

Longitudinal Look at Student Achievement and Psychological Engagement

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Dedication

This dissertation is dedicated to my loving and supportive family,

my husband, David Videen,

our amazing children, Janelle and Brian and

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Abstract

This study examined relations between students' psychological engagement and academic achievement, as well as between students' psychological engagement and growth in academic achievement. The study also examined if relations between students' psychological engagement and academic growth varied by grade level (elementary school compared to middle school). In addition, the study examined whether or not engagement was a predictor of later achievement or growth in achievement.

This study was conducted in a school district located in a first-ring suburb of Minneapolis. Data regarding students' psychological engagement were gathered through a district-wide student survey on two separate occasions and were linked to achievement data. The current study examined data from three groups of students. Primary interest was in a cohort of students tracked from fourth grade to seventh grade. In addition, the study compared the cohort to other groups of similarly aged students who completed the psychological engagement survey at a different point in time.

Results indicated a weak relationship between psychological engagement and achievement and essentially no relationship between psychological engagement and growth in reading achievement. In addition, psychological engagement did not add to the prediction of achievement after accounting for prior achievement. However, the results indicated that, for middle school students, the addition of a Teacher-Student Relationship factor did add to the prediction of growth in reading. Finally, the relationship between psychological engagement and achievement, as well as psychological engagement and growth in achievement, did not vary by grade level (elementary compared to middle school). Implications for practice and future research are discussed.

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Chapter I: Problem Addressed

Introduction

The federal No Child Left Behind (NCLB) program places great emphasis on academic achievement of students, particularly as assessed by standardized tests. Yet achievement is much more than just performance on assessments, representing mastery of important material and development of skills needed for college and careers. To be successful, educators need to identify not only the skills that youth need, but also processes that help move them toward developing those skills. This paper examined the relationship of students' psychological engagement (sense of belonging) with academic achievement; to the extent that sense of belonging is related to academic achievement and may help develop it, identifying ways of enhancing students' sense of belonging in school could help enhance their academic achievement. If sense of belonging can shape outcomes, it needs to be considered as part of the focus of NCLB as well as state initiatives.

The importance of this study lies not only in determining the strength of relationship between students' psychological engagement and academic achievement, but in examining dynamics of the relations between academic achievement and sense of belonging over time. Utilizing previous research as well as new data provided by this study, recommendations for strengthening sense of belonging are made to educators, community leaders, parents, and students themselves.

Purpose of the Study

The purpose of this study was to examine relations between students' psychological engagement and academic achievement, as well as between students' psychological engagement and academic growth. The study also examined if relations between students' psychological engagement and academic growth varied by grade level (elementary school compared to middle school). In addition, the study examined if engagement is a predictor of later achievement or growth in achievement.

Significance of the Study

The results of this study are important for those who study student engagement and its relations with students' academic achievement. No one had examined how psychological engagement affects students' achievement growth. As such, the results of this study add clarity to the existing research associated with school engagement by teasing apart different causal possibilities.

On a broader scale, the results of this study are intended to reveal potential benefits of schools and teachers placing additional effort on helping students develop a strong sense of belonging. Certainly, there are studies that claim importance of engagement (Finn, 1989, 1993; Goodenow, 1991; Anderson, Christenson, Sinclair & Lehr, 2004). Nevertheless, in an era of accountability for achievement, teachers and schools need to focus on efforts that produce enhanced outcomes. If engagement does not help improve achievement, one would expect teachers and others to claim that they should not have to waste their time ensuring that students are psychologically engaged in school. In particular, the need for belonging and social support is especially important

during adolescence (Goodenow, 1991) since that is when young people begin to consider seriously who they are and wish to be, with whom they belong, and where they intend to invest their energy and stake their futures. This study examines the magnitudes of relations of psychological engagement (defined as a student's sense of belonging at school and feeling comfortable with, cared about and respected by school staff) with academic outcomes and how those relations vary by grade level.

Research Questions

The research examines the following questions:

- How does psychological engagement relate to student achievement?
- How does psychological engagement relate to achievement growth?
- Does psychological engagement add to the prediction of achievement over and above prior achievement?
- Does psychological engagement add to the prediction of achievement over and above prior achievement and demographic variables of the student?
- Does psychological engagement add to the prediction of achievement growth over and above demographic variables of the student?
- Do relations of psychological engagement with achievement vary by the grade level (elementary versus middle school) of students?
- Do relations of psychological engagement with achievement growth vary by the grade level (elementary versus middle school) of students?

If a psychological engagement is a predictor of later achievement or growth in achievement, recommendations for strengthening psychological engagement could be made to educators and students.

Hypotheses

This study investigated how psychological engagement relates to achievement and academic growth. It also explored if psychological engagement adds to the prediction of achievement or the prediction of growth in achievement after accounting for prior achievement and demographic variables such as socioeconomic status and ethnicity. In addition, this study examined if relations of psychological engagement with achievement and academic growth varied by students' grade level. Therefore, hypotheses stemming from the research questions articulated above, framed as alternative rather than null hypotheses, are:

- Students who indicate having high psychological engagement will demonstrate higher achievement compared to their peers who indicate having less psychological engagement.
- Students who indicate having high psychological engagement will demonstrate better academic growth compared to their peers who indicate having less psychological engagement.
- Psychological engagement will add positively to the prediction of achievement over and above prior achievement.

- Psychological engagement will add positively to the prediction of achievement over and above prior achievement and student demographic variables (such as socioeconomic status and ethnicity).
- Psychological engagement will add positively to the prediction of growth in achievement over and above student demographic variables (such as socioeconomic status and ethnicity).
- The relationships between psychological engagement and achievement will be stronger for middle school students than for elementary school students.
- The relationship between psychological engagement and growth in achievement will be stronger for middle school students than for elementary school students.

Chapter II: Review of the Research

Student Engagement in Educational Settings

Within an educational setting, student engagement refers to students' attitudes about school, their feelings regarding the school environment and participation in school activities. It is multi-faceted. Most conceptualizations of engagement include a behavioral component and an emotional (or psychological) component (Finn, 1989, 1993; Voelkl, 1995; Marks, 2000). Some add a cognitive component, (e.g., Goodenow, 1991; Newmann, Wehlage, & Lamborn, 1992). Furlong and Christenson (2008) advocate adding a fourth component, academic engagement. Student engagement is thought to be

malleable; unlike many demographic characteristics of students, interventions can affect levels of student engagement.

The definitions of each of the components of engagement vary across studies. Students' affective or emotional reactions to school are encompassed within the psychological engagement component. Researchers have described the psychological (emotional) component of engagement as a sense of belonging, identification with school, and valuing school. Having a connection to or feeling supported by teachers, parents and peers has also been included in the psychological component of engagement. Within this study, psychological engagement is defined as a student's sense of belonging at school and feeling comfortable with, cared about and respected by school staff. Behavioral engagement generally pertains to participation in school and school related activities. It can include participating in class, exerting effort, following the rules and participation in extra-curricular activities such as sports or school governance. The cognitive component of engagement refers to the students' willingness to invest effort in their education. Indicators of cognitive engagement can include students' self regulation, the value they place on learning, their personal goals, and how relevant they view schoolwork to be for their future endeavors. Finally, some researchers describe an academic component of engagement that refers to the amount of time students devote to school or school related activities. It also includes homework completion and credit hours toward graduation.

This paper focuses on psychological engagement and its relationship with academic achievement. It describes a variety of definitions of what is now called psychological engagement – previously labeled as sense of belonging or identification.

The paper then reviews a number of studies that examine behavioral engagement and the participation-identification model of engagement. Finally, research that links academic achievement to various components of engagement (psychological, behavioral, cognitive and academic, as well as combinations of these components of engagement) is reviewed and summarized.

Psychological Engagement

Belonging in Educational Settings

One of the key components of engagement is the psychological or emotional element. Researchers such as Goodenow (1991) and Finn (1993) describe psychological engagement as a sense of belonging, while Deci, Vallerand, Pelletier, and Ryan (1991) use the term relatedness to describe psychological engagement.

Belonging has been considered a basic need since at least 1962 when Maslow's motivation theory suggested that basic needs, including a sense of belonging, must be in place before learning could take place. According to Maslow (1968), after basic material needs for food, shelter and clothing are met, there are non-material basic needs, such as safety and security, belonging and affection, respect and self-esteem, and the development of one's talents (self actualization). These needs are hierarchical in nature and must build upon each other. Once needs for belonging are met, healthy people are motivated primarily by self-actualization – trying to build on their talents and capabilities to reach their highest potential.

In 1992, Youngs defined six vital ingredients for self-esteem. These vital areas include affiliation– a sense of belonging, along with physical safety, emotional security,

identity, competence and mission– having meaning and direction in life. When these elements are in place, an individual is more likely to have a healthy self-esteem, giving one a realistic awareness of self, abilities, and needs. According to Youngs, a child who feels accepted by and connected to others feels liked, appreciated, and respected, and has a sense of belonging.

Edwards (1995) believes that each child needs to find a place to belong, a place in which to feel secure. Since children spend a large portion of their day in school, it is essential for them to have a sense of belonging in school. Without a sense of belonging in school, children may end up feeling they do not have a place anywhere in society.

Finn (1993) defines sense of belonging as perceived warmth and supportiveness of the school staff and students' views of how they are perceived by fellow students. The sense of belonging is an indicator of identification with school. Gallagher's definition of belonging is similar to Finn's. According to Gallagher (1996), a sense of belonging is the extent to which one feels personally accepted, respected, included and supported by those in his/her environment.

Goodenow (1993a) defines belonging as "a student's sense of being accepted, valued, included, and encouraged by others (teachers and peers) in the academic classroom setting and of feeling oneself to be an important part of the life and activity of the class" (p. 25). A student feels a sense of belonging when the social relations between the student and others in the school are of a reciprocal nature. In addition to feeling as though others are friendly toward a student and that the student is valued by others, the individual must share the educational goals of the class in order to feel a sense of belonging. Belonging involves participation in a purposeful group that includes

supportive relationships, social acceptance and respect. It is seen “as arising from the person *within* a particular school environment” (Goodenow, 1993b, p. 87). It is neither solely an individual phenomenon nor exclusively a function of the school environment. It is a “state” that is situation-specific, individual and subjective. It is not a “trait” construct. Thus, unlike many demographic characteristics of students, sense of belonging is capable of changing over time (Goodenow, 1991). In particular, Goodenow believes that a student’s sense of personal place can change during early adolescence; that it is susceptible to both positive and negative influences. This makes social integration in school an especially important concern for educators of early adolescent students.

Goodenow and Grady (1993) observe that both a student’s individual abilities and the belief in supportive resources – the help and encouragement of others- affect the student’s expectations of academic success. The need for belonging, social support, and acceptance takes on special prominence during adolescence because that is when young people begin to consider seriously who they are and wish to be, with whom they belong, and where they intend to invest their energy and stake their futures (Goodenow 1991).

Ryan and Powelson’s (1991) construct of relatedness is similar to Goodenow’s definition of sense of belonging. It states that relatedness “concerns the emotional and personal bonds between individuals” (p.53). They also note that relatedness refers to the experience of connecting with others and that relatedness is essential to student motivation for engagement in school.

Deci et al. (1991) define the need for relatedness as developing connections with others in one’s social environment that are secure and satisfying. Relatedness is one of three innate needs that are part of their self-determination theory, the others being

competence and autonomy. This study suggests that when people have the opportunity to satisfy basic psychological needs such as relatedness, competence, and autonomy within social contexts, their performance, motivation and development will be maximized.

Identification

Identification with school as defined by Voelkl (1997) has two components. It adds a component of valuing school-related outcomes to a student's sense of belonging in school. Voelkl's definition is derived from Finn's work. According to Finn (1989), students who identify with school have an internalized sense that they are an important part of the school environment and that school is an important component of their own experiences. In other words, students feel as though they are part of the school and the school is part of them. Finn also notes that students who identify with school value success in school-relevant goals. Voelkl further delineates the feeling of belonging associated with school to include the feeling of being a significant member in the school community, being accepted and respected in school, feeling proud to be a member of the school, and including school as part of defining one's self. The extent to which a student bonds with the school and includes it as a significant part of personal life is included in Voelkl's definition of identification. In addition, Finn notes that identification with school develops gradually.

Behavioral Engagement

Participation

Finn (1993) examined the relationship between engagement and student achievement in two studies using the U.S. Department of Education's NELS: 88 survey.

In the report on these studies, he distinguished between behavioral engagement, which he termed participation, and psychological engagement, which he called identification.

According to Finn, if students do not participate (engage behaviorally), they may be at risk of school failure regardless of other risk factors such as race/ethnicity and socioeconomic background. These behavioral risk factors, according to Finn, may be a productive area for focusing school level efforts to improve performance. Finn also concluded that behavioral risk factors are rooted in the early school years. Thus, efforts to promote participation need to be made early in a student's school career.

According to Finn (1989), youth will be unlikely to identify with school without a consistent pattern of participation in school activities, and this participation may need to be reinforced with successful academic experiences. He cautions that "it may be tempting to conceive of participation as a matter of degree – i.e., more or less – and to correlate this with school outcomes" (p. 136). However, he recommends a "search for threshold levels of participation below which positive outcomes and identification are unlikely to occur" (p.136). Goodenow concurs, "it is possible that some modest but critical level must be reached before students will be willing to expend energy and risk failure by engaging in school" (p.88). One proposed potential threshold level is the midpoint on the Psychological Sense of School Membership (PSSM) scale (3.0), below which students are more negative than positive in their responses regarding the school (Goodenow, 1993b).

Active participation in class is a minimal and essential condition for formal learning to occur. Performance in class, after allowing for student ability and instructional methods, is viewed as a direct outcome of student participation. "The

association of classroom participation with academic performance is supported consistently in empirical research” (Finn, 1989, p. 127). Note, however, that Finn’s assertion is not based on interventions that manipulate participation, and that the language is one of relationships, not causes.

Participation-Identification Model

Finn (1989) developed a participation-identification model. According to this model, for students to obtain positive school outcomes, such as a sense of belonging and valuing of school-related goals, participation in school activities is essential. The basic premise is that as most students begin school, they are willing and active participants in school activities. Participation continues as long as they experience some level of success. As students age and become more autonomous, participation and success are likely to include experiences both within and outside of the classroom, which will promote identification with school (which is labeled psychological engagement within this study) and continued participation in school-related activities. The model has a self-reinforcing nature such that small frustrations should not be sufficient to interrupt the positive participation-identification cycle. According to Finn’s model, students who do not follow this developmental pattern are at increased risk for emotional or physical withdrawal from school and an unsuccessful school career. Similarly, Voelkl (1996) contends that students who develop a sense of identification with school are likely to experience greater educational gains, expressly as a consequence of active participation in the classroom and in school generally.

Research – Student Engagement and Achievement

Psychological Engagement

Goodenow (1991), in an analysis of 612 middle school students, found a relationship between sense of belonging (labeled psychological engagement within this study), students' expectations of academic success, and their intrinsic interest in the school subject and academic achievement, defined by their course grades and their effort as rated by teachers. She found that sense of belonging rose with age. She also found that these middle school students were significantly surer about the value of their schoolwork and about their own academic capabilities than they were of their sense of belonging. In addition, Goodenow found that correlations of sense of belonging with grades and effort varied by subject area. Relationships were the strongest in heterogeneous social studies classes and weaker in homogeneously ability grouped reading and math classes. In another analysis, low-ability students' reports of belonging were similar to other students' reports in homogeneous reading and math classes but much lower in heterogeneous science, social studies and English classes.

In Goodenow's scale development study, the Psychological Sense of School Membership (PSSM) scale was a significant predictor of achievement as measured by students' first-quarter grade point averages in academic courses and of the grade point average for the year. Results from Goodenow's scale development studies indicate that sense of belonging may be an important contributor to school motivation, effort, participation, and subsequent achievement (Goodenow, 1993b).

In a study of more than three thousand eighth-grade students from Tennessee's Student/Teacher Achievement Ratio (STAR) class size experiment, Radziwon (2003)

examined the relation that a student's level of academic achievement, as measured by the Comprehensive Tests of Basic Skills (CTBS), had with identification with school, as measured by Voelkl's Identification with School questionnaire (similar to what has been defined here as psychological engagement). He found that students with higher academic achievement also had higher levels of identification with school (Radziwon, 2003). In addition, Radziwon found that the relation of academic achievement on identification with school was greater for Caucasian students than for African American students, indicating that achievement is less important in determining African American students' identification with school.

Roeser, Midgley and Urdan (1996) describe a theoretical model in which perceived teacher-student relationships affect students' feelings of belonging which in turn affect the students' self beliefs and emotions (more specifically academic self-efficacy, self-consciousness and school-related effect) which in turn affect school achievement (as measured by grades). They studied nearly 300 eighth grade students and found that feelings of school belonging (similar to what has been defined here as psychological engagement) were related to end of the year achievement (measured by grades in core academic subjects at the end of 8th grade) after controlling for prior achievement and other variables such as race, socioeconomic status, and gender.

