THE INFLUENCE OF TEAMING ON THE ACADEMIC ACHIEVEMENT OF NINTH GRADE STUDENTS IN A COMPREHENSIVE SUBURBAN HIGH SCHOOL

by

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EDUCATIONAL LEADERSHIP

ABSTRACT

The purpose of this study was to examine the impact ninth grade interdisciplinary teaming had on academic achievement of ninth grade students in English, reading and mathematics. As more schools adopt the interdisciplinary teaming approach with ninth grade students, this study sought to investigate the dynamics of interdisciplinary teaming and traditional non-teaming instruction in an effort to educate high school and district administrators who are attempting to compose an appropriate educational model that will contribute to the success of ninth grade students.

This quantitative study’s quasi-experimental design examined ninth grade student achievement in math, English, and reading for students who were part of interdisciplinary teams during their freshman year of high school. A multiple linear regression analysis was used to determine the effect that the independent variables (gender, ethnicity, poverty, teaming, and SAT 10 scores) had on the dependent variable (the PLAN scores.)

The population of this study consisted of ninth grade students from two suburban high schools. One school implemented interdisciplinary teaming in ninth grade and the other implemented traditional, non-teaming instruction for high school students in grade 9 through grade 12. Both schools had similar demographics in gender and poverty, but differed in ethnicity.
Of all the independent variables, the eighth grade SAT-10 scores had the greatest predictive power for math, reading, and English PLAN scores. Ethnicity also had predictive power in math, reading and English PLAN scores with Caucasian students scoring significantly higher than African American students. In addition, gender, poverty, and teaming status did not appear to have predictive power for math, English, or reading PLAN scores.

Keywords: interdisciplinary teaming, academic achievement, ninth grade, SAT-10
DEDICATION

The completion of this journey would not have been possible without a supportive group of friends and family. My wife deserves special recognition for her ongoing and unwavering support throughout the journey. I hope the completion of this journey will serve as inspiration for our children in their future endeavors. The core values provided to me by my mother and father also spurred my resilience throughout this process. Although my father’s death preceded the completion of the journey, I felt his presence throughout the journey. A special thanks to my mother-in-law for her continuous support and encouragement throughout this process. My father’s-in-law death also preceded my completion of the journey, but he too showed unwavering support of my lofty aspiration of completing a terminal degree.
ACKNOWLEDGMENTS

I am grateful to my committee whose guidance and inspiration enabled me to complete this project; their selfless dedication will not be forgotten. I also thank Dr. John Danzler for leading me through statistical analysis with precision and efficiency.

Many regards and blessings to Dr. Lourecia Collins, my committee chair, whose inspiration and encouragement made this journey possible.
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CHAPTER 1

INTRODUCTION

Older students are allowed to roam until the bell, but the ninth graders are herded into the auditorium. We fall into clans: Jocks, Country Clubbers, Idiot Savants, Cheerleaders, Human Waste, Eurotrash, Future Fascists of America, Big Hair Chix, the Marthas, Suffering Artists, Goths, Shredders. I am clanless. I wasted the last week of August watching bad cartoons. I didn’t go to the mall, the lake, or the pool, or answer the phone. I have entered high school with the wrong hair, the wrong clothes, the wrong attitude. And don’t have anyone to sit with.

I am outcast (Anderson, 1999, p. 4).

The aforementioned statement is excerpted from a fictional novel; however, the comment reflects the daily reality of millions of ninth-grade students. Ninth grade is the largest site of student failure in America. Bottoms and Timberlake (2007) emphasize the substantial magnitude of ninth grade as follows:

The ninth grade is the gateway to high school graduation and further education or meaningful employment. It is the make–it–or–break–it year for students. Those who successfully complete grade nine are substantially more likely to graduate from high school than are students who fail the freshman year. (p. 1)

Compared to other grades, promotion rates between ninth and tenth grade are much lower than rates between other grades (Cohen & Smerdon, 2009; Wheelock & Miao, 2005). George and McEwin (1999) note that in virtually every high school, ninth graders account for the largest number of students failing to accumulate enough credits to be promoted to the next grade. This failure to advance, in what Black (2004) calls the ninth grade bulge, creates large numbers of retained students swelling the size of the ninth grade well beyond the size of either the eighth grade or tenth grade. Enrollment figures
show approximately 4.25 million students enrolled in grade 9 in the United States during the 2004-2005 school year, while figures for the following school year (2005-2006) show enrollment numbers for tenth grade at around 3.84 million; a loss of 9%. In Alabama, the total ninth grade enrollment was approximately 64,569 students during the 2004-2005 school year; however, the following year (2005-2006) tenth-grade enrollment fell to 55,630. Alabama’s net loss was 8.7%, which is slightly lower than the national average of 9%. The plunge in the number of students in tenth grade reflects both the large number of students not promoted to tenth grade as well as those students that drop out after ninth grade (Stillwell, 2010).

Students who drop out of high school are much more susceptible to becoming a casualty of reduced earnings and lost opportunities. According to the Bureau of Labor Statistics, workers 25 years of age and older who did not complete high school have the highest percentage of unemployment and the lowest annual income. In 2007, the median weekly earnings for individuals who did not earn a high school diploma were $428, but the median income for those who completed a bachelor’s degree was $987. Furthermore, the unemployment rate for individuals who did not earn a high school diploma was 7.1%, while the unemployment rate for individuals who completed a bachelor’s degree was 2.2%. The statistics clearly illustrate that there is a direct relationship between income and years of education, yet there is an inverse relationship between education and unemployment. As we address the needs of students at risk for dropping out of high school, we are also addressing their income potential. According to a U.S. Census Bureau (2005), the median household income for a high school graduate was $26,933, and the median household income for individuals without a high school diploma was $17,299.
Many of the students who are at-risk for dropping out of school during ninth grade matriculated through elementary and middle school due to the individualized teacher advocacy and ongoing academic monitoring that may not be possible or desirable in the larger secondary school culture (Fulk, 2003; Smith et al., 2008). As the size of American high schools increases, and the needs of the students become more complex and diverse, students will continue to feel more and more isolated unless mechanisms are in place that will assist them in navigating the transition process. This is especially true of freshmen students who are entering unfamiliar academic environments. Unfortunately, large schools that house substantial numbers of students are prevalent, and hundreds are being built nationwide every day. It must also be noted that the aforementioned “mega schools” tend to carry with them a detached anonymity that does not encourage student achievement or provide the intimate and welcoming atmosphere that would nurture social and academic growth. The educational community recognizes this problem and has initiated smaller learning communities for this vulnerable ninth grade group. Smith et al. (2008) highlight the following contemporary trend:

> Recently, some school districts have introduced freshmen centers as an organizational structure to combat poor performance in ninth grade. One major tenet of the freshmen center model is to create a sense of community often absent in a large high school and to ease the academic and social transition from middle school to high school. (p. 33)

In recent years, the emergence of freshman transition initiatives provides a structural foundation for the development of academic safeguards in comprehensive high schools. The operational framework of freshmen transition initiatives bears strong resemblances to the middle school concept, including the use of teaming, where the larger student body is arranged in houses or teams that share a set of teachers (Smith et al.,
The freshmen teaming concept is put in place to make the freshman experience less complicated and more nurturing. Smith and colleagues clarify the objective of freshmen transition initiatives as follows: “the idea is that by having ninth grade teachers who are focused solely on the academic and social development of one grade level, individual students will not get lost” (p. 33). Interdisciplinary teaming, then, promotes and provides a collaborative environment for student and teacher development.

George, Lawrence, and Bushnell (1998) described interdisciplinary teaming as a strategic method of arranging the teachers and students of a school so that a group of two to five teachers shared (a) the same group of students, (b) the same jurisdiction of the building, (c) the identical schedule and planning period, and (d) the responsibility for planning, instructing, and testing curriculum and instruction for more than one subject area. Fostering a sense of community through teaming may be the key to reducing students’ feelings of alienation and social angst. When they are members of a team-based learning community, middle level students develop deeper social bonds and work collaboratively to promote success of the entire group (Johnston, 1992). In essence, community membership fulfills one of young adolescents’ basic needs, the longing to belong (Irvin, 1992). The teaming model has been strongly emphasized by the National Association of Secondary School Principals in their Breaking Ranks publication that outlines recommendations for high school education in the 21st century. Thus, like middle school reform, organizational reform at the high school level includes interdisciplinary teaming as a significant restructuring strategy (Cotton, 2001; McEwin, Dickinson, & Jacobson, 2004).

As states seek strategies to address the high school dropout rate, ninth grade retention has been identified as ground zero in the battle over dropout prevention. The current mandates to increase rigor along with the ongoing revisions of high school graduation re-
quirements throughout the nation have increased the difficulty of seamlessly transitioning students into ninth grade. According to McCallumore and Sparapani (2010), “States that have felt the pressure to compete globally have raised their graduation requirements. Students moving into the ninth grade are the first to experience the effect of any increase in state-mandated high school graduation requirements” (p. 1). In addition to the increased demands of academic rigor and expectations, ninth grade students are also facing some of the following challenges as well: feeling of loneliness, isolation and disconnection (Cooper & Liou, 2007), and becoming overwhelmed by the size of the high school as compared to the smaller middle school (Butts & Cruzeiro, 2005). As a result, the personalized nature of the teaming structure shows promise of bridging a critical gap between middle school and high school that will help combat the challenges of ninth grade transition.

The Problem

High schools across the country are struggling to formulate structures that will provide freshmen students the necessary academic safeguards to propel them into the next phase of academic progression. Researchers at Johns Hopkins University note that up to 40% of ninth grade students in cities with the higher dropout rates repeat the ninth grade, but only 10%-15% of those repeaters go on to graduate (Balfanz & Letgers, 2004). In fact, 29 of 51 states see their greatest “leakage” in the education pipeline occurs during the ninth grade (Edwards, 2006). Some states have as high as a 20% decrease in enrollment between ninth and tenth grades (Wheelock & Miao, 2005). Most high school dro-
pouts fail at least 25% of their ninth grade courses, while only 8% of high school comple-
ters experience the same difficulty (Letgers & Kerr, 2001).

A more in depth review of the data reveals that ninth grade attrition is far greater in urban, high-poverty schools: Forty percent of dropouts in low-income high schools left after ninth grade, compared to 27% in low-poverty districts (Edwards, 2006). Racial disparities highlight the ninth grade bulge and tenth grade plunge—these figures are the greatest for African American and Latino students. For example, grade 9 enrollment is 23%-27% higher than grade 8, and attrition between grade 9 and grade 10 hovers around 20% for African American students; for their White peers, grade 9 enrollment is 6%-8% higher than grade 8, while attrition between grade 9 and grade 10 is stable around 7% (Wheelock & Miao, 2005).

There were 3.86 million ninth graders enrolled in public schools in the United States during the 1998-1999 school year, but there were only 3.42 million tenth graders enrolled in public schools during the 1999-2000 school year. These numbers reflect a net loss of over 400,000 freshmen. Educators must implement academic safeguards to pre-
vent the current freshmen phenomenon from becoming an epidemic that could cause irre-
parable damage to public education in the United States.

The Purpose of the Study

The purpose of the study was to explore the impact of interdisciplinary teams on the academic achievement of ninth grade students in the areas of English, reading, and mathematics.
The staggering increase of students dropping out of high school merits an emphasis on the development of personalized learning environments for all students entering high school (Kennelly & Monrad, 2007). There are many variables that contribute to these at-risk students’ lack of motivation when they enter high school; therefore, schools must utilize creative strategies to assist students in the critical transition for middle to high school (Akos & Galassi, 2004; Cooper & Liou, 2007). In an attempt to provide the personalization needed for a successful transition to high school, interdisciplinary teaming is one strategy that has been implemented in high schools throughout the United States. This study specifically examined the effects of interdisciplinary teaming on the academic performance of ninth graders in the areas of English, reading, and mathematics.

Independent Variable and Dependent Variable

The independent variable in this study was whether or not the school implemented interdisciplinary teaming. The dependent variable is academic achievement as defined by how students perform on the PLAN (Preliminary ACT) during the fall of their sophomore year. Results from the students’ eighth-grade SAT-10 assessment will be used to confirm the control group and experimental group have similar academic abilities.

Research Questions

The following research questions were used for this study:

1. What are the relationships between interdisciplinary teaming and academic achievement in mathematics as measured by the PLAN?
2. What are the relationships between interdisciplinary teaming status and academic performance in English as measured by the PLAN?

3. What are the relationships between interdisciplinary teaming status and academic performance in reading as measured by the PLAN?

Hypotheses

The research questions provided the basis for the following null hypotheses:

1. Tenth grade math achievement is not affected by eighth grade math achievement, race, gender, poverty status, or teaming status of the school.

2. Tenth grade English achievement scores are not affected by eighth grade English achievement scores, race, gender, poverty status, or teaming status of the school.

3. Tenth grade Reading achievement scores are not affected by eighth grade Reading achievement scores, race, gender, poverty status, or teaming status of the school.

Definitions of Terms

For the purposes of this study the following are set operational definitions:

Communities of Practice- Groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly (Wegner, 1998).

Comprehensive High School- a high school with a student population of 1,000 or more.

Horizontal Team/Teaming- A group of teachers for the same grade level working together to enhance student achievement.
**Interdisciplinary Team/Teaming**- Interdisciplinary teams are comprised of groups of teachers from different subject areas who work together to coordinate instruction, communication, and assessment for a common group of students. They meet daily to provide for the educational needs of their students. The duties of a team may include developing interdisciplinary units, coordinating field trips, and providing consistent and developmentally appropriate team rules for academic and behavior standards (Flowers, Mertens, & Mulhall, 2000).

**PLAN- the preliminary ACT examination**- this assessment is used to provide students with practice as well as a baseline score before they take the ACT. The test consists of the following subtests: Reading, Science, Mathematics, and English (ACT, n.d.).

**Professional Learning Community/Communities**- An ongoing process through which teachers and administrators work collaboratively to seek and share learning and to act on their learning, their goal being to enhance their effectiveness as professionals for students’ benefit (Hord, 1997).

**Stanford Achievement Test, Tenth Edition (SAT-10)**- the assessment used in the state of Alabama to measure the academic achievement of public school students in grade 3 through grade 8 (Kelley and colleagues, n.d.).

**Team Teaching**- A group of two or more persons assigned to the same students at the same time for instructional purposes in a particular subject or combination of subjects (Armstrong, 1977).

**Vertical Team/Teaming**- A group of teachers from various grade levels within an educational entity who teach in the same content area and are committed to sharing and
utilizing instructional techniques and strategies in an effort to improve the academic performance of the students served by the organization (Texas Leadership Center, 1998).

Figure 1 and Table 1 provide clarification of the distinctive characteristics of the various structures and configurations affiliated with Communities of Practice.

Assumptions

For the current study it is assumed that both schools provide a comparable academic environment. These characteristics include (but are not limited to) the following: teacher quality, curriculum options, and intervention and support services. Furthermore, this study assumes that a comparable representative population of students can be acquired for the study. The populations for the two groups in this study will have no significant difference in representation of the following characteristics: areas of ethnicity, socioeconomic status, and academic aptitude. As it relates to academic achievement, the assumption is the fundamental difference between the two schools is the use interdisciplinary teaming. Therefore, any identifiable discrepancies in the academic achievement of the participants could be attributed to use of teaming.

Limitations

1. The study is limited to two suburban high schools in Southeast Alabama.

2. The individual intrinsic differences in students’ motivation to demonstrate their highest level of knowledge may affect the outcome of the study.

