

ABSTRACT

Title of Document: TEACHERS' RATINGS OF RELATIONSHIPS
WITH STUDENTS: LINKS TO STUDENT
AND TEACHER CHARACTERISTICS

Sara J. Buhl, Doctor of Philosophy, 2012

Directed By: Professor Sylvia Rosenfield,
Counseling and Personnel Services

This exploratory study examined the associations between teacher-student relationship ratings and characteristics of students and teachers. A sample of fifth grade teachers (N = 115) and their students (N = 2070) were studied. Hierarchical linear modeling was employed to explore the associations between variables while taking both individual characteristics and classroom context into account. An investigation of within-teacher variation indicated that males, Asian students, Hispanic students, FARM eligible students, and students with high prior internalizing scores generally received lower closeness scores. A between-teacher (level-2) model was created to gain a better understanding of the influence of classroom context on teacher reports of closeness with their students. Classroom context was found to play a significant role in relationship ratings for students in general and also for subpopulations of students (i.e., male, high prior externalizing, or high prior internalizing). Teacher self efficacy was positively associated with relationship

closeness. Longitudinal data were used to explore the association between the ratings that teachers had provided during previous years (with prior students) and ratings of closeness with their current students. Results indicated that teacher ratings of their previous students during prior years were a significant positive predictor of how their current relationships were rated. Implications, limitations, and directions for future research are discussed.

TEACHERS' RATINGS OF RELATIONSHIPS WITH STUDENTS: LINKS TO
STUDENT AND TEACHER CHARACTERISTICS

By

Sara J. Buhl

Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
2012

Advisory Committee:
Professor Sylvia Rosenfield, Chair
Associate Professor Robert Croninger
Dr. Deborah Nelson, Special Member
Associate Professor William Strein
Professor Kathryn Wentzel

© Copyright by
Sara J. Buhl
2012

Acknowledgements

I would like to express my gratitude to the many people who played a role in supporting me through the process of completing this doctoral dissertation. Dr. Sylvia Rosenfield has been an inspiring mentor throughout my graduate work. Sylvia, your encouragement and guidance have provided me with the support needed to complete this research. Also, a special thank you is due to Dr. Robert Croninger who generously gave of his knowledge and time. This project would not have been possible without his direction and thoughtful feedback. I would also like to thank my committee members, Dr. William Strein, Dr. Kathryn Wentzel, and Dr. Deborah Nelson. This dissertation was strengthened by your unique perspectives and the thought-provoking questions that you raised. I am grateful to the IC Teams research team members who answered my questions and provided me with the data I needed to complete this study.

I would also like to express appreciation to my parents and siblings who have supported my educational pursuits over the years. My husband, Taber Buhl, deserves my eternal gratitude for providing unwavering support which allowed me to persevere and complete this dissertation. Lastly, I would like to thank my daughters, Evelyn and Vivian, who inspire me to keep learning and working to accomplish my goals.

Table of Contents

Acknowledgements.....	ii
Table of Contents.....	iii
List of Tables.....	v
Chapter 1: Introduction.....	1
Theoretical Foundation.....	2
Empirical Basis.....	5
Statement of the Problem.....	6
Research Question.....	7
Definition of Variables.....	8
Significance of Study.....	11
Chapter 2: Literature Review.....	13
Conceptual Framework.....	13
Student-Teacher Relationships.....	15
Use of Multilevel Methods to Study Student-Teacher Relationships.....	27
Assessment of Student-Teacher Relationship Quality.....	30
Student-Teacher Relationship Scale.....	31
Additional Research on the Psychometric Properties of the STRS.....	35
Summary.....	37
Chapter 3: Methods.....	41
Purpose of the Study.....	41
Description of the Data.....	42
Measures.....	44
Analytic Sample.....	51
Data Analysis Methods.....	56
Chapter 4: Results.....	64
Bivariate Findings.....	64
Fully Unconditional Model.....	68
Within-Teacher Models.....	68
Between-Teachers Model.....	71
Summary of Results.....	76
Chapter 5: Discussion.....	79
Student-Teacher Relationship Ratings.....	79
Implications.....	86
Limitations.....	90
Conclusion.....	93
Author Note.....	95
Appendix.....	96
Appendix A. Student-Teacher Relationship Items from the Teacher Report on Student Behavior (TRSB).....	96
Appendix B. Summary of Major Studies Reviewed.....	97
Appendix C. Student Teacher Relationship Factor Loading, Rotated Two Factor Solution.....	103
Appendix D. Externalizing and Internalizing Behavior Rating Items.....	104
Appendix E. Teacher Self-Efficacy Items.....	105

Appendix F. Description of Variables Used in HLM Analyses	106
References.....	109

List of Tables

Table 1: TRSB Response Rates for the IES IC Teams Effectiveness Study	43
Table 2: Teacher Self Report Survey (TSRS) Response Rates	44
Table 3: Variables Used in Analyses	45
Table 4: Characteristics of Children and Teachers Who Participated in the Survey.....	51
Table 5: Characteristics of Children and Teachers in the Analytic Sample	53
Table 6: Means Comparison of Analytic Sample and Dropped Cases	54
Table 7: Correlations among Student Level Variables	66
Table 8: Correlations among Teacher Level Variables	67
Table 9: Simple Within-Teacher Model to Establish Slope Baselines	69
Table 10: Final Within-Teacher Model for Closeness Ratings	70
Table 11: Final Between-Teachers Model for Closeness Ratings	73

Chapter 1: Introduction

Children spend a large portion of their time in school interacting with their teachers, and student-teacher relations have been linked to positive student outcomes. Emotional bonds between children and supportive adults have been found to be associated with healthy outcomes (Resnick et al., 1997). Because of this connection, there has been considerable interest in understanding these relationships.

Interpersonal relationships influence the behavior of both parties involved in the interaction. However, teacher-student relationships are often studied as a function of characteristics of the student, such as the student's achievement level or behavior skill (e.g., Birch & Ladd, 1998; Howes, Phillipsen, & Peisner-Feinberg, 2000). Less emphasis has been placed on characteristics of the teacher that might influence their ratings of relationships with students. The purpose of this study is to explore the student and teacher characteristics that influence teacher ratings of relationships with students.

The data used in this study were collected as part of a larger experiment investigating the effectiveness of implementing a specific school wide intervention, Instructional Consultation Teams (Rosenfield & Gravois, 1996). The model of IC Teams implemented in the larger study "represents a comprehensive support model that uses a trained team of school-based professionals to support classroom teachers in applying best practices in instructional assessment and delivery" (Gravois & Rosenfield, 2002, p. 10). In part, the IC Teams intervention aims to change teacher perceptions of their relationships with their students. In this study, student-teacher relationships are defined as the degrees of closeness and conflict that comprise the

relationship between teacher and student.

Theoretical Foundation

A review of the literature provides an understanding of the theoretical foundations for student-teacher relationship research. Pianta (1999) hypothesized that supportive teacher-student relationships in schools may enhance child development. Work in this area has primarily developed from the literature on parent-child attachment (i.e., attachment theory; Birch & Ladd, 1997). Attachment theory, as presented by Bowlby (1982), provides a framework for understanding how interpersonal relationships develop in young children. According to attachment theory, infants form attachments with caregivers who are responsive to their needs. In addition, from a systems perspective, a child's development is seen as being influenced by interacting family and school systems (Bronfenbrenner, 1986). General systems theory, which allows for the consideration of the influence of various systems on development, has provided a lens for understanding the formation and maintenance of teacher-child relationships in schools (Christenson & Anderson, 2002).

Such an interactional approach was taken by Pianta and Walsh (1996) and Pianta (1999), whose model of student-teacher relationships suggests that teachers' perceptions of their relationships with students are composed of individual characteristics, the interactions between individuals, and the contexts of the classroom and school. Within this model, interpersonal relationships influence the behavior of both parties involved in the interaction. Pianta believes that dyadic systems, such as those between teachers and students, have an important role in regulating children's social behavior. His theory also states that the types of interactions that occur within

relationship dyads can regulate or restrict the development of both individuals. For example, a child's behavior problems may influence relationship quality, which in turn shapes the child's future behavior. Pianta also takes into account the influence of school systems on shaping teacher-student relations. The rules of the school system can constrain the types of interactions that occur in the classroom.

Oreshkina and Greenberg (2010) found that student-teacher relationships emerged as an important theme during phenomenological interviews conducted with educators from Russia, South Africa, and the United States. The educators in this study worked with underachieving students and were engaged in open-ended interviews about their teaching experiences. A total of 25 educators were interviewed for this qualitative study and the interviews were then interpreted by a research team that worked together to identify themes of the shared experiences. They concluded that the overarching meaning of teachers' experience in all three countries was defined by their relationships with students. In describing their relationships with underachieving students, educators in this study referred to connecting with the students at the student's level, providing support and being available for students, and working to find ways to teach individual students. Teaching was described as a dynamic, mutual, and student-oriented experience. The educators not only felt that they were teaching their students, but that they were changed through their work with students as well. Though the sample size for this study was small and the methods used do not allow for causal inferences to be made, the importance of the student-teacher interactions and relationship that consistently emerged as a theme adds more depth to the theoretical basis upon which much of the research in this area is based.

Many characteristics of students, teachers, and the classroom environment have been hypothesized as being related to the quality of student-teacher relationships. Closeness and conflict in the relationship are thought to be at least partially dependent on characteristics such as children's behavior and teacher's behavior management (Buyse, Verschueren, Doumen, Van Damme, & Maes, 2008). In addition to individual characteristics, it has also been hypothesized that features of classrooms may play a part in the relational quality between teacher and students (Hamre & Pianta, 2005). It is thought that classroom composition, such as increased rates of behavior problems, can result in varying teacher experiences that in turn influence their interactions with the children (e.g., Pianta, Hamre, & Stuhlman, 2003). Having positive connections with caring adults (i.e., teachers) and feeling welcome in school are thought of as safeguards for students, possibly bolstering positive outcomes and preventing participation in more negative behaviors (Rudasill, Reio, Stipanovic, & Taylor, 2010).

The theoretical foundation upon which this study is based highlights the complex, interactional nature of dyadic relationships and links to development. In a broad sense, relationships are composed of individuals, interactions between those individuals, and the context in which the relationship exists. A relationship between two people can be perceived differently by each participant and again differently by an outside observer. The multifaceted nature of relationships makes it difficult to examine all aspects in a single study. In this particular study, relationship is defined as teacher perceptions of closeness and conflict in the relationship (see p. 16 for definitions of the variables), and therefore aims to explore only a small piece of the broad conceptualization of what makes up a relationship.

Empirical Basis

Many studies of student-teacher relations have been conducted to test these theories. Student-teacher relationships have been studied across a range of ages, including children who are of pre-school or kindergarten age (e.g., Birch & Ladd, 1997; Howes et al., 2000) and in middle childhood (e.g., Kesner, 2000; Murray & Greenberg, 2000). Longitudinal studies of student-teacher relationships and outcomes have also been conducted (e.g., Hamre & Pianta, 2001). Much of the research has used rating scales to measure teacher and/or student perceptions of the student-teacher relationship (e.g., Baker, 2006; Murray & Zvoch, 2011). Many studies using rating scales rely on teacher reports of relationship quality, but some researchers have incorporated the use of student and peer ratings as well (e.g., Murray & Greenberg, 2000; Wu, Hughes, & Kwok, 2010). Other methods besides rating scales have occasionally been utilized, such as qualitative studies based on interviews with educators (Oreshkina & Greenberg, 2010). More recent research has employed the use of multilevel analyses to examine factors associated with teacher ratings of their relationships with students (Hamre, Pianta, Downer, & Mashburn, 2008; Thijs, Koomen, & van der Leij, 2008).

Studies of student-teacher relationships document more positive outcomes for children as the quality of the relationship increases. Closeness in the student-teacher relationship has shown positive associations with academic performance and school liking (Birch & Ladd, 1997). Student-teacher relationship quality predicts children's skills in the early elementary grades (Pianta & Stuhlman, 2004). Poor relationships and bonds have been linked to poorer social and emotional adjustment outcomes for

elementary students (Murray & Greenberg, 2000). Student-relationship quality has been connected to behavioral and academic outcomes into the middle school years (Hamre & Pianta, 2001). Adolescent perceptions of teachers as being less nurturing (characterized by negative feedback and lack of encouragement) have been found to negatively predict academic achievement and prosocial behavior (Wentzel, 2002).

Evidence has also been found supporting the association between student perceptions of relationship quality and self- and teacher ratings of student adjustment (Murray & Greenberg, 2000). Student-teacher relationships influence not only the particular child and teacher, but also the peer perceptions of that child (Hughes, Cavell, & Willson, 2001). Student-teacher relationships may provide a protective effect for at-risk students (e.g., Baker, 2006) and the relationship may also mediate behavior outcomes of adolescents (e.g., Rudasill et al., 2010).

Statement of the Problem

In general, the current literature focuses on student characteristics that are related to the teacher's rating of the dyadic relationship. Until recently, less emphasis had been placed on teacher and classroom characteristics that might influence ratings of the relationship. This study aims to broaden our view of the relationship as a two-way interaction that may be influenced by student characteristics, teacher characteristics, and interactions between student and teacher characteristics. Thus, the purpose of this study is to explore the student and teacher characteristics that influence teacher ratings of relationships with students. Data from teacher ratings on an 8-item measure of student-teacher relations were used. Fifth-grade teachers from 45 schools completed this rating for each student in their classroom. As fewer studies have

focused on older elementary school students, studying students and teachers at this grade level make a contribution to the literature in this domain.

As in previous studies, the current study investigated how teacher characteristics (such as gender, race, and self-efficacy) and child characteristics (such as gender, race, and student achievement levels) are related to teacher ratings of the relationship. Additional information about the influence of these characteristics was generated by using ratings completed by teachers on an ethnically and economically diverse sample of fifth grade students. This study also expanded the current literature by considering unique variables such as the child's previous behavior ratings (from prior years and teachers) and the teacher's disposition for rating relationships (based on their average ratings of prior students). Other teacher characteristics that were investigated include education level and years of experience.

Much of the existing literature does not take into account the nested structure of school data. The current study contributed to the current knowledge by using multilevel modeling to account for the individual data that are nested within classrooms. Multilevel modeling was used to determine whether teacher and student characteristics are related to relationship ratings.

Research Question

The research question in this exploratory study is: How are student characteristics and teacher characteristics related to teacher ratings of their relationships with students in grade five?

At the student level, this study examined how student gender, race, FARM status, special education status, achievement level, and past behavior ratings are

related to teacher ratings of the dyadic student-teacher relationship. At the teacher level, this study examined how teacher gender, race, disposition to positive relationships (average of past relationship ratings), education level, years of experience and self-efficacy ratings are related to their perception of relationships with students.

Definition of Variables

Student-Teacher Relationship. Student-teacher relationship is defined by the degrees of closeness and conflict that comprise the relationship between teacher and student. To measure student-teacher relationship quality, this study utilized eight items from the Student-Teacher Relationship Scale (STRS; Pianta, 2001).

- **Closeness** is defined as the amount of warmth, support, and open communication in the relationship as perceived by the teacher (Pianta, 2001). The scale used to measure closeness included four items rated on a Likert-type scale. For example, “I share a caring, warm relationship with this child.”
- **Conflict** is defined by teacher perceptions of negativity and volatility in the relationship (Pianta, 2001). The scale used to assess conflict included four items rated on a Likert-type scale. For example: “This child and I always seem to be struggling with each other.”

See Appendix A for a complete list of the items that were used to assess teacher perceptions of closeness and conflict in their relationships with each student. (Note: The expectation for the study was to use the Conflict scale; however, I was unable to do so because of the psychometric qualities of the scale and the lack of differentiation

of scores in the sample. See chapter 3 for further information.)

Definition of Student Variables. The following student characteristics were included: sex, race, free and reduced meal status, special education status, average externalizing behavior ratings from past teachers (grades 2-4), average internalizing behavior ratings from past teachers (grades 2-4), and fifth grade standardized achievement score.

- **Student sex.** Male or female. This was obtained from the student demographic data.
- **Student race.** Group categories included: Caucasian, Hispanic, African American, and Asian. This information was obtained from the collected student demographic data.
- **Free and reduced meal (FARM) eligibility.** Indicates whether a student is eligible to receive school meals for free or at a reduced rate. This information was obtained from the collected student demographic data.
- **Achievement.** Student academic achievement in reading. Standards of Learning (SOL) standardized test scores, measured in the spring of fifth grade (2009), were used. Standardized test scores were obtained from data provided by the school district.
- **Special education status.** Indicates whether an individual student participates in special education programming within the school. These data were obtained from student demographic records.

- **Past behavior ratings.** Student externalizing and internalizing behavior as rated by previous teachers. Externalizing behavior ratings received in second, third, and fourth grade were averaged to provide a mean score for each student. Internalizing behavior ratings from second, third, and fourth grade were also averaged to provide a mean score for each student. The past behavior rating data were obtained from the Teacher Report on Student Behavior (TRSB) surveys that were completed during the first three years of data collection (when the students of interest in this study were in second, third, and fourth grade).
 - **Externalizing behavior** includes the degree to which students are able to regulate their behavior, emotions, and interactions with other people.
 - **Internalizing behavior** refers to a student's anxious, shy, or withdrawal behaviors.

Definition of Teacher Variables. Traits or qualities of the teachers include sex, race, education level, years of experience, self-efficacy rating, and disposition for positively rating relationships with their students.

- **Teacher sex.** Male or female. This was obtained from the Teacher Self Report Survey completed during Year 4 (2008-2009).
- **Teacher race.** Group categories including Caucasian, Hispanic, African American, Asian, and Other. This information was obtained from the Teacher Self Report Survey completed during Year 4 (2008-

2009).

- **Education level.** Teachers' self-reported level of education. This variable indicates whether the teacher has earned a master's degree or not. These data were obtained from the Year 4 (2008-2009) Teacher Self Report Survey.
- **Years of experience.** The number of years that the teacher has been teaching. These data were obtained from the Year 4 (2008-2009) Teacher Self Report Survey.
- **Self-efficacy ratings.** Teacher self-reported ratings of their ability to successfully achieve classroom and instruction-related goals. The self-efficacy ratings from the fifth grade teacher's responses to the Teacher Self Report Survey during Year 4 (2008-2009) were used.
- **Disposition to positive relationships.** How a teacher has rated their relationships to students in the past. Teacher's average past ratings as measured by the STRS-8 during prior years of data collection (2004-2005, 2006-2007, and 2007-2008). Therefore, up to three years of prior ratings were averaged for each teacher, depending on the data available.