Psychological engagement and peer beliefs.

In addition to examining the relationship of belonging to student's academic achievement, Radziwon's 2003 study also examined whether or not eighth-grade students' identification with school was related to their perceptions of their friends'

beliefs about school. He thought that a student's level of identification with school may be influenced by their friends. He found that academic achievement, race, gender and peer beliefs were related to school identification. Students' perception that their peers identify with school accounted for 27% of the variance in students' identification with school. This perception of their peers' beliefs was a stronger predictor of identification with school than prior academic achievement, gender, race or any of the interaction possibilities. Results of this study suggest that students with friends who think highly of school will themselves think highly of school. A significant interaction was found between peer beliefs and race, suggesting that peer beliefs affect Caucasians and African Americans differently. Perceived peer beliefs had a greater impact on Caucasian students' identification with school than they did for African-American students. Furthermore, the interaction between peer beliefs and gender was not significant, indicating that "the impact of peer beliefs on identification is similar for both males and females" (Radziwon, 2003, p.243).

Goodenow and Grady (1993) found, as did Radziwon, that the relationship between school belonging and friends' values was significant. Although causality was not established, Radziwon concluded that academic achievement and peer beliefs appear to be necessary for identification with school. These results, however, were influenced by strong interactions with race in that African-American students had lower academic achievement but higher identification with school than Caucasians (Radziwon, 2003).

In a longitudinal study of 57 fourth and sixth grade Latino students, Morrison Cosden, O'Farrell, and Campos (2003) found that sense of belonging decreased during the 4th grade for English Language Learners, but not for their classmates who were

proficient English speakers. The study found that peer self-concept and teacher ratings of school functioning were factors that contributed to the changes in school belonging. However, the results for sixth graders in this study differed from those of the fourth grade students. Instead, peer self-concept was a significant predictor of sense of school belonging.

Behavioral Engagement

Finn and Cox (1992) conducted a study examining classroom participation and achievement of nearly 1400 fourth grade students in Tennessee. They found that fourth grade students who were active participants in school scored higher on reading and math achievement tests (Stanford Achievement Tests) administered during grades one through three. Non-participants scored the lowest on previous achievement tests with passive participants scoring between active and non-participants. In other words, the three participation groups had substantial differences in achievement beginning in first grade and persisting through grade three. The results from this study show that classroom participation in younger years is tied to achievement. According to Finn's participation-identification model, this combination of participation and achievement will lead to identification with school.

A study by Fullarton (2002) examined data from the Longitudinal Surveys of Australian Youth (LSAY). The study, which took the view that examining achievement as the only outcome was a narrow view of education, used a nationally representative sample of more than 14,000 Year 9 students. Fullarton examined one portion of behavioral engagement, participation in extra-curricular activities. She found that females had higher engagement (participation) than males and that this held true across

achievement levels. She also found that socioeconomic background was related to participation; that students from higher socioeconomic backgrounds have higher levels of participation in extra-curricular activities. This study also concluded that levels of behavioral engagement were higher in schools where students believed there was a good school climate – one with high quality teachers, effective discipline and high levels of student learning.

Fullarton's study of the LSAY data also examined school level differences and found that the strongest predictor of student-level engagement (participation) was the school's overall level of student engagement. The school level effect (that which was over and above personal level engagement) moderated negative effects of socioeconomic status. In other words, Fullarton concluded that the school environment is an important influence on student engagement. In addition, the study's findings indicate that single-sex schools (in comparison to coeducational schools), smaller schools and schools with high socioeconomic levels had the stronger levels of engagement.

Behavioral and Psychological Engagement

A number of studies explore the relationship between students' sense of belonging in school (labeled psychological engagement in this study) and their participation in class as well as their academic achievement. In one such study, Voelkl (1997) examined how participation in class and academic achievement affected identification with school. School identification was measured with the Identification with School questionnaire which students completed while in eighth grade. The students' eighth grade teachers rated their classroom participation using the Student Participation Questionnaire. The students' fourth- and seventh-grade scores on the Comprehensive

Tests of Basic Skills (CTBS) were used as an indicator of the students' prior academic achievement.

In this study of nearly 1400 students from the Tennessee Student/Teacher Achievement Ratio (STAR) class size experiment, Voelkl (1997) found that previous academic achievement was correlated with identification with school (the correlation was significant but weak). Higher achievement in fourth- and seventh-grade was associated with greater identification with school (similar to what has been defined here as psychological engagement) in eighth grade. The relationship between identification (in eighth grade) and classroom participation (in eighth grade) was stronger than between identification and previous academic achievement.

In Voelkl's 1997 study, females had significantly higher levels of identification with school than did males. Females also had significantly higher levels of classroom participation than did males. However, females were not different from males in previous academic achievement.

Voelkl also found that race was related to classroom participation, academic achievement and identification. Caucasian students were found to have higher levels of achievement in fourth- and seventh-grade and higher levels of classroom participation in eighth grade than did African American students. Voelkl's study also found that Caucasian students with higher prior academic achievement identified more with school in eighth-grade than their lower achieving peers. Among African American students, prior achievement was unrelated to identification with school. However, for both Caucasian students and African American students, higher achievement was related to

greater participation and greater classroom participation was related to higher levels of school identification.

A study by Allen, Christopher, Marks and Miles (2000) was intended to determine the degree to which adolescent students identify with (feel they are a part of) their school and to show whether or not students participate in school activities. Identification with school was defined as enjoying school, being proud of school, and having a feeling of “belonging” at school (similar to what has been defined here as psychological engagement). Four levels of participation were defined: 1) responding to school requirements (being in class, completing homework, not misbehaving), 2) participating in class-related initiatives (engaging in classroom discussions), 3) participation in extracurricular activities (which included spectator and participation in sports, plays, musical performances, attending dances, participating in special school events; belonging to school clubs and organizations and spending time on club and organizational activities) and 4) participation in school governance activities. The study of 245 students was completed in a small, public, rural middle school in an eastern seaboard state.

The authors found a significant difference by grade level in three of the four levels of participation, with participation in class-related initiatives being the exception. Generally, sixth grade students were more likely to participate in school while eighth graders were less likely.

Allen, Christopher, Marks and Miles also studied the relationships between middle school students’ participation in school activities and perceptions of their family educational culture, their academic ability, the quality of their instruction, and their

identification with school. The results of their study indicate that the strongest predictor of a middle school student's identification with school (similar to what has been defined here as psychological engagement) is their perception of quality of instruction (teachers; use of a variety of instructional techniques, teachers' willingness to provide extra help).

One of Finn's 1993 studies focused on the association of participation in school and classroom activities with academic achievement. The study used a sample of 15,737 eighth grade, public school students from the National Educational Longitudinal Study of 1988 (NELS: 88). Students were classified into one of four groups based on their participation in school (highly engaged, middle high, middle-low, not engaged) based on six variables including attendance/tardiness, being prepared for class, behavior, and teacher reports of withdrawal and level of engagement in class as well as participation in school activities outside of the regular school day. There was a strong and consistent association between academic achievement and school engagement (in this case, behavioral engagement or school participation). Those who participated more scored higher on reading, math, science and history achievement tests. In other words, the more forms of participation (good attendance, positive behavior and participation in school activities beyond the school day) a student displayed, the higher their score on the achievement tests. The association found between participation level and achievement did not differ among four ethnic groups (Asian, Hispanic, African American and Caucasian students) or between males and females.

In another study involving approximately six thousand at-risk students, Finn found substantial differences among three achievement-level groups in the extent to which students engaged in productive classroom behavior. The three achievement groups

(successful, passing and unsuccessful) were defined by the students' reading and math scores on the NELS: 88 battery. In addition, Finn found that classroom behaviors, such as attending class, arriving on time, being prepared for class and participating in classroom activities, were associated with acceptable school performance, regardless of ethnic background. Academically successful at-risk students (urban minority, non-English home language or lower socioeconomic status) were more involved in school related activities, such as completing homework and participation in extracurricular activities, than were their less academically successful peers. The data support the view that academic performance of students from different ethnic backgrounds and students of either gender benefit from participating in school-related activities outside of the regular school day.

Finn's 1993 study also examined the relationship between academic achievement of at-risk students and their sense of belonging at school (similar to what has been defined here as psychological engagement). In this case, there were no significant differences among achievement groups. That is, academically successful students were not distinct from their less successful peers in their sense of belonging at school. For this study, sense of belonging included measures that reflected the students' feelings of school belonging, their perceptions on how their peers viewed them and the number of times the student had moved in previous years. The findings from this study of at-risk eighth grade students contradicts Finn's participation-identification model.

In 2006 Finn studied 3500 young adults who were at-risk for educational failure in the eighth-grade NELS:88 study. The study concluded that among these at-risk students, students with higher levels of behavioral engagement (coming to class on time,

attending classes regularly, working hard in class, and completing assignments) were more likely to enter a postsecondary program and earn postsecondary credits.

Participation in extra-curricular activities in high school also was related to entering postsecondary education.

Marks (2000) conducted a study that examined data from 24 schools (evenly distributed among elementary, middle school and high school levels) collected by the Center on the Organization and Restructuring of Schools. The operational definition of student engagement used in the study included behavioral components (student effort, attentiveness and frequency of completing homework assignments) as well as an emotional component (lack of boredom in class). She found that, across all three school levels, authentic instructional work was related strongly to student engagement as she defined it. In addition, Marks found that social support for learning (believing that teachers listen, hold high expectations and provide help for learning, as well as feeling safe, and being treated fairly) also contributed substantially to student engagement. In these schools that were undergoing reforms, Marks also found that when authentic work and social support for learning were in place, ethnicity did not differentiate levels of engagement. She concluded that “because most previous research on student engagement has documented the influence of social background, the absence of such effects may be a consequence of the efforts that are being made by restructuring schools on behalf of equity” (p.174).

Results from an Organisation For Economic Co-Operation and Development (OECD) Programme for International Student Assessment (PISA) study (Willms, 2003) of student engagement found that all schools in nearly every country involved in the

study had at least 15 percent of its students reporting a low sense of belonging and at least 10 percent of its students reporting low school participation. The study concluded that virtually all schools need to address the issues related to disengaged students. However, while all schools had a population of students who were disengaged, within each country, schools varied significantly in the prevalence of disengaged students. Thus, low levels of student engagement did not have to be the norm. Family background of the students only partially accounted for the variations in student engagement, which indicates that school policies and practices contribute to how successful schools are at engaging students.

The PISA student engagement study also found moderately strong school-level correlations among engagement measures and literacy performance, suggesting that schools with high levels of engagement tend to have high levels of achievement. While one cannot conclude from these findings that a school's efforts to increase student engagement would lead to higher student achievement, the study does provide evidence that literacy skill development rarely suffers due to an emphasis on student engagement.

Academic and Psychological Engagement

Smerdon (2002) investigated students' perceptions of school membership and linked student and school characteristics to these perceptions. The study involved a national sample of more than 11,000 high school students from the National Education Longitudinal Study of 1988 (NELS:88). Students who were on an academic track (defined as taking more English and mathematics courses) and who held higher educational expectations had higher school membership levels (defined as belonging, commitment to academic work and commitment to school as an institution). Students in

schools in which students have more influence over their academic work also had higher levels of perceived school membership. Low school membership was associated with low levels of school membership in middle school, negative academic behaviors (being unprepared for class, delinquent behavior, nonattendance) and low grades.

Although Smerdon found that school membership varied significantly among schools depending on school level characteristics, the vast majority of variance in perceived school membership was among students within a school. In other words, the opportunities and experiences within their school was a stronger factor in determining their perceived school membership than which school they attended.

Research conducted in Chicago public schools examined the extent to which gains in achievement were related to student perceptions of social support for learning and the academic press of the school. The research was conducted across more than 300 schools with nearly 30,000 students in sixth and eighth grade. Lee and Smith (1991) found a weak relationship between social support (similar to the Teacher-Student Relationships factor of psychological engagement used in this study) and learning. However, more importantly, they found that the relationship between social support and learning depended on their school's level of academic press. In this study, academic press was a composite of the extent to which teachers felt their school's goals and actions focused on improving student learning and the extent to which students felt their teachers challenge them to reach high levels of academic performance. In schools with low academic press, no amount of social support led to achievement gains. On the other hand, students in schools with medium to high academic press benefited academically from social support for learning, while students in these schools who did not feel as

though they had social support suffered academically. Lee and Smith concluded that their findings suggest the importance of providing social support for students in environments that hold high academic expectations and push students to excel academically, and that students who are in learning environments that lack both academic press and social support for learning actually lose ground academically.

Cognitive Engagement

A study by Klem and Connell (2004) examined teacher support, engagement, and achievement. Using data from the Institute for Research and Reform in Education, Klem and Connell examined cognitive engagement data through a student survey (items regarding exerting effort on schoolwork, paying attention in class, being prepared for class) as well as teacher reports of student engagement (being attentive in class, coming to class prepared) and school records of students' behavioral engagement (attendance, suspensions) and academic achievement (grades and nationally normed test scores). Approximately 3000 third through eighth grade students were involved in the research. Students with high levels of cognitive engagement were more likely to have higher academic performance and high levels of attendance, while students with low levels of cognitive engagement were less likely to have high performance and attendance and were more likely to have low achievement and low attendance. This held true for both student reported and teacher reported cognitive engagement. Klem and Connell also examined how teacher support affected student engagement. They found that students who experience high levels of teacher support were much more likely to feel engaged in school. Students who felt as though there were low levels of teacher support were much more likely to report low levels of engagement. Engagement levels of middle school

students were more strongly related to teacher support than were elementary school students. Middle school students with high teacher support were much more likely to report high cognitive engagement while for elementary students, lack of teacher support had the largest effect.

According to Klem and Connell “teacher support is important to student engagement in school” (p. 270). They conclude that “students who perceive teachers as creating a caring, well-structured learning environment in which expectations are high, clear, and fair are more likely to report engagement in school. In turn, high levels of engagement are associated with higher attendance and test scores – variables that predict whether youth will successfully complete school” (p.270).

Research – Engagement and Dropping out of School

Rumberger’s (1995) multilevel analysis of data from the National Educational Longitudinal Survey of 1988 (NELS: 88) found that middle school students who reported doing more homework (in other words, were academically engaged in school) were less likely to drop out. He also found that students who were not behaviorally engaged in school, as measured by lack of participation in extracurricular activities, had significantly higher chances of dropping out of school. The data also encompassed aspects of psychological engagement. Students who felt as though they were viewed by other students as a troublemaker and not as a good student were much more likely to drop out of school. In addition, odds of dropping out were much lower when students attended schools in which they felt that the discipline policy was fair. Furthermore, students who were not cognitively engaged, those who felt that their academic subjects were not going

to be useful in their future, were more likely to drop out of school between eighth and tenth grade.

Summary of Research

Student engagement has multiple components: behavioral, psychological, cognitive and, according to some definitions, academic. Various components of student engagement have been found to be related to academic achievement. Studies show that psychological engagement, sense of belonging, is correlated with grades (Goodenow, 1991) and that sense of belonging is a significant predictor of achievement (Goodenow, 1993). Other research shows that prior achievement is correlated with psychological engagement (identification) (Voelkl, 1997). Roeser, Midgley and Urdan (1996) found that, after controlling for prior achievement, sense of belonging was related to achievement. Radziwon (2003) found that the relationship impact of academic achievement with identification with school was greater for Caucasian students than for African American students, suggesting that achievement is less of a factor for African American students' identification with school. Voelkl (1997) also found that the relationship between achievement and identification held true for Caucasian students, but not for African American students.

Research also has shown behavioral engagement to be tied to achievement. Participation was found to be strongly related to achievement (Finn, 1993); students who participated more, scored higher on achievement tests. This relationship was true across ethnic backgrounds and for both males and females. In addition, active participation in the classroom was related to prior achievement (Finn & Cox, 1992).

Cognitive engagement, as examined by Klem and Connell (2004), was related to achievement and attendance. Students with higher cognitive engagement were more likely to have high levels of achievement and attendance. In addition, higher levels of psychological engagement (in the form of teacher support) resulted in higher levels of cognitive engagement. Psychological and academic engagement components were examined by Lee and Smith (1999). They found that the combination of a school's level of academic press (academic engagement) and of students' feeling supported (psychological engagement) were related to achievement. A combination of higher academic engagement and high expectations of self were related to higher psychological engagement (belonging) (Smerdon, 2002).

