) Instruct students to work in groups to come up with a formula for solving perimeter of a rectangle instead of simply adding all sides. Provide 2-3 minutes for students to discuss. Have students present their ideas to the class. Students should be able to create the formula \( p = 2(l) + 2(w) \).  
9) Draw a square on the board. Have students work with their groups to determine the perimeter and create the formula for perimeter of a square. Allow students to present after 2-3 minutes. Students should create the formula \( p = 4s \) |
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<th>PHASES</th>
<th>TEACHER GUIDE</th>
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<tr>
<td>10) For final warm-up, draw an irregular polygon on the board with two sides missing. Have students work in their groups to find the missing sides and the perimeter of the irregular polygon. Allow students to present the steps they took to solve the problem. Provide 5 minutes total time for this piece.</td>
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<tr>
<td>11) Before presenting the project, review with the students what perimeter is, based on their findings and how to find perimeter.</td>
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<tr>
<td>12) Discuss with students they will begin a four day project and will work with their current groups. Explain that at the end of the fourth day, they will present their information to the class.</td>
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<tr>
<th>PROJECT-BASED LEARNING ACTIVITY (45 MINUTES)</th>
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<tr>
<td>1) Pass out the letter from the resident. Discuss with students they have been assigned to help a local resident remodel their house. Explain their job is to calculate the cost of a variety of different borders, provide which borders would be the least expensive for each room, and then as a group decide which border for each room would be their choice and explain why.</td>
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<tr>
<td>2) Pass out the floor plan to the students.</td>
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<tr>
<td>3) Direct students to work with their group members to begin finding the perimeter of each of the rooms of the floor plan. Direct them to write the perimeter of each room on the calculation sheet. When all rooms have been calculated, instruct the students to have the measurements checked by the teachers (regular education teacher or special education teacher).</td>
</tr>
<tr>
<td>4) While working in groups, teachers should circulate the room and monitor the groups. When posed questions by the group, teachers should have the students use critical thinking skills to arrive at answers. This can be done by asking higher ordered questions to guide the students in their learning. Teachers should refrain from simply giving the answers to the groups.</td>
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<tr>
<td>5) When students have the perimeter of each room checked, instruct them to begin finding the prices of each of the borders for each room. Remind them they will have three different borders to price. Instruct students to write their calculations on the calculation sheet. Instruct students to have their calculations checked by the teacher before moving to the next step of the project.</td>
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<tr>
<td>6) When students have the calculations for each border for every room checked, instruct them to highlight the border that is least expensive. Then instruct them to decide which border their group would choose for each room. Discuss with the students they need to be persuasive and sell their choices to the client. Have students</td>
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**PHASES** | **TEACHER GUIDE**
---|---
write their ideas on the note sheet. Remind students they will be preparing a presentation of their choices.

**DIFFERENTIATION FOR INCLUSION STUDENTS**
1) Provide a specific job to those students who need support working with group members.
2) Have students verbally restate the directions of the project and what they will be doing with their group.
3) Students should be provided a visual checklist of the steps to be taken when working with their group. Directions should be short and simple.
4) When circulating the room, provide visual examples to the students in order to reinforce the concept of perimeter.

**ASSESSMENT**
1) Students will take Quick Check 17-1 independently during the last 5-10 minutes of class.
2) Teacher will collect quick check

**ADDITIONAL PRACTICE (IF NEEDED)**
1) Students can work with their groups on practice problems and word problems in the textbook.
2) Practice problems will include critical-thinking problems which include concepts of reasonableness, finding missing length/width of polygons when perimeter is given, and writing to explain problems.
Treatment Group Using PBL Method of Instruction - Day 2

<table>
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<tr>
<th>SUBJECT</th>
<th>CLASS</th>
<th>GRADE</th>
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<tbody>
<tr>
<td>Mathematics</td>
<td>Inclusion Class</td>
<td>6</td>
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**LESSON**
Area of Rectangles, Squares, and Irregular Figures

**PROJECT MATERIALS**
Teacher and students will use the resources from the Scott-Foresman-Addison Wesley-Pearson enVisionMath Common Core Mathematics Series
Students will continue to utilize the project based learning materials from the previous lesson.