Significance of Study

The wide array of associations and influences that student-teacher relationships can have on outcomes indicates that consideration of these relationships has an important place in educational research. Knowledge of the teacher/student characteristics that influence teacher perceptions of relationships is an important first

step in understanding how these perceptions might be changed. The potential for positive outcomes to be influenced by student-teacher relationships allows this area to remain valuable to researchers and educators. Therefore, it is important to use adequate samples and appropriate analyses to examine influences on teacher ratings.

This study aimed to provide information about both student and teacher factors that influence teacher perceptions of their relations with students. By including less studied teacher variables along with student characteristics, the aim was to learn more about which teacher characteristics are linked to more negatively or positively perceived relationships. Knowledge about specific characteristics that are associated with more positive perceptions of the relationship, for example, can be used to inform teacher training. A unique aspect of the current study is the inclusion of prior teacher ratings of their relationships with students. To my knowledge, teacher disposition for rating and its association with current relations has not been reported in the current literature.

Chapter 2: Literature Review

This chapter will provide a review of the current base of literature relevant to the study of student-teacher relationships and the factors that are associated with ratings of the relationship. This section begins with a description of the conceptual framework used for understanding student-teacher relationships in this study. Next, I review relevant studies of student-teacher relationships including those seeking to understand the factors that are associated with relationship ratings as well as studies investigating the link between relationship quality and various student outcomes. Recent studies utilizing multilevel data analysis techniques are also reviewed, followed by a discussion of the various types of assessment methods that have been used within this domain. This chapter concludes with a review of the STRS (Pianta, 2001), the rating scale from which the measure used in the study was adapted.

Conceptual Framework

The conceptual framework for this study is based in attachment theory (Bowlby, 1999) and systems theory (Bronfenbrenner, 1986). Attachment theory is used as a framework for understanding that unique interpersonal relationships develop between children and their teachers with varying degrees of attachment as a result. Bowlby theorized that early bonds formed between children and their caregivers result in experiences of connectedness that continue to have an impact throughout one's life. Attachment theory emphasizes the importance of the earliest bonds formed between infants and their caregivers. Ideas based in attachment theory have been extended over the years and applied in an effort to better understand the importance of bonds formed between children and the adults with whom they regularly interact. For instance,

supportive teacher-student relationships in schools are thought to be an asset for children's developmental outcomes (e.g., Pianta, 1999).

A child's development is thought to be influenced by interacting family and school systems (Bronfenbrenner, 1986). Ecological systems theory, as described by Bronfenbrenner, identifies various environmental systems and their influences on individual development. Interactions that influence development are believed to occur within the immediate environment, or microsystems, such as the individual's home, school, or neighborhood. Bronfenbrenner further theorized, however, that several other systems influence individual development such as the interactions between various microsystems. Drawing from systems theory, the quality of the dyadic relationship between the teacher and student is seen as a result of not only individual characteristics, but the interactions between individuals and the contexts of the classroom and school as well (Pianta & Walsh, 1996; Pianta 1999).

The framework for this study is based on the idea that multiple factors likely play a role in ratings of dyadic student-teacher relationships. Characteristics of students, teachers, and the classroom environment have been hypothesized as being associated with the quality of student-teacher relationships. For example, relationship ratings are thought to be influenced by children's behavior and teacher's behavior management (Buyse et al., 2008), as well as classroom features, such as increased rates of behavior problems (e.g., Pianta et al., 2003). From this viewpoint, interactions may be seen as having a reciprocal nature. Adults not only influence children, but are influenced themselves by the unique characteristics and responses of the children with whom they are interacting. Furthermore, the behaviors of children and adults are

thought to vary, dependent on the context or setting in which these interactions occur. In this study, therefore, the relationship is viewed as a two-way interaction that exists within the context of the classroom environment. A relationship may be perceived differently by each participant in the relationship and furthermore may be seen differently by an observer outside of the dyadic relationship. The multifaceted nature of relationships makes it difficult to examine all aspects in a single study. While the interactional nature of the relationship is acknowledged, this study aims to explore only a small component of what makes up a relationship. Specifically, this study was designed to focus on teacher perceptions of closeness and conflict in the relationship.

Student-Teacher Relationships

This section includes a general overview of studies that have investigated variables linked to student-teacher relationship quality. First, I have included examples of studies that emphasized examining the relationship between individual characteristics and student-teacher relationship quality. Next, I discuss studies that emphasized the investigation of the relationship between student-teacher relationship quality and various student outcomes, including outcomes for specific populations (e.g., students at-risk for academic or behavior problems).

Individual characteristics and student-teacher relationships. Both teacher (e.g., Kesner, 2000) and student characteristics (e.g., Baker, 2006) have been found to be associated with student-teacher relationship quality. Research on student-teacher relationships has spanned several decades. Brophy and Good (1974) documented findings about links between teacher characteristics (e.g., expectations) and student characteristics (e.g., achievement and attitudes). For example, teacher expectations of

the entire class were related to student gains. In addition, Brophy and Good reported that students who receive more positive attention from their teachers tend to perform better. Teacher education has been found to be positively associated with more sensitive and less detached teaching behaviors in the classroom (Howes, Whitebrook, & Phillips, 1992). Child characteristics such as gender and ethnicity have also been found to be associated with relationship quality. Girls (Howes, 2000) and European-Americans (Saft & Pianta, 2001) tend to have higher quality student-teacher relationships. Examples of research investigating various teacher and student characteristics are described in more detail in the remainder of this section.

Kesner (2000) studied 132 female preservice teachers to determine whether teachers' attachment history (i.e., teachers' perceptions of their own childhood relationship with their parents), teacher ethnicity, children's ethnicity, or children's gender were associated with student-teacher relationship quality. These teachers provided ratings of 903 students ranging from kindergarten through 5th grade. Variables measuring the teacher's attachment history (Secure base, Separation, Parental Discipline, and Peer Affectional Support) were correlated with the Student Teacher Relationship subscales of Closeness, Conflict, and Dependency. One canonical correlation was found to be significant and regression analyses were then used to further examine links between the attachment variables and the relationship ratings. The only regression model found to achieve statistical significance included the Closeness subscale of the STRS as the dependent variable. The only attachment variable that significantly predicted Closeness in the model was the Parental Discipline variable. Those preservice teachers who reported increased encounters of

severe childhood discipline with their parents tended to report less closeness in their relationships with students. Kesner concluded that teachers' attachment history significantly predicted teacher reports of relationship quality. It seems, however, that this conclusion should be considered cautiously as only one of the attachment history variables significantly predicted closeness while the others did not.

Kesner also explored whether teacher ethnicity, child ethnicity, and child gender were related to the Closeness, Conflict, and Dependency variables. Using multivariate analysis of covariance (MANCOVA), significant main effects were reported for child gender, child ethnicity, and teacher ethnicity. Follow-up analyses of covariance were conducted and it was reported that for the Conflict and Closeness subscales, child gender was the only significant main effect. Teachers reported relationships with boys as having higher levels of conflict and less closeness as compared to their relationships with girls. For the Dependency subscale, child ethnicity and teacher ethnicity were both significant main effects. Preservice teachers who identified as Hispanic or Asian American tended to perceive their relationship with African American children as more dependent than their relationships with Hispanic and Asian American students. White teachers perceived their relationships with all minority children as more dependent than their relationships with White children.

These findings provide some evidence that teacher characteristics, such as teachers' childhood relationship experiences and teacher ethnicity, as well as child characteristics, may be related to the quality of their relationships with students. This study, however, only used data from female preservice teachers. Because preservice

teachers are not fully responsible for a class, these results may be different than those that would be obtained when studying the typical classroom teacher or male teachers.

In addition to investigating individual student characteristics and the association with relationship quality, some researchers have included both teacher and classroom variables. For example, Thijs et al. (2008) used multilevel regression analyses to examine the link between teacher reports of their relationships with students and self-reported teaching practices. The sample included 81 teachers and 284 children in Dutch kindergarten classes. They found significant associations between characteristics of the reported relationship and teacher practices, such as levels of behavior regulation and socioemotional support. For example, characteristics of dependency in the relationship were positively related to the level of socioemotional support reported for each child. Also, relationships characterized by less closeness, more dependence, and more conflict were associated with teacher reports of increased behavior regulation. The authors reported that the effects of the relationship variables were independent of children's behavior. When the relationship variables were added into the second step of the regression models (for socioemotional support and behavior regulation), significant model improvement resulted.

A study by O'Connor (2010) used individual growth modeling to examine student and teacher factors associated with relationship quality using the framework of Pianta and Walsh's (1996) Contextual Systems Model as a theoretical basis. O'Connor conducted secondary analyses with data from the National Institutes of Child Health and Human Development Study of Early Child Care and Youth Development (N = 1,364 mothers and their children). The 15-item Student-Teacher Relationship Survey

(STRS; Pianta, 1992) was used as a measure of relationship quality at first, third, and fifth grade. The closeness and conflict (reversed) scores were combined to attain a measure of overall relationship quality, with higher scores indicating higher quality relationships. Several additional teacher, classroom, and student level variables were included. For example, salary information was obtained via teacher report. Teachers were also asked to complete the Teacher Self-Efficacy Scale (Bandura, 1986) which used 9-point rating scales to assess teachers' perceptions of their ability to influence decision making, provide effective instruction and discipline, and promote a positive classroom environment. Several child and teacher characteristics were found to be associated with teacher-child relationship ratings. For example, at 5th grade, children whose teachers had higher salaries tended to have higher scores on the STRS.

Classrooms with more positive emotional climates and with better behavior management also translated to higher STRS scores for the children. Teacher self-efficacy was positively associated with STRS scores. Female students had higher STRS scores than males and European-American students had higher scores than African-American children. Children with increased behavior problems were more likely to have lower quality relationships. Higher scores on the STRS at kindergarten tended to result in higher scores on the STRS when measured at 5th grade.

O'Connor also reported that the average quality of the teacher-student relationship declined as time passed from first through fifth grade. The analyses, however, indicated that certain characteristics were associated with more gradual declines in relationship quality. For example, rate of decline in the relationship was slowed as teacher salary increased and as teacher self-efficacy increased. In addition,

children in classrooms with more positive climates and with better management tended to experience a more gradual decline in relationship quality over a time period of several years (first to fifth grade). While many characteristics were found to be associated with relationship quality, there were limitations to this study. For instance, causal implications cannot be made due to the lack of a randomized experimental design. Additionally, the sample included a majority of middle-income families limiting the generalizability of the results.

Most recently, Murray and Zvoch (2011) used both student and teacher ratings to study student-teacher relationships using a sample of 193 African American students from high-poverty urban schools. The students were from low-income backgrounds and ranged from 5th to 8th grade. A subsample of students who scored above the clinical range on the externalizing scale of the *Teacher Report Form* (TRF) of the *Child Behavior Checklist* (CBCL; Achenbach, 1991) was also examined. Using multivariate analysis of variance (MANOVA) and examination of standardized discriminant function coefficients (SDFC) in the teacher report model, the authors found that gender (SDFC = .88, $r = .99$) and clinical levels of externalizing behaviors (SDFC = -.20, $r = -.67$) were both related to the weighted multivariate composite. Teachers were found to report higher levels of closeness with female students and more conflict with male students. Furthermore, students who were in the clinical range on the externalizing scale received ratings from their teachers that indicated lower relational closeness and more relational conflict. Those students with high levels of externalizing behavior problems appear to be more likely to experience poorer quality relationships with their teachers than similar students who do not have behavior

problems.

Murray and Zvoch also used multiple regression analyses to explore the associations between teacher ratings of relationships and teacher ratings of adjustment. Gender, disability status, and grade level were controlled for at Step 1 and student ratings of the relationship were controlled for at Step 2. Teacher perceptions of closeness in the relationship were statistically related to teacher ratings of school competence ($\beta = .46, p < .01$), academic competence ($\beta = .63, p < .001$), and school engagement ($\beta = .51, p < .001$). The generalizability of this study was limited because of the focus on only low-income, African American students. The study also employed a cross-sectional design that looked at the students at only one point in time.

The influence of an individual's family background has also been investigated in relation to student-teacher relationship quality. Burchinal, Peisner-Feinberg, Pianta, and Howes (2002) looked at whether child, family, and classroom factors predicted developmental levels over time. Classroom experiences in this study were defined as the teacher perceptions of their relationship with each child. With a sample of 511 children in pre-kindergarten through second grade, these researchers used parent and teacher surveys to assess student-teacher relationship quality and outcomes (e.g., language and academic skills). Hierarchical linear models were used to account for the nested structure of the data (students within classrooms and also for data points within the same student over time). Closer relationships with teachers were found to be positively related to language skills outcomes for African American children. Increased reading competence was also found for those students whose parents had reported more authoritarian attitudes. The authors concluded that their findings

provided additional support for the idea that developmental outcomes result from interactions between individuals and the various facets of their environment (i.e., family and school systems). Strengths of this study include the use of hierarchical linear models and the inclusion of parent surveys in addition to teacher surveys. A limitation of this study, however, is that teacher reports of their relationships with students were used as the primary indicator of classroom experience.

Relationship quality and student outcomes. Cornelius-White (2007) conducted a meta-analysis of the research on learner-centered teacher relationships using 119 studies with 355,325 students. A variety of positive student outcomes (e.g., participation, critical thinking, satisfaction, achievement, self-esteem) were correlated with person-centered teacher variables such as warmth, empathy, and nondirectivity. The corrected correlation between positive student-teacher relationships and positive student outcomes was .36 (SD = .29; 95% confidence interval $r = .33$ to $r = .39$). The author reported that these findings could be considered above average when compared to other educational variables for student outcomes and therefore concluded that further study of learner-centered relationships is warranted.

The Cornelius-White meta-analysis, however, had limitations. Most importantly, the criteria for inclusion as an acceptable study were not particularly rigorous. Most of the studies used correlational designs. Even studies with some form of comparison group did not use random assignment nor did they have large samples. These criteria allowed for the inclusion of studies with no control group along with other limitations that foreclose causal inferences. Even with these generous inclusion criteria, few of the total number of studies found on learner-centered relationships

were actually included in the final sample. Overall, this implies that the majority of articles did not employ strong research designs to examine learner-centered teacher relationships. Lastly, Cornelius-White noted that the heterogeneity of variables resulted in a loss of potential for making inferences about specific effects and instead provided a more general descriptive view of the literature.

Recent research has shed light on the association between student-teacher relationship quality and various student outcomes. For example, Baker (2006) investigated the contribution of teacher-child relationships to school adjustment and examined the degree to which significant child characteristics moderated the relationship. This investigation included 68 teachers and their students (N = 1,310) who spanned kindergarten through the fifth grade. Baker found that children at-risk of poor school outcomes due to behavior or learning problems benefited less from a close teacher relationship than children who did not have behavior or learning problems. It was also found, however, that while children who were considered at-risk benefited less than children without behavior or learning problems, a close student-teacher relationship did provide more of a “protective effect” for at-risk students when compared to similarly at-risk students who did not have a close teacher relationship. In other words, a significant advantage was reported for those at-risk students who had a close relationship with their teacher when compared to similarly at-risk children who did not have a close teacher relationship. This research suggests that at-risk students who have a close teacher relationship are better off than similarly at-risk peers who do not have a close relationship. At the same time, however, these at-risk students with close teacher relationships are not benefiting as much from that relationship as their

peers who lack behavior and academic problems. Baker also reported that positive relationships resulted in better outcomes for girls, though the magnitude of these effects was small. While the effect sizes reported by Baker were small to moderate, the analyses were not conducted using hierarchical modeling to take into account the nesting of students within classrooms.

Additional research also suggests that student-teacher relationships may be particularly important for at-risk students. Decker, Dona, and Christenson (2007) investigated the importance of student-teacher relationships and outcomes for 44 African American students (kindergarten through 6th grade) who were identified by 25 teachers as having behavior problems and considered to be behaviorally at-risk for referral to special education. The researchers explored the quality of student-teacher relationships in this sample by assessing both student and teacher feelings about their relationships. The researchers found that increases in the quality of student-teacher relationships occurred with increases in positive outcomes (social, behavioral, and engagement) for at-risk students. The association between student-teacher relationship quality and positive outcomes was found for both teacher-reports and student-reports of relationship quality. The authors claimed that these results provided evidence that positive outcomes were related to increased quality in student-teacher relationships. The authors cannot explicitly claim that the relationships caused the positive outcomes because the design of their study does not include a control group or any pretest measures. Therefore, the study fails to determine temporal precedence of the relationship-quality variable. It is plausible that those students who are exhibiting more positive outcomes rate their relationships with their teachers more highly;

teachers may also rate their relationship with these students more highly as well.

Rudasill et al. (2010) conducted a longitudinal study to investigate whether student-teacher relationship quality in grades 4, 5, and 6 mediated the association between background characteristics of the child (gender, special education, and socio-economic status), difficult temperament in preschool, and risky behavior in 6th grade. The participants included 1,156 children who were part of the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development. Data were collected when the children were 4 ½ years old and when they were in 4th, 5th, and 6th grade. At age 4 ½ the mothers of the children completed questionnaires that were used as a measure of the child's temperament. In grades 4, 5, and 6, teachers completed the Student-Teacher Relationship Scale: Short Form (STRS; Pianta, 2001) as a measure of the quality of their relationship with the child participating in the study. In 6th grade, risky behavior was assessed via student reports of their own risky behavior and their perceptions of the frequency with which their friends engaged in risky behavior. Mothers were also asked to complete questionnaires to assess their perceptions of their children's risky behavior.

Using structural equation modeling, the researchers examined two models: (1) risky behavior predicted by difficult temperament and student-teacher conflict; and (2) risky behavior predicted by difficult temperament and student-teacher closeness. Significant paths were found from student gender (-.21, $p < .001$) and socio-economic status (-.18, $p < .001$) to Student-Teacher Conflict. Boys and children from lower income families tended to have more conflict in their relationships with their teachers. Paths from Difficult Temperament to Student-Teacher Conflict (.25, $p < .001$) and from

Student-Teacher Conflict to Risky Behavior (.32, $p < .001$) were also significant. Those adolescents who had previously been rated as having a more difficult temperament were found to have more student-teacher conflict. In addition, those with higher ratings of conflict were found to be more likely to engage in risky behavior in 6th grade. The second model examined the role of student-teacher closeness. The authors reported significant paths from student gender (.36, $p < .001$) and socio-economic status (.16, $p < .001$) to Student-Teacher Closeness. Girls and children from higher income families tended to have higher ratings of closeness in their relationships with teachers. The path from Student-Teacher Closeness to Risky Behavior (-.24, $p < .001$) was significant, indicating that those adolescents who had higher ratings of closeness in their relationships with teachers tended to engage in less risky behavior. Analyses indicated that student-teacher conflict mediated the relationships between background characteristics (gender, family income) and risky behavior, and between difficult temperament and risky behavior. The analysis also indicated that student-teacher closeness mediated the relationships between family income and risky behavior. The authors concluded that their findings were in line with the idea that higher quality student-teacher relationships may safeguard some children from engaging in problematic behaviors. Drawbacks to this study include a lack of generalizability (due to a racially homogenous sample) and, because it was not an experimental study, the inability to make causal inferences about the relationships between the variables examined.