Future Research

Although previous research has demonstrated a link between various components of engagement and achievement, much of the work has focused on behavioral engagement (participation) (Appleton, Christenson, & Furlong 2008) or has been cross-sectional (Fredricks, Blumenfeld, & Paris, 2004). Fredricks et al. (2004) also noted that there is little research on psychological engagement and achievement.

In the 2003 report of PISA study results, Willms states that engagement “entails attitudes and behaviours that can be affected by teachers and parents, and shaped by school policy and practice” (p. 9). School policies and practices affect school climate, either fostering or discouraging student engagement with school. As such, examining how psychological engagement interacts with student achievement and, even more importantly, growth in academic achievement is of great practical importance for school

systems. A link between students' sense of belonging and their academic growth will ensure that psychological engagement will not be a casualty of the current accountability system that is heavily focused on academics. Research to establish whether or not psychological engagement adds to the prediction of achievement and achievement growth after controlling for prior achievement would also help to ensure that students' sense of belonging is not lost in an era of academic accountability.

Chapter III: Research Methodology

Introduction

This study started by replicating previous work on linking achievement and psychological engagement; however it extended current research by looking at the relationship of psychological engagement and achievement over multiple school years. The study also examined whether or not psychological engagement added to the prediction of achievement over and above prior achievement. Its focus was across calendar and school years, longitudinally examining if psychological engagement in fourth grade added to the prediction of seventh grade reading achievement. In addition, the assessment used in this study allowed for measuring academic growth in comparison to a growth norm. Thus, the relationship between sense of belonging and average growth in achievement was examined. In an effort to establish internal validity to the study, in addition to examining the cohort of students from fourth grade to seventh grade, the study compared the cohort to other groups of similarly aged students who completed the psychological engagement survey at a different point in time.

The Setting

This study was conducted in a school district located in a first-ring suburb of Minneapolis. During the 2004-05 school year the district enrolled 13,233 students. Due to a steady pattern of declining enrollment, the number of students enrolled had dropped slightly to 13,034 during the 2006-07 school year. As is typical of many first-ring suburban school districts, there was a dramatic expansion of the number of students from various cultural, ethnic and economic backgrounds. The percent of minority students in the district increased from 36% in 2004-05 to 42% two years later. The percent of African American students increased from 20% to 25% during the same time frame. In addition to changes in ethnic distribution, there was also an increase in the percent of students in poverty. For instance, the percent of middle school students receiving free or reduced price lunch increased from 32% in 2004-05 to 38% two years later.

Sample

This research employed historical data from a first-ring suburban district. Data regarding students' psychological engagement were gathered through a district-wide student survey on two separate occasions. The survey data were individually identifiable and were tied to the district's standardized achievement tests. The achievement test uses a scale that allowed measurement of growth as well as providing status data. Achievement data were available from the school years in which the survey was conducted. This research followed a group of elementary students into middle school. For comparison purposes, the study also made use of data from larger samples of students across shorter time spans. The second group of students included those who were in the

sixth grade during the 2004-05 school year and the third group of students included in this study were in fourth grade during the 2006-07 school year.

Participants

Participants were students from a first ring suburb in a Midwestern state. The study includes three distinct groups of students.

The first group completed the district's student opinion survey in the spring of fourth grade (2005) and again in the spring of their sixth grade year (2007). Study participants also had fall reading achievement scores in fourth, fifth, sixth and seventh grades.

Group 1 consisted of 540 students. A majority of the students were Caucasian (71%, n=384), with 12% African American students (n=67), 7% Asian American students (n=40), 8% Hispanic American students (n=45) and 1% American Indian students (n=5). Thirty percent (n=163) of the study participants received free/reduced price lunch in either fourth or sixth grade.

The second group of students completed the district's student opinion survey in the spring of 2005 while in sixth grade. Group 2 students also completed the fall reading achievement tests in sixth and seventh grade. The group consisted of 759 students, 66% of which were Caucasian (n=502), 18% were African American (n=138) and 33% received free/reduced price lunch (n=250).

The third group of students included in the study completed the district's student opinion survey in the spring of 2007 while in fourth grade. To be included in the study these students would also have fall reading achievement scores from fourth and fifth

grade. Group 3 consisted of 776 students of which 60% were Caucasian (n=469), 20% were African American (n=151) and 32% received free/reduced price lunch (n=248).

The participating groups differed slightly from the overall population of the district in that study participants in Group 1 were enrolled in the district for four consecutive years. Students in study Groups 2 and 3 differ from the overall district population in that they were enrolled in the district for two consecutive years.

Measures

Student Opinion Survey

Psychological engagement data for this study were collected through a district Student Opinion Survey. The survey was designed to provide district-wide information on students' sense of belonging and school climate as well as to provide data for the evaluation of a desegregation program. The survey was designed by the program evaluation team which consisted of the district's Director of Teaching and Learning, the Integration Program Director, Student Services Program Director and the Research, Evaluation and Assessment Program Director as well as an external evaluation consultant.

Drafts of the survey were reviewed by numerous district groups including, but not limited to, the curriculum team (consisting of teachers on special assignment as content specialists), the integration committee (including principals and community members), and a student advisory committee (consisting of district students).

The student opinion survey was conducted in May 2002. The survey was revised by district personnel and re-administered in 2005 and again in 2007. Data from the 2005 and 2007 surveys were included in the current study.

Students were asked to complete survey items that were generally on a four point Likert type scale (strongly agree, agree, disagree, strongly disagree). In some instances items included a fifth point labeled “I don’t know” or “does not apply”. Items were re-coded for analyses so that higher scores indicated higher levels of engagement.

Survey administration procedures.

The student opinion survey was administered to all district students in grades four through twelve during March of 2005. The survey was administered once again to all district students in grades four through twelve during March of 2007. Each time the survey was administered during a three week window. Each school chose a survey administration date that worked best within their schedule. The survey was administered to students who were in attendance during the school’s survey administration time. In other words, schools were not required to administer make-up surveys to students who were absent.

Computerized Achievement Level Test

The Northwest Evaluation Association (NWEA) assessment used by the district is the Computerized Achievement Level Test (CALT). The CALT was developed by Bloomington Public Schools in 1999. It uses a “Cold Fusion application to control the item selection and branching algorithm and also to score the final tests” (Angermeyr, 2006). It was the precursor to NWEA’s own Measures of Academic Progress (MAP)

computer adaptive assessment. The CALT uses a large bank of items developed by NWEA using Item Response Theory (IRT). The use of IRT means that each item has a difficulty score which allows students to be tested with different sets of items, appropriate to their ability level, and their scores can be placed on a common scale.

CALT – description of the assessment.

The CALT is a computer adaptive test. It allows students to take test items that are within their ability range and avoids having them spend time and energy on items that are either too hard or too easy. The test uses a branching system that adjusts which level items individual students receive based on their performance on earlier items. Specifically, students start by taking a short, eight item test called a locator that progresses quickly from easy items to hard items. Their score on the locator test determines the block of items on which the student will be assessed. There are 14 different levels or blocks of items. Each block of items consists of approximately 15 items and each test consists of three blocks, which total approximately 45 items.

Once a student completes the items in the first block, it is scored immediately and the computerized system determines which block, or level of item difficulty, is next appropriate for the student. If students scored well on their first block, the system branches to items in the next block up – items that are slightly more difficult. If the student's score on the first block of items is low, the system branches down and the student receives items that are slightly less difficult. This process is repeated between the student's second and third block of items. When the student has finished the third block of items, a scale score is generated.

The CALT system stores the item bank in a Microsoft Access database. The database also contains item difficulty, goal alignment, grade level, year and term. The item selection, branching and scoring program is stored on a central server located at the district's central office. It is distributed to the schools through the district's network via a web browser and is protected through a system of firewalls as a form of security.

Advantages of the CALT.

The CALT provides a RIT scale score. The RIT scale is an equal interval scale that is vertically scaled so that achievement at different points along the achievement continuum and in different grades can be compared. The RIT scale is constructed using Item Response Theory (IRT) and is named after Danish mathematician, Georg Rasch, who developed the specific IRT model NWEA used in creating their scale (RIT is short for Rasch Unit). Because the CALT is an adaptive test and the item bank spans a wide range of ability levels, the assessment has very little ceiling effect. The RIT scale is also norm-referenced and provides a national percentile rank for each student.

Growth Score: A raw growth score for each student can be computed by subtracting a previous RIT score from the most recent RIT score. This produces absolute growth between the two tests. The Northwest Evaluation Association (NWEA) provides a normative table of growth scores which can be used to compare a student's growth score to average growth for same grade students with a similar starting score. A growth index score is computed by subtracting average growth from the raw growth score. The growth index score shows how students perform compared to other students in that grade that began at the same level. Because it is "conditioned on grade and initial proficiency

level, the growth index adds information to raw gains alone” (McCall, Kingsbury & Olson, 2004 p. 12).

CALT test administration and data collection protocol.

The CALT was administered district wide in grades three through seven in the fall of each school year. The assessment was administered during a district specified three week testing window. Prior to the exam, school test coordinators were trained on CALT administration, including the protocol for proctoring the test. All students from a classroom, unless exempted by an IEP or unless the student’s lack of English language skills prevented use of the assessment, were tested together in the school’s computer lab under the supervision of the classroom teacher and a trained test proctor. The school principal and district office personnel conducted random visits to testing sites.

Analyses

The current study examined data from three groups of students. The first group of students was in fourth grade in the 2004-05 school year. The students included in Group 1 completed Computerized Achievement Levels Tests (CALT) in the fall of 2004, 2005, 2006 and 2007. Students in Group 1 also completed both the 2005 and the 2007 district student opinion survey. The second group of students in this study were in the sixth grade during the 2004-05 school year, completed fall CALT tests in 2004 and 2005 and completed the district student opinion survey in spring 2005. The third group of students included in this study completed fall CALT tests in 2006 and 2007 and completed the district student opinion survey in 2007 (Table 1).

First, the underlying factor structure was explored through an exploratory factor analyses completed on data from a randomly selected half of elementary aged students (fourth and fifth grade students) who completed the student opinion survey in 2005. In addition, exploratory factor analyses were completed on data from middle school students (sixth and seventh grade student) who also completed the survey in 2005. The elementary and middle school scales were compared.

Table 1

Study Groups and Available Data

		4 th grade		5 th grade		6 th grade		7 th grade	
		Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
Survey 1	2004	Achv test				Achv test			
		Group 1				Group 2			
	2005	Survey				Survey			
		Group 1				Group 2			
No survey data collected	2005			Achv test				Achv test	
				Group 1				Group 2	
	2006								
Survey 2	2006	Achv test				Achv test			
		Group 3				Group 1			
	2007	Survey				Survey			
		Group 3				Group 1			
No survey data collected	2007			Achv test				Achv test	
				Group 3				Group 1	
	2008								

Thirteen items were selected from the overall survey due to their potential relationship to student engagement with school. These items are similar to items found on the Psychological Sense of School Membership (PSSM) (Goodenow, 1993b), the Student Participation and Engagement Survey (SPES) (Leithwood & Aitken 1995) and the Identification with School questionnaire (Voelkl, 1997).

Survey items were coded so that higher scores indicate higher levels of engagement. Items marked as “I don’t know” or “does not apply” were coded as missing data. Principal axis factoring with varimax rotation was used for these analyses. The internal consistency reliability of resulting scales was checked using the scale reliability analysis (Cronbach's alpha statistic) within SPSS.

The fit of the models found during exploratory factor analyses was examined using confirmatory factor analyses. The other half of the Group 1 data from the 2005 survey administration was used for these analyses.

Next, the stability of the engagement factors was examined. A t-test of the mean factor scores from Group 1 as fourth graders was compared to the mean factor scores from Group 1 as sixth graders. In addition, to examine consistency of the survey factors across cohorts, Group 1 fourth grade mean factor scores were compared to Group 3 (fourth grade) mean factors scores and Group 2 (sixth grade) mean factor scores were compared to Group 1 sixth grade mean factors scores. T-tests (at the 0.01 level) were used for determining consistency of the factor scores.

After checking the stability and consistency of the engagement factors, correlations were run to examine the stability of achievement. For Group 1, correlations of CALT data from fall 2004, 2005, 2006 and 2007 were run. Correlations of fall 2004

and fall 2005 CALT data were completed for Group 2 and for Group 3 correlations of fall 2006 to fall 2007 CALT data were completed.

To examine the first research question “How does psychological engagement relate to student achievement?” a correlation between engagement factors from the spring survey and achievement data from the following fall was run. Correlations were run for five sets of data: 1) Group 1 from 4th grade spring survey to 5th grade fall achievement, 2) Group 1 from 6th grade spring survey to 7th grade fall achievement, 3) Group 1 from 4th grade spring survey to 7th grade fall achievement, 4) Group 2 from 6th grade spring survey to 7th grade fall achievement and 5) Group 3 from 4th grade spring survey to 5th grade fall achievement.

The second research question “How does psychological engagement relate to achievement growth?” was examined by correlating engagement factors from the spring survey with growth index data from the following fall. In order to compute the growth index, first raw growth was computed by subtracting the initial CALT score from the final CALT score. This represents absolute amount of growth over one year. Next, average growth was subtracted from the raw growth; this provided a growth index that indicated how students did relative to others that began at the same level. Average growth tables are provided by NWEA. Correlations were run for each of the five sets of data described for question one.

The third research question “Does psychological engagement add to the prediction of achievement over and above prior achievement?” was examined through multiple regression. The reading achievement as measured by the CALT was the dependent variable. The independent variable of particular interest were the engagement

scales that were defined during the factor analyses described above. A stepwise method in which the engagement factors were added after prior achievement was used. These analyses were conducted for Group 2 (spring 2005 6th grade engagement to fall 2005 7th grade achievement), for Group 3 (spring 2007 4th grade engagement to fall 2007 5th grade achievement) and, if the engagement factor(s) were found to be fairly stable in analyses described above, for Group 1 from spring 2005 4th grade engagement to fall 7th grade achievement.

The fourth research question “Does psychological engagement add to the prediction of achievement over and above prior achievement and demographic variables of the student?” was also examined through multiple regression using a stepwise method in which the engagement factors were added after prior achievement and student demographic variables that are tied to achievement (socio-economic status as measured by free/reduced price lunch status and students’ ethnic background). Student demographic variables were dummy coded for inclusion in the regression equation (students were coded as receiving free or reduced price lunch or not and as a student of color or not). As for the previous question, these analyses were conducted for Group 2, Group 3 and, if the engagement factor(s) were found to be fairly stable, for Group 1 from spring 2005 4th grade engagement to fall 7th grade achievement.

The fifth research question (does psychological engagement add to the prediction of achievement growth over and above demographic variables of the student?) examined the prediction of achievement growth rather than achievement score. Multiple regression was used to examine this question. For this analysis, the growth index was the dependent variable. The engagement factors and demographic variables were the independent

variables. As for the previous questions, these analyses were conducted for Group 2, Group 3 and, if the engagement factor(s) were found to be fairly stable, for Group 1.

The sixth research question “Do relations of psychological engagement with student achievement vary by grade level (elementary versus middle school) of students?” was examined through multiple regression using a stepwise method in which the engagement factors were added after prior achievement, student demographic variables that are tied to achievement, and student grade level. The seventh research question “Do relations of psychological engagement with achievement growth vary by the grade level (elementary versus middle school) of students?” was also examined through multiple regression using a stepwise method in which the engagement factors were added after student demographic variables that are tied to achievement and student grade level. Analyses for questions six and seven compared Group 1 students when they were in 4th grade to Group 1 students when they were in 6th grade. The analyses also compared Group one 4th graders (2005) to group two 6th graders (2005) and group three 4th graders (2007) to group one 6th graders (2007). These additional analyses will be helpful in determining if any differences that are found are due to changes in grade level (maturation, change of school) rather than something historical (a change due to the passage of time).

Chapter IV: Results

Exploratory Factor Analysis

The underlying factor structure was explored through an exploratory factor analysis completed on data from a randomly selected half of elementary aged students

(fourth and fifth grade students) who completed the student opinion survey in 2005. Exploratory factor analysis (EFA) was also completed on data from a randomly selected half of middle school students (sixth and seventh grade students) who also completed the survey in 2005. EFA was conducted using both listwise and pairwise deletion for both the elementary and middle school samples.

Thirteen items were submitted to exploratory factor analysis (EFA) using principal axis factoring. An examination of the eigenvalues greater than one indicated that two or three factors should be retained. Eigenvalues were 4.610, 1.032 and 1.018 for the elementary sample when cases were excluded listwise ($n = 632$) and 4.546, 1.045 and .994 when cases were excluded pairwise (with the sample size ranging from 728 to 885). For the middle school sample, eigenvalues were 5.156, 1.277 and 1.075 when case were excluded listwise ($n = 623$) and 5.174, 1.248 and 1.033 when cases were excluded pairwise (with the sample size ranging from 790 to 955).