<table>
<thead>
<tr>
<th>PHASES</th>
<th>TEACHER GUIDE</th>
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<tbody>
<tr>
<td>OBJECTIVE</td>
<td>Students find the area of rectangles, squares, and irregular figures.</td>
</tr>
<tr>
<td>COMMON CORE STANDARDS</td>
<td>6.EE.2.c- Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order.</td>
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<tr>
<td></td>
<td>6.EE.7- Solve real-world and mathematical problems by writing and solving equations of the form x + z= q and px=q</td>
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<tr>
<td></td>
<td>6.G.1-Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.</td>
</tr>
</tbody>
</table>
**PHASES** | **TEACHER GUIDE**
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**ESSENTIAL UNDERSTANDING** | The measure of a region inside a shape is its area, and area can be found using square units. The area of some irregular shapes can be found by decomposing or taking apart the shape into separate polygons for which formulas exist for finding the area.

**FORMULAS TO UNDERSTAND** | \( A = l \times w \)

**PRETEST** | 1) Students will have taken the Quick Check 17-2 pretest (Handout 1-Day 2) during morning homeroom.  2) Teacher will collect pretest when students are finished. This will be baseline data.

**WARM-UP (10-15 MINUTES)** | 1) Have students review the concept of perimeter and what was learned from the previous day’s lesson. Students should be able to state to find perimeter one must add all sides of a polygon. Ask students to discuss how they found the perimeter of the rooms of the floor plan and review what steps they took when some of the measurements were not given.  2) Pass out grid paper to the students. Have them draw a 10 square unit by 12 square unit figure on their paper. With their project partners, have the students work together to discuss how they would find how many square units are in the shape they drew. Allow students to discuss with their group. Teacher should circulate through the room and listen to the conversations students are having. (2-3 minutes)  3) Have student groups volunteer to come to the front of the room to discuss how their group found the total number of square units. Some groups may have counted the blocks inside the shape, other groups may have already had background knowledge of the formula \( l \times w \). (2-3 minutes)  4) Pose the question to the class: Can you explain what we were finding when we solved this problem? Students should say they were finding how much was inside the shape.
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<th>PHASES</th>
<th>TEACHER GUIDE</th>
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<td>4)</td>
<td>rectangle. Others may say we found the area. After discussion, clarify that students were using area to find the inside of the rectangle. (2-3 minutes)</td>
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<tr>
<td>5)</td>
<td>Ask the students to discuss with their group what formula could be used to solve for area of a rectangle. (2 minutes) Allow the students to provide their formulas. Clarify for the students the exact formula at the end of discussion. (2 minutes)</td>
</tr>
<tr>
<td>6)</td>
<td>Provide the next problem to the group: A room has an area of 240 square feet. The room is 12 feet wide. How long is the room? Allow students to work in their groups to solve this problem. Students should discuss they need to set-up and equation or use division to solve the missing length. Allow groups to present how they solved the problem. (3-4 minutes)</td>
</tr>
<tr>
<td>7)</td>
<td>For final warm-up, draw an irregular figure on the board and have the students draw the figure. In their groups, have students work together to calculate the area of the irregular figure. Teacher should circulate the room. Students should be discussing they need to either extend the figure or break the figure up into rectangles or squares. Have volunteers discuss with the group how they solved the area of the irregular figure. (5 minutes)</td>
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<tr>
<td>8)</td>
<td>Ask the students: Keeping the floor plan in mind, where in everyday life or in the real world would you need to find the number of square units needed to cover a surface or where would you need to find the area of surface? Students should be able to state when buying carpeting, flooring, or paint for a room.</td>
</tr>
</tbody>
</table>
| PROJECT-BASED LEARNING ACTIVITY (45 MINUTES) | 1) Pass out the packets for the project based learning activity that was started in the previous lesson.  
2) Explain to students they will need to work with their groups to find the area of each of the rooms of the floor plan. Remind students when the group has found the area of each room, they are to have the calculations checked. Then they will move to finding the cost of each type of flooring for that particular room. Remind students to have the calculations checked by the teachers.  
3) While working in groups, teachers should circulate the room and monitor the groups. When posed questions by the group, teachers should have the students use critical thinking skills to arrive at answers. This can be done by asking higher ordered questions to guide the students in their learning. |
### PHASES

Teachers should refrain from simply giving the answers to the groups.