3. The instructional capabilities of individual teachers may affect the outcome of the study.
Figure 1. Communities of practice schematic.
### Table 1

**Variables Associated with Communities of Practice**

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<tr>
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<th>Communities of Practice</th>
<th>Professional Learning Communities</th>
<th>Vertical Teaming</th>
<th>Horizontal Teaming</th>
<th>Interdisciplinary Teaming</th>
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<tr>
<td>Two or more people involved</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Contributions made by all participants</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Focused on primarily on student achievement and instructional strategies</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Must share a common group of students</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
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<tr>
<td>Focuses on developing common assessments</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
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<tr>
<td>Focuses on developing thematic lessons across content areas</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Actively seeks support mechanisms and strategies for academically at risk students</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Focuses on the personal social needs of the students</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
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<tr>
<td>Focuses on behavior and other management needs</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
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4. The experimental group in this study was in the first year of a separate ninth grade facility, and the control group was in a traditional grade 9 through grade 12 configuration.

5. Although the study will be conducted in the same suburban school district in the southeast, the two high schools may have differences that may have an affect the validity of the study.

Significance of the Study

There is a plethora of research that addresses the benefits of interdisciplinary teams in the middle school setting (Arhar, 1990; Dickinson & Erb, 1997; Flowers, Mertens & Mulhall, 2000; Jones, 2010). There also exists a paucity of research that links high schools’ organizational structures that include interdisciplinary teaming to an increase in academic performance on standardized achievement measures. In addition, there is also a significant amount of research that illuminates the possible problems with transition from middle school to high school (Kerr, 2002; Reyes et al., 2002; Smith, 2007; Weiss & Bearman, 2007). There are several recommended strategies that contribute to creating a more personalized high school experience by creating smaller learning communities. Some of the recommended strategies include advisories, house plans, schools within schools, career academies, and interdisciplinary teaming. The goal of these strategies is to provide a more nurturing and personalized learning environment that is important for all students in large high schools - especially ninth graders (National Association of Secondary School Principals, 2004).
This study examined the consequences of implementing interdisciplinary teams in the ninth grade to serve as transitioning vehicles. Ninth grade transition is becoming a national crisis as research findings continue to show a trend of more students failing ninth grade than any other grade of school (Kennelly & Monrad, 2007; McCallumore & Sparapani, 2010; Roderick & Camburn, 1999). The lack of personal attention and rigor of academic challenges that many at-risk ninth graders experience often results in a bitter apathy for school and education in general. Schools must systematically breakdown this perception by providing all students entering high school with the supports necessary to ease the challenges of the transition from middle school to high school. The increased loss of students continues to indicate a potential crisis in high schools across America, which further illuminates the necessity for educators to join the movement to giving keen attention and dedication to the radical overhaul of the approach to ninth grade transitioning.
CHAPTER 2
REVIEW OF THE LITERATURE

A comprehensive review of the literature from the historical conception of teaming to the most recent findings related to teaming reports the effects of interdisciplinary teaming on student achievement. This historical perspective includes a review of the theoretical basis for the teaming concept (Communities of Practice) as well as an examination of teaming models (Professional Learning Communities and Interdisciplinary Teaming). Next, the review explores the impact of teaming as a personalization strategy for high school students. The following section addresses the influence of personalization on the academic achievement of at-risk students. And lastly, a critical summary of the literature is added.

The middle school teaming model is attributed to William Alexander who is also known as the father of the American middle school” (Gayton, 2010, p.82). Alexander’s model provided the framework for the contemporary interdisciplinary teaming model used in middle schools and high schools throughout the nation; thus, middle school teaming and interdisciplinary teaming represent the same configuration and philosophy. Interdisciplinary teaming is comprised of a core group of teachers and the students they teach. The construct is designed with the desire to meet students’ academic and socio-emotional needs, and to provide opportunities for collaborative planning, foster collegiality among teachers, and establish a community of learners (Thompson & Homestead, 2004). During the early years, middle schools that had not yet implemented
the teaming component of the “middle school concept” were departmentalized. These “middle” schools kept the same internal organizational structures that they had when they were called “junior high schools.” However, as the middle school concept rapidly spread, it brought forth the interdisciplinary team concept (Thompson & Homestead, 2004).

McEwin and Dickinson (2003) stated that by the year 2001, 77% of middle schools had organized teachers into interdisciplinary teams. As interdisciplinary teaming established a dominant presence in middle schools across the nation, more high school teachers and administrators began to explore the implementation of interdisciplinary teaming at the high school level.

Murata (2002) concludes that team teaching has been in existence at the high school level since the 1960s, but the concept is still considered a practice that is contrary to the established high school culture. In the move from the middle school to the ninth grade, the focus tends to shift from teaching and nurturing the whole child in a collaborative environment to instructing students to learn the content of academic subjects (Herlihy, 2007). In the traditional high school, isolation is the norm (Hochreiter, 2007). Herlihy describes the transition from middle school to high school as a time when students typically move from smaller, more supportive environments to larger, more bureaucratic and depersonalized environments. High schools tend to lack the sense of community that middle schools provide resulting in too many instances, ninth grade becomes the bottleneck year. Cook, Fowler, and Harris (2008) state that, over the last 30 years, the national average for ninth grade non-promotion has more than tripled from approximately 4% to 13%. Furthermore, the increased number of dropouts and failures
has prompted educators to seek ways to make the transition from eighth grade to ninth grade smoother and less difficult.

The impact of interdisciplinary teaming on the academic achievement of freshmen includes a literature review of high school transition, personalizing high schools, and smaller learning communities. These are areas cited by researchers that help create a sense of community in a school while diminishing the sense of alienation (Cook et al., 2008). The following five areas of focus for this study were addressed as a means to provide a perspective from a broader lens:

1. Theoretical Basis: Communities of Practice
2. Professional Learning Communities
3. Interdisciplinary Teaming
4. High School Transition and Personalization
5. High School Transition and At-Risk students

The literature review addressed these five areas, which identified the effects teaming may have on the success of high school freshmen. The aforementioned areas were addressed in numerical order beginning with Theoretical Framework. Each area provided a unique perspective on the effects of collaboration/teaming has on the academic achievement of ninth grade students.

Theoretical Framework

The theoretical framework for this study is based on Wenger's work concerning communities of practice (Wenger, 1998). According to Wenger (1998) practice is the "embodied, delicate, active, social, negotiated, complex process of participation" (p. 49)
in which teachers and students engage. Learning occurs through the interplay of experience and competence in these communities. Wenger's theory includes similar characteristics of Bandura’s (1977) social learning theory. Bandura posited that people learn from others through observation, imitation, and modeling (Bandura, 1977). In a unique assimilation of some components of behaviorist and cognitive learning theories, Bandura's theory succinctly describes some of the main aspects of engagement that are essential to student learning such as attention, memory, and motivation (Bandura, 1977). Wenger’s theory also encompasses the core beliefs of Vygotsky (1978), who asserted that learning occurs in a social context through shared experiences. Vygotsky's theory provided the framework for the use of communities of practice or learning communities. The term “community of practice” has its basis in the business world; the theory is grounded on the foundation of social learning and social cognitive theory, and is introduced through a participatory process of observation and modeling (Bandura, 1989). This communal acquisition of learning defines the community of learning theory (Fullan, 1998). These structures exist in the educational setting as groups of teachers who teach the same content and groups of teachers who teach the same students.

Lave and Wenger's (1991) Situated Learning Theory also paralleled the natural progression of the development of the Communities of Practice Theory as it relates to the embedding of learning within activities, context, and culture. Lave and Wenger (1991) provide a theoretical prospective that attributes learning to engagement in activities of a community of practice. Their work is based on a cross-disciplinary effort to better understand adult learning in a variety of situations. In an earlier study, Wenger (1998) states that learning is more than the acquisition of knowledge; rather, it is the interaction of
meaning and communities in constant “tension” that develops fertile ground for con-
tinuous learning. Wenger emphasizes that the state of ”tension” is extremely important to
the process in that, “If they settle down into a state of locked-in congruence, then learning
slows down, and practice becomes stale” (Wenger, 1998, p. 214). Wenger, McDermott,
and Snyder (2002) purport that the members of a community of practice are united by an
issue of mutual concern. The diversity of concerns of varied stakeholders highlight the
varied facets of a given issue through their diversified views and experiences which re-

Wenger’s assumptions concerning what matters in learning are based on four
premises: (a) we are social beings and this is central to learning; (b) knowledge is a mat-
ter of competence in identified, valued enterprises; (c) knowing stems from participating
in the pursuit of these valued enterprises; and (d) garnering meaning from endeavors in
these enterprises is ultimately what learning is to produce (Wenger, 1998).

Wenger (1998) further states that a community of practice can be defined accord-
ing to three dimensions: (a) mutual engagement, because practice is based upon people
working together to negotiate meaning; (b) joint enterprise, which he defines as the
process by which people work towards the achievement of a mutual goal that generates
mutual accountability which is essential to seeking new meaning; and (c) shared reper-
toire, which are the mutually shared resources that community members use to negotiate
meaning. According to Vygotsky (1978) learning communities promote social interac-
tion that leads to peer-to-peer engagement, which results in more accurate and efficient
joint problem solving. Although learning communities began to be studied and imple-
mented in the 1990's in education, Hord (2004) extrapolated and refined the theories to make them specific to helping principals and teachers bring about school improvement.

Research indicates that collaboration is a critically important ingredient in both adult and student learning (DuFour, Dufour, & Eaker, 2008). Barth (2006) argued that without a collegial culture, no meaningful improvement can take place in schools. This includes such areas as improvements in staff or curriculum development, teacher leadership, team teaching, and parent involvement. In fact, the key to ensuring that every child is taught by a quality teacher is to organize the work place in a way that qualified teachers can collaborate with their colleagues (National Commission on Teaching and America’s Future, 2005). The next section provides research about the practical application of Communities of Practice through the use of Professional Learning Communities.

Professional Learning Communities

Dufour and colleagues (2010) define Professional Learning Communities (PLCs) as a systematic process where teachers work interdependently to improve student achievement through repeated cycles of collective inquiry and action research. Hord (2009) further states that the term “community” in PLCs is indicative of shared purpose, mutual regard and caring, and trust. Graham and Ferriter (2010) note that PLCs are school based teacher-centered organizational structures that are linked to organizational cultures in such a way as to provide an impetus for increased organizational learning. Learning communities are distinguished from ordinary schools by their collective commitment to guiding principles that articulate what the people in the school believe and
what they are striving to achieve. Their mutual goals are embedded in the hearts and minds of people throughout the school (Graham & Ferriter, 2010).

Professional Learning Communities is a professional development model that supports job-embedded learning and action research (Dufour, 2010; Smith, Wilson, & Corbett, 2009). PLCs consist of common faculty, students and community who have common shared values and goals (DuFour, Dufour, Eaker, & Karhanek, 2004). Astuto (1993) states that within a learning community, teachers and administrators seek learning and act on what they learn. According to Hord (2009), in a professional learning community, the staff members prioritize student-learning needs and take responsibility to learn new concepts, strategies, content and approaches in a continuous effort to meet the needs of students who are not successful. Norwood (2007) examined a study in which researchers investigated a low performing school that served many students with high mobility rates and low academic performance. The vast majority of these students lived in poverty which increased the likelihood of being diagnosed with learning disabilities and put them at greater risk of being victims of violence, teen parenthood, family stress, and educational failure. Since No Child Left Behind (NCLB) of 2001, the school had not yet met Adequate Yearly Progress and was in danger of losing federal funding. The well-trained teachers felt they had no voice in isolated decision-making. However, many of the administrators believed they could turn the school around by implementing professional learning communities.

In PLCs, members work together to clarify exactly what each student must learn, monitor each student's learning on a timely basis, and provide systematic intervention that ensures struggling students receive additional time and support for learning (Dufour,
Members of PLCs are action oriented; they quickly turn aspirations into action and visions into reality. Strahan and Hedt (2009) state that the relationships among team members often determine the extent to which the members work together to facilitate professional growth. They become communities of learners characterized by the establishment of a collaborative environment in which dialogue and trust are nurtured within the school and between the school and parents and stakeholders which is imperative to achieving educational excellence (Huffman & Jacobson, 2003). Sagor (2009) notes that a culture of collaborative inquiry emerges once a specific mindset takes hold in a school. This mindset emerges from several behaviors: clarifying a shared vision for success; articulating theories of action; acting purposefully while collecting data; analyzing data collaboratively; using informed team action planning. Rottier (2001) recommends that teams “establish rules to govern their operation. Known as ground rules, they help each member display the behaviors necessary to make teaming function smoothly” (p. 51). Such ground rules may include having a consistent meeting time and place, limiting interruptions during team meeting, being aware of interpersonal behaviors, and allowing every member to participate equally.

There is a consensus among researchers and practitioners as to the components of a successful secondary education. Lave and Wenger (1991) state that learning occurs through participation and the process is the product. The components include rigorous and relevant curricula for all students in a personalized, responsive learning community with strong relations between teachers and students and schools and parents (Fleishman & Heppen, 2009; Marzano, 2003; Scheerens & Bosker, 1997). Just as there is consensus among researchers and practitioners as to what supports successful high school programs,
the research is clear about what works contrary to this success. Teaching in isolation is a common trait especially in secondary schools (Hughes & Kritsonis, 2006). Dufour (2004, 2010) states that school cultures and structures that encourage isolation are unlikely to achieve significantly higher levels of achievement. Many high schools in their quest for reform are turning to learning communities. Dufour et al. (2008) proport that a school operating as a PLC is a school with purpose, collective commitments, and clear direction. They further stress that a school operating as a professional learning community focuses on learning, collaboration and results. Using the concept of communities of learners, large, impersonal high schools purport to be able to transform into smaller, more personalized learning environments, which supports the academic achievement of students. The PLC may be viewed as a community in which teachers and administrators work together and learn to learn together with the shared desired outcome of enlarging their aptitudes to create identical desired outcomes. In addition, if there is transparency- transparency in classroom techniques, lesson plans, and conversation, new patterns of fertile and fruitful thinking will be inevitable (Dufour, 2002).

In a collaborative environment, teachers meet regularly to discuss and share effective teaching and learning strategies. Learning is best understood when those who are participating engage in social and cultural practices that legitimize the work performed (Lave & Wenger, 1991). There is a tremendous amount of planning required to establish the structure necessary for teaming to flourish and provide the student and teacher outcomes that are desired. Teachers and staff work together to remove barriers to student learning. Collaboration ends the practice of solo teaching in isolated classrooms. They are supportive and leadership is shared; they have shared values, which are centered on
student learning; they have collective learning as teachers collaborate and learn from each other; they operate in a supportive environment; they have shared personal practice as teachers share their practices with specific students (Dufour et al., 2008). They work with common tools and use a common language.

In 2001, McLaughlin and Talbert conducted a qualitative study designed to investigate the role of professional learning communities in 16 high schools. One research question posed was, "How do various contexts of secondary schooling affect teachers' work lives and professional development practices?" The research was conducted over a period of four years. Overall, the researchers found that most of the high schools and high school departments did not operate in a culture of collaboration; although, some departments were more collaborative and successful in their practices than others. McLaughlin and Talbert (2001) report on one such school, Oak Valley, where the English department has the strongest technical culture of any department in the sample while the same school's social studies department ranks among the weakest. The English Department in this school worked daily together to meet the needs of all students. Everything was shared including file drawers, materials, computer disks, ideas, successes and failures. The teachers talked about what wonderful students they had and how wonderful it was to work in the school. In the same school, the social studies department was completely isolated. Teachers talked about "my materials." They complained about the school and the students; one teacher even referred to the students as being stupid. Although the teachers shared the same students, their concepts of the school and students were totally opposite. The study revealed three kinds of practices that the teachers employed:
1. Traditional practices- teachers taught using traditional subject-based teaching where only traditional students tended to be successful. Teachers tended to have some sense of mission; they shared some resources with each other. However, they tended to focus on the subject area and had deficit views of non-traditional students.