The studies described above are primarily correlational in nature, studying associations between predictor and outcome variables. Therefore, it is important to

keep in mind that these types of studies do not prove causal connections.

Use of Multilevel Methods to Study Student-Teacher Relationships

Much of the research on student-teacher relationships has not taken into account the nested structure of the data. Students are nested within classrooms and classrooms are nested within schools. This section discusses additional recent examples of research that have used analysis techniques appropriate for the nested structure of the data.

A recent example of research that has taken into account teacher variables, as well as the hierarchical structure of students in classrooms, was conducted by Hamre et al. (2008). These researchers used a large sample of preschoolers ($N = 2282$) and preschool teachers ($N = 597$) to investigate the individual and classroom factors associated with teacher ratings of conflict. The authors reported that while more than half (53%) of the variance in reports of conflict in the relationship was due to teacher perceptions of problem behaviors, there were still many students for whom the expected conflict rating was more or less than would be expected based on problem behavior reports alone. Conflict in the relationship was assessed using the STRS. Standardized residuals were derived from the model to reflect the degree to which students had differing levels of conflict with teachers than would be expected based on level of problem behaviors. Many students were found to have higher ratings of conflict than would be expected based on ratings of their problem behavior, while still others had lower levels than would be expected. When predicting unadjusted teacher ratings of conflict, teachers reported higher conflict levels with boys and lower levels of conflict with Latino children and those who demonstrated better academic skills.

A second model used by the researchers investigated how much child and teacher/classroom variables predicted whether teacher reports of conflict would be higher than expected based on problem behaviors reported. The authors found that the child-level predictors that had been significant in the prior model were no longer significant. Child age, however, was found to be a significant predictor, with teachers reporting more conflict with older children than would be expected. At the teacher and classroom level, higher levels of conflict than would be expected based on behavior were reported by teachers who had lower levels of self-efficacy and higher levels of depression. In addition, higher levels of conflict were found for classrooms that met more hours per week and that were characterized as having decreased quality of emotional supports, as measured by a classroom assessment scoring system (CLASS; Pianta, La Paro, & Hamre, 2008). The emotional support scale from the CLASS was used to assess whether the classroom had a positive climate, warm and supportive relationships, whether yelling or irritation was present in the class, teacher response to individual needs of children, and behavior management. Interactions between ethnicity (of the child and teacher) were entered and found not to be significant. Lower levels of conflict than expected based on behavior reports were found for those classrooms that had more emotional supports, as measured by the CLASS.

The Hamre et al. (2008) study did use a large sample of students and their teachers, but it was limited to students of preschool age. This study provided information about how much of the variance in conflict ratings was explained by teacher ratings of problem behavior and how much was explained by other factors. An additional strength of this study was that child, teacher, and classroom predictors were

taken into account. This study focused on conflict in the relationship and did not investigate closeness. It was also limited by the use of conflict ratings and problem ratings that both came from reports made by the child's preschool teacher. Relationships between the two ratings could therefore be partially due to characteristics of how the teacher rates students. An additional limitation pointed out by the authors is that assessment of within-classroom variation in ratings was limited by their use of random sampling which resulted in small within-class samples of only four students from each class.

Buyse et al. (2008) used hierarchical linear modeling to examine the relationship of child and classroom variables to the quality of student-teacher relationships using a sample of 3,798 kindergarten children and their teachers (N = 187) in Belgium. Measures used included a shortened Dutch version of the STRS (8 items measuring relational closeness and conflict), measures of student math and language ability, and teacher ratings of their teaching style. Two child behavior variables (externalizing and internalizing behavior) were extracted using teacher ratings from a short Dutch version of the Child Behavior Scale (CBS; Ladd & Profilet, 1996). Classroom composition variables were calculated using averages of externalizing and internalizing scores. After controlling for gender, math and language ability, socio-economic status of the family, and ethnic differences between family and teacher, child behavior (as rated by the teacher) significantly contributed to the prediction of closeness and conflict. At the classroom level, higher average levels of internalizing behavior predicted more conflict between the teacher and individual students and while modest, higher average levels of externalizing behavior predicted

less closeness in relationships. The authors concluded that their results confirm the idea that children's classroom behavior is one of the strongest predictors of relationship quality. This study was limited by the reliance on teacher ratings for both the relationship and child behavior measures. In addition, the authors stated that the ethnic gap between teachers and student families tended to be very low. Therefore, these results may not generalize to situations where teachers and students are from more divergent ethnic backgrounds.

Assessment of Student-Teacher Relationship Quality

The assessment of student-teacher relationship quality is most often conducted by using rating scales. Most studies rely on teacher ratings of the relationship; however, some studies have utilized ratings from other sources. This section begins with examples of studies that have used sociometric procedures or child-ratings to obtain information about the relationship. Next, I discuss the Student Teacher Relationship Scale (STRS; Pianta, 2001) from which the items in the present study were excerpted. This section provides details about the STRS, including the psychometric properties of the scale.

Hughes et al. (2001) used sociometric procedures to examine relationships between peer perceptions of student-teacher relationships and children's attributes (i.e., peer ratings of the child's social competency and the child's likeability) in a sample of 993 third and fourth grade children. When rated by peers, girls were perceived as having more supportive and less conflictual relationships with teachers. Peer perceptions of Teacher Conflict and Teacher Support both contributed to peer ratings of children's competency and acceptance.

Two of the studies previously discussed in this literature review also sought to capture child perceptions of the student-teacher relationship. In addition to obtaining teacher ratings of the student-teacher relationship from the STRS, Murray and Zvoch (2011) measured child perceptions by using the *Inventory of Teacher-Student Relationships* (IT-SR; Murray & Zvoch, 2009). Additionally, Decker, Dona, and Christenson (2007) explored the quality of student-teacher relationships by assessing both student and teacher feelings about their relationships. The STRS (Pianta, 2001) was used to measure teachers' perceptions of relationships, while the Relatedness Scale (Wellborn & Connell, 1987) was used to assess student relationship experiences. The Relatedness scale contains two dimensions. The Psychological Proximity Seeking dimension assesses the degree to which students desire to be psychologically closer to their teachers. The second dimension, Emotional Quality, assesses the student's perspective of the overall emotional tone of the relationship.

Studies that have incorporated the use of relationship ratings from sources other than the teacher are generally correlational in nature and therefore causal inferences cannot be made. These studies, however, have been important for expanding the knowledge base in the area of student-teacher relationships by providing perspectives rather than solely relying on teacher reports.

Student-Teacher Relationship Scale

The Student Teacher Relationship Scale (Pianta, 2001) is a widely-used teacher self-report measure that assesses a teacher's perceptions of his or her relationship with a particular student, interactive behavior of the student with the teacher, and teacher beliefs about a particular student's feelings toward the teacher.

The STRS consists of 28-items, rated on 5-point Likert-type scales, with responses that range from 1 (*Definitely does not apply*) to 5 (*Definitely Applies*). The items can be grouped into three subscale scores characterizing relationship dimensions of Conflict, Closeness, and Dependency. In addition, a total score is calculated that assesses the overall quality of the relationship between the teacher and a particular student. According to the STRS Professional Manual (2001), the measure is designed to be completed by teachers for students in preschool through third grade. An administration time of approximately 5 to 10 minutes is required for each form completed.

The STRS Professional Manual (2001) provides the following information about the normative sample. The sample consisted of 275 female teachers, ranging from preschool through third grade. Seventy percent of the teachers were Caucasian, 15% were African American, 10% were Hispanic American, and 5% were from other ethnic backgrounds. Most teachers rated several students, but 37 teachers rated only one of their students. The student sample included 1,535 children ranging from 4 years to 8 years of age. Approximately 53% of the students rated were boys and 47% were girls. Most of the students were Caucasian (63%), while 18% of the students were African American, 10% were Hispanic American, 1.7% were Asian, and 7% either classified as other racial/ethnic groups or data was not reported. The normative sample included students representing a range of socioeconomic levels as assessed by mothers' education level and annual family income.

Descriptive statistics reported in the STRS Professional Manual (Pianta, 2001) indicate that teacher ratings of their relations with students show a great deal of

variability across students (e.g., total STRS scores ranged from 55 to 140, $M = 114.23$, $SD = 15.47$). Teachers in the normative sample tended to view the relations with their students positively. Skewness values for the subscales were Conflict = 1.06, Closeness = -0.71, Dependency = 0.73, and for the Total scale = -0.90. The negatively skewed Closeness value indicates that there were relatively fewer low scores on that subscale (i.e., teachers generally reported higher levels of closeness with students) while the positive skewness value for Conflict indicates that there were relatively fewer high scores on that subscale (i.e., teachers in general reported low levels of conflict). Score distributions were mildly skewed in favor of positive ratings for both boys and girls. Pianta reports that the STRS total scale and subscale scores for boys and girls were compared using Bonferroni correction for multiple testing. Teachers were found to report higher Conflict scores when rating their relations with boys (effect size $d = .17$). Teacher ratings indicated higher Closeness scores ($d = .36$) and higher Total scores ($d = .33$) when rating their relations with girls. Pianta noted that while the patterns of differences were significant, the differences in points that corresponded to these effect sizes (d) were relatively small. The difference between mean scores of boys and girls on the Conflict subscale was less than 2 points ($d = .17$), on the Closeness subscale there was a difference of less than 3 points ($d = .36$), and the Total Scale means differed by less than 4 points ($d = .33$). Pianta concluded that the gender-related differences found were generally not substantial. Due to the small range, however, these differences might be meaningful. Additional research studies have indicated that girls tend to have higher quality relationships with their teachers (e.g., O'Connor, 2010; Rudasill et al., 2010). Differences found in Pianta's sample along with those

found in subsequent studies seem to indicate that variation in scores based on gender may not be inconsequential. Therefore, it is important to acknowledge and consider possible gender-related differences when conducting studies in this area.

Based on the normative sample used by Pianta (2001) the STRS was reported to have high internal consistency for the total scale ($\alpha = .89$), the Conflict subscale ($\alpha = .92$), and the Closeness subscale ($\alpha = .86$). An internal consistency estimate of .64 was found for the Dependency subscale (Pianta, 2001; Pianta & Stuhlman, 2004). Test-retest reliability was also estimated using a subsample of 24 kindergarten teachers from the 2001 normative sample. Each teacher reported on three students from their class and a test-retest correlation of .89 was found for the total scale over a 4-week time period. The STRS provides reliable descriptions of the conflict, closeness, and dependency dimensions of student-teacher relationships (Saft & Pianta, 2001).

Evidence for concurrent validity has been found in correlations between the STRS and several outcomes for students such as kindergarten teacher-ratings of competence (.67) (Pianta, 2001; Pianta & Stuhlman, 2004). According to the STRS manual (Pianta, 2001), evidence for discriminant validity of the STRS has been shown in studies where the STRS scale and subscale scores have been correlated with scores from behavior problem and social competence measures (e.g., Birch & Ladd, 1997; Hamre & Pianta, 2001). These correlations were found not to exceed .58 (with the median r below .30) and it was concluded that the STRS does account for a unique proportion of the explained variance in social and academic outcomes.

Short Form of the STRS. The short form of the STRS consists of 15 self-report

items rated on 5-point Likert-type scales that are then grouped to form Conflict and Closeness subscales. Like the longer version, the short form is an assessment of teacher perceptions of the student-teacher relationship with an individual student. The alpha coefficient for the short form of the STRS (composed of the Conflict and Closeness subscales) is .91 (Pianta, 1994).

Additional Research on the Psychometric Properties of the STRS

Research investigating student-teacher relationships often relies on teacher reports of the quality of the relationship and some researchers have questioned the consistency of relationship quality across teachers. Teacher perceptions of teacher-child relationships have been found to be consistent at least during the early school years (Howes et al., 2000). Howes et al. (2000) followed children through two years of preschool and kindergarten in order to investigate the consistency of student-teacher relationships over time and across teachers. The STRS was completed by the participants' teachers each year. The STRS scores from Year 1 were correlated with those from Year 2 and Year 3, and scores from Year 2 were correlated with those from Year 3. These correlations were computed separately by gender, but no significant gender differences were found. Correlations for the Closeness scores were reported as follows: Year 1 and Year 2 ($r = .40$), Year 1 and Year 3 ($r = .20$), and Year 2 and Year 3 ($r = .29$). Correlations for the Conflict scores were: Year 1 and Year 2 ($r = .61$), Year 1 and Year 3 ($r = .47$), and Year 2 and Year 3 ($r = .50$). Dependency score correlations were reported as follows: Year 1 and Year 2 ($r = .33$), Year 1 and Year 3 ($r = .26$), and Year 2 and Year 3 ($r = .16$). The authors concluded that perceptions of relationship quality held from preschool to kindergarten, particularly with regard to

conflict. These results may provide evidence that teacher perceptions of teacher-child relationships are somewhat consistent across teachers at least during the very early school years. While they were statistically significant, the correlations were not very strong, particularly for closeness and dependency. The teacher perceptions of the relationship may simply be a reflection of stable student behavior during preschool and kindergarten. The authors also noted that this study was limited by the self-report nature of the measures used.

In their research (also discussed in the previous section on research using multilevel models), Thijs et al. (2008) used a preliminary version of the Dutch adaptation of the STRS (Koomen, Verschueren, & Pianta, 2007). This adaptation contained the three subscales of closeness, dependency, and conflict, each measured with 6-items. The scale was used with two independent samples of teachers from different parts of the Netherlands. Sample A was composed of 39 teachers (37 female and 2 male). Sample B was composed of 42 teachers (40 women and 2 men). Both groups of teachers were reported to be similar in age and level of teaching experience. Closeness was recoded as a scale for Distance due to the researchers' interests in unfavorable relationship characteristics. In both samples, Cronbach's alpha was found to be .82 for the Distance scale. The Dependency scale alphas were .87 (Sample A) and .79 (Sample B). Cronbach's Alpha in Sample B was .84. Sample A did not complete the Conflict measure due to a desire to lessen the demands of data collection for this group of teachers who had also participated in interviews.

Principal components analysis was used to examine the factor structure of teachers' relationship ratings. Two components corresponding to Distance and

Dependency explained 59.9% of the variance in sample A. Three components corresponding to the three subscales were found to account for 56.1% of the variance in Sample B. Based on the results of the principal components analysis, the authors concluded that the relationship dimensions were able to be reasonably distinguished in each of the samples. Overall, the analyses of this Dutch adaptation of the STRS were consistent with prior analyses of the STRS.

Summary

Many of the existing studies on student-teacher relationships have focused on child characteristics that influence teacher ratings. Research has generally found that student-teacher relationships are characterized by less conflict and more closeness for female students (e.g., Rudasill et al., 2010; Murray & Zvoch, 2011) and European-American students (O'Connor, 2010). Students with higher levels of academic performance have been found to have more closeness in their relationships with teachers (e.g., Birch, 1997). Conversely, poor relationships have been linked with poorer social and emotional adjustment (Murray & Greenberg, 2000). Evidence also indicates that there is more conflict in relationships for children from lower income families and more closeness for children from higher income families (Rudasill et al., 2010). Students who exhibit higher levels of externalizing behavior have poorer quality relationships marked by higher levels of conflict and less closeness (Murray and Zvoch, 2011).

Fewer studies have considered teacher characteristics and classroom characteristics. The current literature has provided some evidence that teacher characteristics are linked to relationship ratings. Lower levels of teacher self-efficacy

and fewer classroom emotional supports have been associated with higher ratings of conflict in the student-teacher relationship (e.g., Hamre et al., 2008). Likewise, higher levels of self-efficacy and higher teacher salaries have been linked to higher levels of student-teacher relationship quality (O'Connor, 2010). Teachers reporting increased behavioral regulation tended to report less closeness and more conflict in their relationships with students (Thijs et al., 2008). Additionally, some research has indicated that higher classroom levels of internalizing behavior predicts more conflict while higher classroom levels of externalizing behavior predict less closeness (Buyse et al., 2008). See Appendix B for a more complete summary of the major articles discussed in the introduction and literature review.

Prior research in the area of student-teacher relationships has shed light on the numerous factors that likely contribute to relationship ratings, but there is still a need to confirm and expand these findings with varying student populations and grade levels. While some variables have been studied more widely (e.g., student gender), the use of other student, teacher, and classroom variables has been more limited and additional study is warranted to determine whether the associations are consistent. Much of the existing research has been characterized by weak research design, inadequate sample sizes, and inappropriate methods of data analysis. Most studies have not taken into account the nested structure of the data (i.e., students are nested within classrooms and classrooms are nested within schools). In addition, there has been an emphasis on studying teacher-student relationships at lower grade levels, particularly pre-kindergarten through the early elementary school years. This study used hierarchical linear modeling, which takes into account the nested structure of the

data, to investigate teacher perceptions of student-teacher relationships later in elementary school, using a sample of fifth grade teachers and their students. In addition, this study has included a teacher disposition variable that was not found in the review of current literature.

The Current Study. The research question in this study is: How are student characteristics and teacher characteristics related to teacher ratings of their relationships with students in grade five? At the student level, this study examined links between teacher ratings of the dyadic student-teacher relationship and the variables of student:

- gender
- race
- FARM status
- special education status
- achievement level
- past externalizing behavior
- past internalizing behavior

At the teacher level, this study examined links between teacher ratings of the relationship and the variables of teacher:

- gender
- race
- education level
- years of experience
- self-efficacy

- disposition to positive relationships

Of particular interest in this study, are the ratings that teachers provided of their students from previous years (as a measure of teacher disposition). This study aims to explore the extent of the association between teacher disposition for rating relationships (or prior ratings of relationships) and current ratings of the teacher-student relationship.