4) When students have the area of each room checked, instruct them to begin finding the prices of each of the carpeting or tile samples for each room and writing the calculations on their Border/Flooring Quote sheet. Instruct students to have their calculations checked by the teacher before moving to the next step of the project.

5) When students have the calculations for each carpeting and flooring sample for every room checked, instruct them to highlight the price that is least expensive. Then instruct them to decide which carpet/tile sample their group would choose for each room. Discuss with the students they need to be persuasive and sell their choices to the client.

6) Have students write their ideas on the note sheet. Remind students they will be preparing a presentation of their choices.

### DIFFERENTIATION FOR INCLUSION STUDENTS

1) Provide a specific job to those students who need support working with group members.

2) Have students verbally restate the directions of the project and what they will be doing with their group.

3) Students should be provided a visual checklist of the steps to be taken when working with their group. Directions should be short and simple.

4) When circulating the room, provide visual examples to the students in order to reinforce the concept of area.

### ASSESSMENT

1) Students will take Quick Check 17-2 independently during the last 5-10 minutes of class.

2) Teacher will collect the quick check.

### ADDITIONAL PRACTICE (IF NEEDED)

1) Students can work with their groups on practice problems and word problems in the text book.

2) Practice problems will include critical-thinking problems which include concepts of reasonableness, finding missing length/width of polygons when perimeter is given, and writing to explain problems.
### SUBJECT  CLASS  GRADE
Mathematics  Inclusion Class  6

### LESSON
Area of Parallelograms and Triangles

### PROJECT MATERIALS
Teacher and students will use the resources from the Scott-Foresman-Addison Wesley-Pearson enVisionMath Common Core Mathematics Series
Students will continue to utilize the project based learning materials from the previous lesson.

### PHASES  TEACHER GUIDE

<table>
<thead>
<tr>
<th>OBJECTIVE</th>
<th>Students develop and use the formulas for the areas of parallelograms and triangles.</th>
</tr>
</thead>
</table>
| COMMON CORE STANDARDS | 6.EE.2.c- Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order.  
6.EE.7- Solve real-world and mathematical problems by writing and solving equations of the form \( x + z = q \) and \( px = q \)  
6.G.1- Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems. |
<table>
<thead>
<tr>
<th>PHASES</th>
<th>TEACHER GUIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESSENTIAL UNDERSTANDING</td>
<td>The formula for area of a parallelogram is derived from the formula for area of a rectangle. The formula for area of a triangle is derived from the formula for area of a parallelogram.</td>
</tr>
</tbody>
</table>
| FORMULAS TO UNDERSTAND | Area of parallelogram: \( A = b \times h \)  
Area of triangle: \( A = \frac{1}{2} bh \) |
| PRETEST | 1) Students will have taken the Quick Check 17-3 pretest (Handout 1-Day 3) during morning homeroom.  
2) Teacher will collect pretest when students are finished. This will be baseline data. |
| WARM-UP (5 MINUTES) | 1) Review the concepts of perimeter and area of rectangle/square with the students. Students should be giving the formulas to solve these concepts and should provide the definition of each.  
2) Allow students to work with their seat partner in order to write the formulas and definitions. Students will present the information. (5 minutes) |
| PROJECT-BASED LEARNING ACTIVITY (55 MINUTES) | 1) Pass out the teaching tool which has two separate shapes. Students will connect the dots on the first grid to form a rectangle. Prompt students to work with their partner to find the area of this rectangle. Student pairs will share their final answers (2-3 minutes)  
2) Next, have the students connect the dots on the second grid. The students will form a parallelogram when dots are connected. Instruct students to work with their partners to determine how they would find the area of this parallelogram. Allow students to brainstorm with their partners and share ideas. (2 minutes)  
3) Have the students cut their parallelogram straight down from one point to the bottom of the parallelogram to form a triangle. Instruct students to now use these shapes to create something they can find the area. (2-3 minutes)  
4) Allow students to discuss their findings, reinforcing that the triangle formed a rectangle when students have shared this idea. Allow students to then work with their partners to find the formula for a parallelogram. |
<table>
<thead>
<tr>
<th>PHASES</th>
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</tr>
</thead>
<tbody>
<tr>
<td>5)</td>
<td>Conduct a class discussion about the formula for a parallelogram. Have students use math vocabulary terms such as length, width, base, and height. Use higher order thinking questions to have students arrive at the conclusion the parallelogram has a base and a height. (5 minutes)</td>
</tr>
<tr>
<td>6)</td>
<td>Have students then devise a formula for the triangle. (5 minutes)</td>
</tr>
<tr>
<td>7)</td>
<td>Students will then work with partners to complete a center activity which will allow the students to collaboratively work together to identify the areas of parallelograms and triangles. (20 minutes)</td>
</tr>
<tr>
<td>8)</td>
<td>When completed with the center activity, students will then be given the packets for the project based learning activity which has been worked on for the two previous days.</td>
</tr>
<tr>
<td>9)</td>
<td>In addition to the floor plan and project based learning packet, students will now be given another floor plan which incorporates a room in the shape of a parallelogram and a triangular section of a room that needs tile.</td>
</tr>
<tr>
<td>10)</td>
<td>Students will work with their partner on calculating the area of the two rooms and calculating a cost for carpeting and tile.</td>
</tr>
</tbody>
</table>