2. Lowering of expectations and standards- teachers tended to water down the curriculum; students were not motivated and usually not successful. The teachers tended to keep practices private. Resources were not shared, and they did not view their colleagues as resources.

3. Innovating to engage learners- subjects and teachers were considered dynamic and there was a constant pursuit of ways to meet the needs of and involve all students in learning. Students in these classes were comparatively much more successful. Students were seen as everyone's responsibility; the teachers were engaged in collective inquiry.

As indicated, there were distinctive differences in the two classes. In the traditional classes, teachers taught the way they always had. They focused on their subject area with no regard for students who did not learn the way they taught. In the classes with lowered expectations, the teachers tended to identify the students as the problem. In interviews they lamented about such things as not having the right kinds of students. They blamed prior teachers for sending them unprepared students. In the strong collaborative situations, teachers shared instructional resources, they were constantly engaged in reflective practices, and they were engaged in innovations that supported teacher and student learning and success.

The researchers concluded that, the work of high school teaching takes shape in professional communities through norms for teaching, curriculum structures and assign-
ment policies, collegial support, and good professional practice. They also surmised that teachers who taught in schools or departments with strong professional communities tended to engage in innovative practices that support both student and teacher learning and engagement.

Norwood (2007) reports that in 2006-2007 the school district’s boundary lines changed and resulted in a tremendous influx of students from higher socioeconomic backgrounds with higher achievement scores. In addition to restructuring boundary lines, the district changed the calendar to one that allotted additional instructional time. The students were also released early on a bimonthly basis to allow for staff development. The aforementioned changes set the stage for the district to develop customized professional learning communities that would benefit all schools. The primary focus was the issue of student learning. While the decision to implement professional learning communities may have been viewed as radical, the actual implementation was gradual. The high school began by attacking small challenges and making minor changes as they worked together to establish a learning body, set goals, and reflect on current practice and processes of learning. After the development and implementation of the learning community, the school’s test scores began to slowly increase, but there was no solid data to prove that the learning community was responsible for the increase in academic success as the school now had students from higher socioeconomic statuses and a new school calendar. Although the formal research ended at this point, the faculty was sure that the improvement was due, in part, to the implementation of the PLC. The main focus of a professional learning community—student learning, administrative interest, teacher support, purposeful collaboration, shared decision-making, and accountability are all imperative to
the effectiveness of professional learning communities. Norwood (2007) states, however, that the faculty at the school remained focused on ensuring learning improved with the use of the PLC. Norwood purports that the PLC is not a quick fix but it is a community that evolves over time.

Andrews and Lewis (2002) assessed a high school in Queensland, Australia. This qualitative research took place at a school that was typical of schools involved in a project entitled Innovative Designs for Enhancing the Achievement of Schools (IDEAS). A key component of the design was the implementation of professional learning communities. The researchers were university professors who were not involved in the implementation of the project. The school had 37 teachers and 400 students. Ten teachers initially volunteered to work as the core members of the group. Later on, other teachers joined as they were mentored by the core teachers. The data were collected on two occasions using retrospective interviews, focus group discussions, observations, field notes and documentation. The collections were 6 months apart.

The results of the study provided the following outcomes: (a) Teachers self-reported changes in habits as relates to conversations about pedagogy and using varied instructional strategies; (b) mentoring resulted in additional teachers examining and changing instructional strategies; (c) administrative support helped to sustain the efforts; and (d) the efforts led to changes in the organization of the school, the way teachers thought about their students’ learning, the sense of community that existed in the school.

Another study that illuminates the value of teacher collaboration was conducted with high school faculty in California. The faculty at San Clemente High School, California formed PLCs to answer three core questions prescribed by Dufour (2010). "What
is it we want students to learn?; How will we know if they have learned it?; and What do we do if students have not learned?" The teachers analyzed their students' data and developed a pyramid of interventions based on what they determined to be students' needs. In five years, the failure rate for tenth-grade, eleventh-grade, and twelfth-grade students went from 33% to 18%. The failure rate for freshmen went from 41% to 20%. Also, the passing rate on the high school graduation exam went from 63% to 93% (Hinman, 2007).

At the classroom level, the use of PLCs has dramatically increased teachers’ ability to implement a viable curriculum, monitor student progress along with colleagues, and improve the teaching and learning process (Colliton, 2005). A study involving critical friends groups (Dunne et al., 2000) was commissioned by the Annenberg Institute. A critical Friends Group is a professional learning community made up of 8 to 12 educators who voluntarily come together for 2 hr at least once a month to improve their practice using collaborative learning (National School Reform Faculty). Researchers concluded from the findings that practices of those who participated in collaborative efforts of critical friends became more student centered over time. The study included participants from five high schools, two middle schools, and five elementary schools. Schools in the study varied in size and were located in different areas of the country. A total of 1,412 teachers filled out the Professional Climate Survey that was used as the quantitative data for the study. Six hundred thirty-two of the teachers were in the critical friends group; 780 were not. Qualitative data included observations, interviews, and samples of student and teacher work.

The study took place over a 2 year period. The survey data indicated higher levels of opportunity for engagement, collaboration, expectations and support in the class-
rooms of teachers who were critical friends. Observations and interviews indicated a trend towards student-centered pedagogy rather than teacher-centered pedagogy by those who were critical friends. Observations and interviews also indicated a shift to collaborative professional development efforts by members of critical friends. Finally, lower levels of district and state influence on instructional content and pedagogy were noted on survey data by teachers who were critical friends. (National School Reform Faculty)

Additional research provides an operational protocol for the implementation of collaborative teacher teams. D. Clark and S. Clark (2007) suggest that there are three organizational prerequisites for any school that is considering the implementation of teaming: (a) all teams must be given common planning time of at least 45 min three to four times per week.; (b) the student load on the team should not exceed 125 with a teacher/student ratio of 1/25 or less per class; and (c) the team teachers must be trained in the art of collaboration and conflict resolution. These organizational prerequisites provide the fundamental ingredients for the establishment of a teaming structure that will address the essential needs of teachers and students.

The isolation of adults at all levels in the education system actively discourages their learning and capacity to improve their practice. In today's world of work, virtually every other profession has transitioned to various forms of teamwork; yet, most educators still work alone (Wagner & Kegan, 2006). Well implemented professional learning communities are a powerful means of seamlessly blending teaching and professional learning in ways that produce complex, intelligent behaviors in all teachers (Sparks, 2005). In schools that have strong professional learning communities, teachers work together more effectively and put more effort into creating and sustaining opportunities for
student learning (Kruse et al., 1994). The National Council of Teachers of English (2006) posits that creating professional communities where teachers can collaborate and share knowledge fosters an environment of mutual respect where teacher inquiry and reflection can flourish. Such teachers, the research found, feel more confident and prepared to do a good job of teaching their students.

Schools with strong professional learning communities produce engines of hope and achievement for students (Saphier, 2005). Furthermore, research by Goldring et al. (2007) on PLCs demonstrates improved outcomes for both teachers and students. For teachers, the results include improvement in such areas as reduction in isolation which results in shared responsibility for the total development of students and collective responsibility for student success; commitment to making significant and lasting changes; significant and quicker adaptations to differentiating instruction; increased likelihood that teachers are better informed and more motivated to inspire students. The results for students indicate decreased dropout rate and fewer class cuts as well as lower absenteeism; decreased achievement gaps between brothers from varied backgrounds; larger academic gains in math, science, history and reading than in traditional schools. School staff shares understanding and commitment to high goals; the school operates under the tenet that all students can learn.

Interdisciplinary Teaming

George, Lawrence, and Bushnell (1998) described interdisciplinary teaming as a strategic method of arranging the teachers and students so that a group of two to five teachers shared the following: (a) the same group of students; (b) the same jurisdiction of
the building; (c) the identical schedule and planning period; and (d) the responsibility for planning, instructing, and testing for more than one subject area. The first documented attempts at interdisciplinary teaming date back to the 1930s with the idea of using block scheduling programs and joint teacher planning times (Boyer & Bishop, 2004). During this time teachers decided a reformation of the way they worked together could provide a better educational experience for their students (Porter, Roessner, Cohen, & Perreault, 2006).

The term “interdisciplinary” refers to a method of instructing, preparing, and organizing a program so that individual disciplines intersect (Roberts & Kellough, 2008). According to Spraker (2003), teaming is the collaboration of two or more teachers who share the same group of students. For many years, interdisciplinary collaboration has been accepted at the elementary level, but few actually implemented it at the secondary level. Teaming at the high school level emphasizes improved student achievement through teacher collaboration (Spraker, 2003).

Murata’s (2002) research concludes that team teaching has been in existence at the high school level since the 1960s, but the concept is still considered a practice that is contrary to the established high school culture. In fact, teaming is viewed as a direct challenge to the status quo by some high school teachers and administrators (Murata, 2002). Although some high schools may have a less than favorable sentiments towards teaming, the NASSP endorsed the concept of teaming as a viable strategy for high school reform (NASSP, 2004).

Dickinson and Erb (2002) identified five important concepts to assist educational professionals in understanding effective interdisciplinary teaming practices within a
school: mission, reciprocity, coming together, cutting against the grain, and the imposter syndrome. Moreover, Valentine et al. (2004) identified the following four essential strategies needed to maximize the impact of teaming:

1. Schools must provide teachers with time to collaborate and reflect on curriculum, instruction and student achievement.

2. The administrators must empower the teachers to share data, participate in decision-making, and take on additional leadership roles as needed.

3. The school must embrace a culture of learning where adults and students regularly engage in a variety of formal and informal continuous learning activities.

4. Teachers must build strong relationships of trust, to cultivate cultures of collegiality and support, and develop a values system that leads to successful student and adult learning.

After studying schools that practiced these strategies, Valentine and colleagues (2004) concluded that the collaborative work performed during team teaching was the most powerful influence on curriculum, instruction, and school improvement. Clark and Clark (2007) found the following seven characteristics of teams that should be used as benchmarks for the implementation of teaming: (a) the team must be students with the appropriate developmental focus; (b) members of the team must have a strong commitment to student and adult learning; (c) there must be an established plan of action that reflects the school’s vision and goals; (d) data driven decision-making through the use of the results of frequent assessments is the compass that guides the direction of the team; (e) all team members are held accountable by existing school, district, state, and national standards; (f) members of the team are expected to engage in frequent collaboration with
their colleagues and administrators to maximize instructional planning; and (g) a framework of open communication among the team members, the administration, the students, and the parents must be established to ensure the effective two-way communication with all stakeholders. These characteristics should not be considered as a list of individual benchmarks, but rather a group of essential elements that must exist as a unit to maximize the capacity of the teaming strategy (Clark & Clark, 2007).

Goetz (2000) identified the following six styles of team teaching:

1. Traditional Team Teaching- In this configuration, the teachers share instructional time and resources for the same content and students. For example, one teacher may present the initial direct instruction for the lesson while the other teacher provides the closing and review for the lesson.

2. Parallel Instruction- In this scenario, students are divided into two groups and each teacher is responsible for teaching the same content to her/his smaller group. Some schools use this model in conjunction with other forms of collaborative teaching, and it is frequently implemented to maximize the academic engagement of students involved in projects or problem-solving activities, as the instructor can roam and give students specific individualized feedback.

3. Differentiated Split Class - This format of team teaching involves dividing the class into smaller groups according to academic achievement. Many times there are more groups than teachers, so some groups are given tasks that require the self-discipline to work independently. Each educator provides the respective group with the instruction required to meet their learning needs. For example, a class may be divided into those students who have mastery in adding fractions, those students who are proficient but need
more practice with the addition of fractions, and a group of students who have not mastered basic adding of whole numbers. The teachers would develop activities that would challenge the learners who grasped the concept more quickly as well as activities that would be appropriately challenging for students at both the proficient and basic level of understanding.

4. Monitoring Teacher- This instructional process assigns one teacher as the primary instructor for content delivery, while the other instructor circulates the room and closely monitors student understanding and on-task behavior.

5. Collaborative Teaching- This instructional design utilizes a traditional team teaching approach in which the team teachers work collaboratively to design lessons and teach the content through an ongoing exchange and discussion of ideas and theories. Not only do these teachers work in a collaborative manner, but the teachers develop a systematic process that allows specific feedback regarding the impact of their instruction on academic achievement.

6. Complimentary Team Teaching- This instructional plan employs one teacher that is charged with teaching the content to the students initially, while the other teacher is responsible for providing follow-up activities on related topics or on study skills. The first four styles are similar in that they each share or divide responsibilities for teaching the same material to the same class during the same time period. The last two, collaborative teaching and complimentary teaching, follow a somewhat different format.

Berentsen (2006) further clarifies by defining collaborative teaching as the instructional environment where two instructors work together preparing for the same lesson but then deliver their material to the students in a two-way discussion forum. Berent-
sen (2006) also sites a possible drawback of the collaborative teaching approach is the potential to confuse students if two teachers present differing viewpoints on a particular subject. Berentsen (2006) also points out exposing students to a variety of viewpoints may be beneficial as an example of using independent critical thinking to analyze information and encourage them to make their own informed decisions, rather than mindlessly swallowing opinions and thought processes spoon-fed them by a teacher or from a textbook.

With regards to the last model of team teaching, Berentsen (2006) provides a more in-depth description of complimentary team teaching as an instructional format whereas one teacher delivers the core material in his or her lecture class, followed by another teacher working with students on the same material in another class, which usually uses a different style of learning. The goals and objectives of complimentary teaching are most closely related to the goals and objectives of traditional interdisciplinary teaching. Berentsen (2006) offers the following extensive example of the potential benefits of complimentary teaching:

Complimentary team teaching can be an exciting and fruitful style of teaching for both the technology education and core curriculum teachers as well as for their students. It is not a teaching style that results in conflicting information from two different teachers, but, rather, when carefully orchestrated, provides a supportive, reinforcing, and encouraging learning environment for students. In complimentary team teaching, the academic core and technology education teacher work together as equals. In no sense does the technology teacher become a teacher’s aid to the core teacher. Rather, each teacher reinforces what the other has taught. The core teacher provides the lecture, theory, and, together with the technology teacher, designs the student assignments. The technology education teacher provides the laboratory, skills, and expertise to assist the students in building working models for experiments and simulations that verify the theoretical results arrived at in the core lecture class. Simply put, the core teacher explains that \( 2 + 2 = 4 \), and the technology education teacher shows the student how to successfully demonstrate that \( 2 + 2 = 4 \). The
teachers work as a team, moving toward the same conclusion, much as an engineer, a technologist, and a technician do in an industrial environment. (p. 11)

Findings from Goetz’s (2000) study noted that researchers and teachers in secondary schools who have experienced successful teaming attributed their success to commitment to the following themes: (a) compatibility of team members; (b) shared commitment to team-teaching and ongoing communication; (c) sharp interest in joining content with real life; and (d) the passion for providing students with a yearning for knowledge.

It is imperative that the goals and philosophies, as well as the responsibilities of the leaders and teaching professionals are clear and well defined. Most importantly, if the mission, goals, and direction of the process are unclear, success rates are doomed to diminishment (Dickinson & Erb, 2002).

Gaytan (2010) provides the following recommendations for various challenges teachers and administrators face while attempting to implement the team teaching strategy.

Students who are used to lecture-based instruction may resist the team-teaching approach. To help combat this attitude, educational institutions should explain the dynamics of team-taught courses prior to registration. Conversely, training faculty in effective planning, design, delivery, and assessment is crucial to the success of such courses, ensuring that they benefit both faculty and students (Sargent, Allen, Frahm, & Morris, 2009). Once the course begins, instructors must very clearly explain the format of the class and learning outcomes associated with classroom activities, as well as the delivery mechanism used, to ensure that students gain a better understanding of the advantages of
this approach (Helms, Alvis, & Willis, 2005). Finally, both faculty and students must choose to be involved in a team-taught course because forcing them to get involved may not lead to a positive outcome (Booth, Dixon-Brown, & Kohut, 2003).