Chapter 3: Methods

This study was conducted using data collected as part of a larger study of the effectiveness of Instructional Consultation Teams (IC Teams). The larger effectiveness study investigated the effects of the implementation of IC Teams (Gravois, Rosenfield, & Gickling, 2002; Rosenfield, 1987) on school, teacher, and student outcome variables through the use of a school randomized experimental design. The current study investigates the properties of a subset of items from the Teacher Report on Student Behavior (TRSB), a survey administered as part of the larger effectiveness study, and information from the Teacher Self Report (TSR), a second survey also administered to the participants. This chapter describes characteristics of the participants, the measures and data collection procedures used, and the data analysis methods.

Purpose of the Study

The research question in this study is: How are student characteristics and teacher characteristics related to teacher ratings of their relationship with students in grade five?

At the student level, this study examines how student characteristics (e.g., gender, FARM status) are related to teacher ratings of the dyadic student-teacher relationship. At the teacher level, this study examines how teacher characteristics (e.g., education level, teacher self-efficacy) are related to their perception of relationships with students. This study also explored the extent of the association between teacher disposition for rating relationships (using ratings from prior years) and the current ratings of the teacher-student relationship.

Description of the Data

This study uses data collected during the four years of the larger IC Teams effectiveness study, beginning with the 2005-2006 school year and ending with the 2008-2009 school year. This study is therefore a secondary data analysis. One advantage of the use of this data set is that it includes longitudinal data collected over a time period of four years. In addition, well-documented measures were used to collect data about teachers and their students. Another important feature of this dataset is the relatively large within-class sample sizes. Teachers were asked to provide reports on all students in their classrooms rather than a select few.

A drawback to the use of this dataset is that generalizability is limited as the data were collected from one school district. Taken as a whole, however, the data set does provide the opportunity to examine variables representing multiple levels, or systems, and their links to teacher perceptions of relationships with students. As noted earlier, the theoretical basis for this study includes both ecological systems theory (Bronfenbrenner, 1986), which involves multiple systems influencing child development, and Pianta's (1999) theory of student-teacher relationships that are interactional in nature and influenced by the context of classrooms. The use of multilevel modeling with this data set will allow for the investigation of how characteristics at both the student and teacher level are linked to teacher ratings of the relationship.

Data Collection Procedures. In the larger effectiveness study of IC Teams, teachers from 45 schools in the district completed two surveys, the *Teacher Report on Student Behavior* (TRSB) for each student in their classroom and the *Teacher Self-*

Report Survey (TSRS). All student and teacher data were coded so that individual students and teachers were not identifiable.

The TRSB was distributed via the district intranet. During the 2005-2006 school year, server problems led to increased time required to complete the surveys. Therefore, teachers who were unable to complete the electronic version were given the option to complete a paper version of the TRSB during the first year of implementation. After the first year, intranet administration went more smoothly, and no paper versions were distributed. The TRSB was collected in the late winter of each year of the study. See Table 1 for a summary of TRSB completion data for each year (note: these data describe the larger sample of first through fifth grade students and teachers from which the sample in this study was drawn).

Table 1

TRSB Response Rates for the IES IC Teams Effectiveness Study (Grades 1-5)

Year	<i>N</i>	%
2005-2006 (Year 1)	22, 901	84%
2006-2007 (Year 2)	25,325	96%
2007-2008 (Year 3)	25,642	95%
2008-2009 (Year 4)	24, 882	94%

Note: *N* = number of students for whom surveys were completed; % = teacher response rate.

All the teachers were also asked to complete a Teacher Self-Report Survey (TSRS) in the spring. Teachers received a letter informing them of the upcoming data collection as well as a notepad as an encouragement to take part in the surveys.

Additionally, email reminders were periodically sent to teachers, encouraging them to

complete the surveys. See Table 2 for a summary of TSRS completion data for each year. This study focuses on TSRS data collected from fifth-grade teachers during the 2008-2009 school year. During that year, 85% ($N = 162$) of the fifth-grade teachers completed the TSRS.

Table 2

Teacher Self Report Survey (TSRS) Response Rates

Year	N	%
2005-2006 (Year 1)	1,666	88%
2006-2007 (Year 2)	1,686	84%
2007-2008 (Year 3)	1,756	89%
2008-2009 (Year 4)	1,630	85%

Note: N = number of teachers who completed surveys; % = teacher response rate.

Achievement data were provided by the school district for students during each year of the study. The present study focuses on the Standards of Learning (SOL) achievement data that were collected for those students who were in the fifth grade during the 2008-2009 school year.

Measures

Teacher ratings of students, teacher self-report, and school-provided data were used to examine how student, teacher, and classroom characteristics are related to teacher ratings of the student-teacher relationship. A complete list of student and teacher variables included in this study is presented in Table 3.

Table 3

Variables Used in Analyses

<i>Dependent Variable</i>	Individual relationship ratings from the STRS-8.
<i>Level 1 (Student)</i>	
Student Sex:	Student sex. A dichotomous variable (1 = Male; 0 = Female).
Race:	Student race. A set of dichotomous variables for each race category: (e.g., 1 = Caucasian; 0 = Not Caucasian). Race categories include: African American, Hispanic, Caucasian, or Asian.
FARM:	Dichotomous variable indicating individual student FARM eligibility (1 = Yes; 0 = No).
Achieve:	Student standardized achievement score on the Reading Standards of Learning (SOL) test as measured in the spring of 5 th grade.
Special Ed:	Dichotomous variable indicating individual special education eligibility (1 = Yes; 0 = No).
Prior Ext Behavior:	A dichotomous variable indicating high prior externalizing scores from teachers in 2 nd , 3 rd , and/or 4 th grade (1 = High; 0 = Moderate or Low).
Prior Int Behavior:	A dichotomous variable indicating high prior internalizing scores from teachers in 2 nd , 3 rd , and/or 4 th grade (1 = High; 0 = Moderate or Low).
<i>Level 2 (Teacher/Classroom)</i>	
Sex:	Teacher sex. A dichotomous variable (1 = Male; 0 = Female).
Minority Race:	Teacher minority race. A dichotomous variable (1 = Minority; 0 = Caucasian).
Education Level:	Highest level of education attained by the teacher. A dichotomous variable (1 = Master's degree or more; 0 = Master's not obtained).
Years Experience:	Years of teaching experience. A set of dichotomous variables to

describe level of experience. Groups include: Less than 5 years; 6-20 years; 20 years or more.

Efficacy: Self-efficacy rating completed by teachers.

Prior Relationship/
Disposition: Teacher's average past relationship ratings obtained during prior years (2004-2005, 2006-2007, and/or 2007-2008).

Student-Teacher Relationship Scale. The perceived relationships that fifth-grade teachers have with their students were measured through an 8-item Student-Teacher Relations Scale, (STRS-8). The STRS-8 was part of the 36-item Teacher Report on Student Behavior (TRSB), which was used in the larger effectiveness study. The STRS-8 items ask teachers to reflect on their relationship with each child in their class. Four items, adapted from the short form, assess the dimension of closeness and an additional four items assess the dimension of conflict. Sample items include: *I share a warm, caring relationship with this child* (closeness) and *This child and I always seem to be struggling with each other* (conflict). Appendix A displays the complete set of items. The eight self-report items are rated on 5-point Likert-type scales that are then grouped to form conflict and closeness subscales.

The STRS-8 is based on the short form of Pianta's (2001) Student Teacher Relationship Scale. The short form of the STRS consists of 15 self-report items rated on 5-point Likert-type scales that are then grouped to form conflict and closeness subscales. Like the longer (28-item) version of the STRS, the short form is an assessment of teacher perceptions of the student-teacher relationship with an individual student. The alpha coefficient for the short form of the STRS (composed of the Conflict and Closeness subscales) is .91 (Pianta, 1994). Preliminary analyses were

conducted to provide information about the reliability of the scale for the sample of interest. Reliability estimates, for the current sample, were calculated for the STRS Closeness scale ($\alpha = .88$) and Conflict scale ($\alpha = .87$), indicating relatively high internal consistency.

Preliminary analyses were completed to assess evidence of the structural validity of the STRS-8. Exploratory factor analysis was used to describe the internal structure of the scale. Examination of Eigenvalues and the scree plot indicated that two factors best explained the variance of the STRS-8. The two factors that emerged were: (1) Closeness, which included items such as, “This child values his relationship with me”; and (2) Conflict, which included items such as, “This child is sneaky or manipulative with me.” Additional details about the items and factors can be found in Appendix C.

In this study, the influence of teacher and student characteristics was originally designed to examine each of these subscales. Preliminary analyses indicated that the Conflict scale of the STRS-8 was extremely skewed. The analyses to be used in the study assume normality of the variable distributions. Several transformations were attempted, but the Conflict scale remained highly skewed, and there was no clear point on the scale to divide the ratings into two meaningful categories (e.g., conflictual v. non-conflictual). Most teachers rated their relationship with most students as involving little or no conflict. Therefore, the Conflict scale was not included as a dependent variable in the remaining analyses.

Behavior Ratings. Ratings of externalizing and internalizing behavior were obtained from the TRSB. The externalizing and internalizing behavior scales were

adapted from the *Teacher Observation of Classroom Adaptation - Revised* (TOCA-R; Werthamer-Larsson, Kellam, & Wheeler, 1991). The externalizing behavior scale is comprised of 8 items assessing the degree to which students are able to regulate their behavior, emotions and interactions with other people. Examples of items from this scale include, “Argues or quarrels with others,” and “Breaks rules.” The internalizing behavior scale is comprised of 8 items that measure each student’s anxious, shy, or withdrawal behaviors. Sample items include: “Withdrawn doesn’t get involved with others” and “Is a loner.” A list of all items on the externalizing and internalizing behavior scales can be found in Appendix D. Items for the externalizing and internalizing scales are rated on a four point Likert-type scale (0 = Never/Almost never, 1 = Sometimes, 2 = Often and 3 = Very Often). In this study, average behavior rating scores were computed for each fifth grade student. The average was based on the scores that a student received from their prior teachers in the second, third, and fourth grades on each scale. Using the fifth grade sample, the reliability estimate was calculated for the externalizing behavior scale ($\alpha = .90$) and the internalizing behavior scale ($\alpha = .85$), indicating relatively high internal consistency for each scale.

Teacher Self-Report Survey. Teachers were asked to complete a Teacher Self-Report Survey (TSRS) each year over a four-year period. This survey assessed the following areas: teacher self-efficacy, job satisfaction, school climate, instructional practices, collaboration, and teacher demographics. The TSRS supplies demographic information about the participants who completed the surveys. For the purposes of this study, demographic data from the TSRS were used to control for teacher variables that may influence teacher perceptions of their relations with students: (a) Teacher gender

was used to control for possible variations in perceived student-teacher relationships that may be related to gender; (b) Teacher education level (i.e., less than a master's degree, master's degree or more) and (c) years of experience (using the following categories: 5 years or fewer, 6 – 20 years, or more than 20 years) was used to control for differences in perceptions of student-teacher relationships that could be related to educational and professional background.

The TSRS was also used to obtain teacher self-reported ratings of their ability to successfully achieve classroom and instruction-related goals. These ratings of their ability were used as a measure of teacher self-efficacy. The measure of teacher self-efficacy was comprised of six items adapted from the short-form Efficacy for Instructional Strategies scale (Tschannen-Moran & Hoy, 2001). Items used to assess teacher self-efficacy included: “How well can you implement alternative teaching strategies in your classroom?” and “To what extent can you use a variety of assessment strategies?” A list of all items on the teacher efficacy scale can be found in Appendix E. Teachers were asked to rate each of the efficacy items using a 5-point Likert type scale with the following response options: (1) nothing/not at all; (2) very little; (3) some; (4) quite a bit; and (5) a great deal. Using the larger sample from which the current study was drawn, Koehler (2009) reported the reliability coefficient for the teacher self-efficacy subscale ($\alpha = .85$), indicating relatively high internal consistency.

Achievement. Student standardized achievement scores in reading were used to investigate whether there was a correlation between ratings of student-teacher relations and achievement levels. School archival data were collected over the 4-year

period, and include standardized achievement test scores. *Standards of Learning* (SOL) test scores were collected for third through fifth grade students. The SOL assessments are designed to measure whether students are meeting minimum learning and achievement expectations (SOL Test Administration and Development, 2010). In the current study, student standardized achievement scores (measured in the spring of fifth grade) in reading were used as a student-level variable and averages of these scores were used to obtain classroom mean reading levels. Overall reliability estimates were reported for the spring 2009 administration of the SOL. Cronbach's Alphas for the fifth grade Reading subject test were reported to be .84 for the online administration and .82 for paper administration (Virginia State Department of Education, 2010).

Demographic Data. This study included the teacher demographic variables of race, sex, education level, and years of experience described above, taken from the teacher survey. In addition, this study included student demographic variables of race, sex, special education status, and whether the student participated in the free and reduced meal program. Coded data were provided by the school district. Because the teacher and student race variable included five categories, dichotomous race variables were created. Four dichotomous race variables were created for students (Caucasian, African American, Hispanic, and Asian) to indicate whether the individual belonged to any of the specified groups. Due to relatively small numbers of teachers in the minority race categories (African American, Hispanic, Asian, and American Indian or Native Alaskan), one dichotomous variable was created to indicate whether the teacher identified as having a minority racial background.

Analytic Sample

Participants. The participants in this study are drawn from a group of 5th grade teachers ($N = 190$) and their students from 44 schools in a mid-Atlantic suburban school district. These teachers completed surveys for 3,959 fifth grade students.

Data were collected over a period of four years beginning with the 2005-2006 school year and ending with the 2008-2009 school year. The relationship ratings that these teachers provided for their students in prior years were included as predictors. In addition, data were collected from the students' previous teachers who completed behavior reports during the years prior to when the student entered fifth grade.

The demographics of the students and teachers in the *total survey* group are presented in Table 4, along with the number of missing cases for each variable.

Table 4

Characteristics of Children and Teachers Who Participated in the Survey

	N	%
Children (N = 3959)		
Female	1936	49
Male	1950	49
Sex Missing	73	2
African American	837	21
Asian	303	8
Caucasian	1676	42
Hispanic	891	23
Other Race	14	<1
Race Missing	238	6
FARM Eligible	1257	32
FARM Not-Eligible	2629	66
FARM Missing	73	2

Special Education Identified	419	11
General Education	3467	88
Special Education Status Missing	73	2
Teachers (N = 190)		
Female	141	74
Male	17	9
Sex Missing	32	17
Caucasian	132	70
Minority Race	25	13
Race Missing	33	17
No Master's Degree	72	38
Master's Degree or More	87	46
Education Level Missing	31	16
Less than 5 Years Experience	58	31
6-20 Years Experience	71	37
>20 Years Experience	57	15
Years of Experience Missing	33	17

The teachers selected in this study were limited to those who had at least one year (and up to three years) of prior STRS-8 data available. Students and teachers with any other missing data were excluded from the analyses. After excluding teachers who did not meet minimal requirements, 115 teachers from 41 schools remained. After excluding students with missing data on the variables of interest, 2,070 students remained. The number of teachers from each school with complete data ranged from 1 to 6 teachers. Most schools (N = 31) were represented by two, three, or four teachers. An average of 18 students were rated per teacher (Min = 2; Max = 26; SD = 4.01). Table 5, below, describes the characteristics of the analytic sample selected for use in this study.

Table 5

Characteristics of Children and Teachers in the Analytic Sample

	N	%
Children (N = 2070)		
Female	1022	49
Male	1048	51
African American	462	22
Asian	170	8
Caucasian	973	47
Hispanic	465	23
FARM Eligible	645	31
FARM Not-Eligible	1425	69
Special Education Identified	154	7
General Education	1916	93
Teachers (N = 115)		
Female	102	89
Male	13	11
Caucasian	98	85
Minority Race	17	15
No Master's Degree	52	45
Master's Degree or Higher	63	55
Less than 5 Years Experience	40	35
6 - 20 Years Experience	56	49
>20 Years Experience	19	17

Children in the analytic sample have similar characteristics as children in the full sample. Although the analytic sample has slightly more Caucasian children and fewer special education students, these differences are five percentage points or lower. Larger differences can be observed for teacher characteristics, as the analytic sample has larger percentages of Caucasian teachers with a difference of 15 percentage points.

The analytic sample also has a higher proportion (12 percentage point difference) of teachers with 6 - 20 years of experience as compared to the base sample.

T-tests were used to examine whether the cases in the analytic sample differed from the cases that had been dropped due to missing data. The results of these comparisons for both children and teachers are displayed in Table 6. The children in the analytic sample had a significantly higher proportion of Caucasian students and a significantly lower proportion of special education students, when compared to the missing data group. The analytic sample also had a lower proportion of high prior internalizing behavior students. The two groups did not differ on the remaining student level variables.

Table 6

Means Comparison of Analytic Sample and Dropped Cases

	<u>Mean</u>		<u>t-statistic</u>
	Analytic Sample	Missing Data	
Children			
Sex (1 = Male)	.51	.50	.60
African American	.22	.21	1.27
Asian	.08	.07	1.03
Caucasian	.47	.39	5.23**
Hispanic	.23	.24	-.74
FARM Eligible	.31	.34	-1.70
Special Education Identified	.07	.15	-7.08**
Reading Achievement	.00	-.00	.39
High Prior Externalizing	.13	.14	-.67
High Prior Internalizing	.14	.17	-2.63**
Closeness Score	-.00	.00	-.30

Teachers/Classrooms			
Sex (1 = Male)	.11	.09	.36
Minority Race (1 = Yes)	.15	.19	-.64
Master's Degree (1 = Yes)	.55	.55	.03
5 Years or Less Experience	.35	.43	-.93
6-20 Years Experience	.49	.36	1.47
20+ Years Experience	.17	.21	-.71
High Teacher Efficacy	.45	.70	-3.05**
All Boy Class	.02	.15	-3.58**
High Minority Class	.68	.68	.04
High FARM Class	.30	.42	-1.60
Class Reading	-.04	-.00	-.61
All Special Ed Class	.02	.31	-5.28**
High Prior Externalizing Mean	.04	.11	-1.84
High Prior Internalizing Mean	.02	.14	-2.83**
Closeness 1 Prior Yr Available	.23	.11	2.25*
Closeness 2 Prior Yrs Available	.19	.12	1.35
Closeness 3 Prior Yrs Available	.58	.28	4.34**
Prior Closeness/Disposition	-.04	.12	-.83

Note. *Significant at the .05 level (2-tailed). **Significant at the .01 level (2-tailed).