The factor loadings represent the degree to which individual items correlate with the factors. Items with low factor loadings would be eliminated for subsequent analyses. Only one item, “during this school year do you have friends in this school?” had a factor loading below .30 and was excluded from subsequent analyses.

The final factor solution was based on 12 items, three reflecting students’ sense of belonging and nine reflecting teacher-student relationships. The factor loadings for the 12 items ranged from .376 to .643 (elementary students, excluding cases pairwise, Table 2). The factor loadings at the middle school level ranged from .395 to .783 (excluding cases pairwise, Table 4). Both two- and three-factor solutions were submitted to Confirmatory Factor Analysis.

Table 2

Elementary Survey Items comprising the two-factor model Factor Loadings (cases excluded pairwise)

	Factor	
	1	2
22. My teachers do everything they can to help me do well in school.	.643	.266
18. My teachers care about me.	.611	.306
8. Most teachers in this school treat me with respect.	.515	.311
27. Students are treated fairly at my school regardless of their race or culture.	.474	.225
36. I feel safe in the classroom.	.465	.309
20. My principal treats students in this school with respect.	.423	.175
13. I think it is important for me to do well in school.	.408	.332
21. My teacher expects me to do my best in class.	.396	.132
4. I feel comfortable asking my classroom teacher for help.	.376	.192
31. During this school year do you have friends in this school?	.280	.249
2. I am happy to be a student at this school.	.339	.698
3. I feel like I belong at this school.	.301	.650
1. I like school.	.210	.572

Table 3

Elementary Survey Items comprising the three-factor model Factor Loadings (cases excluded listwise)

	Factor		
	1	2	3
18. My teachers care about me.	.659	.267	.236
22. My teachers do everything they can to help me do well in school.	.602	.254	.253
8. Most teachers in this school treat me with respect.	.477	.315	.244
4. I feel comfortable asking my classroom teacher for help.	.445	.097	.075
36. I feel safe in the classroom.	.444	.299	.115
27. Students are treated fairly at my school regardless of their race or culture.	.374	.222	.266
31. During this school year do you have friends in this school?	.343	.231	.036
20. My principal treats students in this school with respect.	.301	.221	.209
2. I am happy to be a student at this school.	.290	.762	.149
3. I feel like I belong at this school.	.317	.636	.122
1. I like school.	.185	.506	.165
21. My teacher expects me to do my best in class.	.153	.103	.709
13. I think it is important for me to do well in school.	.262	.334	.380

Table 4

Middle School Survey Items comprising three-factor model Factor Loadings (cases excluded pairwise)

	Factor		
	1	2	3
18. My teachers care about me.	.753	.198	.085
22. My teachers do everything they can to help me do well in school.	.688	.210	.031
8. Most teachers in this school treat me with respect.	.686	.264	.011
20. The principals in this school treat students with respect.	.635	.230	-.038
21. Most teachers expect me to do my best in class.	.603	.169	.085
4. I am generally comfortable asking my teachers for help.	.472	.260	.241
36. I feel safe in the classroom.	.437	.261	.316
13. I think it is important for me to do well in school.	.425	.189	.180
27. Students are treated fairly at my school regardless of their race or culture.	.395	.177	.229
2. I am proud to be a student at this school.	.334	.783	.031
1. I like attending this school.	.349	.731	.078
3. I feel like I belong at this school.	.190	.602	.360
31. During this school year do you have friends in this school? (rev)	.016	.049	.468

Table 5

Middle School Survey Items comprising three-factor model Factor Loadings (cases excluded listwise)

	Factor		
	1	2	3
18. My teachers care about me.	.768	.156	.058
22. My teachers do everything they can to help me do well in school.	.682	.185	-.025
8. Most teachers in this school treat me with respect.	.665	.270	.019
20. The principals in this school treat students with respect.	.615	.192	-.019
21. Most teachers expect me to do my best in class.	.584	.222	.095
4. I am generally comfortable asking my teachers for help.	.537	.214	.154
36. I feel safe in the classroom.	.485	.247	.291
13. I think it is important for me to do well in school.	.477	.209	.088
27. Students are treated fairly at my school regardless of their race or culture.	.435	.121	.216
2. I am proud to be a student at this school.	.304	.790	.022
1. I like attending this school.	.335	.776	.047
3. I feel like I belong at this school.	.222	.572	.445
31. During this school year do you have friends in this school? (rev)	.022	.022	.495

The internal consistency reliability of the scales was computed separately for the elementary and the secondary samples. Using Cronbach's alpha as an indicator, the Belonging scale reliability was .751 for elementary students and .826 for middle school students. The reliability of the Teacher-Student Relationships factor was .768 for elementary students and .853 for middle school students (Table 6).

Table 6

Internal Consistency Reliability

Group	Factor 1 Belonging		Factor 2 Teacher Student Relationships	
	Cronbachs alpha	# of items	Cronbachs alpha	# of items
4 th & 5 th grade 2005	.751 (n=1812)	3	.768 (n=1321)	9
4 th grade only	.742 (n=889)	3	.732 (n=627)	9
5 th grade only	.758 (n=923)	3	.788 (n=694)	9
6 th & 7 th grade 2005 (n=)	.826 (n=1840)	3	.853 (n=1246)	9
6 th grade only	.821 (n=889)	3	.855 (n=584)	9
7 th grade only	.828 (n=951)	3	.850 (n=662)	9

Confirmatory Factor Analyses

The fit of the models found during exploratory factor analysis was examined using confirmatory factor analysis. The other half of the data from the 2005 survey administration was used for the confirmatory factor analysis.

Two- and three-factor models were subjected to confirmatory factor analyses (CFA) using the remaining half of each (elementary and middle school) dataset. Results are reported in Table 7 for the elementary data and in Table 8 for the middle school data.

Table 7

Confirmatory Factor Analyses Summary Results for Elementary Data

Model	χ^2	<i>df</i>	χ^2/df ratio	GFI	RMSEA	CFI	NFI
2-factor oblique	162.30	64	2.54	0.96	0.048	0.94	0.91
2-factor orthogonal	364.13	65	5.60	0.93	0.077	0.83	0.80
2-factor oblique (no q31)	132.85	53	2.51	0.97	0.047	0.95	0.93
3-factor oblique	139.17	62	2.24	0.97	0.044	0.96	0.92
3-factor oblique (no q31)	108.49	51	2.13	0.97	0.041	0.97	0.94

Table 8

Confirmatory Factor Analyses Summary Results for Middle School Data

Model	χ^2	<i>df</i>	χ^2/df ratio	GFI	RMSEA	CFI	NFI
2-factor oblique	1163.28	64	18.18	0.86	0.12	0.72	0.71
2-factor orthogonal	1409.22	65	21.68	0.83	0.14	0.66	0.65
2-factor oblique (no q31)	179.26	53	3.38	0.95	0.061	0.96	0.94
3-factor oblique	1123.90	62	18.13	0.86	0.12	0.73	0.72
3-factor oblique (no q31)	139.77	51	2.74	0.96	0.052	0.97	0.95

The results for both the two- and three-factor solutions were compared using 5 indexes of fit. The goodness-of-fit index (GFI), which ranges from 0 to 1, measures how much better the hypothesized model fits as compared to no model at all. The GFIs for the elementary data were .97 for both the two- and three- factor models that excluded item 31. For the middle school data, the GFIs were .95 and .96 for the two- and three- factor solutions that excluded item 31, respectively. According to Garson (1999), GFIs greater than or equal to .90 should be obtained in order to accept the model. Chi-square to degrees of freedom ratio ranged from 2.13 to 5.60 for the elementary school data, with

the lowest ratios being for the two- and three-factor solutions excluding item 31 (.251 and 2.13 respectively). The χ^2/df ratio for the middle school data ranged from 18.13 to 21.68 when item 31 was included and was 3.38 for the two factor model that excluded item 31 and 2.74 for the three factor model that excluded item 31. Generally, χ^2/df ratios as low as 2 and up to 5 have been used as a general “rule of thumb” to establish reasonable fit (Marsh & Hocevar, 1985). But because they are directly influenced by sample size, they are less meaningful than other fit indices reported in this paper. The root mean square error of approximation (RMSEA) measures the closeness of fit of the model in relation to the degrees of freedom. A close fit of the model in relation to its degrees of freedom is indicated by a RMSEA of 0.05 or less and values of 0.08 or less indicate adequate fit errors of approximations (Garson, 1999). The RMSEA measures were .047 and .041 for the elementary data and .061 and .052 for the middle school data (two- and three-factor solutions excluding item 31), indicating relatively good fit of the predicted structures to the actual data. The comparative fit index (CFI) values of the two- and three-factor solutions excluding item 31 ranged from .95 to .97, above the .90 value typically used for accepting models (Garson, 1999); however, the middle school CFI values for solutions including item 31 were well below the .90 (.72 for the two factor solution and .73 for the three factor solution). The two-factor orthogonal solution for the elementary school data also attained a value below .90 (.83). CFI and RMSEA measures are among the least affected by sample size (Garson, 1999). According to Maruyama (1998), NFI values range from 0 to 1 and NFIs of .90 or greater are indicative of a good fit. The NFI values ranged from .80 to .94 for elementary school data, with the highest values for the two- and three-factor solutions excluding item 31 (.93 and .94 respectively). The NFI values

from the middle school data ranged from .65 to .72 when item 31 was included. NFI values of .94 and .95 were obtained for the two- and three-factor solutions when item 31 was excluded.

The results from the confirmatory factor analysis indicated that either the two- and three-factor solutions that exclude item 31 fit the data reasonably well. Since the addition of a third factor did not add substantially to the fit, the two-factor solution was used for this study.

The Belonging and Teacher-Student Relationships factor scores were obtained by taking the average of the three and nine items, respectively. Correlations between the two factors from the factor scores (which ranged between .55 and .60 across the four groups) were similar to the correlations found by the CFA ($r = .66$ for both elementary and middle school students). The two factors were moderately related, but clearly distinct.

Table 9

Elementary Survey Items included in each Factor

ELEMENTARY ITEMS INCLUDED IN STUDY	
BELONGING FACTOR	I like school.
	I am happy to be a student at this school.
	I feel like I belong at this school.
TEACHER-STUDENT RELATIONSHIPS	My teachers do everything they can to help me do well in school.
	My teachers care about me.
	My teacher expects me to do my best in class.
	I feel comfortable asking my classroom teacher for help.
	Most teachers in this school treat me with respect.
	My principal treats students in this school with respect.
	I think it is important for me to do well in school.
	Students are treated fairly at my school regardless of their race or culture.
	I feel safe in the classroom.

Table 10

Middle School Survey Items included in each Factor

MIDDLE SCHOOL ITEMS INCLUDED IN STUDY	
BELONGING FACTOR	I like attending this school.
	I am proud to be a student at this school.
	I feel like I belong at this school.
TEACHER-STUDENT RELATIONSHIPS	My teachers do everything they can to help me do well in school.
	My teachers care about me.
	Most teachers expect me to do my best in class.
	I am generally comfortable asking my teachers for help.
	Most teachers in this school treat me with respect.
	The principals in this school treat students with respect.
	I think it is important for me to do well in school.
	Students are treated fairly at my school regardless of their race or culture.
	I feel safe in the classroom.

Missing Data

The current study examined data from three groups of students. The first group of students was in fourth grade in the 2004-05 school year. The students included in Group 1 completed Computerized Achievement Levels Tests (CALT) in the fall of 2004, 2005, 2006 and 2007. Students in Group1 also completed both the 2005 and the 2007 district student opinion survey. This group consists of 540 students. If missing data were excluded using listwise deletion, 46% of the sample would have been lost (n=292). The percent of students missing data from within demographic subgroups was even higher.

Fifty percent of students of color and 52% of students receiving free/reduced price lunch would have been lost from the sample if listwise deletion was employed.

Since Groups 2 and 3 only required data from one survey administration, losses due to the use of listwise deletion within these groups were not as large. The size of the second group of students, those who were in the sixth grade during the 2004-05 school year who completed fall CALT tests in 2004 and 2005 and who completed the district student opinion survey in spring 2005, would have decreased from 759 to 509; a loss of 33% of the sample. The size of the third group of students, those who completed fall CALT tests in 2006 and 2007 and completed the district student opinion survey in 2007, would have decreased from 776 to 554; a loss of 29% of the sample.

As in Group 1, the proportion of students that would be lost to missing data using listwise deletion was higher for students of color and students receiving free/reduced price lunch. Within Group 2, 38% of students of color and 38% of students receiving free/reduced price lunch would have been lost from the sample. Within Group 3, 35% of students of color and 35% of students receiving free/reduced price lunch would have been lost from the sample.

A missing values analysis using the expectation maximization (EM) method in SPSS 13.0 was used to impute missing values. Imputation is more efficient than case deletion because the full sample is retained, preventing loss of power that results from a smaller sample size. Imputation procedures make use of the information contained in observed data to predict missing values. EM is a major advance over traditional (e.g. listwise deletion) approaches to missing data (Acock, 2005). Prior reading achievement scores were used as the independent variable in the EM process.

Analyses in this study make use of samples including imputed data.

Stability and Consistency of the Engagement Factors

Table 11 shows the results of the paired samples t-test comparing the mean factor scores for Group 1 as fourth graders to their mean factors scores as sixth graders. The average Belonging factor score decreased from 3.36 to 3.19. The change in the mean score for the Belonging factor from fourth grade to sixth grade was significant at a .01 level ($M_{diff} = .16259, t(539) = 5.910, p = .000$) (alpha = .01 except for Levene's test for the equality of variance, in which case alpha = .05). The proportion of variation accounted for by the differences in the Belonging factor between these groups is 2.1% ($Eta\ squared = .021$). Within the same cohort of students, the mean score for the Teacher-Student Relationships factor decreased from fourth grade ($M = 3.66$) to sixth grade ($M = 3.41$). The change in mean score for the Teacher-Student Relationships factor was also significant ($M_{diff} = .24591, t(539) = 13.533, p = .000$). The proportion of variation accounted for by the differences in the Teacher-Student Relationships factor between these groups is 10.3% ($Eta\ squared = .103$).

Table 11

Stability of Psychological Engagement Factors Group 1: 4th grade to 6th grade Cohort

	Mean ¹	N	Std. Deviation	Std. Error Mean	Correlation	Sig.	Mean difference	t	df	Sig. (2-tailed)
Belonging factor										
4 th grade	3.3560	540	.53608	.02307	.34	.000	.16259	5.910	539	.000
6 th grade	3.1934	540	.57233	.02463						
Teacher-Student Relationships factor										
4 th grade	3.6674	540	.30719	.01322	.34	.000	.24591	13.533	539	.000
6 th grade	3.4215	540	.41082	.01768						

Table 12 shows the results of an independent samples t-test comparing the mean Belonging factor scores for two groups of fourth grade students (Group 1 from 2005 and Group 3 from 2007). The mean Belonging factor score for fourth grade students from Group 1 was 3.36 while the mean for fourth grade students from Group 3 was 3.28. Levene's test for equality of variances suggested differences ($p < .05$); thus, results that do not assume equal variances for both groups are reported. The mean difference for the groups was 0.74 ($M_{diff} = 0.74$, $t(1222) = 2.369$, $p = .018$). The proportion of variation accounted for by the differences in the Belonging factor between these groups is 0.4% ($Eta\ squared = .004$). The difference in mean scores for Groups 1 and 3 on the Belonging factor did not reach the alpha (.01) level.

¹ Mean factor scores based on imputed data.

Table 12

Consistency of Psychological Engagement Factors: Comparison of 4th Grade Groups

Factor	Group	N	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)	Mean Difference
Belonging	1	540	3.3560	.53608	.02307	2.369	1222.149	.018	.07401
	3	776	3.2820	.58713	.02108				
Teacher-Student Relationships	1	540	3.6674	.30719	.01322	2.873	1263.678	.004	.05326
	3	776	3.6141	.36214	.01300				

Table 12 also shows the results of an independent samples t-test comparing the mean Teacher-Student Relationships factor scores for two groups of fourth grade students (Group 1 from 2005 and Group 3 from 2007). The mean Teacher-Student Relationships factor score for fourth grade students from Group 1 was 3.67 while the mean for fourth grade students from Group 3 was 3.61. Levene's test for equality of variances was significant ($p < .05$) thus results that do not assume equal variances for both groups are reported. The mean difference for the groups was 0.053 ($M_{diff}=0.053$, $t(1264) = 2.873$, $p = .004$). The proportion of variation accounted for by the differences in the Teacher-Student Relationships factor between these groups is 0.6% ($Eta\ squared = .006$). The mean scores for Groups 1 and 3 on the Teacher-Student Relationships factor are significantly different at the .01 level.