Instructors involved in team teaching may find difficulty in taking a “backseat” role in their own classrooms, as they remove themselves from the center of attention to become facilitators of information. To successfully respond to this challenge, however, instructors “must make the shift from being ‘experts’ to being ‘expert learners,’ for in the collaborative classroom, teachers and students join in a shared process of intellectual discovery” (Wentworth & Davis, 2002, p. 23).

Competing for limited resources and using conflicting methodologies (e.g., course content, grading policies, teaching styles, instructional preferences) represent ongoing challenges to faculty members involved in team-teaching learning environments (Booth et al., 2003). However, instructors can successfully meet these challenges by engaging in joint planning and teaching efforts. In addition, course content may require revision for standardization, and instructors’ teaching styles and methodologies should become seamless. Finally, team teaching requires planning in the areas of physical facilities and instructional technologies to accommodate two or more instructors delivering one course (Booth et al., 2003, pp. 85-86).

Interdisciplinary teams are a proven method of supplying individual student support that is vital to academic achievement (McIntosh & White, 2006). Panaritis (1995) identified five essential attributes of a successful interdisciplinary team.

1. Time—Panaritis contends that teachers need a significant amount of time to prepare lessons that seamlessly integrate across multiple disciplines. The team must also
have time to rapport among the members as well as familiarize themselves with pedagogy and their colleagues’ curriculum requirements. As a result, some schools require their teams to meet daily to enhance the knowledge of the group collectively and individually.

2. Resources—According to Panaritis, programs without adequate resources will not succeed. Besides time, teams need professional development, classroom accessibility, and access to new materials as needed, but the most important resource is administrative support. The most committed and enthusiastic interdisciplinary team cannot survive long-term without a consistent commitment from the administration. If the most committed teachers experience burnout due to a lack of resources, it will be a challenge to convince the faculty to support the next proposed innovation.

3. Incentives—Teachers must be convinced that they are receiving a perk before a resource can be framed as an incentive. An incentive must provide a compelling and inspiring attraction for teachers to meet Panaritis’s definition of incentive. Many successful interdisciplinary teams begin as pilot programs with attractive incentives. Possible incentives could include grant money, preferential room assignments, and relief from other duty assignments.

4. Talented, Committed Teachers—Even reluctant teachers are inspired by direct feedback from teachers who have successfully completed tasks that are scheduled for school wide implementation. When teachers hear from their colleagues about a new program that is scheduled to be implemented, it will spark interest which will subsequently lead to intrigue, inspiration, and taking initiative. Thus, many schools attribute their successful implementation of interdisciplinary teaming to a pilot group of talented and committed teachers.
5. Flexibility and Patience- There is no magic formula or equation for interdisciplinary teaming. To effectively integrate a lesson that involves all four core teachers, there must be a commitment to deep broad themes that seamlessly illuminates the core standards of each content area. Some schools ambitiously pursue the development of integrating every lesson, but the result is usually a superficial version of interdisciplinary teaching. A rich interdisciplinary lesson will spur prosperous and sustainable dialogue. Panartitis suggests the interdisciplinary team start with by planning one lesson that requires mutual ownership from all four teachers. Long term gains of interdisciplinary teaming rests solely on the teams’ ability to systematically customize and develop effective integrated lessons in the short term.

A recent study indicated that the use of interdisciplinary teaming in ninth grade may have a positive impact of the academic achievement of students exposed to the teaming strategy. Styron and Peasant (2010) conducted a study that compared the academic achievement of ninth-grade students on a standardized assessment for Algebra 1 and Biology. The study was conducted with participants from six high schools with similar gender, socioeconomic and ethnic demographics. Fifty participants were randomly selected for the control group as well as the experimental group. Algebra 1 and Biology archival assessment data were gathered for each participant. The researchers performed an independent t-test with a .05 alpha level to calculate the potential difference in academic achievement between the experimental group and the control group. Two hypotheses were presented by the researchers: (a) There is a significant difference in Algebra 1 scores between ninth grade students who were exposed to teaming in ninth grade and ninth grade students who received a traditional ninth grade experience; and (b) There is a
significant difference in Biology scores between ninth grade students who were exposed to teaming in ninth grade and ninth grade students who received a traditional ninth grade experience. The results were of this study included that Algebra 1 mean scores of students exposed to teaming in ninth grade was significantly higher than the mean scores of the students who received a traditional ninth grade experience. Additionally, the Biology mean scores of students exposed to teaming in ninth grade was significantly higher than the mean scores of the students who received a traditional ninth grade experience. Teaming school students scored more than 15 points higher than their counterparts and almost 25 points higher in Biology. The performance gap between teaming schools and traditional schools in biology is magnified by the discrepancy in the scores of the Black students. African American students from the teaming school scored 58 points higher than the African American students from the traditional high school. Furthermore, Black students at the teaming school scored three tenths of one point lower than their Caucasian counterparts; on the other hand, black students from the traditional high school scored 40.3 points lower than their Caucasian counterparts. With the current national emphasis on closing the achievement gap among ethnic groups, the results of this study provides a foundation for additional inquiry in the feasibility and viability of teaming in ninth grade.

The Importance of High School Transition and Personalization

Schiller (1999) defined academic transition as “a process during which institutional factors influence which students’ educational careers are positively or negatively affected by this movement between organizations” (pp. 216-217). The transition from middle school to ninth grade can be a major event in the life of an adolescent. As a re-
sult, moving to a larger environment where there is a reduction in personal support along with greater academic challenge is too often problematic for a rising high school freshman (Smith, 2007). As a result of the increased demands of high schools, ninth graders have a higher rate of failures, drop outs, class absences, suspensions and expulsions than any other grade in high school (NCES, 2005). The ninth grade is also usually the grade with the highest enrollment due to repeaters (Kennelly & Monrad, 2007).

Ninth grade is clearly the “make or break” year in terms of secondary school success or failure (Reinhard, 1997). Students who leave the eighth grade and enter their first year of high school are at a critical point in their lives” (Kerr, 2002). Reyes et al. (2000) found that the transition into a new high school is significant. They state that successful transition to high school is an ongoing process. It cannot be accomplished in a day, in a week, or through a single program. It requires a fundamental reshaping of the culture in secondary schools and classrooms.

High schools and the feeder middle schools need to work collaboratively to identify the distinctive features of their academic, social, and organizational attributes (Smith, 2007). Smith purports the effectiveness of the collaboration between middle and high schools can be measured by the level of understanding the incoming freshmen display in their answer(s) to the following question: “What are the similarities and differences in the academic expectations between high school and middle school?” (Smith et al., 2008). If incoming freshmen enter high school with a thorough understanding of the academic expectations of high school, their likelihood of academic success will be improved tremendously. In addition to the clear articulation of the academic expectation of high school, middle school students must receive a consistent message (formulated through
collaborative interaction between the high school and middle school) from the middle school staff regarding the social and organizational aspects of high school transition. As schools examine ninth grade transition initiatives, they should not limit their focus to the grade level configurations. This recommendation is supported by Weiss and Bearman’s research (2007) which concluded that consistent with previous studies of the high school transition, student outcomes change as students move from eighth grade to ninth grade; however, their findings suggest also that these changes are driven by factors other than changing schools. Although there are important changes in the levels of both school-related and non-academic outcomes examined, the magnitude of changes is remarkably similar for students who change schools and for those who do not. That is to say, moving from eighth grade to ninth grade results in changes for all students regardless of whether the move is accompanied by a change of schools.

It is extremely important that the middle and high school teachers work together to create an atmosphere of personalization so that the student does not feel that he has no identity as a human being in the new environment (Smith et al, 2008). Allenworth and Easton (2007) conclude that a strong relationship with the teacher and a perception that the coursework is relevant results in higher student attendance and that ninth grade attendance and course grades are powerful predictors of high school graduation. Students report that caring relationships, characterized by unwavering teacher access, support and pressure, are the most powerful forces in getting them to achieve at higher levels and graduate (Ancess, 2003). For both teachers and students, creating a more personalized climate is a valuable end in itself and can certainly set the stage for changes in instruction. Some students who are at-risk for failure may have advanced through earlier grades
due to individual teacher attention and vigilant monitoring that may not be possible or desirable within the larger secondary school culture (Reith & Polsgrove, 1994). In fact, it is noted that once schools have identified the distinctive features in the transition, they should create a consistent message about academic, social and organization issues associated with transition and intentionally share that message with parents and students throughout the eighth grade. If middle school staff represented consistent and intentional messages about transition, there would be a decrease in the perceptual gaps” (Smith et al., 2008).

A study by Butts and Cruziero (2005) researched factors perceived by students as having the greatest influence on their transition to high school. The study took place in a large Midwestern High School, and the subjects were first time ninth graders transitioning from the three middle schools in the district. The high school had no transition program in place. The total population of the school was 2,300 students. For this study, each new ninth grader completed a survey in homeroom under the supervision of a teacher. The survey consisted of thirty questions; 495 students completed the survey. Analysis of the results revealed helpful factors to be teachers who explained things well; having an interest in the class, having friends in the class, and going to class daily. Factors reported that were not helpful were mentors, tutors, the large size of the school, and limiting time with friends.

The researchers concluded that steps such as making the school feel smaller and more personal would help the students. For example, ninth graders could be put in a separate wing of the school. They recommended that teachers function as a community to form teams focusing on individual student needs. The researchers also suggested to the
school that if students are comfortable and engaged in interesting, relevant learning, there may be less need for mentors and tutors.

The successful transition to high school is paramount to the academic success of students matriculating through secondary schools. Recently, some school districts have introduced freshmen centers as an organizational structure to combat poor performance in ninth grade (Fleischman & Heppen, 2009). Freshman academies are designed to ease the transition into high school by placing ninth graders in separate buildings or wings (Holland & Mazzoli, 2001). Students are given an entire year of transition before being integrated into the total high school experience (Kennelly & Monrad, 2007). Reents (2002) cites research that shows many ninth graders fail because they get lost in large high schools; students in the academies are given more individual attention. McIntosh and White (2006) note that the ninth grade year of segregation gives students the opportunity to adjust to the rigors of high school as they mature.

Holland and Mazzoli (2001) relate the story about leaders of an industrial conglomerate who pledged $10 million to resurrect a large urban middle school that their relatives had founded. Educators used part of the funds to create a freshman academy to ease the transition from eighth grade to ninth grade. The faculty and administrators vowed to save every child who entered the ninth grade at the high school. The principal noted that the school would be touted by every ninth grader as a place where, “everybody knows your name.” During the pilot year (1999-2000), one third of the ninth graders (330 students) from across the district attended the school. One of the distinguishing features of the school was an emphasis on relationships. The research based views of the principal was that in order to meet the needs of the child, the whole child had to be served. This
included their emotional, physical and mental needs as well as their academic needs. The Search Institute developed a prescription of 40 essential building blocks a young person must have to successfully go from dependent adolescent to independent adult. The school worked with the Search institute and discovered that fewer than 20 students had 30 or more of the assets; most had an average of 18. Students with 10 or less of the behaviors tended to be in continuous trouble and failed most if not all of their courses. Although classes were very small, an average of 10:1 ratio, the teachers found the job extremely hard. District administrators such as an ex FBI agent who demanded that students who lost their IDs pay $5.00 or be sent home, did not help. Some students left and never returned. A teacher wanted students suspended if they did not push their seats under the table. There were, however, some extraordinary people on the staff who were able to save many troubled students who eventually became academically successful students. Many of the success stories at this school were related to the outstanding support provided by some extraordinary faculty members that resulted in many at-risk students deciding to stay and complete high school.

There are many examples of successful ninth grade academies. Those that are successful, however, do much more than move students to a separate wing: they develop a philosophy focused on success and meeting the individual needs of the students (Chmelynski, 2004). An example of a successful freshman academy is in Scott County, Kentucky. Statistics showed that 45% of the incoming freshman class would likely fail one or more courses (Smith et al., 2008). The students were given a separate space, and more attention was focused on their individual needs. As a result of the academy, freshmen
failures decreased from 17% to 6%, the daily attendance rate increased, and standardized test scores increased by six points (Smith et al., 2008).

High School Transitions and At-Risk Students

Legters and Kerr (2001) suggest that by eighth grade, almost 40% of African American and Latina/o youth in this country are in situations that cause them to be “at risk” of school failure. As students struggle to fit in socially, poor prior academic preparation in core subjects exacerbates the anxiety associated with transitioning into high school (Benner & Graham, 2009). For many urban youth, school failure translates into disengagement from the schooling process. This failure becomes most evident during the transition from middle school to high school, when students who are disengaged from the learning process are pushed out of the educational pipeline altogether. The Southern Regional Educational Board (2005) published a report that explained the pivotal nature of the ninth grade especially for minorities and male students. It stated that the fourteen and fifteen year olds who leave middle school without the academic, social and study skills they need to be successful in high school can be overwhelmed by ninth grade courses. It further states that these deficiencies can make the transition to the more academically rigorous, independent environment of the high school a potentially devastating situation for these students.

A study by Benner and Graham (2009) examined the high school transition experiences of students from different racial groups. The study was specifically geared towards their perceptions of school climate, psychological functioning, and academic behaviors in middle school and how they were affected by the transition to high school. The
conceptual framework of the study was the life course perspective that posits that social ties influence and are influenced by transition (Elder, 1998). The participant sample for the study was made up of a large and multiethnic group of students from 11 urban middle schools that transitioned to over 100 high schools in the ninth grade. Twice a year from grade 7 through grade 10, data were collected on such things as school liking/belonging, loneliness/anxiety, grades and attendance. Two individual social-structural characteristics were included in the study—gender and race/ethnicity. The results indicated that the transition was more stressful on African American and Latino students when there were significantly fewer students of their ethnicity. Both experienced comparatively more feelings of not belonging and liked school less. Also, their grades declined more and their absences increased more steeply.

When urban students enter high school, many enter with high academic and career aspirations (Goldenberg, Gallimore, Reese, & Garnier, 2001). Many of these students will be excluded from the educational process not because they lack motivation or intellectual tenacity, but because they lack the necessary information to successfully navigate and negotiate distribution of possibilities (Stanton-Salazar, 1997). The literature is extensive regarding the ways in which guidance counselors and counseling programs are critical in students’ schooling process (House & Martin, 1998; Stone & Clark, 2001). A study by Cooper and Liou (2007) examined high school counselors’ distribution of information as one of the key factors in providing students with Opportunity to Learn (OTL). Opportunity to Learn is defined in the study as those conditions in a school that promote learning for all students. In the study, information is divided into two types. The first type is high stakes information which is information that leads to understanding
school culture, policies and practices and to the development of a strong academic self-
identity. This is the “hidden curriculum” that leads to AP courses, honors programs and
selected extra-curricular activities. The second type is functional information. These are
policies and procedures that help the institution operate as a safe orderly school. The re-
searchers saw this second type of information as being more beneficial to the school than
to empowering the students. The study involved follow-up with students who had partic-
cipated in a high school bridge program designed to ease their transition into high school.
One hundred nineteen students participated in the summer program. Ninety five percent
of the students who attended the high school the students transitioned to were Latino;
98% of the students in the study were Latino. Data were collected through a mixed me-
thods approach—student surveys, student focus groups, counselor interviews, and student
individual interviews. The results indicated that although there was general agreement
among counselors that ninth grade students who were most successful in the transition
were those whom they had provided information regarding the many specialized academ-
ic programs at the high school; yet, this information was not made available to all stu-
dents. The research showed very weak counselor-student relationships severely limited
students’ OTL. Most of the information counselors provided was functional. The data
also showed that very little information was given by counselors to push students to think
beyond the ninth grade; almost none was given to help them think beyond high school.