When compared to the missing data group, the analytic sample had a significantly lower proportion of teachers reporting high teacher efficacy. The teachers in the analytic sample were also more likely than the missing data group to have one or three years of prior closeness data available. The analytic sample had significantly fewer classes with all-male students and with all special education eligible students. The analytic sample had a lower proportion of classes with a high prior internalizing mean when compared to the missing data group. Teachers and classrooms in the two

groups did not differ significantly on the remaining variables. Because the original survey was not based on a random sample, the deviations at the teacher level influence the external validity of the results but not the internal validity.

Data Analysis Methods

Teachers and students are clustered within schools. Therefore Hierarchical Linear Modeling (HLM; Raudenbush & Bryk, 2002) was used to take into account the nested structure of the data. As part of the data analysis, descriptive statistics were computed for all variables of interest, including predictor and outcome variables, to assess the normality of distribution and to suggest necessary transformations. Continuous variables were transformed into z-scores. Several variables had non-normal distributions. For example, the dependent variable of closeness ratings was negatively skewed. A logarithmic transformation was applied to the closeness factors that resulted in an improved distribution for use in the analyses. As previously indicated, the Conflict Scale was extremely skewed and therefore could not be used in the analyses.

Of particular interest in this study was teacher disposition to positive relations with students. This disposition variable was considered to be a trait or characteristic that varied from teacher to teacher. It is believed that some teachers may be more disposed to like most students while others may be more disposed to dislike students and that this disposition may influence teacher ratings. This variable was calculated by averaging the teachers' prior ratings of students across the first three years of data collection and all students they rated. To control for differences in the amount of prior closeness information available, dichotomous variables were created to identify

whether teachers had one, two, or three years of prior closeness data.

Dichotomous, or dummy, variables were also created to handle categorical variables such as race and years of teaching experience. Dichotomous variables were also used for some variables that had non-normal distributions but reasonable indication of whether a data point was relatively high or not on a particular variable (e.g., prior externalizing and prior internalizing behavior ratings). A more detailed summary of the variables used and the decisions made during the preliminary analyses can be found in Appendix F.

After conducting preliminary data analyses, an analysis of the fully unconditional model (i.e., a model that included no predictors) was used to assess whether quality of student-teacher relationship closeness varies between teachers. This model was used to partition total variance in the closeness scores into within- and between-teacher components and estimate the reliability of teachers' ratings of closeness with students ($\hat{\lambda}$). The intraclass correlation (ICC) was then calculated to provide information about the amount of variation that occurs between teachers (i.e., the teacher/classroom level) on the measure of student-teacher relationships.

Within the proposed research question, there were two areas of interest: (1) the influence of student characteristics on relationship ratings and (2) the influence of teacher and classroom characteristics on relationship ratings. Therefore, centering decisions were made by taking these different aspects of the research question into account. Centering decisions were based on recommendations by Enders and Tofighi (2007) and by considering the aims of this particular study.

A simple model including level-1 predictors was created to establish baselines

for the slopes of interest in this study. At the student-level, the gender, high prior externalizing, and high prior internalizing variable slopes were of interest. These slopes were examined to determine whether the relationships between closeness ratings and these predictors varied between teachers. The baselines established within this simpler model allowed for later calculations of variance explained by the slopes in the final level-2 (between) model.

The following equation represents the within-teacher model created for this analysis:

Level One (Individual/Student)

$$Y_{ij} = \beta_{0j} + \beta_{1j}X_{1ij} + \beta_{2j}X_{2ij} + \beta_{3j}X_{3ij} + \beta_{4j}X_{4ij} + \beta_{5j}X_{5ij} + \beta_{6j}X_{6ij} + \beta_{7j}X_{7ij} + \beta_{8j}X_{8ij} + \beta_{9j}X_{9ij} + r_{ij}$$

Where:

Y_{ij} = spring 2009 closeness ratings of student i by teacher j

β_{0j} = intercept, or adjusted classroom mean (adjusted for grand-mean centered variables) for those groups who are coded 0 on the indicator variables (below)

$\beta_{1j}X_{1ij}$ = student sex, group-mean centered (male = 1; female = 0)

$\beta_{2j}X_{2ij}$ = Asian, grand-mean centered (Asian = 1; non-Asian = 0)

$\beta_{3j}X_{3ij}$ = African American, grand-mean centered (African American = 1; non-African American = 0)

$\beta_{4j}X_{4ij}$ = Hispanic, grand-mean centered (Hispanic = 1; non-Hispanic = 0)

$\beta_{5j}X_{5ij}$ = FARM, grand-mean centered (Eligible = 1; Not Eligible = 0)

$\beta_{6j}X_{6ij}$ = special education, grand-mean centered (Identified = 1; Not Identified = 0)

$\beta_{7j}X_{7ij}$ = spring 2009 student reading achievement, grand-mean centered

$\beta_{8j}X_{8ij}$ = prior externalizing behavior, group-mean centered (High = 1;
Moderate or Low = 0)

$\beta_{9j}X_{9ij}$ = prior internalizing behavior, group-mean centered (High = 1;
Moderate or Low = 0)

r_{ij} = error term at the individual level

The within-teacher model was used to explore how student-level variables influenced closeness ratings. At level-1, the score on the STRS Closeness scale in 5th grade was the dependent variable and was a function of individual student characteristics. Predictor variables representing the student characteristics included gender, race, special education status, free and reduced meal status, prior externalizing and internalizing behavior ratings, and standardized achievement score (tested in the spring of 5th grade). A summary of the student-level predictor variables can be found in Table 2. Level-2 remained fully unconditional in the within model (i.e., no teacher or classroom predictors were included). Group-mean centering was used for the predictors with slopes with error terms that were left free (i.e., allowed to vary). The error terms for the gender, high prior externalizing, and high prior internalizing slopes at level-2 were left to vary in order to examine whether aspects of classrooms and teachers influenced how these variables predicted the outcome. The remaining level-1 predictors were centered around the grand mean and the slopes were fixed.

The level-2 (between-teacher) model is represented with the following HLM equations:

Level Two (Teacher/Classroom)

$$\beta_{0j} = \gamma_{00} + \gamma_{01}W_{1j} + \gamma_{02}W_{2j} + \gamma_{03}W_{3j} + \gamma_{04}W_{4j} + \gamma_{05}W_{5j} + \gamma_{06}W_{6j} + \gamma_{07}W_{7j} + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}W_{1j} + \gamma_{12}W_{2j} + \gamma_{13}W_{3j} + \gamma_{14}W_{4j} + \gamma_{15}W_{5j} + u_{1j}$$

$$\beta_{2j} = \gamma_{20}$$

$$\beta_{3j} = \gamma_{30}$$

$$\beta_{4j} = \gamma_{40}$$

$$\beta_{5j} = \gamma_{50}$$

$$\beta_{6j} = \gamma_{60}$$

$$\beta_{7j} = \gamma_{70}$$

$$\beta_{8j} = \gamma_{80} + \gamma_{81}W_{1j} + \gamma_{82}W_{2j} + \gamma_{83}W_{3j} + \gamma_{84}W_{4j} + \gamma_{85}W_{5j} + u_{8j}$$

$$\beta_{9j} = \gamma_{90} + \gamma_{91}W_{1j} + \gamma_{92}W_{9j} + \gamma_{93}W_{3j} + \gamma_{94}W_{4j} + u_{9j}$$

Where:

γ_{00} = the grand mean for the outcome across all classrooms

γ_{01} = the main effect of teacher efficacy

γ_{02} = the main effect of all boys in classrooms

γ_{03} = the main effect of high prior externalizing behavior classroom means

γ_{04} = the main effect of high prior internalizing behavior classroom means

γ_{05} = the main effect of having only one prior year of closeness data available

γ_{06} = the main effect of having only two prior years of closeness data available

γ_{07} = the main effect of teacher disposition (mean STRS ratings)

Level-2 sub-models were created for the following: the intercept, the sex slope, the high prior externalizing slope, and the high prior internalizing slope. For the intercept, β_{0j} :

W_{1j} = whether the teacher reported high self-efficacy (Yes = 1; No = 0)

W_{2j} = whether the class was all boys (Yes = 1; No = 0)

W_{3j} = whether the class had a high prior externalizing behavior mean (Yes = 1; No = 0)

W_{4j} = whether the class had a high prior internalizing behavior mean (Yes = 1; No = 0)

W_{5j} = whether the teacher had only one prior year of closeness data available (Yes = 1; No = 0)

W_{6j} = whether the teacher had only two prior years of closeness data available (Yes = 1; No = 0)

W_{7j} = teacher disposition to positive relations (average past closeness ratings)

u_{0j} = error term

For the sex slope, β_{1j} :

W_{1j} = whether the teacher was of a minority race (Yes = 1; No = 0)

W_{2j} = classroom mean reading achievement

W_{3j} = whether the teacher had only one prior year of closeness data available (Yes = 1; No = 0)

W_{4j} = whether the teacher had only two prior years of closeness data available (Yes = 1; No = 0)

W_{5j} = teacher disposition to positive relations (average past closeness ratings)

u_{1j} = error term

For the high prior externalizing slope, β_{8j} :

W_{1j} = whether the teacher had a master's degree or more (Yes = 1; No = 0)

W_{2j} = classroom mean reading achievement

W_{3j} = whether the teacher had only one prior year of closeness data available
(Yes = 1; No = 0)

W_{4j} = whether the teacher had only two prior years of closeness data available
(Yes = 1; No = 0)

W_{5j} = teacher disposition to positive relations (average past closeness ratings)

u_{8j} = error term

For the high prior internalizing slope, β_{9j} :

W_{1j} = whether the classroom had a high proportion of FARM eligible students
(Yes = 1; No = 0)

W_{2j} = whether the teacher had only one prior year of closeness data available
(Yes = 1; No = 0)

W_{3j} = whether the teacher had only two prior years of closeness data available
(Yes = 1; No = 0)

W_{4j} = teacher disposition to positive relations (average past closeness ratings)

u_{9j} = error term

The level-2 model was created using teacher characteristics as predictor variables. Predictor variables representing teacher characteristics included gender, race, self-efficacy, education level, years of experience, and teacher average ratings on the STRS Closeness Scale. The teacher variables to be included at level-2 are summarized in Table 1. Classroom variables were also included as controls. The classroom variables were aggregates computed from student-level data. More details

about these aggregated variables and the decisions made for their use are presented in Table 5. Grand-mean centering was used for the continuous level-2 variables (i.e., classroom mean reading scores and prior closeness ratings). All other level-2 variables were entered uncentered.

Chapter 4: Results

This study seeks to explore the student and teacher characteristics that are associated with teacher reports of the quality of their relationships with students. This chapter describes the models that were built to glean information about the associations between the predictor variables of interest (i.e., student, teacher and classroom characteristics) and the outcome variable (i.e., closeness ratings). The results of the preliminary data analyses are presented, followed by the results of the HLM analyses. Four primary HLM models were used and are described in detail: (1) the unconditional model to obtain the intraclass correlation and an estimate of the reliability of the dependent variable, (2) a within model with only random effects used to establish baselines for the amount of variance explained, (3) a full within model with random and fixed effects to examine student-level characteristics that are associated with closeness ratings, and lastly (4) the final between-teacher model that incorporates both student (level 1) and teacher/classroom (level 2) variables to gain a better understanding of how classroom context plays a role in closeness ratings.

Bivariate Findings

Correlations among the student level variables and among the teacher level variables were also calculated. Tables 7 and 8 include information about the correlations at each level. At the student level, significant correlations were found between the dependent variable (Closeness score) and student sex, some race designations (African American, Caucasian, and Hispanic), FARM status, Special Education designation, reading scores, high prior externalizing behavior, and high prior internalizing behavior. All of the correlations with the closeness rating were

relatively small with sex having the highest correlation with closeness ($r = -.19$), indicating that being a male student is associated with lower closeness ratings. FARM eligibility demonstrated the highest levels of multicollinearity with the Caucasian race ($r = -.42$), Hispanic race ($r = .42$), and reading achievement ($r = -.26$) variables.

This study was designed to use prior behavior ratings as an indicator of child behavior that was independent of the teacher who provided the closeness rating. Significant negative correlations were found between the dependent variable of Closeness and the ratings of current externalizing behavior ($r = -.13$, $p < .01$) and current internalizing behavior ($r = -.43$, $p < .01$). Bivariate correlations were calculated to examine the strength of the relationship between prior behavior and current behavior. Prior average externalizing behavior scores were positively correlated with current externalizing behavior ($r = .58$, $p < .01$) and prior internalizing behavior scores were positively correlated with current internalizing behavior ($r = .48$, $p < .01$). Current behavior ratings were not used in the multilevel models in an effort to reduce multicollinearity, or intercorrelations among variables.

At the teacher level (level-2), correlations indicated that less experienced teachers reported lower self-efficacy ($r = -.26$). Additionally, more efficacious teachers tended to report closer relationships with their students ($r = .29$). Average closeness ratings were significantly correlated with prior closeness ratings ($r = .83$), providing a strong indication that teachers have predispositions toward rating their relationship with students. The correlation matrix for the level-2 variables is presented in Table 8.

Table 7

Correlations among Student Level Variables

Variable n = 2070	Sex	Asian	Af. Am.	Cauc.	Hispanic	FARM	Sp. Ed.	Reading	Ext.	Int.	Closeness
Sex (Male)	1.00	--	--	--	--	--	--	--	--	--	--
Asian	.00	1.00	--	--	--	--	--	--	--	--	--
African Amer.	-.04	-.16**	1.00	--	--	--	--	--	--	--	--
Caucasian	.00	-.28**	-.51**	1.00	--	--	--	--	--	--	--
Hispanic	.04	-.16**	-.29**	-.51**	1.00	--	--	--	--	--	--
FARM Eligible	.02	-.03	.11**	-.42**	.42**	1.00	--	--	--	--	--
Special Ed.	.14**	-.02	.02	.02	-.03	.00	1.00	--	--	--	--
Reading Scores	-.18**	.07**	-.18**	.22**	-.13**	-.26**	-.23**	1.00	--	--	--
High Prior Ext.	.14**	-.08**	.21**	-.10**	-.04	.10**	.07**	-.18**	1.00	--	--
High Prior Int.	.09**	.03	.02	-.04	.00	.01	.18**	-.18**	.09**	1.00	--
Closeness	-.19**	-.03	-.05*	.11**	-.06**	-.10**	-.05*	.12**	-.04*	-.14**	1.00

Note. * = Correlation is significant at the .05 level (2-tailed). ** = Correlation is significant at the .01 level (2-tailed).

Table 8

Correlations among Teacher Level Variables

Variable n = 115	Sex	Minority	Master's	< 5 Yrs.	6-20 Yrs.	20+ Yrs.	Efficacy	Prior Closeness	Current Closeness
Sex (male)	1.00	--	--	--	--	--	--	--	--
Minority Race	.08	1.00	--	--	--	--	--	--	--
Ed. Level (Master's)	.10	.03	1.00	--	--	--	--	--	--
< 5 Years Exp.	.14	-.05	-.11	1.00	--	--	--	--	--
6-20 Years Exp.	-.07	.04	.08	-.71**	1.00	--	--	--	--
20+ Years Exp.	-.09	.01	.03	-.33**	-.43**	1.00	--	--	--
Efficacy (high)	-.05	-.03	.12	-.26**	.16	.11	1.00	--	--
Prior Closeness/ Teacher Disposition	-.03	.10	-.06	-.00	.05	-.06	.27**	1.00	--
Closeness	-.08	-.03	-.02	-.09	.16	-.09	.29**	.83**	1.00

Note. * = Correlation is significant at the .05 level (2-tailed). ** = Correlation is significant at the .01 level (2-tailed).

Fully Unconditional Model

Analysis of the fully unconditional model was used to calculate the intraclass correlation (ICC) and estimate of reliability for the intercept (average teacher closeness rating, γ_{00}). The ICC provides information about the amount of variation that occurs between teachers on the measure of student-teacher relationships and is the proportion of between-group variance in the outcome variable compared to total variance. In this analysis the between-teacher variance (τ_{00}) was .48 and the within-teacher variance (σ^2) was .54, resulting in an ICC of .47 (between teacher variance/total variance or $.48/.48 + .54$). The ICC of .47 indicated that approximately 47% of the variance in student-teacher closeness ratings occurred between teachers. Results of the fully unconditional model indicated that the reliability of teachers' ratings of closeness with students was .94 ($\hat{\lambda} = .94$).

Within-Teacher Models

Within models using level-1 predictors were created to establish baselines for the slopes of interest in this study and to determine whether relationships between predictors and the outcome variable significantly varied by teacher. For the simple within model, the predictors of gender, high prior externalizing behavior, and high prior internalizing behavior were group-mean centered and the effects were free to vary. This simple within model was used to establish a baseline for the intercept and each slope for later comparison with the results of the final between model (e.g., calculate the variance in slopes explained by the final model). The results of the simple within model are shown in Table 9. The fixed effects results indicate that before taking teacher and classroom characteristics into account, lower closeness

scores are found for male students and students with high prior internalizing behavior. As indicated by the random effects, the relationships between closeness ratings and the variables of student gender, high prior externalizing behavior, and high prior internalizing behavior were found to vary significantly between teachers. Although the reliability estimates for the intercepts and slopes vary substantially, from .95 for the intercept to .20 for the slope for high prior externalizing behavior, the estimates of reliability and variance indicates that there is sufficient data to model variance in the intercept and slopes at level 2. The slopes of these predictors were left free to vary in the subsequent models.

Table 9

Simple Within-Teacher Model to Establish Slope Baselines

<u>Fixed Effects</u>				
Variable	Coefficient	Standard Error	p-value	
Closeness Rating, γ_{00}	-.01	.07	.84	
Student Gender, γ_{10}	-.38	.04	<.00	
High Prior Externalizing, γ_{20}	.08	.06	.14	
High Prior Internalizing, γ_{30}	-.37	.05	<.00	
<u>Random Effects</u>				
Variable	Variance	df	p-value	Reliability
Closeness Rating, u_{0j}	.49	90	<.00	.95
Student Gender, u_{1j}	.11	90	<.00	.47
High Prior Externalizing, u_{2j}	.07	90	<.00	.20
High Prior Internalizing, u_{3j}	.09	90	<.00	.26
Level-1 error, r	.45			

Note. Level 1 variables group-mean centered with random effects.