| DIFFERENTIATION FOR INCLUSION STUDENTS | 1) Provide a specific job to those students who need support working with group members. |
|                                        | 2) Have students verbally restate the directions of the project and what they will be doing with their group. |
|                                        | 3) Students should be provided a visual checklist of the steps to be taken when working with their group. Directions should be short and simple. |
|                                        | 4) When circulating the room, provide visual examples to the students in order to reinforce the concept of area. |

| ASSESSMENT | 1) Students will take Quick Check 17-3 independently during the last 5-10 minutes of class. |
|            | 2) Teacher will collect the quick check. |

| ADDITIONAL PRACTICE (IF NEEDED) | 1) Students can work with their groups on practice problems and word problems in the text book. |
|                                | 2) Practice problems will include critical-thinking problems which include concepts of reasonableness, finding missing length/width of polygons when perimeter is given, and writing to explain problems. |
SUBJECT    CLASS    GRADE  
Mathematics  Inclusion Class  6  

LESSON  
Area of Parallelograms and Triangles  

PROJECT MATERIALS  
Teacher and students will use the resources from the Scott-Foresman-Addison Wesley-Pearson enVisionMath Common Core Mathematics Series  
Students will continue to utilize the project based learning materials from the previous lesson.  

PHASES    TEACHER GUIDE  

OBJECTIVE    Students classify polyhedrons and identify vertices, edges, and faces.  
Students will identify a polyhedron from its net and draw top, side, and front views.  

COMMON CORE STANDARDS    6.G.4- Represent three-dimensional figures using nets made up of rectangles and triangles. Use the nets to find surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.  

ESSENTIAL UNDERSTANDING    A polyhedron is a three-dimensional figure made of flat surfaces. The shapes of these flat surfaces and the way they are connected at edges and vertices determine the characteristics of the polyhedron.  