Table 13 shows the results of an independent samples t-test comparing the mean Belonging factor scores for two groups of sixth grade students (Group 1 from 2007 and Group 2 from 2005). The mean Belonging factor score for sixth grade students from Group 1 was 3.19 while the mean for sixth grade students from Group 2 was 3.17. Levene's test for equality of variances was significant ($p < .05$) thus results that do not

assume equal variances for both groups are reported. The mean difference for the groups was .021 ($M_{diff} = .021$, $t(1227) = .634$, $p = .526$). The proportion of variation accounted for by the differences in the Belonging factor between these groups is 0.03% ($Eta squared = .0003$). The difference in mean scores for Groups 1 and 2 on the Belonging factor did not reach significance (.01).

Table 13

Consistency of Psychological Engagement Factors: Comparison of 6th Grade Groups

Factor	Group	N	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)	Mean Difference
Belonging	1	540	3.1934	.57233	.02463	.634	1227.133	.526	.02137
	2	759	3.1720	.63493	.02305				
Teacher-Student relationships	1	540	3.4215	.41082	.01768	2.851	1251.931	.004	.07064
	2	759	3.3508	.47829	.01736				

Table 13 also shows the results of an independent samples t-test comparing the mean Teacher-Student Relationships factor scores for two groups of sixth grade students (Group 1 from 2007 and Group 2 from 2005). The mean Teacher-Student Relationships factor score for sixth grade students from Group 1 was 3.42 while the mean for sixth grade students from Group 2 was 3.35. Levene's test for equality of variances was significant ($p < .05$), thus results that do not assume equal variances for both groups are reported. The mean difference for the groups was 0.071 ($M_{diff} = 0.071$, $t(1252) = 2.85$, $p = .004$). The proportion of variation accounted for by the differences in the Teacher-Student Relationships factor between these groups is 0.6% ($Eta squared = .006$). The

mean scores for Groups 1 and 2 on the Teacher-Student Relationships factor are significantly different at the .01 level.

Stability of Achievement

The stability of achievement was examined for each of the three groups. For Group 1, correlations of reading Computerized Achievement Level Tests (CALT) data from fall 2004, 2005, 2006 and 2007 were run.

Table 14 provides the mean scores for Group 1 on each of these four reading tests. Table 15 provides the correlations between the four administrations of the reading CALT. Correlations among reading test scores were very high, from .81 when examining test scores from the fall of fourth grade to fall of seventh grade to .87 when comparing test scores from the fall of sixth grade to the fall of seventh grade. All correlations were significant at the .01 level (2-tailed).

Table 14

Descriptive Statistics: Reading CALT scores, Group 1 4th grade to 6th grade Cohort

Reading RIT – Fall of	Mean	SD
N=540		
2004	201.65	13.828
2005	210.19	12.793
2006	214.84	13.002
2007	219.40	12.831

Table 15

Correlations: Reading CALT scores, Group 1 4th grade to 6th grade Cohort

Reading RIT – Fall of	2005	2006	2007
N=540			
2004	.83*	.84*	.81*
2005		.85*	.82*
2006			.87*

* Correlation is significant at the 0.01 level (2-tailed).

The stability of achievement for Group 2 was also examined through a correlation of CALT data from fall 2004 and fall 2005. Table 16 provides the mean scores for Group 2 on each of the reading tests. The correlation between the two reading test scores was very high (.87). The correlation was significant at the .01 level (2-tailed).

Table 16

Descriptive Statistics: Reading CALT scores, Group 2 - 6th grade students

Reading RIT – Fall of	Mean	SD
N=759		
2004	214.05	15.314
2005	217.97	13.702

The stability of achievement for Group 3 was also examined through a correlation of CALT data fall 2006 and fall 2007. Table 17 provides the mean scores for Group 3 on each of the reading tests. The correlation between the two reading test scores was very high (.89). The correlation was significant at the .01 level (2-tailed).

Table 17

Descriptive Statistics: Reading CALT scores, Group 3 – 4th grade students

Reading RIT – Fall of	Mean	SD
N=776		
2006	199.70	15.969
2007	208.47	14.757

Research Question One

How does psychological engagement relate to student achievement?

Correlations between engagement factors and achievement data were run for five sets of data: 1) Group 1 from fourth grade spring survey to fifth grade fall achievement, 2) Group 1 from sixth grade spring survey to seventh grade fall achievement, 3) Group 1 from fourth grade spring survey to seventh grade fall achievement, 4) Group 2 from sixth grade spring survey to seventh grade fall achievement and 5) Group 3 from fourth grade spring survey to fifth grade fall achievement. Table 18 provides the correlations for each of these groups.

The correlations for the Belonging factor range from .04 to .12. The correlations for the Teacher-Student Relationships factor range from .03 to .11. For Group 1 students, correlations between psychological engagement factors and achievement were lower when the span of time between the survey and the reading test increased. Correlations between psychological engagement factors and achievement for Group 1 did not reach significance (.01) levels. The correlations for middle school students in Group 2 did not reach significance for either of the psychological engagement factors (.05 for the Belonging factor and .06 for the Teacher-Student Relationships factor). The correlations

for elementary students in Group 3 reached significance for both psychological engagement factors (.12 for the Belonging factor and .11 for the Teacher-Student Relationships factor).

Table 18

Correlations between engagement factors and achievement data, Groups 1, 2 & 3

Grade of Survey Administration	Group	Reading RIT Fall		Reading RIT Fall		N
		5 th grade	7 th grade	5 th grade	7 th grade	
		Belonging factor		Teacher-Student Relationship factor		
4	1	.08	.04	.06	.03	540
4	3	.12*		.11*		776
6	1		.08		.03	540
6	2		.05		.06	759

*Correlation is significant at the 0.01 level (2-tailed).

Research Question Two

How does psychological engagement relate to achievement growth?

Correlations between psychological engagement factors and growth data were run for five sets of data: 1) Group 1 fourth grade spring survey with growth from fourth to fifth grade, 2) Group 1 sixth grade spring survey with sixth to seventh grade growth, 3) Group 1 fourth grade spring survey with sixth to seventh grade growth, 4) Group 2 sixth grade spring survey with sixth to seventh grade growth and 5) Group 3 fourth grade spring survey with fourth to fifth grade growth. Table 19 provides the correlations for each of these groups.

Growth is reported in two formats; first raw growth is reported, secondly a growth index is reported. Raw growth was computed by subtracting the initial CALT score from

the final CALT score. This represents absolute amount of growth over one year. Next, average growth, as determined by the growth table provided by NWEA, was subtracted from the raw growth; this provided a growth index that indicates how students did relative to others that began at the same level.

Table 19

Correlations between engagement factors and growth data, Groups 1, 2 & 3

Grade of Survey Administration	Grade of reading growth	Group	Raw Growth	Growth Index	N
Belonging factor					
4	4	1	.07	.09	540
4	4	3	-.03	.01	776
6	6	1	-.03	-.01	540
6	6	2	-.10*	-.09*	759
4	6	1	-.05	-.03	540
Teacher-Student Relationship factor					
4	4	1	.07	.08	540
4	4	3	.01	.05	776
6	6	1	-.07	-.05	540
6	6	2	-.13*	-.12*	759
4	6	1	-.01	-.004	540

* Correlation is significant at the 0.01 level (2-tailed).

Correlations of the Belonging factor with raw growth for elementary students were -.03 and .07 (Table 19). Teacher-Student Relationships factor correlations with raw growth were .01 and -.07. Correlations of the Belonging factor with raw growth for middle school students were -.10, which was significant at the .01 level (2-tailed), and -

.03. Teacher-Student Relationships factor correlations with raw growth were -.13, which was significant at the .01 level (2-tailed), and -.07. The correlation of elementary school Belonging with raw growth in middle school was -.05 and the correlation of elementary school Teacher-Student Relationships with raw growth in middle school was -.01.

Correlations of Belonging with the growth index for elementary students were .09 and .01. Teacher-Student Relationships factor correlations with the growth index were .08 and .05. Correlations of the Belonging factor with the growth index for middle school students were -.01, and -.09, which was significant at the .01 level (2-tailed). Factor 2 (Teacher-Student Relationships) correlations with the growth index were -.12, which was significant at the .01 level (2-tailed), and -.05. The correlation of elementary school Belonging with the growth index in middle school was -.03 and the correlation of elementary school Teacher-Student Relationships with the growth index in middle school was -.004. Neither of these was significant at the .01 level.

Research Question Three

Does psychological engagement add to the prediction of achievement over and above prior achievement?

A multiple regression was conducted with reading achievement as the dependent variable. The independent variables of particular interest were two psychological engagement factors (Belonging and Teacher-Student Relationships). A stepwise method in which the psychological engagement factors were added after prior achievement was used. These analyses were conducted for Group 2 (spring 2005 sixth grade engagement

to fall 2005 seventh grade achievement) and for Group 3 (spring 2007 fourth grade engagement to fall 2007 fifth grade achievement).

For Group 2 prior achievement accounted for 76.3% of the variation in later reading achievement (Table 20). The results indicate that Belonging did not meet the inclusion criteria (probability-of-*F*-to-enter $\leq .050$, probability-of-*F*-to-remove $\geq .100$) and was excluded from the model, leaving only prior achievement as a predictor of later achievement. The results of the regression indicate that the addition of Teacher-Student Relationships resulted in an R square change of .002 over and above prior achievement (Table 22). This change did not reach significant (.01) levels ($f_{change}(755) = 5.948, p = 0.015$).

Table 20

Multiple Regression Model Summary: Predicting Achievement from Prior Achievement and Belonging Factor:

6th grade students (Group 2)

	R	Adjusted R	Std. Error of the	R Square	F			Sig. F
Model	R	Square	Estimate	Change	Change	df1	df2	Change
1	.874	.763	6.674	.763	2438.032	1	757	.000

Model 1: Predictors: (Constant), Reading RIT Fall 04

Dependent Variable: Reading RIT Fall 2005

Table 21

*Multiple Regression Coefficients: Predicting Achievement from Prior Achievement and Belonging Factor:
6th grade students (Group 2)*

Model	Unstandardized Coefficients		Standardized Coefficients	
	B	Std. Error	Beta	
1	(Constant)	50.670	3.397	
	Reading RIT Fall 04	.782	.016	.874

Dependent Variable: Reading RIT Fall 2005

Table 22

Multiple Regression Model Summary: Predicting Achievement from Prior Achievement and Teacher-Student Relationships Factor: 6th grade students (Group 2)

Model	R		Adjusted R	Std. Error of the	R Square	F	Sig. F		
	R	Square	Square	Estimate	Change	Change	df1	df2	Change
1	.874	.763	.763	6.674	.763	2438.032	1	757	.000
2	.875	.765	.764	6.652	.002	5.948	1	756	.015

Model 1: Predictors: (Constant), Reading RIT Fall 04

Model 2: Predictors: (Constant), Reading RIT Fall 04, Teacher-Student Relationships factor

Dependent Variable: Reading RIT Fall 2005

Table 23

Multiple Regression Coefficients: Predicting Achievement from Prior Achievement and Teacher-Student Relationships

Factor: 6th grade students (Group 2)

Model	Unstandardized Coefficients		Standardized Coefficients	
	B	Std. Error	Beta	
1	(Constant)	50.670	3.397	
	Reading RIT Fall 04	.782	.016	.874
2	(Constant)	53.829	3.625	
	Reading RIT Fall 04	.786	.016	.879
	Teacher –Student Relationships factor	-1.241	.509	-.043

Dependent Variable: Read RIT Fall 2005

For Group 3 (spring 2007 fourth grade engagement to fall 2007 fifth grade achievement) prior achievement accounted for 78.4% of the variation in later reading achievement. The results indicate that both Belonging and Teacher-Student Relationships did not meet the inclusion criteria (probability-of-*F*-to-enter $\leq .050$, probability-of-*F*-to-remove $\geq .100$) and both were excluded from the model, leaving only prior achievement as a predictor of later achievement (Table 24).

Table 24

Multiple Regression Model Summary: Predicting Achievement from Prior Achievement and Belonging or

Teacher-Student Relationships Factors: 4th grade students (Group 3)

Model	R		Adjusted R	Std. Error of the	R Square	F	Sig. F		
	R	Square	Square	Estimate	Change	Change	df1	df2	Change
1	.885	.784	.784	6.864	.784	2808.209	1	774	.000

Model 1: Predictors: (Constant), Reading RIT Fall 06

Dependent Variable: Reading RIT Fall 2007

Table 25

Multiple Regression Coefficients: Predicting Achievement from Prior Achievement and Belonging or Teacher-Student Relationships Factors: 4th grade students (Group 3)

Model	Unstandardized Coefficients		Standardized Coefficients
	B	Std. Error	Beta
(Constant)	45.083	3.093	
Reading RIT Fall 06	.818	.015	.885

Dependent Variable: Reading RIT Fall 2007

Research Question Four

Does psychological engagement add to the prediction of achievement over and above prior achievement and demographic variables of the student?

A multiple regression was conducted with reading achievement as the dependent variable. The independent variables of particular interest were two psychological engagement factors (Belonging and Teacher-Student Relationships). A stepwise method in which the psychological engagement factors were added after prior achievement and student demographic variables that are tied to achievement (socio-economic status as measured by free/reduced price lunch status and students' ethnic background) was used. Student demographic variables were dummy coded for inclusion in the regression equation (students will be coded as receiving free or reduced price lunch or not and as a student of color or not). These analyses were conducted for Group 2 (spring 2005 sixth grade engagement to fall 2005 seventh grade achievement) and for Group 3 (spring 2007 fourth grade engagement to fall 2007 fifth grade achievement).

For Group 2 (spring 2005 sixth grade engagement to fall 2005 seventh grade achievement) prior achievement accounted for 76.3% of the variation in later reading achievement. The R square change with the addition of minority status was .003 ($f_{change}(756) = 8.403, p=.004$). The results of the regression indicate that the addition of Belonging over and above prior achievement and minority status, resulted in an R square change of .001 which was not significant at the .01 level ($f_{change}(755) = 4.185, p=.041$) (Table 26). The results of the regression indicate that the addition of Teacher-Student Relationships over and above prior achievement and minority status, resulted in an R square change of .002 which was a statistically significant change ($f_{change}(755) = 6.680, p=.010$) (Table 28).

Table 26

Multiple Regression Model Summary: Predicting Achievement from Prior Achievement, Student Demographics and Belonging Factor: 6th grade students (Group 2)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.874	.763	.763	6.674	.763	2438.032	1	757	.000
2	.875	.766	.765	6.641	.003	8.403	1	756	.004
3	.876	.767	.766	6.628	.001	4.185	1	755	.041

Model 1: Predictors: (Constant), Reading RIT Fall 04

Model 2: Predictors: (Constant), Reading RIT Fall 04, Students of Color

Model 3: Predictors: (Constant), Reading RIT Fall 04, Students of Color, Belonging factor

Dependent Variable: Reading RIT Fall 2005

Table 27

Multiple Regression Coefficients: Predicting Achievement from Prior Achievement, Student Demographics and Belonging Factor: 6th grade students (Group 2)

	Model	Unstandardized Coefficients		Standardized Coefficients
		B	Std. Error	Beta
1	(Constant)	50.670	3.397	
	Reading RIT Fall 04	.782	.016	.874
2	(Constant)	55.602	3.784	
	Reading RIT Fall 04	.761	.017	.851
	Students of Color	-1.618	.558	-.056
3	(Constant)	57.578	3.898	
	reading RIT Fall 04	.763	.017	.853
	Students of Color	-1.661	.558	-.057
	Belonging factor	-.779	.381	-.036

Dependent Variable: Reading RIT fall 2005

Table 28

Multiple Regression Model Summary: Predicting Achievement from Prior Achievement, Student Demographics and Teacher-Student Relationships Factor: 6th grade students (Group 2)

Model	R		Adjusted R	Std. Error of the	R Square	F	Sig. F		
	R	Square	Square	Estimate	Change	Change	df1	df2	Change
1	.874	.763	.763	6.674	.763	2438.032	1	757	.000
2	.875	.766	.765	6.641	.003	8.403	1	756	.004
3	.876	.768	.767	6.617	.002	6.680	1	755	.010

Model 1: Predictors: (Constant), Reading RIT Fall 04

Model 2: Predictors: (Constant), Reading RIT Fall 04, Students of Color

Model 3: Predictors: (Constant), Reading RIT Fall 04, Students of Color, Teacher-Student Relationships factor

Dependent Variable: Reading RIT Fall 2005

Table 29

Multiple Regression Coefficients: Predicting Achievement from Prior Achievement, Student Demographics and Teacher-Student Relationships Factor: 6th grade students (Group 2)

Model	Unstandardized Coefficients		Standardized Coefficients	
	B	Std. Error	Beta	
1	(Constant)	50.670	3.397	
	Reading RIT Fall 04	.782	.016	.874
2	(Constant)	55.602	3.784	
	Reading RIT Fall 04	.761	.017	.851
	Students of Color	-1.618	.558	-.056
3	(Constant)	59.131	4.010	
	Reading RIT Fall 04	.765	.017	.855
	Students of Color	-1.683	.557	-.058
	Teacher-Student Relationships factor	-1.310	.507	-.046

For Group 3 (spring 2007 fourth grade engagement to fall 2007 fifth grade achievement) prior achievement accounted for 78.4% of the variation in later reading achievement (Table 30). The results indicate that minority status and poverty status (as measured by participation in the free/reduced price lunch program) did not meet the inclusion criteria (probability-of- F -to-enter $\leq .050$, probability-of- F -to-remove $\geq .100$) and both were excluded from the model. Neither Belonging nor Teacher-Student Relationships met the inclusion criteria, leaving only prior achievement as a predictor of later achievement.