A full within-teacher model was used to explore how student-level variables influenced closeness ratings. In this within-teacher model, level-2 remained fully unconditional and group-mean centering was used for the slopes with error terms that

were left free (i.e., student gender, high prior externalizing, and high prior internalizing). The remaining level-1 predictors were centered around the grand mean and the slopes were fixed. The results of the fully conditional within model can be seen in Table 10.

Table 10

Final Within-Teacher Model for Closeness Ratings

<u>Fixed Effects</u>				
Variable	Coefficient	Standard Error	p-value	
Closeness Rating, γ_{00}	-.01	.07	.88	
Male, γ_{10}	-.37	.04	<.01	
Asian, γ_{20}	-.22	.07	<.01	
African American, γ_{30}	-.07	.04	.10	
Hispanic, γ_{40}	-.10	.05	.04	
FARM, γ_{50}	-.09	.04	.02	
Special Education, γ_{60}	<.01	.08	.96	
Reading Achievement, γ_{70}	.03	.02	.10	
High Prior Externalizing, γ_{80}	.09	.05	.10	
High Prior Internalizing, γ_{90}	-.35	.06	<.01	
<u>Random Effects</u>				
Variable	Variance	df	p-value	Reliability
Closeness Rating, u_{0j}	.48	90	<.01	.95
Student Gender, u_{1j}	.10	90	<.01	.46
High Prior Externalizing, u_{8j}	.08	90	<.01	.22
High Prior Internalizing, u_{9j}	.09	90	<.01	.28
Level-1 error, r	.44			

Note. Student gender, high prior externalizing, and high prior internalizing group-mean centered with random effects. The remaining level-1 variables were grand-mean centered with fixed effects.

Results of the within-teacher model indicated that, on average, male students received closeness ratings that were .37 of a standard deviation (SD) less than the ratings female students received. On average Asian students received a closeness rating that was .22 of a standard deviation less than ratings received by Caucasian

students. Hispanic students, on average, received a rating that was .10 of a standard deviation less than received by Caucasian students. Those students who qualified for the free and reduced meals program and students with higher prior internalizing scores also scored lower on the closeness measure (.09 SD and .35 SD respectively). Prior externalizing behavior and achievement had positive relationships with closeness, but neither reached the $p < .05$ criterion for statistical significance.

It is possible to obtain a gross estimate of R^2 by determining the amount of variance explained by the within model. R^2 was calculated by taking the difference between the unconditional and within-teacher model variances and dividing by the unconditional model variance (i.e., $.54 - .44 / .54$). Approximately 19% of the within-teacher variance ($R^2 = .19$) in closeness ratings was explained by the final within model.

Between-Teachers Model

Predictor variables representing teacher and classroom characteristics were included at level-2. Teacher variables included their gender, race, self-efficacy ratings, education level, years of experience, and prior closeness ratings. The teacher variables to be included at level-2 are summarized in Table 2, in Chapter 3. Classroom variables were also included as controls. A level-2 variable indicating class mean reading achievement was computed by aggregating the individual student-level scores. Variables were also created to indicate classes composed of all special education students, classes with more than 50% of students eligible for free and reduced meals, and classes with over 40% of students identified as having a minority racial background. While most classrooms had relatively even numbers of male and female

students, assessment of the distribution of this variable indicated that there were some classes with all boy students and all girl students. Therefore, a variable was created to indicate classes composed of all boys and was included in the model as a control. More details about the classroom variables and the decisions made for their use are presented in Appendix F.

Grand-mean centering was used for the continuous level-2 variables (i.e., classroom mean reading scores and prior closeness ratings). All other level-2 variables were entered uncentered. The error terms for the gender, high prior externalizing, and high prior internalizing slopes at level-2 were left to vary in order to examine how teacher and classroom characteristics predicted the effects of these variables in teachers' classrooms. The final between-teacher model was created by leaving only those variables that were significant at the .10 level. Aggregates of the slope variables were retained at the intercept, even if they were not significant, to take into account that the slopes were not grand-mean centered. The set of prior closeness variables (prior closeness average and the indicators for whether one or two years of prior closeness data were available) were also retained, regardless of significance, to control for differences in the amount of information available and to provide more reliable estimates.

The results of the final between-teacher model are displayed in Table 11. Variables included in the within-school model are listed on the far left (starting with γ_{00} and ending with γ_{90}). The variables for the between-classroom models are indented under the corresponding intercept (γ_{00}) and slopes (Student Gender, γ_{10} ; High Prior Externalizing, γ_{80} ; and High Prior Internalizing, γ_{90}). All coefficients represent a

percent of a standard deviation change in the dependent variable for every unit change in the independent variable.

Table 11

Final Between-Teachers Model for Closeness Ratings

<u>Fixed Effects</u>			
Variable	Coefficient	Standard Error	p-value
Closeness Rating, γ_{00}	-.06	.06	.34
High Teacher Efficacy, γ_{01}	.17	.09	.05
All Boy Class, γ_{02}	-.14	.28	.62
High Prior Externalizing Mean, γ_{03}	-.46	.23	.05
High Prior Internalizing Mean, γ_{04}	.34	.11	<.01
Closeness 1 year prior data, γ_{05}	-.02	.09	.83
Closeness 2 years prior data, γ_{06}	-.08	.10	.43
Teacher Prior Closeness Ratings, γ_{07}	.55	.04	<.01
Male, γ_{10}	-.41	.06	<.01
Minority Teacher, γ_{11}	.28	.13	.04
Mean Reading Achievement, γ_{12}	.22	.11	.06
Closeness 1 year prior data, γ_{13}	.12	.10	.22
Closeness 2 years prior data, γ_{14}	-.19	.12	.11
Teacher Prior Closeness Ratings, γ_{15}	.04	.04	.27
Asian, γ_{20}	-.21	.06	<.01
African American, γ_{30}	-.06	.04	.12
Hispanic, γ_{40}	-.09	.05	.05
FARM, γ_{50}	-.08	.04	.03
Special Education, γ_{60}	<.00	.08	.98
Reading Achievement, γ_{70}	.03	.02	.07
High Prior Externalizing, γ_{80}	.26	.10	<.01
Masters Degree or higher, γ_{81}	-.25	.11	.02
Mean Reading Achievement, γ_{82}	-.32	.15	.04
Closeness 1 year prior data, γ_{83}	-.24	.11	.04
Closeness 2 years prior data, γ_{84}	.15	.12	.22
Teacher Prior Closeness Ratings, γ_{85}	-.08	.05	.13
High Prior Internalizing, γ_{90}	-.29	.08	<.01
High FARM, γ_{91}	.25	.09	<.01
Closeness 1 year prior data, γ_{92}	-.45	.12	<.01
Closeness 2 years prior data, γ_{93}	-.18	.14	.22
Teacher Prior Closeness Ratings, γ_{94}	-.06	.04	.15

<u>Random Effects</u>				
Variable	Variance	df	p-value	Reliability
Closeness Rating, u_{0j}	.14	83	<.01	.85
Student Gender, u_{1j}	.09	85	<.01	.44
High Prior Externalizing, u_{8j}	.05	85	<.01	.17
High Prior Internalizing, u_{9j}	.05	86	.01	.17
Level-1 error, r	.44			

Note. At Level-1 student gender, high prior externalizing, and high prior internalizing were group-mean centered with random effects. The remaining level-1 variables were grand-mean centered with fixed effects. At Level-2, mean achievement and prior closeness were grand-mean centered and the remaining predictors were uncentered.

The major findings that were significant for the intercept model include the relationship between closeness ratings and the variables of teacher efficacy, average prior externalizing behavior, average prior internalizing behavior, and average teacher disposition for rating students. Teachers who reported higher levels of teacher efficacy, on average, felt closer to students, with closeness ratings that were .17 of a standard deviation (SD) higher. Teachers reported less closeness to their students when the class mean score for prior externalizing was higher (.46 SD). Teachers reported increased closeness to students when the class had higher prior internalizing scores (.34 SD). Teachers who were disposed to rating relationships as being more close in the past were more likely to rate their current relationships more positively as well (.55 SD).

Significant results were also found with regard to the analysis of the gender, prior externalizing, and prior internalizing slopes. While male students generally received lower closeness scores (.41 SD), differences in ratings for male and female students were less noticeable in classes with a teacher who identified as a minority race (African American, Hispanic, or American Indian/Alaskan Native; .28 SD). In

classrooms with a minority teacher, the difference is $-.13$ SD whereas in classrooms with a Caucasian teacher, the difference is $-.41$ SD, nearly half of a standard deviation.

While students who exhibited high prior levels of externalizing behavior generally received higher closeness scores ($.26$ SD), these differences in ratings for high externalizing students were diminished in classes with teachers who had at least a master's degree ($.25$ SD) and in classes with higher average levels of reading achievement ($.32$ SD). In classrooms with a teacher who had obtained a master's degree, the difference is $.01$ SD whereas in classrooms with non-master's degreed teachers the difference is $.26$, or approximately one-quarter of a standard deviation. Average reading achievement had the most dramatic effect on the relationship between closeness ratings and high prior externalizing behavior. In a high reading classroom ($+1$ SD), the difference is $-.06$ SD whereas in a low reading classroom (-1 SD), the difference is $.58$ SD, more than half of a standard deviation. Differences in ratings for high externalizing students were also less noticeable in classrooms with teachers who had only one year of prior closeness data available ($.24$ SD), indicating that closeness ratings were found to vary somewhat based on the amount of data available for each teacher.

While students who exhibited high prior levels of internalizing behavior generally received lower closeness scores ($.29$ SD), differences in ratings of high internalizing students, were diminished in classes with higher proportions ($> 50\%$) of FARM-eligible students ($.25$ SD). In a high FARM classroom, the difference is reduced to $-.04$ SD, less than one-twentieth of a standard deviation. On the other hand, differences in ratings for high internalizing students were even more noticeable in

classes with teachers who only had one year of prior closeness data available (.47 SD). For these classes, the difference is -.74 SD, or three-quarters of a standard deviation lower than classrooms whose teachers had all three years of prior closeness data reported.

To obtain a gross estimate of fit and to determine the amount of variance explained by the models, calculations of R^2 were used. The final within-teacher model was used as a baseline to determine the amount of variance explained by the final between-teacher model. R^2 was calculated by taking the difference between the within-teacher and between-teacher model variances and dividing by the within-teacher model variance. Seventy-one percent of the between-teacher variance ($R^2 = .71$) in the intercept (average closeness ratings) was explained by the final between-teacher model. The model explained 10% ($R^2 = .10$) of the variance in the gender slope, 30% ($R^2 = .30$) of the variance in the externalizing slope, and 47% ($R^2 = .47$) of the variance in the internalizing slope.

Summary of Results

In summary, the results of this analysis provided information about the associations between predictor variables and teacher reports of closeness in relationships with students. Bivariate correlations were used to examine the strengths of relationships between variables. The strongest correlation was found between teacher prior closeness and current closeness ratings ($r = .83$), indicating that teachers have a strong predisposition toward rating their relationship with students similarly from year to year. Multilevel analyses were conducted to further examine differences in closeness ratings while taking the nested structure of the data into account. It was

determined that approximately 47% of the variance in student-teacher closeness ratings occurred between teachers with the remaining 53% occurring between students in the same teacher's classroom. A within-teacher model was used to explore how student-level variables influenced closeness ratings before taking classroom and teacher characteristics into account. Significant results from the within-model included:

- Significantly lower closeness ratings for males (.37 SD), Asians (.22 SD), Hispanics (.10 SD), FARM eligible students (.09 SD), and students with higher prior internalizing scores (.35 SD), though these relationships change somewhat in the final between-teacher model.
- The relationship between closeness ratings and student gender were found to vary significantly between teachers.
- The relationships between closeness ratings and both high prior externalizing behavior and high prior internalizing behavior were found to vary significantly between teachers.

Relationships between the variables of primary interest (i.e., closeness ratings, student gender, prior externalizing behavior, and prior internalizing behavior) were further explored in the final between-teacher model while controlling for selected student-level and teacher-level predictors (i.e., student race, FARM eligibility, special education eligibility, reading achievement, teacher education level, teacher race, teacher self-efficacy, and prior closeness ratings). Several significant findings emerged from the final between-teacher model, including the following:

- Higher levels of teacher efficacy were associated with increased reports of close relationships with students (.17 SD).
- Classes with higher averages of prior externalizing behavior tended to have decreased reports of student-teacher closeness (.46 SD).
- Classes with higher averages of prior internalizing behavior tended to have increased reports of student-teacher closeness (.34 SD).
- Teacher disposition for rating closeness, as measured by their past ratings of relationships with prior students, was a significant positive predictor of how their current relationships were rated (.55 SD).
- Male students generally received lower closeness scores (.41 SD), but differences in ratings for male and female students were less noticeable in classes headed by a minority teacher (.28 SD).
- High prior externalizing students received higher closeness scores (.26 SD) when teachers did not have a master's degree and in classes with average reading achievement. These rating differences were diminished in classes with teachers who had at least a master's degree (difference reduced to .01 SD) and in high reading classes (difference reduced to -.06 SD).
- High prior internalizing students generally received lower closeness scores (.29 SD) in classes with lower proportions of FARM-eligible students. These differences in ratings were not found in high FARM classes (difference reduced to -.04 SD).

Chapter 5: Discussion

The purpose of this study was to examine how student and teacher characteristics related to teacher ratings of their relationships with students in grade five. To account for the nested nature of the data (students within classrooms), hierarchical linear modeling was used to glean information about the roles of student level and teacher/classroom level variables. This chapter will begin with a summary and discussion of the major findings from the results of this study. Implications for practice, limitations of the study, and suggestions for future research will also be discussed.

Student-Teacher Relationship Ratings

This study posed the research question: How are student characteristics and teacher characteristics related to teacher ratings of their relationships with students in grade five? The findings of this study provided information about student and classroom level characteristics and their association with teacher ratings of closeness in their relationships with students. Some of the findings from this study were consistent with prior research that had been conducted with different samples and grade level, as will be discussed later in this chapter.

Other findings, however, were somewhat unexpected based on the current literature. For instance, during preliminary analyses, little variation was found in the Conflict scale scores. It may be that differences in the specific population under study were not differentiated well with the scale. It is also possible that there might be a more fundamental underlying problem with regards to sensitivity of the scale to make fine distinctions between levels of conflict.

The findings from the multilevel analysis are expanded upon in the following text, beginning with a discussion of the results from the within-teacher model. Next, the findings from the between-teacher model are discussed in the context of the current literature base.

Bivariate Findings. Bivariate correlations were used to examine the strengths of relationships between variables. At the student level, relatively small correlations were found between the dependent variable (Closeness score) and student sex, some race designations (African American, Caucasian, and Hispanic), FARM status, Special Education designation, reading scores, high prior externalizing behavior, and high prior internalizing behavior. At the teacher level, correlations indicated that less experienced teachers reported lower self-efficacy ($r = -.26$) and that more efficacious teachers reported more closeness ($r = .29$). The strongest correlation was found between teacher prior closeness and current closeness ratings ($r = .83$), indicating that teachers have a strong predisposition toward rating their relationship with students similarly from year to year. The strength of this finding is particularly striking considering that the teachers were rating different students each year.

Within-Teacher Findings. An investigation of within-teacher variation indicated that males, Asian students, Hispanic students, FARM eligible students, and students with high prior internalizing scores all tended to receive lower closeness scores, as rated by their teachers. Coefficients ranged in magnitude from a high of $-.37$ SD (Male) to a low of $-.09$ SD (FARM). The relationship between closeness ratings and student gender was generally consistent with previous findings (Murray & Zvoch, 2011; Rudasill et al., 2010). The links between closeness ratings and the student race

variables were also generally consistent, as prior research has found that European-American students tend to receive higher ratings of relationship quality (O'Connor, 2010). The finding that Asian students received significantly lower closeness ratings, however, was unexpected. Possible reasons for this finding may be speculated, such as influences of incongruent student and teacher racial backgrounds or characteristics specific to the sample used in this study. Differences in communication or priorities found between Asian and Western European cultures could also play a role and the cultural loading of the items used to measure closeness should be considered (Yiu, 2011). This finding provides a reminder to consider the implications of minority race even when the group is not considered to be historically disadvantaged. The finding of less close relationships with FARM students was also consistent with prior research (Rudasill et al., 2010).

While analysis of the within-teacher model provided information about differences in closeness ratings at the individual/student level, there were also indications that differences in ratings for some sub-populations existed between teachers at the teacher/classroom level as well. For instance, the relationship between closeness ratings and student gender was found to vary significantly between teachers. In other words, in some classrooms male students might receive more discrepant ratings compared to their female peers, whereas in another classroom with a different teacher, rating discrepancies based on gender may not exist. Likewise, the relationships between closeness ratings and both high prior internalizing behavior and high prior externalizing behavior were found to vary significantly between teachers. Specifically, students who had exhibited problem behaviors in the past may receive

closeness ratings more or less like their classmates, dependent upon the classroom they are in and which teacher is providing the rating. In order to further examine these between-teacher differences in ratings, level-2 models were developed for analysis and are discussed in the following section.

Between-Teacher Findings. Further analyses were conducted to investigate the variance between teachers (i.e., at the classroom level), while controlling for student-level and teacher-level predictors. The between-teacher (level-2) model was created to gain a better understanding of the influence of classroom context on teacher reports of closeness with their students. Classroom context was found to play a significant role in relationship ratings for students in general and also for certain subpopulations of students (i.e., male, high prior externalizing, or high prior internalizing).

Consistent with prior research (O'Connor, 2010), teachers who reported higher self efficacy, on average, felt closer to their students (.17 SD). Higher average levels of prior externalizing behavior were associated with less closeness in relationships (.46 SD), a finding that was also in line with prior research (Murray & Zvoch, 2011). In contrast, classes with higher average levels of prior internalizing behavior were associated with increased reports of closeness (.34). This finding is somewhat inconsistent with prior research findings, where higher average levels of internalizing behavior in kindergarten students predicted poorer quality relationships (e.g., Buyse et al., 2008). Some differences in findings, however, may be due to the type of data used. The studies in the existing literature tend to use current behavior ratings whereas the present study used prior behavior ratings from previous years.

Although the meaning of the current finding that classes with higher averages of internalizing behavior have more positive relationships is uncertain, one speculation is that grade level or student age may play a role in moderating the relationship between levels of internalizing behavior and relationship quality. One consideration that may warrant further investigation is whether internalizing behaviors become more prevalent as children get older. Differences over time have been found with regard to relationship quality. O'Connor (2010), for example, found that student-teacher relationship quality generally declined over the elementary years (from kindergarten to grade 5), but the speed of this decline varied depending on student characteristics. The current findings, along with previous research, highlight a need for continued investigations using longitudinal data across grade levels to better understand how relationship quality and the factors that influence it change over time.