VOCABULARY TO UNDERSTAND    Polyhedron  
Face  
Vertex  
Edge  

166
<table>
<thead>
<tr>
<th>PHASES</th>
<th>TEACHER GUIDE</th>
</tr>
</thead>
</table>
| PRETEST                      | 1) Students will have taken the Quick Check 18-1 pretest during morning homeroom.  
2) Teacher will collect pretest when students are finished. This will be baseline data. |
| WARM-UP (5 MINUTES)          | Show students a square and a cube. Ask students to identify how the two are different. Students should respond that one is flat or one dimensional and the other is three dimensional. |
| PROJECT-BASED LEARNING ACTIVITY (55 MINUTES) | 1) Pass out the net for rectangular prism and net for cylinder worksheets to all students. Have students work with partners to determine which shape the two nets will make. Have students share answers. (2-3 minutes)  
2) Have students cut out the nets and identify the shapes made. (3-5 minutes)  
3) Instruct the students to make a chart and label it rectangular prism and cylinder. With their partner, have the students list the characteristics of each shape. (5 minutes)  
4) Allow students to share the characteristics and identify the names for each of the characteristics given. (3-4 minutes)  
5) Allow students to then search the classroom for polyhedrons. Have the students identify the polyhedron, the number of faces, edges and vertices. (10 minutes)  
6) Next, give each group of students a net figure of a polyhedron from everyday items (cereal box, Kleenex box). Give the students time to determine the polyhedron based on the net shape and the characteristics of the polyhedron. (10 minutes)  
7) Give students time to complete the teamwork activity and classify the polyhedron based on given characteristics.  
8) When finished, students will get their project based learning packet and continue working on calculating the areas and the cost of flooring for each room. |
| DIFFERENTIATION FOR INCLUSION STUDENTS | 1) Provide a specific job to those students who need support working with group members.  
2) Have students verbally restate the directions of the project and what they will be doing with their group.  
3) Students should be provided a visual checklist of the steps to be taken when working with their group. Directions should be short and simple. |
<table>
<thead>
<tr>
<th><strong>PHASES</strong></th>
<th><strong>TEACHER GUIDE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>4) When circulating the room, provide visual examples to the students in order to reinforce the concept of area.</td>
<td></td>
</tr>
</tbody>
</table>
| **ASSESSMENT** | 1) Students will take Quick Check 18-1 independently during the last 5-10 minutes of class.  
2) Teacher will collect the quick check. |
| **ADDITIONAL PRACTICE (IF NEEDED)** | 1) Students can work with their groups on practice problems and word problems in the text book.  
2) Practice problems will include critical-thinking problems which include concepts of reasonableness, finding missing length/width of polygons when perimeter is given, and writing to explain problems. |
Traditional TDI Group Lesson Plans- Days 1-4

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>CLASS</th>
<th>GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>Inclusion</td>
<td>6</td>
</tr>
</tbody>
</table>

**OVERVIEW**
Teacher and students will use the resources from the Scott-Foresman-Addison Wesley-Pearson enVisionMath Common Core Mathematics Series

**PHASES**

<table>
<thead>
<tr>
<th>OBJECTIVES</th>
<th>TEACHER GUIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Day 1:</strong> Students select and use appropriate units, tools, and/or formulas to measure and solve problems involving the perimeter of regular and irregular polygons.</td>
<td></td>
</tr>
<tr>
<td><strong>Day 2:</strong> Students find the area of rectangles, squares, and irregular figures.</td>
<td></td>
</tr>
<tr>
<td><strong>Day 3:</strong> Students develop and use the formulas for the areas of parallelograms and triangles.</td>
<td></td>
</tr>
<tr>
<td><strong>Day 4:</strong> Students classify polyhedrons and identify vertices, edges, and faces. Students will identify a polyhedron from its net and draw top, side, and front views.</td>
<td></td>
</tr>
</tbody>
</table>

**COMMON CORE STANDARDS**

| **Day 1:** 6.EE.2.c- Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order. |
| **6.EE.7-** Solve real-world and mathematical problems by writing and solving equations of the form x + z= q and px=q |