Investigations have been conducted on racial differences during the transition
from middle school to high school. Akos and Galassi (2004) studied racial factors and
discovered that Latino students viewed their transition to middle school as more difficult
than did Caucasian or African American students. Latino students also felt their counse-
lors played more of an integral role in attempting to ease the transition than did their parents. Moreover, Ding (2008) assessed how the transition to high school impacted a student’s grades in math and English. The results of the study revealed that the transition had an impact on about 36% of the math grades and about 46% for English. According to the results of the study, African American students were more negatively impacted by the transition in math than Caucasian students, but there was not a significant difference in the impact of the transition in English between African American and Caucasian students.

One of the most noteworthy statistics related to urban high schools is the overwhelming number of students who drop out (Balfanz & Legters, 2004). Somers and colleagues (2008) notes that dropping out of high school is a symptom of a larger societal problems African American urban students face. He states that many of these students are poor, live in violent environments, and are also faced with the stereotypes of racism. These factors of poverty, violence and racism present both academic and emotional hindrances (Guo, Brooks-Gunn, & Harris, 1996). Many times these students are unable to see the correlation between academic success and success in their future (Cokley, 2003).

A study conducted by Somers et al. (2007) examined various environmental factors were related to success in urban schools. The purpose of the study was to discover interventions that would help African American students be more successful in high school. The research questions included the following: (a) what is the role of personal support and (b) what is the combined role of support and attitude and behavior in predicting the success of the African American students in the study. The participants were 118 African American boys and girls in the ninth grade in a large urban high school where
65% of the students were on free or reduced lunch. Almost all of the students identified participated in the study. Students were given a survey that used five measures taken from the Children and Adolescent social support scale. The study variables to be measured were social support from parents, peers, teachers, classmates and close friends. A multiple linear regression analysis was run with the five support variables. Six measures from Somers and Piliawksy (2004) were used to measure educational attitudes and behaviors. The six educational attitudes and behaviors that were included were educational intentions, educational behavior, personal control, persistence and the understanding of the personal value of an education. Correlations were run between the five support variables and the six education-related attitudes and behaviors. Next, using all eleven variables, a hierarchical linear regression analyses was used to examine the individual and combined effects of all variables with grade point average (GPA) as the criterion variable.

Analysis of the support variables indicated that the support of parents and peers was most strongly correlated with grades; teachers were next. Personal control, but not persistence was strongly correlated with positive outcomes. Jeynes (2000) found that parental involvement does positively affect academics, but socioeconomic status is also a factor. Hoover-Dempsey and Sandler (1997) noted a tendency for low-income parents to feel inadequately equipped to question and get involved in their children’s education. They are also less likely to be aware of their rights. Educational intentions or students who had intentions of finishing high school emerged as the variable most significant to the variance in GPA. According to Somers et al. (2008), their study revealed that for this sample of African American children, social support from parents and teachers need to be
encouraged, increased, and programs put into place to broaden parental involvement in
their children’s education. They also cite the importance of teacher relationships to aca-
demic success as well as the need for long term programs that offer social support. The
fact that peer relationships can affect success can be a hindrance as evidenced by a study
by Fordham and Ogbu (1986) which suggests that some African American students may
not perform as well as they can for fear of losing acceptance of friends.

Conclusion

If the outcomes from students’ performance in ninth grade play a significant role
in the prediction of the dropout rate despite the controls of student background and pre-
vious academic achievement, it might be reasonable to assume that the transition many
students’ experience between eighth and ninth grades impairs their future educational tra-
jectories in ways that can not be predicted before high school. This deduction would
suggest that there could be crucial moments in urban students’ educational journey that, if
not handled properly, could increase the possibility of these students’ dropping out. Fur-
thermore, if the freshman year of high school is one of heightened susceptibility to drop-
ning out, it may also be viewed as a crucial time for intervention to decreasing this risk
(Neild, Stoner-Eby, & Furstenberg, 2008).

Research clearly reveals that the transition from middle school to high school can
be a very difficult time in the academic life of an adolescent (Kennelly & Monrad, 2007;
Kerr, 2000; Reinhard, 1997; Reyes et al., 2000; Smith 2007). Considering the reality of
the importance of a high school education in today’s society coupled with the tremend-
ously high rate of freshman dropouts, especially in urban, inner city schools, it is impera-
tive that every possible step is taken to ensure that students make a successful transition into high school (Neild, 2009).

Interdisciplinary teaming is a proven method of supplying individual student support that is vital to academic achievement (McIntosh & White, 2006). Despite the organization and size of the schools, all students can benefit from the community established as a result of an effective interdisciplinary team (McEwin, Dickinson, & Jacobson, 2003). Students are the beneficiaries when the strengths and weaknesses of the teachers balance each other out, and they are exposed to various teaching styles (Muth & Alvermann, 1999). When students are members of a team, they can more easily see the connection of the content across the subject matter with the help of their teachers (Muth & Alvermann, 1999). Because a set of teachers is responsible to the same students throughout the day for an entire school year, relationships are formed and strengthened among students and their fellow teammates, among the team of teachers and among the teachers and the students. Essentially, students and teachers on a team form one cohesive unit (George & Alexander, 2003). Therefore, by focusing on the relationship aspects of high school, students will be more successful and feel more involved and at ease in the high school environment, thus decreasing one of the primary causes of student failure in the ninth grade (Lehr, 2003).
CHAPTER 3

METHODOLOGY

Purpose

The purpose of this study was to determine if any relationships existed between the implementation of interdisciplinary teams in ninth grade and academic achievement in English, reading, and mathematics in ninth grade. An assessment of this relationship was conducted through the collection of student achievement data from schools that implemented interdisciplinary teaming in ninth grade. Those data were compared to schools that had not implemented interdisciplinary teaming in ninth grade. The independent variables for this study were eighth grade achievement (in math, language and reading), gender, race, poverty, and teaming. The dependent variable in the study was academic achievement in English, reading and mathematics as measured by the PLAN. An analysis of the results of each group’s performance on the assessments provided a clear understanding of the impact of the independent variables had on academic achievement in English, reading and mathematics in ninth grade.

Research Design

This study compared ninth grade academic achievement data of two high schools within the same school district. The independent variables for this study were eighth grade achievement (in math, language and reading), gender, race, poverty, and teaming. The dependent variable was student achievement in English, reading and mathematics as
measured by students’ grades and scores on the PLAN. Data for both high schools were collected from the school district’s database. There were 612 freshmen at the high school that had implemented interdisciplinary teams, and there were 375 freshmen at the high school without interdisciplinary teams. The study included a total of 730 students which represented the total number of students in the district who successfully completed eighth grade and ninth grade between 2006-2009. A multiple linear regression analysis was used to determine if the use of interdisciplinary teaming generated a statistically significant impact on English, reading or mathematics achievement as measured by the PLAN. The analysis also assessed the impact of eighth grade achievement, gender, race, and poverty on academic achievement as measured by the PLAN. A multiple linear regression analysis was used to determine if the use of interdisciplinary teaming generated a statistically significant impact on English, reading or mathematics as it related to the covariates gender, ethnicity, and socioeconomic status. Archival student data from the 2006-2007 and 2008-2009 school years were examined in this study.

Variables

The independent variables for this study were ninth grade interdisciplinary team configuration and non-interdisciplinary team configuration in ninth grade, while the dependent variable were academic achievement in English, reading and math in ninth grade. Covariates such as gender, ethnicity and socioeconomic status (and the impacts thereof) were also examined in this study.
The Instruments

The SAT-10 and PLAN chosen for this study were administered to every student in the population. Thus they provided the necessary consistency for increased reliability of the results of the pretest and posttest.

Hypotheses

The following hypotheses were proposed to examine the relationship between team teaching and non-team teaching on the academic achievement of ninth graders in the areas of English, reading and mathematics as measured by the PLAN assessment:

1. There was no significant difference between average math scores on the PLAN for students who were taught in an interdisciplinary team format and those who were taught in a configuration that did not utilize teaming.

2. There was no significant difference between average English scores on the PLAN for students who were taught in an interdisciplinary team format and those who were taught in a configuration that did not utilize teaming.

3. There was no significant difference between average reading scores on the PLAN for students who were taught in an interdisciplinary team format and those who were taught in a configuration that did not utilize teaming.

Population

The proposed study examines a southeastern suburban school district which had been in existence since 1988, and opened its second high school in 2001. While the demographic makeup of each high school was similar, the enrollment sizes were signifi-
cantly different. Both schools had an approximate 1 to 1 gender ratio (See Table 2), but school A had a total enrollment of 2,345 students for the 2005-2006 school year- 1,015 more students than school B. School A’s ethnic demographics break down was as follows: 71% White, 18% Black, 7% Asian, 4% Hispanic, less than 1% Indian, and less than 1% Unknown (See Table 3). School B’s ethnic demographics break down was as follows: 76% White, 16% Black, 5% Hispanic, 3% Asian, and less than 1% Unknown (See Table 2).

The socioeconomic indicators for schools were similar as well. School A’s socioeconomic indicators were as follows: 88.6% of students paid full price for lunch; 3.8% qualified to pay a reduced price for lunch; and 7.63% qualified to receive free lunches (See Table 3). School B’s socioeconomic indicators were as follows: 88.8% paid full price for lunches, 3.98% qualified to pay a reduced price for lunch; and 7.22% qualified to receive free lunches (See Table 4).

Interdisciplinary teams were an integral part of the structure for ninth graders at one high school, but the other implemented a more traditional, non-teaming configuration for ninth graders. Nevertheless, all the middle schools in this district had interdisciplinary team configurations at every grade level, so all students who entered ninth grade in this district were exposed to interdisciplinary teams in middle school.

Table 2

<table>
<thead>
<tr>
<th>School</th>
<th>Male Students</th>
<th>Female Students</th>
<th>Total Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>School A</td>
<td>1163</td>
<td>1182</td>
<td>2345</td>
</tr>
<tr>
<td>School B</td>
<td>700</td>
<td>630</td>
<td>1330</td>
</tr>
</tbody>
</table>
Table 3

*Enrollment by Ethnic Group*

<table>
<thead>
<tr>
<th>School</th>
<th>White Students</th>
<th>Black Students</th>
<th>Asian Students</th>
<th>Hispanic Students</th>
<th>Indian Students</th>
<th>Ethnicity Unknown</th>
<th>Total Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1669 (71%)</td>
<td>412 (18%)</td>
<td>162 (7%)</td>
<td>95 (4%)</td>
<td>4 (&lt; 1%)</td>
<td>3 (&lt; 1%)</td>
<td>2345</td>
</tr>
<tr>
<td>B</td>
<td>1010 (76%)</td>
<td>213 (16%)</td>
<td>46 (3%)</td>
<td>60 (5%)</td>
<td>0 (&lt; 1%)</td>
<td>1 (&lt; 1%)</td>
<td>1330</td>
</tr>
</tbody>
</table>

Table 4

*Enrollment by Socioeconomic Status*

<table>
<thead>
<tr>
<th>School</th>
<th>Paid Lunch</th>
<th>Reduced Lunch</th>
<th>Free Lunch</th>
<th>Total Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2077 (88.6%)</td>
<td>89 (3.8%)</td>
<td>179 (7.6%)</td>
<td>2345</td>
</tr>
<tr>
<td>B</td>
<td>1181 (88.8%)</td>
<td>53 (3.9%)</td>
<td>96 (7.2%)</td>
<td>1330</td>
</tr>
</tbody>
</table>

The participants in the study included all eighth graders who took the SAT-10 in the spring of 2005, and tenth graders from that cohort who took the PLAN in tenth grade. A comparison of subgroups from the experimental and the control group was performed to insure that the populations were similar in terms of representation of subgroups. The SAT-10 scores were used as a pretest to verify that the control group and the experimental group had similar academic abilities. The PLAN in the fall of tenth grade served as a posttest.

*Instrumentation*

The relationship between interdisciplinary teaming and the academic performance of ninth graders in language arts and math was determined by the analysis of the assessment data collected. Interdisciplinary teaming was the independent variable for this
study. The dependent variables were the average scores in language arts and math on the SAT-10 and PLAN. The instruments chosen for this study were administered to every student in the population which provided the consistency necessary to enhance the reliability of the results yielded by the pretest and posttest. The SAT-10 and PLAN chosen for this study were administered to every student in the population, which provided the consistency necessary to enhance the reliability of the results of the pretest and posttest.

The SAT-10 was a required state assessment in Alabama for students in grades 3-8. Although Alabama requires abbreviated batteries at different grade levels, the SAT-10 was designed to measure achievement in Reading, Mathematics, Spelling, Language, Science, Social Science, and Listening. For the purposes of this study, each group’s Reading, Language, and Mathematics scores were compared.

The norms for the SAT-10 reflect the national K-12 population for the fall and spring of 2002. A total of 360,000 students were involved in the fall and spring samples - 250,000 and 110,000, respectively. The sample was selected based on a stratified cluster sampling design that included variables reflected in the 2000 Census of Population and Housing and the 2000-2001 National Center for Education Statistics. Standardization samples also included special education students who were typically included in school-wide assessments.

Results from the SAT-10 were provided in the following formats: raw scores, scaled scores, individual percentile ranks, stanines, grade equivalents, Normal Curve Equivalents, Achievement/Ability Comparisons, group percentile ranks and stanines, content cluster and process cluster performance categories, and performance standards. In addition to the use of multiple types of scores, the SAT-10 exhibited a high degree of
The PLAN was an assessment designed by ACT to measure the academic achievement of students entering the tenth-grade. Although Alabama required the PLAN...
for all tenth graders, some school districts required this assessment for all tenth graders at the district’s expense. The PLAN was designed to measure achievement in Reading, Mathematics, Language, and Science. For the purposes of this study, each group’s Reading, Language, and Mathematics scores were compared.

The norms for the PLAN reflected the national representative population of tenth-graders and eleventh graders in the fall of 2005. A total of 6,912 students were involved in the fall sample (4,356 and 2,556, respectively). The sample was selected based on a stratified sample of high schools by the size of the tenth-grade class, geographic region, gender, ethnicity, and school affiliation (public/private). Weights were applied to ensure appropriate representation of the aforementioned demographics could be achieved.

Results from the PLAN were provided in a raw score format as well as a scaled score format that was similar to the scale score of the ACT. In addition to providing test results in both raw and scaled formats, the PLAN also exhibited reliability according to the results of the Kuder-Richardson Formula 20 coefficients. The majority of the Kuder-Richardson Formula 20 coefficients for the raw scores and scale scores for the four content area assessed by the PLAN were in the low-.80s to the high-.80s. Content validity, on the other hand, was built into the PLAN through rigorous test development procedures. Test professionals and content specialists were contracted with ACT to construct test items for the PLAN. ACT made every effort to assemble a diverse group of item writers who reflected the diverse population of the United States with respect to ethnicity, gender, and geographic location. Once a test item was submitted, it was edited to meet ACT’s specifications for content, accuracy, word count, item classification, item format, and language. An additional internal screening was conducted by ACT to ensure that the
test item met all of ACT’s standards. After the completion of the internal screening, the test items were submitted to a group of high school teachers, curriculum specialists, and college and university professors for an external screening of the test items. The external panel assessed the items for content accuracy, educational importance, and grade level appropriateness. These procedures were in place to help ensure fairness to all examinees. Moreover, the aforementioned procedures were executed as a final review and assessment once the test items had been field-tested.
CHAPTER 4

RESULTS

The purpose of this study was to determine if any relationships existed between the implementation of interdisciplinary teams in the ninth grade and academic achievement in English, reading and mathematics. The study compared the ninth grade academic achievement data of two high schools in the same school district. One of the high schools had implemented interdisciplinary teaming in ninth grade; the other had not. The independent variable for this study was interdisciplinary teaming; the dependent variable was student achievement in English, reading and mathematics as measured by students' grades and scores on the plan. Gender, ethnicity and socioeconomic status were covariates examined in the study. Data for both high schools were collected from the school district's database for the school years 2006-2007, and 2008-2009. A total of 730 students were used in the study.