For both the externalizing and internalizing measures, seemingly inconsistent results emerged when comparing closeness rating differences at the individual level to differences at the classroom level. For example, at level 1, individuals with high prior internalizing behavior received significantly lower closeness ratings ($SD = .29$). On the other hand, at level 2, it was found that in classrooms with higher levels of prior internalizing behavior, students generally received higher closeness scores ($SD = .34$). On the surface, these findings may seem contradictory, but there may be two different phenomena at work. One phenomenon at play is that an individual may be rated as high internalizing by prior teachers. The other phenomenon is that some classes have higher proportions of students who have exhibited relatively higher levels of internalizing behavior in the past. While more study is needed, one speculation is that

there could be some degree of sorting of students into particular classes (e.g., being assigned a particular teacher) because of behavioral characteristics. In addition, it should be kept in mind that in the current study, the high prior externalizing and internalizing behavior variables were created to capture information about which students scored relatively high on those measures (i.e., one standard deviation or more above the mean). While these students were found to score relatively high compared to the rest of the sample, their scores may not have been that elevated in a clinical sense.

Prior researchers (Howes, Phillipsen, & Peisner-Feinberg, 2000) have found some evidence for year-to-year (i.e., teacher to teacher) consistency of closeness scores received by early elementary students, though these correlations were in the small to moderate range. In the current study, longitudinal data were used to explore the association between the ratings that teachers had provided during previous years (with prior students) and ratings of closeness with their current students. Results indicated that teacher ratings of their previous students during prior years were a significant positive predictor of how their current relationships were rated. A significant portion of the closeness rating score (.55 SD) that a student receives can be explained by the teacher's past ratings of other students. In other words, the relationship rating between the teacher and his or her current students is influenced at least partially by the teacher's disposition for rating above and beyond characteristics of the children being rated.

Classroom context was found to play a role by either intensifying or diminishing closeness rating differences within the following subpopulations: (1) male

students, (2) students who had high prior rates of externalizing behavior, and (3) students who had high prior rates of internalizing behavior. For example, differences in ratings for male and female students became less noticeable in classes headed by minority race teachers.

When the subpopulations of high prior externalizing and high prior internalizing students were examined more closely, classroom context was found to be associated with the closeness ratings they received. Relationships with high externalizing students were rated more positively in classrooms with average reading achievement and when the teacher did not have a master's degree (.26 SD). The differences in ratings for these externalizing students, however, were diminished when the classroom teacher had a master's degree and as class levels of reading achievement increased.

Ratings of internalizing students were found to be associated with the proportion of students in the class who were FARM eligible. High internalizing students received lower closeness ratings in classes with smaller proportions of FARM-eligible students (.29 SD). This variability in rating internalizing students disappears, however, in classes when more than 50% of students are FARM-eligible. While the meaning of this finding is uncertain, one possible explanation is that students in the high FARM classes are more similar to each other in terms of behavior. In other words, in low FARM classes there might be greater variability between students (e.g., greater variation in socioeconomic, racial, or academic backgrounds), which could result in more variability in closeness scores.

Taken as a whole, the results of this study not only provide supporting evidence for past findings, but also expand on our understanding of factors that influence student-teacher relationship quality. In general, the individual level (level-1) findings were consistent with the current research base. Through the use of teacher level (level-2) analyses, this study also builds upon the existing literature by providing information about variations in closeness ratings for specific subpopulations of students. Additionally, this study adds new information about the influences of classroom context on teacher ratings of closeness with their students. Lastly, this study found a significant relationship between teacher ratings of closeness with their prior students and with their current students. This does appear to reflect a characteristic or disposition of teachers that warrants further consideration in future research.

Implications

Many studies have investigated student-teacher relationships, including the factors that influence relationship quality (e.g., Hamre et al., 2008) and the outcomes related to relationship quality (Baker, 2006; Decker, Donna, & Christenson, 2007). Research in this area generally supports the theory that these dyadic relationships are complex and comprised of interactions between individuals who exist in a system with a number of layers (e.g., home, classroom, school). While there is a common view that strong relationships with adults are important for student outcomes, continued research in this area is necessary to provide accurate information that can then be linked to practice to improve educational outcomes.

Implications for Practice. The present findings confirm that it is important to look not only at individual characteristics of the student, but to consider teacher and

classroom characteristics as well. That classroom context has significant links to ratings of students is consistent with systems theory (Bronfenbrenner, 1986; Christenson & Anderson, 2002), a major component of the conceptual framework used for this study. Awareness of the factors that are related to closeness in the student-teacher relationship can provide guidance for improving and strengthening the bonds between students and teachers. School psychologists could apply past and current findings to consultative work with teachers who refer children for academic or behavior difficulties. The influence of cultural issues on the practice of consultation in schools has been documented and it is important to consider this aspect when planning delivery of such services (Ingraham, 2000). Encouraging teachers to examine their relationships in a broader context (including their own feelings and beliefs as well as characteristics of the classroom) may help teachers see problems from a different perspective. Additionally, building upon the existing teacher-student relationship can provide a base that teachers can then use to initiate interventions or instructional changes designed to help a particular child.

Prior research has found that classrooms with more emotional supports (e.g., positive classroom climate, warm and supportive relationships, teacher response to individual child needs) are associated with lower levels of conflict (Hamre et al., 2008). The results of this study extend the current research base and indicate that classroom context is also associated with closeness ratings, particularly for specific subpopulations of students. These prior and current findings underscore the importance of continuing to include and control for various contextual factors when studying student outcomes. While more research is needed to fully understand the

complexities of the relationships between variables, educators can still glean valuable insight from the existing research. Working to build positive learning climates and educating teachers about the relationships between classroom context and student outcome measures are both ways in which research findings can be applied to practice.

In addition, teacher predisposition was found to be significantly associated with closeness ratings. Combined with the existing literature that highlights the importance of high quality relationships, these findings can inform training and professional development programs. For example, educators could benefit from workshops that encourage them to examine their own predispositions and to think about how they might influence relationships that they build with their students. Furthermore, professional development could be designed to help teachers move away from a one-size-fits-all approach and encourage them to relate to students in their classrooms on a more individualized basis.

Teacher sense of self-efficacy was found to be positively related to closeness ratings. Teachers who were more confident in their abilities to tailor instruction and assessment within their classrooms tended to rate relationships with students more positively. This finding has implications for teacher training as well as for examining the culture of schools. For instance, school leaders can work to implement programs that provide support to teachers, offer skills training to build teacher confidence, and foster a culture in which teachers feel empowered to make instructional choices tailored to their students.

Implications for Future Research. Future research in the area of student-teacher relationships should investigate whether interventions effectively influence

relationship quality. For instance, future studies could evaluate effectiveness of trainings that aim to increase teacher awareness of factors that influence relationship perceptions or interventions that strive to foster more closeness between teachers and their students. To make causal inferences between variables and outcomes of interest, future research should be conducted that employs randomized experimental design.

The nested structure of educational data (at student, teacher/classroom, and school levels) should continue to be taken into account when studying student-teacher relationships. Analyzing data at the individual level provides information about students on average, but does not take into account other important classroom factors. As evidenced by the findings of this study, more detailed information can be gleaned about specific subpopulations and the influences of classroom context when multiple levels are considered. Future research should consider not only the individual and classroom level, but incorporate the school as a third level in the analysis. Schools differ in many ways that could play a role in facilitating or preventing the development of quality student-teacher bonds. School characteristics such as culture, financial resources, training and support provided to teachers, and implementation of school-wide interventions are just a few examples of school-level characteristics that seem worthy of further study to examine their links to relationship quality between teachers and students.

Additionally, there is a need for continued research using alternative methods of measuring the relationship. The current base relies heavily on the STRS and teacher reports as the primary source of information about the student relationship. Studies using large samples and multiple methods from more than one source (e.g., students,

peers, observers) could provide more objective information about the quality of the relationship. Research utilizing ratings at different levels (i.e., at the individual/student level and the teacher level) would provide important information about how ratings differ based on who is completing the ratings. Further research would be helpful in determining whether similar differences are found when the ratings are provided from the student's perspective (level 1) rather than the teacher's perspective (level 2).

Lastly, more research on the scales used to assess student-teacher relationships is needed. This research could lead to the design of scales that are more sensitive to distinguish finer degrees of differences in relationships. While teacher ratings of relationships are generally positive, further research providing more in depth examination of subgroups of those students who receive poor relationship ratings seems warranted. It is also important to consider the construct validity of the scales in use today to ensure that relationship quality is measured as a unique variable rather than another indicator of child behavior. Continued research is necessary to determine the unique contribution of the student-teacher relationship while controlling for associated student, teacher, and classroom level variables.

Limitations

The concept of *relationship* in this study was based on theories (Bowlby, 1982; Bronfenbrenner, 1986; and Pianta, 1999) that underscore the complex, interactional nature of dyadic relationships and highlight links between interpersonal bonds and development. In a broad sense, relationships were conceptualized as being composed of individuals (and their characteristics), interactions between those individuals, and the context in which the dyadic relationship exists. A relationship between two people

can be perceived differently by each participant and again differently by an outside observer. The multifaceted nature of relationships makes it difficult to examine all aspects in a single study. In this particular study, the dependent variable was teacher perceptions of closeness in their relationships with students and therefore examined only a small component of what makes up a relationship. While the current study did allow for the investigation of the role that context plays in ratings of closeness in the relationship, the data did not investigate differences in ratings from a student or peer perspective. Therefore, the results of this study captured only a small portion of the broad construct of relationships.

As just mentioned, a considerable limitation of this study was that data about teacher-student relationships were only provided by teacher-report. This reliance on a single source of data is a threat to the construct validity of the dependent variable. Measures of the relationship quality completed by students would have provided a more complete picture of the interpersonal nature of relationship quality. With the inclusion of student ratings, it is possible that additional associations between variables could be found. For example, it is possible that collecting information about the relationship from the individual or student perspective may have resulted in greater variation in ratings at level 1 (within-class variation). Rating scales completed by observers outside of the teacher-student dyad would have also added a unique dimension to the description of the quality of the relationship. Due to the constraints of the collected data, however, multiple ratings of relationship quality were not available.

This study was also limited by the brief nature of the scale used to measure student-teacher relationships. The STRS-8 used in the current study was adapted from

the short form of the STRS. Furthermore, the Closeness scale of the STRS-8 was comprised of only four items. While the wording of these four items aims to capture the degree of closeness and warmth in the relationship shared between student and teacher, consideration of how well the measure actually does so is warranted. It is possible that these ratings may be, at least in part, a measure of student behavior or student competence. Care was taken, however, to control for a variety of student characteristics in this study and prior research with the Closeness scale of the STRS has provided evidence of discriminant validity (Birch & Ladd, 1997; Pianta & Hamre, 2001).

This study used prior ratings of behavior to describe individual and class levels of behavior. This was done in an effort to provide a greater range of information from multiple raters. Bivariate findings indicated that prior externalizing and prior internalizing behavior scores were significantly and positively correlated with current ratings of behavior, but only the prior behavior variables were included in the multilevel analyses. Results of the multilevel analysis may have differed somewhat had current levels of behavior also been included.

Restriction of range may have been a threat to statistical conclusion validity in this study due to floor and ceiling effects found in the ratings of student-teacher relationships. It is possible that teachers could tend to consistently rate relationships with students highly, particularly if they feel that it would be socially desirable to do so. As mentioned above, in the literature review, teachers in the normative sample used by Pianta (2001) tended to view relations with their students positively. This resulted in score distributions that were mildly skewed in favor of positive ratings for

both boys and girls. This could also reflect that teachers, in general, do tend to have positive relationships with their students. In this study, the relationship data were skewed, with teachers reporting generally high levels of closeness and generally low levels of conflict. In fact, the Conflict scale results in this study were so extremely skewed that the data were unable to be analyzed as planned. In addition, data transformations were required to normalize the distribution of the Closeness scale results prior to analysis.

Within this study, there are also limitations with regard to external validity. The suburban school district that volunteered to take part in this study is likely to be different from many school districts in the United States. The district was willing to expend considerable effort and resources (e.g., time, money) to collaborate on the effectiveness study that overarched the current study. This willingness to implement a school-wide intervention in multiple schools may reflect a number of possible setting characteristics (such as district resources) and the sample may not be representative of the majority of schools in the United States.

Conclusion

This study resulted in statistically significant findings that contribute to the literature in the area of student-teacher relationships. The use of hierarchical linear modeling was an important method choice that considered the nested nature of the data, a characteristic that had not been accounted for in much of the previous research. The results of this study also expand on the current literature, by providing information about the influence of student and teacher/classroom characteristics with a diverse sample of fifth grade students and their teachers.

In sum, this study provides confirmatory as well as new information about closeness in the student-teacher relationship for upper-elementary-aged students and their teachers. This study is unique in that a diverse sample of fifth grade students and their teachers were included in the analyses. Additionally, it is the first study known to examine teacher disposition for rating prior students and the influence this disposition has on their ratings of current students. Although continued research is needed to further our knowledge about student-teacher relationships and the systems that influence them, the present findings highlight the need to consider student, teacher, and classroom characteristics on closeness ratings.

Author Note

Sara Buhl, Counseling and Personnel Services, University of Maryland.

This research is supported in part by grant number R305F050051 from the Institute of Education Sciences, U.S. Department of Education. Opinions expressed do not necessarily reflect the opinions or policies of the U.S. Department of Education. The development of the data used in this research would not have been possible without the members of the Instructional Consultation Teams research group at the University of Maryland (Sylvia Rosenfield, Todd Gravois, Gary Gottfredson, Deborah Nelson, Lauren Kaiser, Denise Stringer, Amy Silverman, Jessica Koehler, Samantha Sedlik, Michael Rocque, Kate Bruckman, and Phuong Vu) or the Prince William County School System Administration.

Correspondence concerning this manuscript should be addressed to Sara Buhl, Counseling and Personnel Services, University of Maryland – College Park, College Park, MD 20742. Email: signor@umd.edu

Appendix

Appendix A. Student-Teacher Relationship Items from the Teacher Report on Student Behavior (TRSB)

Next, we are interested in learning about your relationship with this student. Please reflect on the degree to which each of the following statements currently applies to your relationship with this child.

	Definitely does not apply	Not really	Neutral, not sure	Applies somewhat	Definitely applies
1. I share a caring, warm relationship with this child.	0	1	2	3	4
2. This child and I always seem to be struggling with each other.	0	1	2	3	4
3. If upset, this child will seek me out for support.	0	1	2	3	4
4. This child values his/her relationship with me.	0	1	2	3	4
5. This child's feelings toward me can be unpredictable or change suddenly.	0	1	2	3	4
6. This child is sneaky or manipulative with me.	0	1	2	3	4
7. Dealing with this child drains my energy.	0	1	2	3	4
8. This child spontaneously shares his/her feelings and experiences with me.	0	1	2	3	4

Note. The Closeness subscale consists of items 1, 3, 4, and 8. The Conflict subscale consists of items 2, 5, 6, and 7.

Appendix B. Summary of Major Studies Reviewed

Author (Date)	Focus/Variables of Interest	Participants	Primary Method	Results
<i>Student Characteristics as Primary Predictor and/or Outcome Variables</i>				
Baker (2006)	Contribution of teacher-child relationships to school adjustment; degree to which child characteristics moderate the relationship <i>Student variables:</i> Gender; at-risk status (due to learning or behavior problems); school adjustment	1,310 children (K-5) 68 teachers	Rating scales GLM regression	Close ST relationships provided a protective effect for at-risk students, but the benefit was less than for students who were not at-risk; Positive ST relationships related to better outcomes for girls
Birch & Ladd (1997)	Features of ST relationship and relation to school adjustment <i>Student variables:</i> Academic performance, school liking	206 children (K) 16 teachers	STRS; school adjustment outcome measure	Closeness positively associated with academic performance & school liking
Decker, Donna, & Christenson (2007)	ST relationship & outcomes for behaviorally at-risk (for referral to Sp. Ed.) African American students <i>Student Variables:</i> Feelings about the ST relationship; social outcomes; behavioral outcomes; student engagement	44 students (K-6) 25 teachers	Rating scales (teacher & student); Hierarchical multiple regression analyses	Increases in STRQ occurred with increases in positive outcomes (social, behavioral, and engagement) for at-risk students
Howes, Phillipsen, & Peisner-Feinberg	Consistency of teacher perceptions of STRQ <i>Student Variables:</i> Gender	793 children (PreK – K)	STRS; classroom behavior	STRS scores from Year 1 correlated with those from Year 2 and Year 3, and scores from Year 2 were

(2000)				correlated with those from Year 3. No significant gender differences found.
Hughes, Cavell, & Wilson (2001)	Relationships between peer perceptions of STRQ and children's attributes <i>Student Variables:</i> Peer perceptions of teacher conflict and support, peer ratings of child's social competency and likeability, gender	993 children (grades 3-4)	Sociometric nominations & ratings; Aggression Scale	Peer perceptions of Teacher Conflict and Teacher Support contributed to peer ratings of children's competency and acceptance. Peers perceived girls as having more supportive, less conflictual relationships with teachers.
Murray & Greenberg (2000)	Aspects of children's social & contextual experience in school <i>Student Variables:</i> Gender; ethnicity; special education status; relationship with parents, peers, and teachers; social competence; depression; delinquency; conduct problems; anxiety	289 children (elementary)	Student completed measure of relationship quality & perception of school environment	Poor relationships and bonds associated with poorer social & emotional adjustment
Murray and Zvoch (2011)	ST relationships of low-income, African American students and those with high externalizing behaviors. <i>Student Variables:</i> Gender, disability status, externalizing behavior, adjustment	193 African American students from high-poverty urban schools (grades 5-8); Also examined subsample of those with externalizing	Student and teacher ratings; MANOVA; multiple regression analyses.	Teachers reported more closeness with female students, more conflict with males. High levels of externalizing behavior linked to poorer STRQ (less closeness and more conflict). Teacher perceptions of closeness were related to teacher ratings of school

		behavior scores above the clinical range.		competence, academic competence, and school engagement.
Pianta & Stuhlman (2004)	ST relationships and social & academic skills <i>Student Variables:</i> STRQ; academic skills; cognitive development; social competence, gender, SES	490 Children (Pre-K - grade 1)	Parent & teacher report; CBCL; Social Competence; STRS	Teachers' ratings of conflict moderately correlated across years; slightly lower correlations among teachers' ratings of closeness across years. Children's skills in 1 st grade predicted from STRQ.
Rudasill et al. (2010)	ST relationship quality as a mediator of the association between background characteristics of the child, difficult temperament, and risky behavior <i>Student Variables:</i> Gender, special education status, SES, difficult temperament (Pre-K), risky behavior	1,156 children (grades 4-6)	Mother and Teacher reports; Structural Equation Modeling	More conflict in STRQ found for boys, children from lower income families, those with more difficult temperament. More conflict linked to more risky behaviors. More closeness in relationships found for girls and children from higher income families. More closeness linked to less risky behaviors. Conflict mediated relationships between gender, family income and risky behavior, and between difficult temperament and risky behavior. ST closeness mediated the relationships between family income and risky behavior.