<p>| <strong>Day 2:</strong> 6.EE.2.c- Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order. |
| <strong>6.EE.7-</strong> Solve real-world and mathematical problems by writing and solving equations of the form x + z= q and px=q |</p>
<table>
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<tr>
<th>PHASES</th>
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</thead>
<tbody>
<tr>
<td>6.G.1- Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.</td>
<td></td>
</tr>
<tr>
<td>Day 3: 6.EE.2.c- Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order.</td>
<td></td>
</tr>
<tr>
<td>6.EE.7- Solve real-world and mathematical problems by writing and solving equations of the form ( x + z = q ) and ( px = q )</td>
<td></td>
</tr>
<tr>
<td>6.G.1- Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.</td>
<td></td>
</tr>
<tr>
<td>Day 4: 6.G.4- Represent three-dimensional figures using nets made up of rectangles and triangles. Use the nets to find surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ESSENTIAL UNDERSTANDING</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1: Students will understand the distance around a figure is its perimeter. Through group discussion and class discussion, the students will understand formulas exist for finding the perimeter of some polygons and some formulas may be represented in more than one way.</td>
<td></td>
</tr>
<tr>
<td>Day 2: The measure of a region inside a shape is its area, and area can be found using square units. The area of some irregular shapes can be found by decomposing or taking apart the shape into separate polygons for which formulas exist for finding the area.</td>
<td></td>
</tr>
<tr>
<td>Day 3: The formula for area of a parallelogram is derived from the formula for area of a rectangle. The formula for area of a</td>
<td></td>
</tr>
<tr>
<td>PHASES</td>
<td>TEACHER GUIDE</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>triangle is derived from the formula for area of a parallelogram. Day 4: A polyhedron is a three-dimensional figure made of flat surfaces. The shapes of these flat surfaces and the way they are connected at edges and vertices determine the characteristics of the polyhedron.</td>
<td></td>
</tr>
<tr>
<td>FORMULAS AND VOCABULARY TO UNDERSTAND</td>
<td>Day 1: Perimeter of Rectangle: ( P = 2l \times 2w ) Perimeter of Equilateral Triangle: ( P = 3s ) Perimeter of Square: ( P = 4s ) Perimeter of Regular Pentagon: ( P = 5s ) Day 2: ( A = l \times w ) Day 3: Area of parallelogram: ( A = b \times h ) Area of triangle: ( A = \frac{1}{2} bh ) Day 4: Polyhedron Face Vertex Edge</td>
</tr>
<tr>
<td>PRETEST</td>
<td>1) Students will take the Quick Check pretest during morning homeroom. 2) Teacher will collect pretest when students are finished. This will be baseline data.</td>
</tr>
<tr>
<td>WARM-UP</td>
<td>1) Students will independently work on problem of the day. 2) Discussion of how to solve the problem will be led by the teacher. Volunteers will called on to discuss how they solved it. 3) On Days 2, 3, and 4, students will check homework with a peer and ask for clarification for answers that are not the same.</td>
</tr>
<tr>
<td>INSTRUCTION</td>
<td>1) Teacher will provide direct instruction using teacher created flipcharts. 2) During instruction, teacher will ask questions to check for understanding and engage students by having students solve basic computation problems. 3) Students will take notes during the teacher instruction. (35-40 minutes)</td>
</tr>
</tbody>
</table>
## PHASES

### TEACHER GUIDE

4) After teacher directed instruction, students will be given an opportunity to work on practice problems with a peer or a group.
5) Teacher and special education teacher will use time to work with individual students or groups on the concept taught.
6) Students will have practice problems checked by teacher.
7) Students will then go to their seat and independently complete the posttest quick check.
8) When finished, students will be given opportunity to work on homework.

### DIFFERENTIATION FOR INCLUSION STUDENTS

1) Allow inclusion students to work in a small group with the special education teacher in order to provide review of concepts.
2) Reduce the amount of practice problems to be completed.
3) Provide manipulatives and calculators.

### ASSESSMENT

1) Students will take the posttest quick check assessment.
2) Teacher will collect the quick check and grade it.