Table 30

Multiple Regression Model Summary: Predicting Achievement from Prior Achievement, Student Demographics and Belonging or Teacher-Student Relationships Factors: 4th grade students (Group 3)

	R	Adjusted R	Std. Error of the	R Square	F			Sig. F
Model	R	Square	Estimate	Change	Change	df1	df2	Change
1	.885	.784	6.864	.784	2808.209	1	774	.000

Model 1: Predictors: (Constant), Reading RIT Fall 06

Dependent Variable: Reading RIT Fall 2007

Table 31

Multiple Regression Coefficients: Predicting Achievement from Prior Achievement, Student Demographics and Belonging or Teacher-Student Relationships Factors: 4th grade students (Group 3)

Model	Unstandardized Coefficients		Standardized Coefficients
	B	Std. Error	Beta
(Constant)	45.083	3.093	
reading RIT Fall 06	.818	.015	.885

Dependent Variable: Reading RIT Fall 2007

Research Question Five

Does psychological engagement add to the prediction of achievement growth over and above demographic variables of the student?

The fifth research question examined the prediction of achievement growth rather than achievement score. Growth is reported in two formats; first a growth index is reported, secondly raw growth is reported. Multiple regression was used to examine this question. For these analyses, a growth variable was the dependent variable. The psychological engagement factors and demographic variables were the independent variables. A stepwise method in which the psychological engagement factors were added

after student demographic variables that are tied to achievement (socio-economic status as measured by free/reduced price lunch status and students' ethnic background) was used. Student demographic variables were dummy coded for inclusion in the regression equation (students will be coded as receiving free or reduced price lunch or not and as a student of color or not).

For Group 2 (spring 2005 sixth grade engagement to fall 2005 seventh grade achievement) students' poverty status accounted for 1.2% of the variation in growth index scores, which was a statistically significant change ($f_{change}(757) = 9.154, p = .003$) (Table 32). The results of the regression indicate that the addition of Belonging over and above poverty status, resulted in an R square change of .007 which was not significant at the .01 level ($f_{change}(756) = 5.473, p = .020$) (Table 32). The minority status of students did not meet the inclusion criteria (probability-of- F -to-enter $\leq .050$, probability-of- F -to-remove $\geq .100$) and was excluded from the model. For Group 2, the results of the regression indicate that the addition of the Teacher-Student Relationships factor over and above poverty status, resulted in an R square change of .011, which was a statistically significant change ($f_{change}(756) = 8.256, p = .004$) (Table 34). The minority status of students did not meet the inclusion criteria (probability-of- F -to-enter $\leq .050$, probability-of- F -to-remove $\geq .100$) and was excluded from the model.

Table 32

Multiple Regression Model Summary: Predicting Growth Index from Student Demographics and Belonging Factor: 6th grade students (Group 2)

	R	Adjusted R	Std. Error of the	R Square	F			Sig. F
Model	R	Square	Estimate	Change	Change	df1	df2	Change
1	.109	.012	6.86600	.012	9.154	1	757	.003
2	.138	.019	6.84580	.007	5.473	1	756	.020

Model 1: Predictors: (Constant), poverty status

Model 2: Predictors: (Constant), poverty status, Belonging factor

Dependent Variable: Reading growth index 04-05

Table 33

Multiple Regression Coefficients: Predicting Growth Index from Student Demographics and Belonging Factor: 6th grade students (Group 2)

Model		Unstandardized Coefficients		Standardized Coefficients
		B	Std. Error	Beta
1	(Constant)	-1.738	.304	
	SES	1.604	.530	.109
2	(Constant)	1.224	1.302	
	SES	1.481	.531	.101
	Factor 1 Belonging	-.921	.394	-.085

Dependent Variable: reading growth index 04-05

Table 34

Multiple Regression Results: Predicting Growth Index from Student Demographics and Teacher-Student Relationships

Factor: 6th grade students (Group 2)

Group 2	R	Adjusted R	Std. Error of the	R Square	F	Sig. F			
Model	R	Square	Square	Estimate	Change	Change	df1	df2	Change
1	.109	.012	.011	6.86600	.012	9.154	1	757	.003
2	.150	.023	.020	6.83332	.011	8.256	1	756	.004

Model 1: Predictors: (Constant), poverty status

Model 2: Predictors: (Constant), poverty status, Teacher-Student Relationships factor,

Dependent Variable: Reading growth index 04-05

Table 35

Multiple Regression Coefficients: Predicting Growth Index from Student Demographics and Teacher-Student

Relationships Factor: 6th grade students (Group 2)

Model		Unstandardized Coefficients		Standardized Coefficients
		B	Std. Error	Beta
1	(Constant)	-1.738	.304	
	poverty status	1.604	.530	.109
2	(Constant)	3.377	1.806	
	poverty status	1.392	.533	.095
	Factor 2 Teacher-student relationships	-1.506	.524	-.104

Dependent Variable: Reading growth index 04-05

For Group 3 (spring 2007 fourth grade engagement to fall 2007 fifth grade achievement), all three independent variables, minority status of the students, poverty status of the students and Belonging, did not meet the inclusion criteria (probability-of-*F*-to-enter $\leq .050$, probability-of-*F*-to-remove $\geq .100$) and were excluded from the model when the reading growth index was the dependent variable. Similarly, all three

independent variables, minority status of the students, poverty status of the students and Teacher-Student Relationships, did not meet the inclusion criteria (probability-of- F -to-enter $\leq .050$, probability-of- F -to-remove $\geq .100$) and were excluded from the model when the reading growth index was the dependent variable.

For Group 2 (spring 2005 sixth grade engagement to fall 2005 seventh grade achievement), students' poverty status accounted for 3.7% of the variation in raw reading growth ($f_{change} (757) = 29.218, p = .000$) (Table 36). The results of the regression indicate that the addition of Belonging over and above poverty status, resulted in an R square change of .007, which was not significant at the .01 level ($f_{change} (756) = 5.597, p = .018$) (Table 36). The minority status of students did not meet the inclusion criteria (probability-of- F -to-enter $\leq .050$, probability-of- F -to-remove $\geq .100$) and was excluded from the model. For Group 2, the results of the regression indicate that the addition of Teacher-Student Relationships over and above poverty status, resulted in an R square change of .011, which was a statistically significant change ($f_{change} (756) = 9.055, p = .003$) (Table 38).

Table 36

Multiple Regression Model Summary: Predicting Raw Growth from Student Demographics and Belonging Factor: 6th grade students (Group 2)

	R	Adjusted R	Std. Error of the	R Square	F			Sig. F
Model	R	Square	Estimate	Change	Change	df1	df2	Change
1	.193	.037	7.32611	.037	29.218	1	757	.000
2	.210	.044	7.30396	.007	5.597	1	756	.018

Model 1: Predictors: (Constant), poverty status

Model 2: Predictors: (Constant), poverty status, Belonging factor

Dependent Variable: Raw reading growth 04 to 05

Table 37

Multiple Regression Coefficients: Predicting Raw Growth from Student Demographics and Belonging Factor: 6th grade students (Group 2)

Model		Unstandardized Coefficients		Standardized Coefficients
		B	Std. Error	Beta
1	(Constant)	2.910	.325	
	poverty status	3.058	.566	.193
2	(Constant)	6.104	1.389	
	poverty status	2.926	.567	.184
	Belonging factor	-.993	.420	-.085

Dependent Variable: Raw reading growth 04 to 05

Table 38

Multiple Regression Model Summary: Predicting Raw Growth from Student Demographics and Teacher-Student Relationships Factor: 6th grade students (Group 2)

	R	Adjusted R	Std. Error of the	R Square	F			Sig. F	
Models	R	Square	Square	Estimate	Change	Change	df1	df2	Change
1	.193	.037	.036	7.32611	.037	29.218	1	757	.000
2	.220	.049	.046	7.28744	.011	9.055	1	756	.003

Model 1: Predictors: (Constant), poverty status

Model 2: Predictors: (Constant), poverty status, Teacher –Student Relationships factor

Dependent Variable: Raw reading growth 04 to 05

Table 39

Multiple Regression Coefficients: Predicting Raw Growth from Student Demographics and Teacher-Student Relationships Factor: 6th grade students (Group 2)

Model	Model	Unstandardized		Standardized
		Coefficients		Coefficients
		B	Std. Error	Beta
1	(Constant)	2.910	.325	
	poverty status	3.058	.566	.193
2	(Constant)	8.622	1.926	
	poverty status	2.822	.568	.178
	Teacher-Student Relationships factor	-1.681	.559	-.108

Dependent Variable: raw reading growth 04 to 05

For Group 3 (spring 2007 fourth grade engagement to fall 2007 fifth grade achievement) poverty status accounted for 2.5% of the variation in raw reading growth (Table 40). Minority status of the students and Belonging did not meet the inclusion criteria (probability-of-*F*-to-enter $\leq .050$, probability-of-*F*-to-remove $\geq .100$) and were

excluded from the model when raw reading growth was the dependent variable. Similarly, minority status of the students and Teacher-Student Relationships, did not meet the inclusion criteria (probability-of-*F*-to-enter $\leq .050$, probability-of-*F*-to-remove $\geq .100$) and were excluded from the model when raw reading growth was the dependent variable.

Table 40

Multiple Regression Model Summary: Predicting Raw Growth from Student Demographics and Belonging or Teacher-Student Relationships Factors: 4th grade students (Group 3)

Group 3	R	Adjusted R	Std. Error of the	R Square	F			Sig. F	
Model	R	Square	Square	Estimate	Change	Change	df1	df2	Change
1	.158	.025	.024	7.35964	.025	19.875	1	774	.000

Model 1: Predictors: (Constant), poverty status

Dependent Variable: Raw reading growth 06 to 07

Table 41

Multiple Regression Coefficients: Predicting Raw Growth from Student Demographics and Belonging or Teacher-Student Relationships Factors: 4th grade students (Group 3)

Model		Unstandardized Coefficients		Standardized Coefficients
		B	Std. Error	Beta
1	(Constant)	7.962	.320	
	poverty status	2.526	.567	.158

Dependent Variable: Raw reading growth 06 to 07

Research Question Six

Do relations of psychological engagement with achievement vary by the grade level (elementary versus middle school) of students?

Variations by grade level in the relations of psychological engagement with achievement were examined through a comparison of the non-standardized coefficients of fourth grade students to the non-standardized coefficients of sixth grade students from multiple regression analyses performed for research question four. The multiple regression analyses were conducted with reading achievement as the dependent variable; they used a stepwise method in which the psychological engagement factors were added after prior achievement and student demographic variables that are tied to achievement (socio-economic status and students' ethnic background). Student demographic variables were dummy coded for inclusion in the regression equation (for socioeconomic status, students were coded as receiving free or reduced price lunch or not; for ethnic background, as being a student of color or not). The analyses compared the non-standardized coefficients from Group 1 fourth graders (2005) to the non-standardized coefficients from Group 2 sixth graders (2005). In addition, the non-standardized coefficients from Group 3 fourth graders (2007) were compared to the non-standardized coefficients from Group 1 sixth graders (2007). Finally, the non-standardized coefficients from Group 1 students when they were in fourth grade (2005) were compared to non-standardized coefficients from Group 1 students when they were in sixth grade (2007). To compare the engagement factors as predictors of reading achievement for fourth grade students and sixth grade students, tests of the differences between regression coefficients were conducted.

A test of the difference between the unstandardized coefficients for Group 1 fourth graders (2005) and Group 2 sixth graders (2005) was significant, indicating that, in 2005 there was a difference between fourth grade and sixth grade students on how the Belonging factor was related to achievement, after accounting for prior achievement and minority status (Table 42).

Table 42

Multiple Regression Coefficients: Predicting Achievement from Prior Achievement, Student Demographics and Belonging by Grade Level (2005 students)

Model	Unstandardized		Standardized	95% confidence interval for B		
	Coefficients		Coefficients			
	B	Std. Error	Beta	Lower Bound	Upper Bound	
Fourth grade students (2005) n=540	(Constant)	54.830	5.042		44.925	64.736
	Reading RIT Fall 04	.751	.023	.812	.706	.797
	Students of color	-1.662	.706	-.059	-3.048	-.276
	Belonging factor	1.296	.565	.054	.186	2.405
Sixth grade students (2005) n=759	(Constant)	57.578	3.898		49.926	65.230
	Reading RIT Fall 04	.763	.017	.853	.730	.797
	Students of color	-1.661	.558	-.057	-2.756	-.567
	Belonging factor	-.779	.381	-.036	-1.527	-.031

Dependent Variable: Reading RIT fall 2005 All regression coefficients were significant at $p < .05$.

A test of the difference between the unstandardized coefficients for Group 1 fourth graders (2005) and Group 2 sixth graders (2005) was significant (at the .05 level), indicating that, in 2005 there was a difference between fourth and sixth grade students on

how the Teacher-Student Relationship factor was related to achievement, after accounting for prior achievement and minority status (Table 43).

Table 43

Multiple Regression Coefficients: Predicting Achievement from Prior Achievement, Student Demographics and Teacher-Student Relationships by Grade Level (2005 students)

Model		Unstandardized		Standardized	95% confidence interval for B	
		Coefficients		Coefficients	Lower Bound	Upper Bound
		B	Std. Error	Beta		
Fourth grade students (2005) n=540	(Constant)	52.018*	5.984		40.262	63.773
	Reading RIT Fall 04	.754*	.023	.815	.708	.799
	Students of color	-1.542*	.707	-.055	-2.931	-.152
	Teacher-Student Relationships factor	1.815*	.987	.044	-.124	3.755
Sixth grade students (2005) n=759	(Constant)	59.131*	4.010		51.259	67.003
	Reading RIT Fall 04	.765*	.017	.855	.731	.799
	Students of color	-1.683*	.557	-.058	-2.776	-.590
	Teacher-Student Relationships factor	-1.310	.507	-.046	-2.304	-.315

Dependent Variable: Reading RIT fall 2005

*coefficients significantly different, $p < .05$

A test of the difference between the unstandardized coefficients for Group 3 fourth graders (2007) and Group 1 sixth graders (2007) was not significant indicating that in 2007 there was no difference between fourth grade and sixth grade students on how the Belonging factor is related to achievement, after accounting for prior achievement and minority status (Table 44).

Table 44

Multiple Regression Coefficients: Predicting Achievement from Prior Achievement, Student Demographics and Belonging by Grade Level (2007 students)

Model		Unstandardized		Standardized	95% confidence interval for B	
		Coefficients		Coefficients	Lower Bound	Upper Bound
		B	Std. Error	Beta		
Fourth grade students (2007) n=776	(Constant)	46.206*	3.636		39.069	53.342
	Reading RIT Fall 06	.810*	.017	.877	.777	.844
	Students of color	-.561	.551	-.019	-1.643	.521
	Belonging factor	.203	.425	.008	-.631	1.037
Sixth grade students (2007) n=540	(Constant)	36.630*	4.828		27.147	46.114
	Reading RIT Fall 06	.853*	.022	.865	.811	.896
	Students of color	-.981	.618	-.035	-2.195	.233
	Belonging factor	-.092	.470	-.004	-1.015	.831

Dependent Variable: Reading RIT fall 2007

*coefficients significantly different, $p < .05$

A test of the difference between the unstandardized coefficients for Group 3 fourth graders (2007) and Group 1 sixth graders (2007) was not significant indicating that, in 2007 there was no difference between fourth grade and sixth grade students on how the Teacher-Student Relationships factor is related to achievement, after accounting for prior achievement and minority status (Table 45).