Descriptive Analysis

A total of 730 students were represented in the sample from both schools; 65.5% \((n = 478)\) from the school with interdisciplinary teaming and 34.5% \((n = 252)\) from the school without teaming. The sample consisted of 51.5% \((n = 376)\) male and 48.5% \((n = 354)\) female students with 9.5% \((n = 69)\) of the total sample receiving free or reduced lunch and 90.5% \((n = 661)\) paying full price for lunch. In terms of race or ethnicity, 76.7% \((n = 560)\) were Caucasian, 16.2% \((n = 118)\) were Black or African American,
4.4% ($n = 32$) were Asian, and 2.3% ($n = 17$) were Hispanic. Three students (0.4%) had no race/ethnicity listed or were listed as “other” (Table 5).

Table 5

Descriptive Statistics of the Demographics of the Sample

<table>
<thead>
<tr>
<th></th>
<th>Total Sample</th>
<th>Non-Teaming</th>
<th>Teaming</th>
<th>$x^2$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
<td>%</td>
<td>$n$</td>
<td>%</td>
<td>$n$</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>376</td>
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<td>116</td>
<td>46.0</td>
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<tr>
<td>Female</td>
<td>354</td>
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<td>240</td>
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<tr>
<td>Poverty</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>No</td>
<td>661</td>
<td>90.5</td>
<td>234</td>
<td>92.9</td>
<td>427</td>
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<tr>
<td>Yes</td>
<td>69</td>
<td>9.5</td>
<td>18</td>
<td>7.1</td>
<td>51</td>
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<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>560</td>
<td>76.7</td>
<td>211</td>
<td>84.1</td>
<td>349</td>
</tr>
<tr>
<td>Black</td>
<td>118</td>
<td>16.2</td>
<td>29</td>
<td>11.6</td>
<td>89</td>
</tr>
<tr>
<td>Asian</td>
<td>32</td>
<td>4.4</td>
<td>7</td>
<td>2.8</td>
<td>25</td>
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<td>Hispanic</td>
<td>17</td>
<td>2.3</td>
<td>4</td>
<td>1.6</td>
<td>13</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>0.4</td>
<td>2</td>
<td>0.8</td>
<td>1</td>
</tr>
</tbody>
</table>

*significant at .05 alpha level

There was no statistically significant difference in the proportion of males and females between teaming and non-teaming schools ($x^2=0.934$, df=1, $p = .334$), nor was there a significant difference in the proportion of free/reduced lunch students between teaming and non-teaming schools ($x^2=2.40$, df=1, $p = .122$). There was, however, a statistically significant difference in the racial makeup of teaming and non-teaming schools ($x^2=10.81$, df=4, $p = .029$). The school without interdisciplinary teams had a sample with a higher percentage of Caucasian students, whereas the school with interdisciplinary teams had a higher percentage of Black students.

Achievement Data Analysis

SAT-10 scores were reported as normal curve equivalents (NCE). The average sample SAT Math NCE was 67.6 ($SD = 19.5$). There was no statistically significant dif-
ference between teaming \((M = 67.35, SD = 19.7)\) and non-teaming schools \((M = 67.9, SD = 19.2)\) in eighth-grade math SAT NCEs \((t=0.381, df=728, p = .703)\). There was, however, a statistically significant difference in reading NCEs between team \((M = 62.9, SD = 18.7)\) and non-teaming \((M = 66.2, SD = 16.8)\) schools \((t=2.489, df=558.5, p = .013, r^2=.011)\). The effect size of .011 indicates a very small effect with only 1.1% of the variability in SAT Reading NCEs explained by teaming status. Similarly, there was a statistically significant difference in Language NCEs between teaming \((M = 61.0, SD = 16.9)\) and non-teaming \((M = 64.5, SD = 15.6)\) schools \((t=2.717, df=728, p = .007, r^2=.01)\). As with the difference in Reading NCEs, the effect size for the difference in Language NCEs is very small with only 1% of the variability in Language NCEs explained by teaming status (Table 3).

Tenth grade ACT PLAN scores were analyzed for differences between teaming and non-teaming schools. There was no statistically significant difference in Math PLAN scores between teaming \((M = 19.47, SD = 4.67)\) and non-teaming \((M = 19.57, SD = 19.57)\) schools \((t=0.259, df=725, p=.796)\). There was also no statistically significant difference in Reading PLAN scores between teaming \((M = 17.9, SD = 4.82)\) and non-teaming \((M = 18.3, SD = 4.55)\) schools \((t=1.275, df=725, p = .203)\). Nor was there a statistically significant difference in English PLAN scores between teaming \((M = 18.56, SD = 5.12)\) and non-teaming \((M = 19.27, SD = 4.67)\) schools \((t=1.829, df=725, p = .07)\).
Table 6

Descriptive Statistics of Achievement Data

<table>
<thead>
<tr>
<th></th>
<th>Teaming</th>
<th>Non-Teaming</th>
<th>t</th>
<th>df</th>
<th>r^2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M(SD)</td>
<td>SE</td>
<td>M(SD)</td>
<td>SE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAT</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>Math</td>
<td>67.4</td>
<td>0.90</td>
<td>67.9</td>
<td>1.21</td>
<td>0.381</td>
<td>0.703</td>
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<tr>
<td></td>
<td>(19.7)</td>
<td></td>
<td>(19.2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td>62.9</td>
<td>0.85</td>
<td>66.2</td>
<td>1.06</td>
<td>2.489</td>
<td>0.011</td>
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<tr>
<td></td>
<td>(18.7)</td>
<td></td>
<td>(16.8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Language</td>
<td>61.0</td>
<td>0.77</td>
<td>64.5</td>
<td>0.98</td>
<td>2.717</td>
<td>0.010</td>
</tr>
<tr>
<td></td>
<td>(16.9)</td>
<td></td>
<td>(15.5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLAN</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Math</td>
<td>19.5</td>
<td>0.30</td>
<td>19.6(4.9)</td>
<td>0.24</td>
<td>0.259</td>
<td>0.796</td>
</tr>
<tr>
<td></td>
<td>(5.2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td>17.9</td>
<td>0.22</td>
<td>18.3(4.5)</td>
<td>0.29</td>
<td>1.275</td>
<td>0.203</td>
</tr>
<tr>
<td></td>
<td>(4.8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>18.6</td>
<td>0.23</td>
<td>19.3(4.7)</td>
<td>0.30</td>
<td>1.829</td>
<td>0.068</td>
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<tr>
<td></td>
<td>(5.1)</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*significant at .05 alpha level  ** significant at the .01 alpha level

Multiple Linear Regression Analyses

The research questions address the relationship of a number of independent variables to PLAN performance in tenth grade. Of specific interest is the relationship to PLAN of being a student in a teaming or non-teaming school. A multiple linear regression analysis is used to assess the linear relationship of many independent variables to a dependent variable. For the three research questions of interest, there are three dichotomous independent variables (gender, teaming, and poverty), one categorical independent variable (race/ethnicity), and one continuous independent variable (eighth-grade SAT score). The single categorical independent variable must be subdivided into dummy coded dichotomous independent variables for inclusion in a multiple linear regression analysis. In the process of creating “dummy” codes there are in categories minus one dummy code created for the categorical variable. For the proposed study there would be five minus one, or four, dummy categories created with one referent variable. Therefore,
the current study would have eight independent variables for each of the three multiple regression equations.

A multiple linear regression analysis carries assumptions about the variables which are necessary for an accurate modeling of the data. These pivotal criteria are that the sample size is adequately large, that there are no univariate or multivariate outliers in the data, that independent variables are not highly correlated with each other, and that the distribution of residuals of the final model are normally distributed, linear, and homoscedastic. The first two of these assumptions must be tested before analysis and the others are examined after the regression equation has been established.

Sample Size

Tabachnick and Fidell (2007) discuss a need for a “substantial” case to independent variable ratio in order to be confident in the final regression equation. They quote a few rules of thumb for sample size in regression. The first is to have a sample size \( N \) where \( N \geq 50 + 8m \) where \( m \) is the number of independent variables in the equation. If the goal is to also test the adequacy of individual predictors, not just the multiple correlation coefficient, then the suggested rule of thumb is to have a sample size \( N \) where \( N \geq 104 + m \). A third rule of thumb cited by Tabachnick and Fidell is more complex and takes effect size into account. This rule states that \( N \geq \frac{(8/f^2)}{m-1} \), where \( f^2 \) is the effect size equaling .02 for detection of a small effect, .15 for detection of a moderate effect, and .35 for the detection of a large effect.

Taking these rules of thumb into account, the sample size of this study \( (n = 730) \) meets all three rules. For the first rule of thumb, the sample size would need to be greater
or equal to 114. The sample size for the second rule of thumb would need to be greater or equal to 112. The third, more complex, rule of thumb would require a sample size of 407 to detect a small effect. Given these calculations, the sample of 730 is sufficient for this study.

Outlier Analysis

Univariate outliers for the continuous variables (both DVs and IVs) were assessed as being any standardized score (z-scores) on the variable in excess of 3.29 or below -3.29. Scores above or below these z-benchmarks indicate that the scores are within the area of the distribution where less than 1 of 1000 cases reside ($p < .001$). The data from the six continuous variables; PLAN Math, PLAN Reading, PLAN English, SAT Math, SAT Reading, and SAT Language were transformed into standardized z-scores and assessed for outliers. All cases in the PLAN variables and in the SAT Math and SAT Reading variables had standardized values below within the -3.29 to 3.29 range. There was a single case in SAT Language that had a standardized score of -3.36 indicating that it was most likely an outlier in the data. This case was removed from analysis.

Univariate outliers for dichotomous variables were assessed using Rummel’s (1970) suggestion that any dichotomous variable with a 90% to 10% split or worse should be considered for removal due to the truncation of correlation coefficients within these categories. It should be noted that for dichotomous data, the analysis of outliers takes place at the variable level as opposed to the case level as with continuous variables. In assessing the variable in this analysis for dichotomous outliers, gender has a 51.5% to 48.5% male to female split so should remain in the analysis. Also to remain, teaming
(yes/no) has a 35% to 65% split, Caucasian (yes/no) has a 77% to 23% split, and black (yes/no) has a 16% to 84% split. The categories of Asian (yes/no) with a 4% to 96% split, Hispanic (yes/no) with a 2% to 98% split, and Other race (yes/no) with a 0.5% to 95.5% split may cause significant problems in the analysis and should be removed as variables.

The category of poverty (yes/no) is problematic in that it has a dichotomous split of 9.5% to 90.5% which is on the cusp of acceptable. Given the proximity to the cutoff, the large overall sample size and the importance of this variable, it will remain in the analysis.

Because three of the five racial/ethnic categories have been removed due to outlier status, the remaining two racial/ethnic categories can be summarized into one dichotomous variable. The referent for this variable is arbitrary and will be set as the larger of the two categories which is Caucasian. Therefore, the two categories of Black and Caucasian will be reflected by one category of ethnicity with Caucasian being coded as “1” and Black/African-American coded as “0”. The elimination of racial/ethnic variables reduces the number of independent variables in the study to five for each analysis.

Multivariate outliers were assessed through an examination of Mahalanobis distance values. According to Tabachnick and Fidell (2007), Mahalanobis distance is a value that reflects the “distance of a case from the centroid of the remaining cases where the centroid is the point created at the intersection of the means of all variables.” Therefore, in multivariate space, if a case has a Mahalanobis distance that is very far from the center of the multivariate distribution then it should be considered as an outlier and removed from the analysis. The general criterion for determining how far is too far is using the
critical value of a chi-square distribution at \( \alpha = .001 \) with degrees of freedom equaling the number of variables in the multivariate distribution. Any case that has a Mahalanobis distance in excess of this critical value would be considered an outlier and removed from analysis.

Mahalanobis distances were calculated using PASW version 18 statistical software for the multivariate distribution of six variables to be used in each of the three regression analyses. The critical value for the Mahalanobis distances were found to be 22.458 which is the critical \( \chi^2 \) value at \( \alpha = .001 \) with six degrees of freedom. The largest distances found for Math, Reading and Language, respectively, were 17.15, 18.54, and 19.93. None of these distances met the threshold for exclusion, so all remaining cases are retained for analyses.

In summary, univariate outlier analyses identified one case and three variables for removal. Multivariate outlier analyses identified no cases for removal.

Multiple Linear Regression Analysis

Regression analyses were conducted for three separate equations using different dependent variables in order to answer the research questions. The analyses for each question are detailed.

Tenth-Grade Math Achievement

A standard multiple regression analysis was performed using tenth grade ACT PLAN Math scores as the dependent variable and eighth grade Math SAT NCE, gender, poverty (as measured by free or reduced lunch status), race (Caucasian or African-
American), and school teaming (yes or no) as independent variables. All analyses were performed using PASW Statistics version 18. Once outliers and cases with missing data on the dependent variable were removed from analysis, the total sample consisted of 726 tenth-grade students from a large, suburban public school district.

Table 7 displays the correlations between all variables, the non-standardized \( (B) \) and standardized regression coefficients \( (\beta) \), the semi-partial correlations \( (sr^2) \), the multiple correlation coefficient \( (R^2) \), and adjusted \( R^2 \). The linear combination of the IVs were good predictors of tenth grade Math PLAN score, \( F(5,720) = 57.740, p < .001 \). The multiple correlation coefficient \( (R^2=.286) \) and adjusted multiple correlation coefficient \( (\text{Adj. } R^2=.281) \) indicated that around 28% of variability in Math PLAN score can be explained by the linear relationship of the five IVs. The variance explained by unique sources is 22.7%, with the amount of shared variability among the five IVs being 5.4%.

The non-standardized beta weights of the individual variables indicate that only two of the five IVs have beta weights that are significantly different from zero. The African American/Caucasian race beta was significant at the \( \alpha=.05 \) level \( (t=2.787, p = .005) \) with a positive weight of \( B = 1.174 \). Unique variation explained by this variable was less than 1% \( (sr^2=.008) \). Given that this variable was coded as 0 for African American and 1 for Caucasian, then Caucasian status of a student increases predicted Math PLAN score by 1.174 points.

The beta weight for eighth grade Math SAT NCE was also significantly different from zero at the \( \alpha=.05 \) level \( (t=14.872, p < .001) \) with a positive weight of \( B = 0.130 \). Unique variation explained by this variable was 23.6% \( (sr^2=.236) \) making Math SAT NCE the strongest predictor of the five IVs. The beta of .130 indicates that for every 1
point increase in Math SAT NCE, there is a .130 increase in predicted Math PLAN score in tenth grade.

The predictive equation for the set of IVs and the Math PLAN DV is:

Math PLAN = 9.644 + Gend(0.329) + Team(0.094) + Pov(-0.012) + White(1.174) + SAT(0.130)

While gender, teaming and poverty are all shown in this equation, the beta weights for these variables are statistically equal to zero; therefore, the contribution of these variables to prediction is negligible. These results indicate that gender, poverty status and whether or not a child is in an interdisciplinary teaming school have no relationship to tenth grade Math PLAN score. The only variables in this equation that do have a substantial predictive relationship are Caucasian status and performance on the eighth grade Math portion of the SAT.