### ADDITIONAL PRACTICE (IF NEEDED)

1) Additional practice problems will be used from the text book.
2) Students can also be given an assignment on the ipad app that correlates with the lesson.
## Appendix B

### Table 1

The Inclusion Definition Instrument (IDI)

<table>
<thead>
<tr>
<th>Classroom Demographic Attributes</th>
<th>Variables to disclose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class attributes including:</td>
<td></td>
</tr>
<tr>
<td>- Grade level(s) of students in inclusive classroom</td>
<td></td>
</tr>
<tr>
<td>- Number of students registered in inclusive classroom</td>
<td></td>
</tr>
<tr>
<td>Student attributes including:</td>
<td></td>
</tr>
<tr>
<td>- Number of students without disabilities</td>
<td></td>
</tr>
<tr>
<td>- Number of students with disabilities</td>
<td></td>
</tr>
<tr>
<td>- Nature of disabilities (mild, moderate, severe)</td>
<td></td>
</tr>
<tr>
<td>- Percentage of time per day that students with disabilities are in inclusive setting</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teachers’ Attributes</th>
<th>Variables to disclose</th>
</tr>
</thead>
<tbody>
<tr>
<td>General educator(s) attributes including:</td>
<td></td>
</tr>
<tr>
<td>- Years’ experience teaching in general education classrooms</td>
<td></td>
</tr>
<tr>
<td>- Years’ experience teaching in inclusive education classrooms</td>
<td></td>
</tr>
<tr>
<td>- Prior training in inclusive education</td>
<td></td>
</tr>
<tr>
<td>- Amount of time per week allocated for planning with other staff involved in inclusive classroom instruction</td>
<td></td>
</tr>
<tr>
<td>Special educator(s) attributes including:</td>
<td></td>
</tr>
<tr>
<td>- Years’ experience teaching in special education classrooms</td>
<td></td>
</tr>
<tr>
<td>- Years’ experience teaching in inclusive education classrooms</td>
<td></td>
</tr>
<tr>
<td>- Prior training in inclusive education</td>
<td></td>
</tr>
<tr>
<td>- Percentage of school day working in inclusive setting</td>
<td></td>
</tr>
<tr>
<td>- Amount of time per week allocated for planning with other staff involved in inclusive classroom instruction</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Support Staff Attributes</th>
<th>Variables to disclose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support staff attributes including:</td>
<td></td>
</tr>
<tr>
<td>- Specific support staff used to plan and facilitate student(s) instruction</td>
<td></td>
</tr>
<tr>
<td>- Years’ experience working with staff of general education classrooms</td>
<td></td>
</tr>
<tr>
<td>- Years’ experience working with staff of inclusive education classrooms</td>
<td></td>
</tr>
<tr>
<td>- Prior training in inclusive education</td>
<td></td>
</tr>
<tr>
<td>- Percentage of school day working in inclusive setting</td>
<td></td>
</tr>
<tr>
<td>- Amount of time per week allocated for planning with other staff involved in inclusive classroom instruction</td>
<td></td>
</tr>
</tbody>
</table>
Appendix C

Participant Number __________
Attentiveness in Mathematics Class
Student Survey

<table>
<thead>
<tr>
<th>Question 1: I listen to the teacher’s instruction attentively.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Strongly Disagree</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question 2: I take an active part in class discussion.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Strongly Disagree</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question 3: I really make an effort in the mathematics lesson.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Strongly Disagree</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question 4: I concentrate very hard when the teacher introduces new mathematical concepts.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Strongly Disagree</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question 5: I will use every means to understand what the teacher teaches in mathematics.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Strongly Disagree</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question 6: I always take part in the discussion in the mathematics class.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Strongly Disagree</td>
</tr>
</tbody>
</table>
Open Ended Student Survey Questions
Directions: Please provide a response to the following questions which focus on the delivery of instruction and the learning of mathematics.

1. Do you prefer to learn by having the teacher lecture or by having hands-on activities? Explain why you prefer this way of learning.

________________________________________________________________________

________________________________________________________________________

2. What part of your mathematics lesson do you enjoy most?

________________________________________________________________________

________________________________________________________________________

3. What can be done to make mathematics lessons more enjoyable?

________________________________________________________________________

________________________________________________________________________

4. What can be done to make you learn more during a mathematics lesson?

________________________________________________________________________

________________________________________________________________________