Table 45

Multiple Regression Coefficients: Predicting Achievement from Prior Achievement, Student Demographics and Teacher-Student Relationships by Grade Level (2007 students)

Model		Unstandardized		Standardized	95% confidence interval for B	
		Coefficients		Coefficients	Lower Bound	Upper Bound
		B	Std. Error	Beta		
Fourth grade students (2007) n=776	(Constant)	43.539*	4.133		35.426	51.651
	Reading RIT Fall 06	.809*	.017	.876	.776	.843
	Students of color	-.534	.550	-.018	-1.614	.546
	Teacher-Student Relationships factor	.969	.685	.024	-.376	2.313
Sixth grade students (2007) n=540	(Constant)	38.668*	5.075		28.698	48.637
	Reading RIT Fall 06	.855*	.022	.866	.812	.897
	Students of color	-.966	.617	-.034	-2.178	.247
	Teacher-Student Relationships factor	-.766	.652	-.025	-2.047	.515

Dependent Variable: Reading RIT fall 2007

*coefficients significantly different, $p < .05$

Tests of the difference between the unstandardized coefficients for Group 1 students when they were in fourth grade (2005) to when they were in sixth graders (2007) were not significant for either the Belonging or the Teacher-Student Relationships factors. Thus, within a cohort of students, across time, there was no difference between fourth grade and sixth grade students on how the psychological engagement factors of Belonging and Teacher-Student Relationships were related to achievement, after accounting for prior achievement and minority status (Tables 42-45).

Research Question Seven

Do relations of psychological engagement with achievement growth vary by the grade level (elementary versus middle school) of students?

The seventh research question examined variations by grade level in the relations of psychological engagement with achievement growth rather than achievement score. Growth is reported in two formats; first a growth index is reported, secondly raw growth is reported. Grade level variations were examined through a comparison of the non-standardized coefficients of fourth grade students to the non-standardized coefficients of sixth grade students from the multiple regression analyses performed for research question five. For these multiple regression analyses, a growth variable was the dependent variable. The psychological engagement factors and demographic variables were the independent variables. A stepwise method in which the psychological engagement factors were added after student demographic variables that are tied to achievement (socio-economic status and students' ethnic background) was used. Student demographic variables were dummy coded for inclusion in the regression equation (for socio economic status, students were coded as receiving free or reduced price lunch or not; for ethnic background, as being a student of color or not). The analyses compared the non-standardized coefficients from Group 1 fourth graders (2005) to the non-standardized coefficients from Group 2 sixth graders (2005). In addition, the non-standardized coefficients from Group 3 fourth graders (2007) were compared to the non-standardized coefficients from Group 1 sixth graders (2007). Finally, the non-standardized coefficients from Group 1 students when they were in fourth grade were

compared to non-standardized coefficients from Group 1 students when they were in sixth grade.

To compare the engagement factors as predictors of growth in reading achievement for fourth grade students and sixth grade students, tests of the differences between regression coefficients were conducted.

A test of the difference between the unstandardized coefficients for Group 1 fourth graders (2005) and Group 2 sixth graders (2005) was significant, indicating that, in 2005 there was a difference between fourth and sixth grade students on how the Belonging factor was related to the growth index, after accounting for socio-economic status (Table 46). The relationship between Belonging and growth was stronger for fourth grade than it was for sixth grade students.

Table 46

Multiple Regression Coefficients: Predicting Growth Index from Student Demographics and Belonging Factor Differences by Grade Level (2005 students)

Model	Unstandardized		Standardized	95% confidence interval for B		
	Coefficients		Coefficients			
	B	Std. Error	Beta	Lower Bound	Upper Bound	
Fourth grade students (2005) n=540	(Constant)	-3.217	1.966		-7.079	.645
	Socio-Economic Status	-.406	.676	-.026	-1.734	.921
	Belonging factor	1.212*	.576	.090	.080	2.343
Sixth grade students (2005) n=759	(Constant)	1.224	1.302		-1.332	3.779
	Socio-Economic Status	1.481*	.531	.101	.438	2.524
	Belonging factor	-.921*	.394	-.085	-1.693	-.148

Dependent Variable: Reading Growth Index 04 to 05

*coefficients significantly different, $p < .05$

A test of the difference between the unstandardized coefficients for Group 1 fourth graders (2005) and Group 2 sixth graders (2005) was significant, indicating that, in 2005 there was a difference between fourth and sixth grade students on how the Teacher-Student Relationships factor was related to the growth index, after accounting for socio-economic status (Table 47).

Table 47

Multiple Regression Coefficients: Predicting Growth Index from Student Demographics and Teacher-Student Relationships Factor Differences by Grade Level (2005 students)

Model		Unstandardized		Standardized	95% confidence interval for B	
		Coefficients			Beta	Lower
		B	Error	Bound		Bound
Fourth grade students (2005) n=540	(Constant)	-5.917	3.703		-13.192	1.358
	Socio-Economic Status	-.469	.678	-.030	-1.800	.862
	Teacher-Student Relationship factor	1.850	1.008	.079	-.130	3.831
Sixth grade students (2005) n=759	(Constant)	3.377	1.806		-.167	6.922
	Socio-Economic Status	1.392*	.533	.095	.346	2.438
	Teacher-Student Relationship factor	-1.506*	.524	-.104	-2.534	-.477

Dependent Variable: Reading Growth Index 04 to 05

*coefficients significantly different, $p < .05$

A test of the difference between the unstandardized coefficients for Group 3 fourth graders (2007) and Group 1 sixth graders (2007) was not significant indicating that, in 2007 there was no difference between fourth grade and sixth grade students on

how the Belonging factor is related to the growth index, after accounting for socio-economic status (Table 48).

Table 48

Multiple Regression Coefficients: Predicting Growth Index from Student Demographics and Belonging Factor Differences by Grade Level (2007 students)

Model	Unstandardized		Standardized	95% confidence interval for B		
	Coefficients		Coefficients			
	B	Std. Error	Beta	Lower Bound	Upper Bound	
Fourth grade students (2007) n=776	(Constant)	.197	1.442		-2.633	3.028
	Socio-Economic Status	.537	.534	.036	-512	1.586
	Belonging factor	.122	.425	.010	-.712	.955
Sixth grade students (2007) n=540	(Constant)	.582	1.535		-2.433	3.597
	Socio-Economic Status	-1.595*	.586	-.117	-2.745	-.444
	Belonging factor	-.187	.468	-.017	-1.106	.732

Dependent Variable: Reading Growth Index 06 to 07

*coefficients significantly different, $p < .05$

A test of the difference between the unstandardized coefficients for Group 3 fourth graders (2007) and Group 1 sixth graders (2007) was not significant indicating that, in 2007 there was no difference between fourth grade and sixth grade students on how the Teacher-Student Relationships factor is related to the growth index, after accounting for socio-economic status (Table 49).

Table 49

Multiple Regression Coefficients: Predicting Growth Index from Student Demographics and Teacher-Student Relationships Factor Differences by Grade Level (2007 students)

Model		Unstandardized		Standardized	95% confidence interval for B	
		Coefficients		Coefficients	Lower	Upper
		B	Std. Error	Beta	Bound	Bound
Fourth grade	(Constant)	-2.756	2.507		-7.678	2.166
students (2007) n=776	Socio-Economic Status	.568	.532	.038	-.477	1.613
	Teacher-Student Relationship factor	.925	.686	.049	-.421	2.271
Sixth grade	(Constant)	2.537	2.243		-1.869	6.943
students (2007) n=540	Socio-Economic Status	-1.554*	.585	-.114	-2.704	-.404
	Teacher-Student Relationship factor	-.749	.651	-.049	-2.028	.530

Dependent Variable: Reading Growth Index 06 to 07

*coefficients significantly different, $p < .05$

A test of the difference between the unstandardized coefficients for Group 1 fourth graders (2005) and Group 2 sixth graders (2005) was not significant, indicating that, in 2005 there was no difference between fourth and sixth grade students on how the Belonging factor was related to raw growth, after accounting for socio-economic status (Table 50).

Table 50 Multiple Regression Coefficients: Predicting Raw Growth from Student Demographics and Belonging Factor Differences by Grade Level (2005 students)

Model		Unstandardized		Standardized	95% confidence interval for B	
		Coefficients		Coefficients	Lower Bound	Upper Bound
		B	Std. Error	Beta		
Fourth grade students (2005) n=540	(Constant)	4.846*	2.120		.682	9.010
	Socio-Economic Status	.767	.729	.045	-.665	2.198
	Belonging factor	1.031	.621	.071	-.189	2.251
Sixth grade students (2005) n=759	(Constant)	6.104*	1.389		3.378	8.830
	Socio-Economic Status	2.926*	.567	.184	1.813	4.039
	Belonging factor	-.993*	.420	-.085	-1.818	-.169

Dependent Variable: Raw Reading Growth 04 to 05

*coefficients significantly different, $p < .05$

A test of the difference between the unstandardized coefficients for Group 1 fourth graders (2005) and Group 2 sixth graders (2005) was significant indicating that, in 2005 there was a difference between fourth and sixth grade students on how the Teacher-Student Relationships factor was related to raw growth, after accounting for socio-economic status (Table 51).

Table 51 Multiple Regression Coefficients: Predicting Raw Growth from Student Demographics and Teacher-Student Relationship Factor Differences by Grade Level (2005 students)

Model	Unstandardized		Standardized	95% confidence interval for B	
	Coefficients		Coefficients		
	B	Std. Error	Beta	Lower Bound	Upper Bound
Fourth grade students (2005) n=540	(Constant)	2.249	3.990		-5.590 10.087
	Socio-Economic Status	.710	.730	.042	-.724 2.144
	Teacher-Student Relationship factor	1.656	1.086	.066	-.478 3.790
Sixth grade students (2005) n=759	(Constant)	8.622*	1.926		4.842 12.402
	Socio-Economic Status	2.822*	.568	.178	1.706 3.937
	Teacher-Student Relationship factor	-1.681*	.559	-.108	-2.778 -.585

Dependent Variable: Raw Reading Growth 04 to 05

*coefficients significantly different, $p < .05$

A test of the difference between the unstandardized coefficients for Group 3 fourth graders (2007) and Group 1 sixth graders (2007) was not significant, indicating that, in 2007 there was no difference between fourth grade and sixth grade students on how the Belonging factor is related to raw growth, after accounting for socio-economic status (Table 52).

Table 52

Multiple Regression Coefficients: Predicting Raw Growth from Student Demographics and Belonging Factor Differences by Grade level (2007 students)

Model		Unstandardized		Standardized	95% confidence interval for B	
		Coefficients		Coefficients	Lower Bound	Upper Bound
		B	Std. Error	Beta		
Fourth grade students (2007) n=776	(Constant)	8.693 [*]	1.537		5.676	11.711
	Socio-Economic Status	2.499 [*]	.570	.157	1.381	3.617
	Belonging factor	-.220	.453	-.017	-1.109	.668
Sixth grade students (2007) n=540	(Constant)	6.138 [*]	1.596		3.004	9.273
	Socio-Economic Status	-.831	.609	-.059	-2.027	.366
	Belonging factor	-.416	.486	-.037	-1.372	.539

Dependent Variable: Raw Reading Growth 06 to 07

^{*}coefficients significantly different, $p < .05$

A test of the difference between the unstandardized coefficients for Group 3 fourth graders (2007) and Group 1 sixth graders (2007) was not significant indicating that, in 2007 there was no difference between fourth grade and sixth grade students on how the Teacher-Student Relationships factor is related to raw growth, after accounting for socio-economic status (Table 53).

Table 53

Multiple Regression Coefficients: Predicting Raw Growth from Student Demographics and Teacher-Student Relationship Factor Differences by Grade Level (2007 students)

Model	Unstandardized		Standardized	95% confidence interval for B		
	Coefficients		Coefficients	Lower Bound	Upper	
	B	Std. Error	Beta		Bound	
Fourth grade students (2007) n=776	(Constant)	6.496*	2.676		1.243	11.748
	Socio-Economic Status	2.546*	.568	.159	1.431	3.661
	Teacher-Student Relationship factor	.404	.732	.020	-1.033	1.841
Sixth grade students (2007) n=540	(Constant)	8.291*	2.331		3.712	12.871
	Socio-Economic Status	-.767	.608	-.054	-1.962	.428
	Teacher-Student Relationship factor	-1.023	.677	-.065	-2.353	.306

Dependent Variable: Raw Reading Growth 06 to 07

*coefficients significantly different, $p < .05$

The tests of the differences between regression coefficients comparing growth (both the growth index and raw growth) of Group 1 students when they were in fourth grade to Group 1 students when they were in sixth grade were not significant. Thus, within a cohort of students, across time, there was no difference between fourth grade and sixth grade students on how the psychological engagement factors of Belonging and Teacher-Student Relationships were related to growth (as measured by either the growth index or raw growth), after accounting for socio-economic status (Tables 46-53).

Chapter V: Discussion

This study investigated how psychological engagement relates to achievement and academic growth. It also explored whether or not psychological engagement added to the prediction of achievement or of growth in achievement after accounting for prior achievement and demographic variables such as socioeconomic status and ethnicity. In addition, this study examined if relations of psychological engagement with achievement and academic growth varied by students' grade level.

A summary of the results from this study are found in Table 54. Discussion of the results follows.

Table 54
Summary of Results

		Belonging:	Teacher-Student Relationships:
Reliability	Elementary	Acceptable (.75)	Acceptable (.77)
	Middle School	Good (.83)	Good (.85)
Stability of	4 th to 6 th grade	Significant	Significant
Engagement	within cohort	Not Stable	Not Stable
			Consistent
Consistency of	4 th grade	Consistent	Statistically different: however proportion of variation is small
	6 th grade	Consistent	Statistically different: however proportion of variation is small

Stability of Achievement	Very stable		
Question 1	Weak relationship between Psychological Engagement and Achievement		
Question 2	Essentially no relationship between Psychological Engagement and Achievement Growth		
Question 3	Did not add positively to prediction of achievement over and above prior achievement		
Question 4	Did not add positively to prediction of achievement over and above prior achievement and demographic variables		
		Belonging	Teacher-Student Relationships
	4 th grade	Did not add	Did not add to the prediction of growth
Question 5		positively to the	Added positively to the prediction of growth
	6 th grade	prediction of growth	(using either metric), over and above poverty
		for students.	status
Question 6	The relationship between psychological engagement and achievement did not consistently vary by grade level		
Question 7	The relationship between psychological engagement and growth did not consistently vary by grade level		

Exploratory Factor Analysis

The underlying factor structure was explored through an exploratory factor analysis completed on data from a randomly selected half of elementary aged students who completed the student opinion survey. Exploratory factor analysis (EFA) was also completed on data from a randomly selected half of middle school students who completed the survey in the same year.

The internal consistency reliability of the psychological engagement scales was computed using Cronbach's alpha as an indicator. The Belonging scale reliability was .75 for elementary students and .83 for middle school students and the reliability of the Teacher-Student Relationships factor was .77 for elementary students and .85 for middle school students. According to George and Mallery (2003) rules of thumb, the reliability of both psychological engagement reliabilities are within the "acceptable" range for elementary students ($> .7$) and within the "good" range for middle school students ($> .8$).

Confirmatory Factor Analyses

The fit of the models found during exploratory factor analysis was examined using confirmatory factor analysis. Results from the confirmatory factor analysis indicated that either the two- or three-factor solution excluding the *do you have friends in this school* item fit the data reasonably well. Since the addition of the third factor did not add substantially to the fit, the two factor model was used in this study.

Stability and Consistency of the Engagement Factors

In general, both elementary students and middle school students feel a sense of belonging and have positive feelings about their relationships with teachers. With a four point scale, mean Belonging factors scores of 3.28 and 3.36 for elementary students and 3.17 and 3.19 for middle school students were well above the 2.5 mid-point, indicating that students were more likely to agree or strongly agree than disagree or strongly disagree with Belonging factor items. The Teacher-Student Relationships factor scores were also well above the 2.5 mid-point, 3.61 and 3.67 for elementary students and 3.35 and 3.42 for middle school students.

The consistency of the psychological engagement factors across fourth- and sixth-grade cohorts was also examined. The mean Belonging scores were consistent (differences were not statistically significant) across the two groups of fourth grade students with mean scores of 3.36 for Group 1 and 3.28 for Group 2. The mean Teacher-Student Relationships scores were statistically different for the two groups of fourth grade students; however, the proportion of variation accounted for by these differences was small (0.6%). The large sample size appears to have produced results that were statistically significant even though the practical difference is quite small.

The consistency of the psychological engagement factors across the sixth grade groups was similar to that for the fourth grade students. The mean Belonging scores (Group 1, 3.19 and Group 2, 3.17) were consistent (the differences were not statistically significant). Once again, the Teacher-Student Relationships score was statistically significant (at the .01 level); however, the proportion of variation accounted for by these differences was small (0.6%). The large sample size appears to have produced results that were statistically significant even though the practical difference was quite small.

In summary, the Belonging scores are consistent for the two groups of fourth grade students and for the two groups of sixth grade students. In addition, the differences between the Teacher-Student Relationship scores for both grade level groups were quite small and one could conclude that they were also consistent within grade level groups.