Table 7

<table>
<thead>
<tr>
<th>Variables</th>
<th>Math PLAN</th>
<th>Gender</th>
<th>Teaming</th>
<th>Poverty</th>
<th>Caucasian</th>
<th>Math SAT</th>
<th>B</th>
<th>B</th>
<th>sr² (unique)</th>
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<td>.04</td>
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<td></td>
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<td></td>
<td>.329</td>
<td>.323</td>
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<tr>
<td>Teaming</td>
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<td>.04</td>
<td></td>
<td></td>
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<td></td>
<td>.094</td>
<td>.341</td>
<td>--</td>
</tr>
<tr>
<td>Poverty</td>
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<td>-.01</td>
<td>.06</td>
<td></td>
<td></td>
<td></td>
<td>-.012</td>
<td>.593</td>
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<td>Caucasian</td>
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<td>.04</td>
<td>-.12</td>
<td>-.36</td>
<td></td>
<td></td>
<td>1.17**</td>
<td>.421</td>
<td>.008</td>
</tr>
<tr>
<td>Math SAT</td>
<td>.53</td>
<td>.07</td>
<td>-.01</td>
<td>-.24</td>
<td>.29</td>
<td></td>
<td>0.130***</td>
<td>.009</td>
<td>.236</td>
</tr>
</tbody>
</table>

Intercept = 9.644

Means 19.52 0.49 .66 .10 .77 67.57
Std. Dev. 5.12 0.50 .48 .29 .42 19.54

R² = .286
Adj. R² = .281
R = .535***

**p < .01  ***p < .001  “Unique variability = .24; shared variability = .04
Multicolinearity was assessed using variance inflation factors (VIF) computed through the PASW regression command. Variance inflation factors are measures of how much variance in the standardized beta weights will inflate for an independent variable if it is totally uncorrelated with the other IVs. Any inflation factor near 1 is considered a good VIF indicating that the IV is not highly correlated with other IVs. VIF levels greater than 10 are considered to be very problematic. The VIF levels for the IVs of gender, teaming, poverty, Caucasian, and Math SAT were 1.01, 1.02, 1.17, 1.22, and 1.12, respectively. These results indicate that multicollinearity is not an issue with the IVs in this solution.

Linearity, normality and homoscedasticity of residuals were examined through plots of residuals. Figure 2 shows a histogram of residuals with a normal curve overlay. The residuals generally take the shape of a normal curve with a very slight positive skew. The distribution is close enough to normal to be considered not problematic.

Figure 3 shows a scatterplot of standardized residuals by standardized predicted values and shows a rather symmetrical plot of residuals and predicted values; thereby indicating that the assumptions of normality, linearity, and homoscedasticity of residuals were met.
Figure 2. Histogram of Math PLAN residuals.
Figure 3. Scatterplot of standardized residuals by standardized predicted values.
Tenth-Grade Reading Achievement

A standard multiple regression analysis was performed using tenth grade ACT PLAN Reading scores as the dependent variable and eighth grade Reading SAT NCE, gender, poverty (as measured by free or reduced lunch status), race (Caucasian or African-American), and school teaming (yes or no) as independent variables. All analyses were performed using PASW Statistics version 18. Once outliers and cases with missing data on the dependent variable were removed from analysis, the total sample consisted of 726 tenth grade students from a large, suburban public school district.

Table 8 displays the correlations between all variables, the non-standardized \((B)\) and standardized regression coefficients \((\beta)\), the semi-partial correlations \((sr^2)\), the multiple correlation coefficient \((R^2)\), and adjusted \(R^2\). The linear combination of the IVs were good predictors of 10\(^{th}\) grade Reading PLAN score, \(F(5,720) = 53.803, p<.001\). The multiple correlation coefficient \((R^2= .272)\) and adjusted multiple correlation coefficient \((\text{Adj. } R^2= .267)\) indicated that around 27\% of variability in Reading PLAN score can be explained by the linear relationship of the five IVs. The variance explained by unique sources is 21.5\%, with the amount of shared variability among the five IVs being 5.5\%.

The non-standardized beta weights of the individual variables indicate that only two of the five IVs have beta weights that are significantly different from zero. The African American/Caucasian race beta was significant at the \(\alpha=.05\) level \((t=1.969, \ p=.05)\) with a positive weight of \(B = 0.788\). Unique variation explained by this variable was 0.4\% \((sr^2= .004)\). Given that this variable was coded as 0 for African American and 1 for Caucasian, Caucasian status of a student increases predicted Reading PLAN score by 0.79 points.
Table 8

**Standard Multiple Regression of Five IVs on Tenth Grade Reading PLAN Score**

<table>
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<tr>
<th>Variables</th>
<th>Reading PLAN</th>
<th>Gender</th>
<th>Teaming</th>
<th>Poverty</th>
<th>Caucasian</th>
<th>Reading SAT</th>
<th>B</th>
<th>β</th>
<th>sr² (unique)</th>
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<td>-</td>
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<td>--</td>
<td>-.052</td>
<td>.055</td>
<td>.005</td>
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<td>Teaming</td>
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<td>.052</td>
<td>.005</td>
<td>--</td>
<td>-.09</td>
<td>.218</td>
<td>.014</td>
<td>--</td>
</tr>
<tr>
<td>Poverty</td>
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<td>-.01</td>
<td>.06</td>
<td>.218</td>
<td>.014</td>
<td>-.36</td>
<td>.788</td>
<td>.070</td>
<td>.004</td>
</tr>
<tr>
<td>Caucasian</td>
<td>.23</td>
<td>.04</td>
<td>-.12</td>
<td>.35</td>
<td>.070</td>
<td>.788</td>
<td>.494</td>
<td>.211</td>
<td></td>
</tr>
<tr>
<td>Read SAT</td>
<td>.52</td>
<td>-.09</td>
<td>.35</td>
<td>.211</td>
<td></td>
<td>.129</td>
<td>.494</td>
<td>.211</td>
<td></td>
</tr>
</tbody>
</table>

Intercept = 9.301

Means 18.04 0.49 0.66 0.10 0.77 64.08
Std. Dev. 4.73 0.50 0.48 0.29 0.42 18.05

R² = .272
Adj. R² = .267
R = .522

*p < .05  ***p < .001  aUnique variability = .215; shared variability = .055

The beta weight for eighth grade Reading SAT NCE was also significantly different from zero at the α=.05 level (t=14.428, p<.001) with a positive weight of B = 0.129. Unique variation explained by this variable was 21.1% (sr²=.211) making Reading SAT NCE the strongest predictor of the five IVs. The beta of .129 indicates that for every 1 point increase in Reading SAT NCE, there is a .129 increase in predicted Reading PLAN score in tenth grade.

The predictive equation for the set of IVs and the Reading PLAN DV is:

Read PLAN = 9.301 + Gend(-0.43) + Team(0.052) + Pov(0.218) + White(0.788) + SAT(0.129)

While gender, teaming and poverty are all shown in this equation, the beta weights for these variables are statistically equal to zero; therefore, the contribution of these variables to prediction is negligible. These results indicate that gender, poverty status and whether or not a child is in an interdisciplinary teaming school have no relation-
ship to tenth grade Reading PLAN score. The only variables in this equation that do have a substantial predictive relationship are Caucasian status and performance on the eighth grade Reading portion of the SAT.

Multicollinearity was assessed using variance inflation factors (VIF) computed through the PASW regression command. Variance inflation factors are measures of how much variance in the standardized beta weights will inflate for an independent variable if it is totally uncorrelated with the other IVs. Any inflation factor near 1 is considered a good VIF indicating that the IV is not highly correlated with other IVs. VIF levels greater than 10 are considered to be very problematic. The VIF levels for the IVs of gender, teaming, poverty, Caucasian, and Reading SAT were 1.01, 1.02, 1.16, 1.26, and 1.16 respectively. These results indicate that multicollinearity is not an issue with the IVs in this solution.

Linearity, normality and homoscedasticity of residuals were examined through plots of residuals. Figure 4 shows a histogram of residuals with a normal curve overlay. The residual frequencies seem to fall within the shape of a normal curve well. The distribution is close enough to normal to be considered not problematic.

Figure 5 shows a scatterplot of standardized residuals by standardized predicted values and shows a rather symmetrical plot of residuals and predicted values; thereby indicating that the assumptions of normality, linearity, and homoscedasticity of residuals were met.
Figure 4. Histogram of Reading PLAN residuals.
Figure 5. Scatterplot of standardized residuals by standardized predicted values.
Tenth-Grade English Achievement

A standard multiple regression analysis was performed using tenth grade ACT PLAN English scores as the dependent variable and eighth grade Language SAT NCE, gender, poverty (as measured by free or reduced lunch status), race (Caucasian or African American), and school teaming (yes or no) as independent variables. All analyses were performed using PASW Statistics version 18. Once outliers and cases with missing data on the dependent variable were removed from analysis, the total sample consisted of 726 tenth grade students from a large, suburban public school district.

Table 9 displays the correlations between all variables, the unstandardized ($B$) and standardized regression coefficients ($\beta$), the semipartial correlations ($sr^2$), the multiple correlation coefficient ($R^2$), and adjusted $R^2$. The linear combination of the IVs were good predictors of tenth grade English PLAN score, $F(5,720) = 70.334, p<.001$. The multiple correlation coefficient ($R^2=.328$) and adjusted multiple correlation coefficient (Adj. $R^2=.323$) indicated that around 32% of variability in English PLAN score can be explained by the linear relationship of the five IVs. The variance explained by unique sources is 26.9%, with the amount of shared variability among the five IVs being 5.9%.

The non-standardized beta weights of the individual variables indicate that only two of the five IVs have beta weights that are significantly different from zero. The African American/Caucasian race beta was significant at the $\alpha=.05$ level ($t=2.469, p=.01$) with a positive weight of $B = 0.98$. Unique variation explained by this variable was 0.6% ($sr^2=.006$). Given that this variable was coded as 0 for African American and 1 for Caucasian, then Caucasian status of a student increases predicted English PLAN score by 0.98 points.
Table 9

<table>
<thead>
<tr>
<th>Variables</th>
<th>English PLAN</th>
<th>Gender</th>
<th>Teaming</th>
<th>Poverty</th>
<th>Caucasian</th>
<th>Language SAT</th>
<th>B</th>
<th>β</th>
<th>sr² (unique)</th>
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<tr>
<td>Gender</td>
<td>-.07</td>
<td>-.023</td>
<td>-</td>
<td>-.002</td>
<td></td>
<td></td>
<td>-07</td>
<td>-.023</td>
<td>-</td>
</tr>
<tr>
<td>Teaming</td>
<td>-.07</td>
<td>.04</td>
<td></td>
<td>-.020</td>
<td></td>
<td></td>
<td>-</td>
<td></td>
<td>.002</td>
</tr>
<tr>
<td>Poverty</td>
<td>-.15</td>
<td>-.01</td>
<td>.06</td>
<td>.026</td>
<td>.002</td>
<td></td>
<td>-.15</td>
<td>-.01</td>
<td>.002</td>
</tr>
<tr>
<td>Caucasian</td>
<td>.23</td>
<td>.04</td>
<td>-.12</td>
<td>-.36</td>
<td>.980**</td>
<td>.083 .002</td>
<td>.23</td>
<td>.04</td>
<td>.980** .002</td>
</tr>
<tr>
<td>Lang SAT</td>
<td>.57</td>
<td>-.13</td>
<td>-.10</td>
<td>-.22</td>
<td>.27</td>
<td>.165*** .544</td>
<td>.57</td>
<td>-.13</td>
<td>.165*** .544</td>
</tr>
<tr>
<td>Intercept</td>
<td>7.822</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Means 18.82 0.49 0.66 0.10 0.77 62.31
Std. Dev. 4.97 0.50 0.48 0.29 0.42 16.42

R² = .328
Adj. R² = .323
R = .573***

**p < .01  ***p < .001  "Unique variability = .269; shared variability = .059"

The beta weight for eighth grade Language SAT NCE was also significantly different from zero at the α=.05 level (t=16.777, p<.001) with a positive weight of B = 0.165.

Unique variation explained by this variable was 26.3% (sr²=.263) making Language SAT NCE the strongest predictor of the five IVs. The beta of .165 indicates that for every 1 point increase in Language SAT NCE, there is a .165 increase in predicted English PLAN score in tenth grade.

The predictive equation for the set of IVs and the English PLAN DV is:

Eng PLAN = 7.822 + Gend(-0.023) + Team(-0.02) + Pov(0.026) + White(0.980) + SAT(0.165)

While gender, teaming and poverty are all shown in this equation, the beta weights for these variables are statistically equal to zero; therefore, the contribution of these variables to prediction is negligible. These results indicate that gender, poverty status and whether or not a child is in an interdisciplinary teaming school have no relation-
ship to tenth grade English PLAN score. The only variables in this equation that do have a substantial predictive relationship are Caucasian status and performance on the eighth grade Language portion of the SAT.

Multicolinearity was assessed using variance inflation factors (VIF) computed through the PASW regression command. Variance inflation factors are measures of how much variance in the standardized beta weights will inflate for an independent variable if it is totally uncorrelated with the other IVs. Any inflation factor near 1 is considered a good VIF indicating that the IV is not highly correlated with other IVs. VIF levels greater than 10 are considered to be very problematic. The VIF levels for the IVs of gender, teaming, poverty, Caucasian, and Language SAT were 1.02, 1.02, 1.17, 1.22, and 1.13, respectively. These results indicate that multicollinearity is not an issue with the IVs in this solution.

Linearity, normality and homoscedasticity of residuals were examined through plots of residuals. Figure 6 shows a histogram of residuals with a normal curve overlay. The residual frequencies seem to fall within the shape of a normal curve well, perhaps with a very slight positive skew. The distribution is close enough to normal to be considered not problematic.

Figure 7 shows a scatter plot of standardized residuals by standardized predicted values and shows a rather symmetrical plot of residuals and predicted values thereby indicating that the assumptions of normality, linearity, and homoscedasticity of residuals were met. The distribution of residuals may be a bit heteroscedastic with the negative
Figure 6. Histogram of English PLAN residuals.
Figure 7. Scatterplot of standardized residuals by standardized predicted values
standardized predicted values having lower residuals than the positive standardized predicted values. The level of heteroscedasticity is slight but may warrant concerns especially at the higher predicted English PLAN predicted values. These values may have more error connected to them than the lower values using the regression equation detailed above.

Conclusion

For the purposes of analysis of data used in this body of research, Gender, poverty, and whether a child attended an interdisciplinary teaming school have no relationship to the 10th grade English, Math or Reading PLAN. The only variables that do have a substantial predictive relationship to the English, Reading and Math PLAN are ethnicity and performance on the eighth grade English, Reading and Math achievement scores. If a child is black, the decrease in PLAN is 1.458 points for the English subtest. If a child is black, the decrease in PLAN is 0.861 points for the reading subtest. For math, a child's ethnicity as white and Asian has a positive relationship to PLAN scores. Eighth grade achievement scores are the most consistent predictor of PLAN scores for all 3 subtests. Although this study did not find that teaming is a significant predictor of PLAN scores, the results of this study do reveal some substantial achievement gaps among ethnic groups.
CHAPTER 5

OVERVIEW, MAJOR FINDINGS AND RECOMMENDATIONS

Overview

This study investigated the relationship between two types of instructional formats: interdisciplinary teaming and traditional non-teaming instruction. For the purpose of this study, interdisciplinary teaming is defined as a group of four core teachers who share the same group of students. Team teachers also share the same planning time. A critical aspect of team teaching is that classrooms are located in close proximity to one another. Teaming is used frequently at the middle school level, but this study looks at the impact teaming has on academic achievement in the areas of English, reading and mathematics in the ninth grade. An assessment of this relationship was conducted through the collection of student achievement data from a school district that implemented interdisciplinary teaming in ninth grade. Those data were compared to schools that had not implemented interdisciplinary teaming in ninth grade. The independent variables in this study were interdisciplinary teaming and non-interdisciplinary teaming in ninth grade. The dependent variable in the study was academic achievement in English, reading and mathematics as measured by a series of assessments. The results of each group’s performance on the assessments provided a clear understanding of the impact of ninth grade interdisciplinary teaming on academic achievement in English, reading and mathematics in ninth grade.
The independent variable in this study was whether or not a school implemented interdisciplinary teaming. The dependent variable is academic achievement as defined by how students perform on the PLAN (Preliminary ACT) during the fall of their sophomore year. Results from the students’ eighth grade SAT-10 assessment will be used to confirm that the control group and experimental group have similar academic abilities. These variables were used to attempt to answer the following research questions:

1. How well does the linear combination of eighth grade math achievement, race, gender, poverty status, and teeming status of a school predict tenth grade math achievement?