Stability of Achievement

Achievement scores were very stable across time. Between adjacent grades reading achievement scores had correlations that ranged from .87 to .89. Even when

examining achievement from the fall of fourth grade to the fall of seventh grade, achievement was very stable ($r = .808$).

Research Question One

How does psychological engagement relate to student achievement?

The relationship between psychological engagement factors and student achievement was examined. The correlations between the Belonging factor and reading achievement were weak (.04 to .12) and only significant for one of the three groups of students. The correlation between the Belonging factor and reading achievement was significant for elementary students in Group 3. The correlations between the Teacher-Student Relationship factor and reading achievement were also weak (.03 to .11) and only significant for one of the three groups of students. The correlation between the Teacher-Student Relationship factor and reading achievement was significant for elementary students in Group 3.

These results are consistent with Appleton, Christenson, Kim, and Reschly (2006), who found correlations of .17 between the Teacher-Student Relationships factor of the Student Engagement Instrument and reading achievement scores based on the paper-pencil version of the CALT (NWEA's Achievement Levels Test).

Although the correlations were weak, in general, they are consistent also with Voelkl (1997), who found that correlations between student's identification with school and fourth -grade achievement ($r = .07$) and seventh -grade achievement ($r = .10$) were weak, but significant. Thor (1996) also examined the correlation of reading test scores

and psychological engagement. The findings of the current study are also generally consistent with her results ($r = .04$ for at-risk students and $r = .06$ for not at-risk students).

In a 1991 study, Goodenow correlated psychological engagement with quarter-grades and found correlations that were somewhat stronger (.19 at fifth grade and .30 at seventh grade) than those from the current study. Goodenow also examined correlations of psychological engagement with quarter grades by subject and, once again, found a correlation (.20 for reading fifth through eighth grade students) that was somewhat stronger than those from the current study.

According to Finn's theoretical participation-identification model (1989) for students to obtain positive school outcomes, such as a sense of belonging and valuing of school-related goals, participation in school activities is essential. In his self-reinforcing model, students who participate experience success which promotes identification with school and continued participation in school related activities. Voelkl (1996) also contends that students who develop a sense of identification with school are likely to experience greater educational gains. Radziwon (2003) found that students with higher academic achievement (as measured by the CTBS) also had higher levels of identification with school (Identification with School questionnaire).

This study's hypothesis that students who indicate having high psychological engagement would demonstrate higher achievement compared to their peers who indicate having less psychological engagement, was not substantiated by the data. The results from this study show only a weak relationship between two psychological engagement factors, Belonging and Teacher-Student Relationships, and reading achievement.

Research Question Two

How does psychological engagement relate to achievement growth?

Correlations of the Belonging factor with both raw growth and the growth index for elementary students were weak (-.03 to .09) and did not reach significance. Teacher-Student Relationships factor correlations with both raw growth and the growth index for elementary students were also weak (.01 to .08) and did not reach significance.

Correlations of the Belonging factor with both raw growth and the growth index for middle school students were significant for one group, but failed to reach significance for the other group of middle school students. The correlations for the Belonging factor range from .04 to .12. Teacher-Student Relationships factor correlations with both raw growth and the growth index were significant for one group of middle school students, but failed to reach significance levels for the other group of middle school students. The correlations for the Teacher-Student Relationship factor range from -.10 to -.01.

The correlation of elementary school Belonging with both raw growth (-.05) and the growth index (-.033) in middle school were weak and not significant. The correlation of elementary school Teacher-Student Relationships with both raw growth (-.01) and the growth index (-.004) in middle school also were weak and not significant.

This study's hypothesis that students who indicate having high psychological engagement would demonstrate better academic growth compared to their peers who indicate having less psychological engagement, was not substantiated by the data. The results from this study show essentially no relationship between two psychological engagement factors, Belonging and Teacher-Student Relationships, and growth in reading achievement.

Research Question Three

Does psychological engagement add to the prediction of achievement over and above prior achievement?

The vast majority of variation in reading achievement (78.4% for fourth grade students and 76.3% for sixth grade students) is predicted by prior reading achievement. Psychological engagement factors (Belonging and Teacher-Student Relationships) did not add to the prediction of reading achievement for fourth grade or sixth grade students.

Other researchers (Goodenow, 1993b and Thor, 1996) found that belonging was a significant predictor of grades and achievement. However, prior achievement, which in the current study accounted for the vast majority of variation in reading achievement, was not included in their models.

This study's hypothesis that psychological engagement would add positively to the prediction of achievement over and above prior achievement, was not substantiated by the data in this study.

Research Question Four

Does psychological engagement add to the prediction of achievement over and above prior achievement and demographic variables of the student?

The vast majority of variation in reading achievement (78.4% for fourth grade students and 76.3% for sixth grade students) is predicted by prior reading achievement. The addition of minority status and poverty status did not add to the prediction of reading achievement for elementary students. Neither Belonging nor Teacher-Student Relationships added to the prediction of reading achievement for elementary students.

For middle school students, the addition of minority status resulted in a statistically significant change ($p=.004$); however it accounted for less than 1% of the variance above and beyond prior achievement. Belonging did not significantly add to the prediction of reading achievement. Although the addition of Teacher-Student Relationships was statistically significant ($p=.010$), it accounted for less than 1% of the variation in reading achievement.

Consistent with the current study, Roeser, Midgley and Urda (1996) found that prior academic achievement was the strongest predictor of end-of-the-year school achievement (measured by grades in core academic subjects at the end of 8th grade). However, feelings of belonging also had small, positive effects on end-of-the-year achievement above and beyond prior achievement and other variables (such as ethnic background and socio-economic status) in their model. In the current study, Teacher-Student Relationships also had a small, positive effect on the reading achievement of middle school students.

This study's hypothesis that psychological engagement would add positively to the prediction of achievement over and above prior achievement and student demographic variables (such as socioeconomic status and ethnicity) was not substantiated by the data. Only Teacher-Student Relationships at the middle school level added significantly to the prediction of reading achievement over and above prior achievement and students' minority status, and the proportion of the variance accounted for by this psychological engagement factor was less than 1%.

Research Question Five

Does psychological engagement add to the prediction of achievement growth over and above demographic variables of the student?

A small, but significant proportion of the variation in reading growth (as measured by the growth index) for sixth grade students was accounted for by students' poverty status (1.2%). Belonging did not significantly add to the prediction of reading growth, accounting for less than 1% of reading growth over and above poverty status. However, the addition of Teacher-Student Relationships was statistically significant ($p=.004$) and accounted for 1.1% of the variation in reading growth over and above poverty status.

Students' poverty status accounted for a statistically significant proportion of the variation in raw reading growth for sixth grade students (3.7%). While Belonging did not significantly add to the prediction of reading growth, accounting for less than 1% of reading growth over and above poverty status, the addition of Teacher-Student Relationships was statistically significant ($p=.003$) and accounted for 1.1% of the variation in raw reading growth over and above poverty status.

Minority status, poverty status and the two psychological engagement factors, Belonging and Teacher-Student Relationships, did not meet inclusion criteria for model with the reading growth index as the dependent variable for fourth grade students.

Students' poverty status accounted for a statistically significant proportion of the variation in raw reading growth for fourth grade students (2.5%). The addition of minority status did not add to the prediction of raw reading growth. Neither Belonging

nor Teacher-Student Relationships added to the prediction of raw reading growth for fourth grade students.

It is difficult to compare these findings to the literature base since no other study used similar growth metrics. However, Lee and Smith (1999) found that student perceived social support from teachers, parents, peers and the community did not, in and of itself, relate to one-year achievement gains in math or reading. Only when social support for learning was combined with academic press (defined as teacher and students perceptions of students being academically challenged) were substantial increases in learning found. Results from the current study are similar in that Teacher-Student Relationships added a small, but significant amount to the prediction of reading growth for middle school students. Academic press was not measured in the current study. The addition of academic press to future research may clarify factors that affect academic growth.

This study's hypothesis that psychological engagement would add positively to the prediction of growth in achievement over and above student demographic variables (such as socioeconomic status and ethnicity) was partially substantiated by the data in this study. For middle school students, the Teacher-Student Relationship factor added positively to the prediction of growth, using either growth metric, over and above students' poverty status. However, when the Belonging factor was examined for middle school students, the hypothesis was not substantiated by the data. In addition, when elementary students were examined the hypothesis was not substantiated by the data.

Research Question Six

Do relations of psychological engagement with achievement vary by the grade level (elementary versus middle school) of students?

While this study found the relationship between Belonging and achievement was different for one set of fourth- and sixth- grade students, the finding was not replicated when other groups of fourth and sixth grade students were compared. In addition, the relationship between Belonging and achievement was stronger for fourth grade students than it was for sixth grade students. Thus, the direction of the finding was contradictory to this study's hypothesis.

When examining the relationship between Teacher-Student Relationships and achievement, a difference was found between one set of fourth- and sixth- grade students; however, the finding also was not replicated as other groups of fourth and sixth grade students were compared. The relationship between Teacher-Student Relationships and achievement was stronger for fourth grade students than it was for sixth grade students. Thus, the direction of the finding was contradictory to this study's hypothesis.

This study's hypothesis that relationships between psychological engagement and achievement would be stronger for middle school students than for elementary school students was not substantiated by the data in this study.

Research Question Seven

Do relations of psychological engagement with achievement growth vary by the grade level (elementary versus middle school) of students?

While this study found a difference between one set of fourth- and sixth- grade students in regards to the relationship between Belonging and growth in reading (as measured by the growth index), the finding did not appear as other groups of fourth and sixth grade students were compared. When examining the relationship between Teacher-Student Relationships and growth in reading (as measured by the growth index), a difference was found between one set of fourth- and sixth- grade students; however, the finding was not repeated as other groups of fourth and sixth grade students were compared. When raw growth was the outcome variable, differences between fourth- and sixth- grade students were not found for either of the psychological engagement factors.

This study's hypothesis that relationships between psychological engagement and growth in achievement would be stronger for middle school students than for elementary school students was not substantiated by the data in this study.

Limitations of the Study

While the use of existing data from a school district allowed for the examination of longitudinal data, it was also a limitation in that the data were from within only one district. Any generalizations to a rural area, to a central city, to areas outside of the Midwest or to populations that differ socially, economically, or racially would require accepting untested assumptions about comparability of samples. Examining data across districts would provide more generalizable results.

Attrition may have impacted the results. Since the study is longitudinal in nature, only students who were enrolled at each of the data collection points (from three to six data collection points for each group) are included in the analyses. Although the

differences between groups of students who had been in the district two consecutive years compared to four consecutive years were small, psychological engagement was consistently higher for less mobile students. Thus, generalizations to a student population that is more or less mobile may not hold.

The size of the student samples was both a strength and a weakness of this study. Generally, a large sample size is considered a positive feature within a study; however, large sample sizes can produce results that reach statistical significance levels when group differences are actually quite small. As such, interpreting results can be more challenging. The three groups in this study were fairly large (range from 540 to 776).

Self report surveys contain a certain level of bias. Research using a variety of sources, including student self report, teacher report, and classroom observation would provide a more accurate view of student engagement.

The reliability and validity of the district student opinion survey in which the Belonging and Teacher-Student Relationship factors were embedded had not been previously studied. It may be that there are unknown biases inherent in the survey that influences student responses.

If students had not been given an “I don’t know” response option on four of the items (*teachers care about me, most teachers in this school treat me with respect, the principals in this school treat students with respect, and students are treated fairly at my school regardless of their race or culture*) the data set may have been more complete and there may have been more variability in the Teacher-Student Relationships factor. However, the survey was designed for school district purposes and the survey development team felt that it was important to give students an “I don’t know” option.

While the survey was reliable, factor scores were well above the scale's midpoint. While the lack of variability in student responses to psychological engagement questions could be due to students' strong psychological engagement, it is also possible that the survey instrument was not sensitive enough to detect true variability in students' psychological engagement. With an instrument that was able to detect finer differences in psychological engagement factor scores, its true effect on students' subsequent achievement may be detected.

Conclusion

The decrease in Teacher-Student Relationships from fourth to sixth grade is not surprising. The students left relatively small elementary schools in which the majority of their instruction was provided by one or two classroom teachers and moved to larger middle schools in which they encounter half a dozen or more teachers every day. Even with the statistically significant decrease in the Teacher-Student Relationship factor score, the students who were followed from fourth to sixth grade reported very positive Teacher-Student Relationships in middle school.

Due to the restricted range of the psychological engagement factors, the correlation between the psychological engagement factors and reading achievement was very low. A more sensitive examination of the relationship between psychological engagement and reading achievement would require either a sample of students with much more variability in their psychological engagement scores than was part of this study or an instrument that was able to measure much more subtle differences in psychological engagement.

In a sample of over 500 students, one will see a relatively normal distribution of reading achievement scores. However, with less than 15% of students disagreeing with statements, such as, “I feel like I belong,” or, “my teachers care about me,” there was limited variability in psychological engagement scores, which made it less likely that these factors would appear as strong predictors of reading achievement. It has been suggested that, without a certain level of feeling of belonging, students are not able to focus on learning. However, that baseline of psychological engagement, while perhaps necessary, does not appear to be sufficient for reading achievement.

While the relationship between psychological engagement and reading test scores was weak, it was consistent with other research findings. Relationships between psychological engagement and grades in other research were somewhat higher than the relationship found in this study between psychological engagement and reading test scores. That may be because grades in part reflect a relationship between the teacher and the student, while test scores do not. This also could indicate that class participation and student effort play important roles since class participation and homework completion are a substantial portion of the course grades that many teachers assign.

Future Research

Future research examining engagement should investigate how the four types of engagement; psychological, cognitive, academic, and behavioral, interact with each other and what their relationship is with achievement status and growth. Is one type of engagement more predictive of achievement or growth than another? Is a particular combination of engagement types more predictive of achievement or growth than another

combination? The use of an instrument that is sensitive enough to detect variability in students' engagement and the differences between psychological, cognitive, academic and behavioral engagement is critical.

Lee and Smith (1999) found that substantial gains in achievement were obtained when social support for learning was combined with academic press. Academic press was not measured in the current study. The addition of academic press to future research may clarify factors that affect academic growth.

In order for future research to benefit students, educators need to know which aspects of student engagement contribute to long term student success. In an era of academic accountability, strong research tying psychological engagement to achievement and growth in achievement will allow teachers and schools to focus on efforts that produce enhanced outcomes. In addition, future research should examine which groups of students may benefit the most from an additional emphasis on engagement with school.

In this study, prior reading test scores accounted for more than three-quarters of the variation in subsequent reading test scores. This combined with little variation in psychological engagement scores made it very difficult to identify any additional effects that psychological engagement may have on test scores. In addition, this study did not consider any possible effects of psychological engagement, or lack thereof, in primary grades. It may be that the impacts of engagement have already affected student test scores, so additional impacts from later changes in engagement are modest. To thoroughly examine the relationship of engagement and achievement, future research

should start with much younger students and follow them into later grades. This longitudinal research would be strengthened by the inclusion of both test scores and grades as measures of achievement and by the use of observational methods as well as survey results in the measurement of the four types of engagement.

Recent Minnesota legislation requires the state's Department of Education to report on student engagement and connection at school within the next few years. Based on the results of this study, the department would need sufficient funds to carefully develop and pilot a data collection instrument sensitive enough to detect the full range of each of the types of student engagement. In addition, the department would need to demonstrate that measures of student engagement, be they behavioral, psychological, cognitive and/or academic, add substantially to the information schools need to help students become successful. Future research needs to examine how each of the four components of engagement, behavioral, psychological, cognitive and academic, relate to outcomes such as achievement measured by test scores (both achievement status and growth), achievement as measured by student grades, and persistence (for example, absenteeism rates or school completion rates). If the Department of Education does not adequately demonstrate the value of this additional data collection, it would be difficult to justify the investment in student time away from academic lessons and the investment in taxpayer dollars. Since the results of the current study do not indicate that the addition of psychological engagement alone adds to the prediction of achievement beyond the information that prior achievement provides, additional research is essential as the department will need to demonstrate that collecting student engagement data provides information to educators and policy makers that will truly benefit students.

Future researchers should examine various combinations of engagement (psychological, cognitive, academic and behavioral) to find the right combination of engagement factors that would add to the prediction of reading achievement over and above students' prior achievement, or to dismiss engagement as a correlate but not a cause. This study speaks to the issue, suggesting that the relationships are not simple and likely not robust. However, until there is research that can clarify the relationships between these types of engagement and achievement, teachers and other educators will be limited in how they can use engagement to spur learning. But they also will need to continue to work with each student to provide instruction that will lead to learning, and also to inform researchers in their quest to find an optimal blend of engagement factors so that they, as teachers, can lead their students to academic success.

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