2. How well does the linear combination of eighth grade language achievement, race, gender, poverty status, and teeming status of a school predict tenth grade English achievement?

3. How well does the linear combination of grade reading achievement, race, gender, poverty status, and teeming status of a school predict tenth grade reading achievement?

This study compared the ninth grade academic achievement data of two high schools within the same school district. The independent variable for this study was interdisciplinary teaming. The dependent variable was student achievement in English, reading and mathematics as measured by students’ grades and scores on the PLAN. Data for both high schools were collected from the school district’s database. There were 612 freshmen at the high school that had implemented interdisciplinary teams, and there were 375 freshmen at the high school without interdisciplinary teams. A total of 730 students were represented in the sample from both schools; 65.5% \((n = 478)\) from the school with
interdisciplinary teaming and 34.5% \((n = 252)\) from the school without teaming. The sample consisted of 51.5% \((n = 376)\) male and 48.5% \((n = 354)\) female students with 9.5% \((n = 69)\) of the total sample receiving free or reduced lunch and 90.5% \((n = 661)\) paying full price for lunch. In terms of race or ethnicity, 76.7% \((n = 560)\) were Caucasian, 16.2% \((n = 118)\) were Black or African American, 4.4% \((n = 32)\) were Asian, and 2.3% \((n = 17)\) were Hispanic. Three students (0.4%) had no race/ethnicity listed or were listed as “other.” The populations’ mirrored each other by proportion of subgroups examined in this study except in the area of race. There was no statistically significant difference in the proportion of males and females between teaming and non-teaming schools \(\chi^2=0.934, \text{df}=1, p=.334\), nor was there a significant difference in the proportion of free/reduced lunch students between teaming and non-teaming schools \(\chi^2=2.40, \text{df}=1, p=.122\). There was, however, a statistically significant difference in the racial makeup of teaming and non-teaming schools \(\chi^2=10.81, \text{df}=4, p=.029\). The school without interdisciplinary teams had a sample with a higher percentage of Caucasian students, whereas the school with interdisciplinary teams had a higher percentage of Black students.

Major Findings

The first research question inquired as to whether the linear combination of eighth grade math achievement, race, gender, poverty status, and teaming status of school predicts tenth grade math achievement. An analysis of the achievement data indicated the significant predictors explaining 28.8% of the variability in Math PLAN were SAT Math \(B=.127\), Ethnicity-White \(B=1.597\), and Ethnicity-Asian \(B=1.848\). These results suggest that for every one NCE point increase we see a rise in PLAN 0.127 points. If a
child is White, the increase in PLAN is 1.597 points, and if a child is Asian the increase in PLAN is 1.848 points. The beta weights for gender, poverty, teaming status, and ethnicity-black were not statistically significant indicating that these variables do not add to the predictive power of the linear equation. So, for math, teaming status does not appear to have a relationship with Math PLAN achievement. The beta weight for teaming was .009 which is not significantly different from 0.

The second research question probed whether the linear combination of 8th grade language achievement, race, gender, poverty status, and teaming status of school predicts 10th grade language achievement. An analysis of the achievement data showed that the significant predictors explaining 33.5% of the variability in English PLAN were SAT language (B=.164), and Ethnicity-Black (B=-1.458) These results suggest that for every one NCE point increase we see a rise in PLAN 0.164 points. If a child is Black, the decrease in PLAN is 1.458 points. The beta weights for gender, poverty, teaming status, ethnicity-Asian and ethnicity-White were not statistically significant indicating that these variables do not add to the predictive power of the linear equation. So, for Language, teaming status does not seem to have a relationship with English PLAN achievement. The beta weight for teaming was -.003, which is not significantly different from 0.

The third research question explored whether the linear combination of eighth grade reading achievement, race, gender, poverty status, and teaming status of school predicts tenth grade reading achievement. An examination of these results suggests that for every one NCE point increase we see a rise in PLAN 0.129 points. If a child is Black, the decrease in PLAN is 0.861 points. The beta weights for gender, poverty, teaming status, ethnicity-Asian and ethnicity-White were not statistically significant, indicating that
these variables do not add to the predictive power of the linear equation. So, for Reading, teaming status does not appear to have a relationship to Reading PLAN achievement. The beta weight for teaming was .005 which is not significantly different from 0.

There was not a significant difference between the poverty group and the non-poverty group in Math, Reading or Language achievement scores. The size of poverty group was marginal, according to Rummel’s Rule, but was included because of the importance of the poverty subgroup. However, the small sample of poverty students contributed to the lack of variability among poverty students that resulted in no significant difference between the groups. A larger sample size of poverty students is needed to consider these results viable.

The use of interdisciplinary teaming in this study did not have a significant impact on student achievement as measured by the tenth grade PLAN assessment in the areas of math, language and reading. According to the results of this study the best predictors for success on PLAN in tenth grade is achievement in eighth grade. For English and Reading, a child's ethnicity as Black or African American has a negative relationship to PLAN scores in those areas. For math, a child's ethnicity as white has a positive relationship to PLAN scores. Although there was previous research that indicates interdisciplinary teaming can impact academic achievement in the areas of math, language and reading, the results of this study do not support those findings.

Connecting the Literature to the Results

The literature suggests that Communities of Practice in the form of professional learning communities, vertical teams, horizontal teams and hybrid teams have a positive
impact on student achievement (DuFour et al., 2008; Goldring et al., 2007; Hinman, 2007; Saphier, 2005). Both schools in this study had elements of the four aforementioned forms of Communities of Practice. Schools A and B provided instructional planning time for vertical and horizontal teams to meet regarding content and instructional strategies. School A offered time for their teachers to meet for instructional planning at different times throughout the school day on assigned days during the week. School B set aside time for their teachers to meet for instructional planning by scheduling a late start for students one day per week. Moreover, Schools A and B offered academic interventions for at-risk students during the school day. These key likenesses may have attributed to the lack of variance in academic achievement between the two schools. Given these points, the primary difference between the two was School A exercised horizontal teaming (interdisciplinary teaming) in addition to vertical teaming. Table 10 provides a breakdown of the Communities of Practice in place at each school.

Table 10

Communities of Practice by School

<table>
<thead>
<tr>
<th></th>
<th>School A</th>
<th>School B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Planning Time</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Academic Intervention</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Core Teachers Shared the Same Group of Students</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Teachers Meet Weekly to Discuss Shared Students</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Core Teachers Created Thematic Lessons Together</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

According to the literature, implementation of interdisciplinary teams at the high school level was difficult because the fundamental philosophy of interdisciplinary team-
ing was a direct challenge to established instructional norms of most high schools (Mura-
ta, 2002). School A implemented the interdisciplinary teaming structure. That is to say, all the essential elements of interdisciplinary teaming were not present. For example, common planning time was provided for interdisciplinary teams to explore curricu-
lum/content overlap among the four core content areas, but most of that time was spent calibrating calendars for tests and major assignments instead of planning thematic les-
sons. It must also be noted that these teachers did not receive professional development on the intended use of this complex strategy; thus, there was a lack of common under-
standing to guide a unified implementation of this component. Furthermore, and consid-
ering all the essential elements of interdisciplinary teaming, inter-curricula planning were the one area where School A lacked consistency and fidelity. Consequently, the ab-
sence of interdisciplinary curriculum planning may have contributed to the lack of vari-
bility between the two schools.

The literature identifies personalization as a significant factor in the academic success of ninth grade students (Allenworth & Easton, 2007; Ancess, 2003; Reith & Pol-
sgrove, 1994; Smith, 2007; Smith et al., 2008). Some of the key attributes of personaliza-
tion include the following: caring relationships, perceived course relevance, unwavering teacher access, and steadfast support. School A and School B had structures in place to provide a personalized experience for ninth grade students. While School A also pro-
vided an interdisciplinary teaming structure, career academies, and advisories to address the students need for personalization, School B offered career academies, majors, and a high school 101 course to address the students need for personalization.
The existence of these structures at each school afforded all ninth grade students a personalized experience. As a result, the aforementioned personalized structures may have served as yet another contributor to the lack of variability in academic achievement between the two schools. Table 11 provides a breakdown of the personalization structures that were in place at each school.

Table 11

<table>
<thead>
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<th>Personalization Structures of Each School</th>
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</thead>
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<tr>
<td>School A</td>
</tr>
<tr>
<td>Career Academies</td>
</tr>
<tr>
<td>Advisories</td>
</tr>
<tr>
<td>High School 101</td>
</tr>
<tr>
<td>Interdisciplinary Teaming</td>
</tr>
<tr>
<td>Majors</td>
</tr>
</tbody>
</table>

The academic achievement gap between African Americans and Caucasians in the ninth grade is illuminated in the literature, and the academic achievement results from School A and School B were consistent with the results of studies found therein (Benner & Graham, 2009; Legters & Kerr, 2001; Southern Regional Education Board, 2005). Although both schools had transition structures in place to assist students in their transition to high school, the PLAN results show an achievement gap between African Americans and Caucasians. As the literature indicates, African American students continue to lag behind their Caucasian counterparts in ninth grade achievement (Ding, 2008). The literature also highlights the gloomy ninth grade achievement results from various urban school districts throughout the country. These results have the potential to dramatically impact results in suburban districts as families continue to flee urban districts in pursuit
of a better academic setting for their children. Thus, suburban districts must be attentive to these rapid changes and prepare to address the academic needs of students who may not fit the traditional student profile. In spite of this, the PLAN results clearly indicated that School A and School B achieved a monumental feat by maintaining similar achievement levels for poverty and non-poverty students. The strategies used to conquer the colossal task of closing the achievement gap between poverty and non-poverty students may be useful in addressing the achievement gap between African Americans and Caucasians. On the whole, School A and School B have transition structures in place that must be fluid to address the changing student population trends occurring in suburban school districts throughout the nation.

Recommendations for Future Research

Additional data and research is needed to assess other variables that impact the effective operation of a school that includes ninth grade students. Quantitative factors such as discipline, attendance and retention should be examined in future studies. Discipline can be analyzed by comparing the discipline data of a teaming school to a non-teaming school. The discipline variables need to be limited to a finite number of discipline categories that are consistently defined by each participating school. The ability of team teachers to meet frequently about students should provide a venue for a rich discussion and an exchange of ideas of effective strategies and interventions to address inappropriate student behavior. Assisting students in adapting to the behavior expectations during their transition from middle school to high school will enhance the overall transition process for ninth grade students. Attendance data could be analyzed to determine if teaming has
an impact on absences and tardiness. Students who are not at school to obtain instruction are at greater risk for failure based on a lack of instruction. If poor attendance becomes a pattern that continues beyond ninth grade, a student could be at greater risk to drop out of high school. Retention data in ninth grade is a predictor of overall high school success. Students who successfully complete ninth grade are more likely to complete the requirements for high school graduation than students who are retained in ninth grade (Bottoms & Timberlake 2007). A study that compares retention data as well as graduation rates of ninth grade cohorts would add to the body of knowledge of the impact of teaming in ninth grade.

In addition to examining the impact of the other quantitative variables, future studies should consider the impact of qualitative variables related to teachers, students and parents such as teachers’ attitudes about the school, their colleagues and their students; parents’ attitudes about the school and their child’s teachers; the students’ attitude about the school, their teachers and their classmates. In addition to the aforementioned variables, a future study should assess the impact teaming has on a student’s self-concept, self-esteem, and self-efficacy. The qualitative variables of teaming may be difficult to definitively measure, but they are critical variables to consider for a comprehensive analysis of teaming. An instrument that could assess the level of commitment of critical stakeholder groups, the level of buy-in from critical stakeholder groups, and the quality of relationship among stakeholders will add to the current body of knowledge about the impact of teaming. Combining the quantitative and qualitative variables and instruments will provide a more comprehensive analysis of the potential impact of interdisciplinary teams. To maximize the reliability of the results of future studies, the sample size needs
to be larger with a more diverse group of schools and school districts. A larger sample size with more diverse schools and school districts will require a metric to define “teaming”, so the researcher could be confident in the reliability of the implementation of the teaming model across all schools.

Implications of the Study

The findings in this study conclude that interdisciplinary teaming did not have a significant impact on academic achievement. This study provides a platform for further exploration of the operational definition of interdisciplinary teaming. Many schools are assigning teachers from four different disciplines to a group of students and call it “interdisciplinary teaming.” Although the configuration of personnel is a core component of interdisciplinary teaming, the implementation of the concept is much more complex than grouping students and teachers together.

Furthermore, this study illuminates the value of teaming structures with a school. The nurturing and cultivation of Communities of Practice (regardless of a choice to implement interdisciplinary teams) is a vital component of a school’s success. There was empirical evidence in this study that provided conclusive evidence that teaming did not have a significant impact on the academic achievement of ninth grade students; however, this study should not stand alone as a conclusive determiner of the future of interdisciplinary teaming in ninth grade, but as a catalyst for broader and deeper future studies on the qualitative and quantitative value of teaming as it relates to academic achievement.
Conclusion

The purpose of this study was to determine the impact of interdisciplinary teaming on the academic achievement of ninth graders as measured by the PLAN administered in the fall immediately following ninth grade. The study revealed that there was not a significant difference in the performance of the teaming and non-teaming groups in the areas of math, language and reading. Limiting the measure of a complex and comprehensive instructional format to a single quantitative variable (student achievement) measured by a single instrument limits the ability to measure the overall impact of effective teaming. Interdisciplinary teaming is a comprehensive, robust, and complex concept that cultivates and enriches relationships among stakeholders. Teaming affords stakeholders a multitude of opportunities to interact and discuss interventions that enhance the educational experience of all students. Findings from this study do not support the assertion that the practice of interdisciplinary teaming improves academic achievement more than traditional instructional models. However, the limitations of the scope of this study impeded the ability to measure the impact of teaming on multiple cohorts. The current study analyzed one sample year in one school district. The power and effectiveness of teaming is difficult to harness by measuring a finite group in a finite amount time. Even though this study did not provide evidence of the value of interdisciplinary teaming as it relates to improving academic achievement, this study is not an indictment on the concept of interdisciplinary teaming and does not suggest the abandonment of teaming as an effective model for high school transition. The outcome of future comprehensive research will determine the future viability and sustainability of teaming as an effective transition strategy for ninth grade students.
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APPENDIX

INSTITUTIONAL REVIEW BOARD APPROVAL FORM
Form 4: IRB Approval Form
Identification and Certification of Research
Projects Involving Human Subjects

UAB's Institutional Review Boards for Human Use (IRBs) have an approved Federalwide Assurance with the Office for Human Research Protections (OHRP). The Assurance number is FWA00005960 and it expires on September 29, 2013. The UAB IRBs are also in compliance with 21 CFR Parts 50 and 56.

Principal Investigator: NALLS, MARTIN
Co-Investigator(s):
Protocol Number: E090828010
Protocol Title: The Impact of Interdisciplinary Teams on the Academic Performance of Ninth Grade Students in a Comprehensive Suburban High School

The above project was reviewed on 10/27/10. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services. This project qualifies as an exemption as defined in 45CF46.101, paragraph 1.

This project received EXEMPT review.

IRB Approval Date: 10/27/10
Date IRB Approval Issued:________________

________________________
Principal Investigator