<i>Teacher/Classroom Characteristics as Primary Predictor and/or Outcome Variables</i>				
Thijs, Koomen, and van der Leij (2008)	Link between kindergarten teacher reports of their relations with students and self-reported teaching practices <i>Student Variables:</i> Behavior <i>Teacher Variables:</i> Socioemotional support; behavior regulation	81 Dutch kindergarten teachers and 284 students	Multilevel regression analyses	Dependency in the relationship positively related to the level of socioemotional support reported for each child. Less close, more dependent, and more conflictual STRQ associated with increased behavior regulation. The effects of the relationship variables were independent of children's behavior.
<i>Student & Teacher/Classroom Characteristics as Primary Predictor and/or Outcome Variables</i>				
Burchinal, Peisner-Feinberg, Pianta, & Howes (2002)	Child, family, & classroom (STRS) factors predicting developmental levels over time <i>Student Variables:</i> Language skills, academic skills, attitudes/beliefs of parent (e.g., authoritarian) <i>Classroom Variables:</i> STRS	511 children (PreK-2)	Parent & teacher surveys; assess language & academic skills HLM	Closer relationship w/ teacher positively related to lang. skills & reading competence
Buyse, Verschueren, Doumen, Van Damme, & Maes (2008)	Relationship of child and classroom variables to the quality of student-teacher relationships <i>Student Variables:</i> Externalizing behavior, internalizing behavior, gender, SES, ethnicity, math ability, language ability <i>Classroom Variables:</i> Behavior management, average classroom	3,798 Belgian kindergarten children and their teachers (N = 187)	Shortened Dutch version of the STRS (8 items) HLM	Child behavior significantly contributed to the prediction of closeness and conflict. At the classroom level, higher average levels of internalizing behavior predicted more conflict between the teacher and individual students and

	externalizing behavior & internalizing behavior			higher average levels of externalizing behavior predicted less closeness in relationships.
Cornelius-White (2007)	Analyzed studies of learner-centered teacher relationships to determine whether teacher characteristics were correlated with positive student outcomes <i>Student Variables:</i> e.g., achievement, self-esteem/mental health, social connection, attendance <i>Teacher Variables:</i> e.g., warmth, empathy, encouraging learning	119 studies with 355,325 students	Meta-analysis	Teacher characteristics (e.g., warmth, empathy) correlated with positive student outcomes
Hamre, Pianta, Downer, & Mashburn (2008)	Individual and classroom factors associated with teacher ratings of conflict <i>Student Variables:</i> Gender, ethnicity, academic skills, behavior <i>Teacher/Class Variables:</i> Self-efficacy, depression, # of hours class meets, emotional supports	Preschool teachers (N = 597) & students (N = 2282)	Hierarchical modeling; looked at teacher (classroom) variables; STRS; CLASS	Higher conflict levels with boys; lower levels with Latino children and those with better academic skills. At the teacher/classroom level higher levels of conflict than would be expected based on behavior reports were reported by teachers with lower self-efficacy and higher depression scores. More conflict found for classrooms that met more hours per week and that had

				fewer emotional supports. Less conflict found for classrooms that had more emotional supports.
Kesner (2000)	Studied teacher and child characteristics and their association with STRQ. <i>Student Variables:</i> Gender, ethnicity <i>Teacher Variables:</i> Attachment history as a child (Secure base, Separation, Parental Discipline, and Peer Affectional Support), ethnicity	903 students (K-5) 132 pre-service, female teachers	Rating scales (e.g., STRS); MANCOVA	Attachment history was a predictor of STRQ; gender & ethnic differences found
O'Connor (2010)	Student and teacher factors associated with STRQ within the framework of Pianta and Walsh's (1996) Contextual Systems Model. <i>Student Variables:</i> Gender, ethnicity, behavior <i>Teacher/Class Variables:</i> Salary, self-efficacy, emotional climate, behavior management	NICHHD Study of Early Child Care and Youth Development; 1,364 mothers and their children followed grades K-5.	Individual growth modeling; 15-item STRS	Average STRQ declines over time. Higher teacher salaries and teacher self-efficacy related to higher STRS scores and more gradual STRQ declines. More positive emotional climates and better behavior management linked to higher STRQ scores and more gradual decline. Female and European-American students had higher scores. Increased behavior problems linked to lower STRQ.

*ST = Student-teacher; STRQ = Student-teacher relationship quality

Appendix C. Student Teacher Relationship Factor Loading, Rotated Two Factor Solution

Student Teacher Relationship Scale	Factor Loadings	
	1	2
<u>Factor 1: Relationship Closeness</u>		
I share a caring, warm relationship with this child.	.83	-.29
If upset, this child will seek me out for support.	.86	-.09
This child values his/her relationship with me.	.88	-.20
This child spontaneously shares his/her feelings and experiences with me.	.84	-.01
<u>Factor 2: Relationship Conflict</u>		
This child and I always seem to be struggling with each other.	-.16	.86
This child's feelings toward me can be unpredictable or change suddenly.	-.12	.79
This child is sneaky or manipulative with me.	-.14	.84
Dealing with this child drains my energy.	-.11	.86

Appendix D. Externalizing and Internalizing Behavior Rating Items

Rated on a scale of 0 (Never/Almost Never) to 3 (Very Often)

Externalizing Behavior Items

Defies teachers or other school personnel

Argues or quarrels with others

Teases or taunts others

Takes others property without permission

Is physically aggressive or fights with others

Gossips or spreads rumors

Is disruptive

Breaks rules

Internalizing Behavior Items

Interacts with teachers (reverse score)

Seems sad

Makes friends easily (reverse score)

Withdrawn doesn't get involved with others

Seems anxious or worried

Shy or timid around classmates or adults

Socializes or interacts with classmates (reverse score)

Is a loner

Appendix E. Teacher Self-Efficacy Items

1. How well can you implement alternative teaching strategies in your classroom?
2. To what extent can you use a variety of assessment strategies?
3. To what extent can you provide an alternative explanation or example when students are confused?
4. To what extent can you craft good questions for your students?
5. How much can you do to adjust lessons to the proper level for individual students?
6. To what extent can you gauge student comprehension of what you have taught?

Appendix F. Description of Variables Used in HLM Analyses

Variable	Description	Coding/Decisions Made
Dependent Variable Closeness Rating	Individual student ratings on the Closeness scale of the STRS 8	A continuous variable. Negatively skewed distribution of factors (-1.07). Transformed by cubing the factors which resulted in a near-normal distribution. Values were standardized.
Level 1 (Student)		
Sex	Indicates whether the student is male or female.	A dichotomous variable (male = 1; female = 0).
Race	Student race. Race categories include: African American, Hispanic, Caucasian, Asian, or Other/Unspecified.	A set of dichotomous variables was created for each race category: (e.g., 1 = African American; 0 = not African American).
FARM	Indicates whether the student was eligible to receive free or reduced meals.	A dichotomous variable (1 = Yes; 0 = No).
Reading	Student achievement score on the Reading SOL test as measured in the spring of 5 th grade.	Continuous variable with values standardized.
Special Education	Indicates whether an individual student qualified for special education services.	A dichotomous variable (1 = Yes; 0 = No).
Prior Externalizing Behavior	An individual student's prior externalizing behavior ratings. Each student's average score was computed using data available from 1, 2, or 3 prior years.	Variable not normally distributed. Recoded into a dichotomous variable to differentiate between those with scores 1 or more standard deviations above the mean (high externalizing = 1) and those whose scores were less than one standard

Prior Internalizing Behavior	An individual student's prior internalizing behavior ratings. Each student's average score was computed using data available from 1, 2, or 3 prior years.	deviation above the mean (moderate or low = 0). Variable not normally distributed. Recoded into a dichotomous variable to differentiate between those with scores 1 or more standard deviations above the mean (high internalizing = 1) and those whose scores were less than one standard deviation above the mean (moderate or low = 0).
Level 2 (Teacher/Classroom)		
Sex	Indicated whether the teacher was male or female.	A dichotomous variable (male = 1; female = 0).
Minority	Indicated whether the teacher reported a minority racial background (African American, Hispanic, or American Indian/Alaskan Native).	A dichotomous variable (1 = minority; 0 = Caucasian).
Education Level	Highest level of education attained by the teacher.	A dichotomous variable. (1 = Master's degree or more; 0 = less than a Master's degree)
Experience	Years of teaching experience. Categories include: Less than 5 years; 6-20 years; 20 years or more.	Three dichotomous variables were created for each experience category (e.g., 1 = less than 5 years of experience; 0 = not less than 5 years of experience).
Efficacy	Self-efficacy rating completed by teachers.	Distribution of z scores was bimodal. Created a dichotomous variable splitting into higher self efficacy ratings (z score >0 = 1) and lower self efficacy ratings (z score <0 = 0).

Prior Closeness	Teacher's average past ratings on the STRS Closeness scale reported during prior years (2004-2005, 2006-2007, and/or 2007-2008).	Continuous variable, standardized as z scores with a mean (<i>M</i>) of 0 and standard deviation (<i>SD</i>) of 1.
Class Minority	Proportion of students in the class who were from minority racial groups.	Distribution was not normal. Dichotomous variable created where classes with 40% or more minorities coded as 1; else Class Minority = 0.
Class FARM	Proportion of students in the class who were eligible for free or reduced meals.	Distribution was not normal. Dichotomous variable where classes with 50% or more FARM eligible = 1; else Class FARM = 0.
Class Reading	Average class reading achievement.	Continuous variable, standardized as z scores with a mean (<i>M</i>) of 0 and standard deviation (<i>SD</i>) of 1.
Class Special Education	Proportion of students in the class who were eligible for special education services.	Dummy was created. Classes that had 100% special education eligible students were coded 1.
Class Externalizing	Classroom average of prior externalizing behavior.	Not normally distributed. Created dichotomous variable with high prior externalizing defined as greater than 1 standard deviation above the mean and coded 1.
Class Internalizing	Classroom average of prior internalizing behavior.	Not normally distributed. Created dichotomous variable with high prior internalizing defined as greater than 1 standard deviation above the mean and coded 1.

References

- Achenbach, T. M. (1991). *Manual for the Teacher's Report Form and 1991 profile*. Burlington: University of Vermont, Department of Psychiatry.
- Baker, J. A. (2006). Contributions of teacher-child relationships to positive school adjustment during elementary school. *Journal of School Psychology, 44*, 211-229.
- Bandura, A. (1986). *Social foundation of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.
- Birch, S. H., & Ladd, G. W. (1997). The teacher-child relationship and children's early school adjustment. *Journal of School Psychology, 35*, 61-79.
- Birch, S. H., & Ladd, G. W. (1998). Children's interpersonal behaviors and the teacher-child relationship. *Developmental Psychology, 34*, 934-946.
- Bowlby, J. (1982). *Attachment*. New York, New York: Basic Books.
- Bronfenbrenner, U. (1986). Ecology of family as a context for human development: Research perspectives. *Developmental Psychology, 22*, 723-742.
- Brophy, J., & Good, T. (1974). *Teacher-student relationships: Causes and consequences*. New York: Holt, Rinehart and Winston.
- Burchinal, M. R., Peisner-Feinberg, E., Pianta, R., & Howes, C. (2002). Development of academic skills from preschool through second grade: Family and classroom predictors of developmental trajectories. *Journal of School Psychology, 40*, 415-436.
- Buyse, E., Verschueren, K., Doumen, S., Van Damme, J., & Maes, F. (2008). Classroom problem behavior and teacher-child relationships in kindergarten:

- The moderating role of classroom climate. *Journal of School Psychology, 46*, 367-391.
- Christenson, S. L., & Anderson, A. R. (2002). Commentary: The centrality of the learning context for students' academic enabler skills. *School Psychology Review, 31*, 378-393.
- Cornelius-White, J. (2007). Learner-centered teacher-student relationships are effective: A meta-analysis. *Review of Educational Research, 77*, 113-143.
- Decker, D. M., Dona, D. P., & Christenson, S. L. (2007). Behaviorally at-risk African American students: The importance of student-teacher relationships for student outcomes. *Journal of School Psychology, 45*, 83-109.
- Enders, C. K., & Tofighi, D. (2007). Centering predictor variables in cross-sectional multilevel modes: A new look at an old issue. *Psychological Methods, 12*, 121-138.
- Gravois, T. A., & Rosenfield, S. A. (2002). A multi-dimensional framework for the evaluation of instructional consultation teams. *Journal of Applied School Psychology, 19*, 5-29.
- Gravois, T., Rosenfield, S., & Gickling, E. (2002). *Instructional consultation teams: Training manual*. University of Maryland, Instructional Consultation Lab, College Park, MD.
- Hamre, B. K., & Pianta, R. C. (2001). Early teacher-child relationships and the trajectory of children's school outcomes through eighth grade. *Child Development, 72*, 625-638.
- Hamre, B. K., Pianta, R. C., Downer, J. T., & Mashburn, A. J. (2008). Teachers'

- perceptions of conflict with young students: Looking beyond problem behaviors. *Social Development*, 17, 115-136.
- Hamre, K. H., & Pianta, R. C. (2005). Can instructional and emotional support in the first-grade classroom make a difference for children at risk of school failure? *Child Development*, 76, 949-967.
- Howes, C. (2000). Social-emotional classroom climate in child care, child-teacher relationships and children's second grade peer relations. *Social Development*, 9, 191-204.
- Howes, C., Phillipsen, L. C., & Peisner-Feinberg, E. (2000). The consistency of perceived teacher-child relationships between preschool and kindergarten. *Journal of School Psychology*, 38, 113-132.
- Howes, C., Whitebrook, M., & Phillips, D. (1992). Teacher characteristics and effective teaching in child care: Findings from the National Child Care Staffing Study. *Child & Youth Care Forum*, 21, 399-414.
- Hughes, J. N., Cavell, T. A., & Willson, V. (2001). Further support for the developmental significance of the quality of the teacher-student relationship. *Journal of School Psychology*, 39, 289-301.
- Ingraham, C. L. (2000). Consultation through a multicultural lens: Multicultural and cross-cultural consultation in schools. *School Psychology Review*, 29, 320-343.
- Kesner, J. E. (2000). Teacher characteristics and the quality of child-teacher relationships. *Journal of School Psychology*, 28, 133-149.

- Koehler, J. R. (2009). An experimental evaluation of the effect of Instructional Consultation Teams on teacher efficacy: A multivariate, multilevel examination. (Doctoral dissertation, University of Maryland, College Park, 2009). (Retrieved from <http://hdl.handle.net/1903/10210>).
- Koomen, H. M. Y., Verschueren, K., & Pianta, R. C. (2007). *Leerling-Leraar Relatie Vragenlijst. Handleiding [Student-Teacher Relationship Questionnaire Manual]*. Houten: Bohn Stafleu Van Loghum.
- Ladd, G. W., & Profilet, S. M. (1996). The child behavior scale: A teacher-report measure of young children's aggressive, withdrawn, and prosocial behaviors. *Developmental Psychology, 32*, 1008-1024.
- Murray, C. & Greenberg, M.T. (2000). Children's relationships with teachers and bonds with school: An investigation of patterns and correlates in middle childhood. *Journal of School Psychology, 38*, 423-445.
- Murray, C., & Zvoch, K. (2009, April). *The Inventory of Teacher-Student Relationships: Factor structure, reliability, and validity among African American youth in low-income urban schools*. Paper presented at the annual meeting of the American Educational Research Association, San Diego, CA.
- Murray, C., & Zvoch, K. (2011). Teacher-student relationships among behaviorally at-risk African American youth from low-income backgrounds: Student perceptions, teacher perceptions, and socioemotional adjustment correlates. *Journal of Emotional and Behavioral Disorders, 19*, 41-54.
- O'Connor, E. (2010). Teacher-child relationships as dynamic systems. *Journal of School Psychology, 48*, 187-218.

- Oreshkina, M., & Greenberg, K.H. (2010). Teacher-student relationships: The meaning of teachers' experience working with underachieving students. *Journal of Pedagogy, 1* (2), 52-66.
- Pianta, R. C. (1994). Patterns of relationships between children and kindergarten teachers. *Journal of School Psychology, 32*, 15-31.
- Pianta, R. C. (1999). *Enhancing relationships between children and teachers*. Washington, DC: American Psychological Association.
- Pianta, R. C. (2001). *Student-teacher relationship scale: Professional manual*. Lutz, FL: Psychology Assessment Resources, Inc.
- Pianta, R. C. (1992). *The student teacher relationship scale*. University of Virginia, Charlottesville.
- Pianta, R. C., Hamre, B., & Stuhlman, M. (2003). Relationships between teachers and children. In W.M. Reynolds, G.E. Miller, & I.B. Weiner (Eds.), *Handbook of psychology: Vol. 7 – Educational psychology* (pp. 199-234). Hoboken, NJ : Wiley.
- Pianta, R. C., La Paro, K. M., & Hamre, B. K. (2008). *Classroom assessment scoring system (CLASS)*. Baltimore, MD: Brookes.
- Pianta, R. C., & Stuhlman, M. W. (2004). Teacher-child relationships and children's success in the first years of school. *School Psychology Review, 33*, 444-458.
- Pianta, R. C., & Walsh, D. J. (1996). *High risk children in schools: Constructing sustaining relationships*. New York: Routledge.
- Resnick, M. D., Bearman, P. S., Blum, R. W., Bauman, K., Harris, K. M., Jones, J., Tabor, J., Beuhring, T., Sieving, R. E., Shew, M., Ireland, M., Behringer, L.

- H., & Udry, J. R. (1997). Protecting adolescents from harm: Findings from the National Longitudinal Study of Adolescent Health. *Journal of the American Medical Association, 278*, 823-832.
- Rosenfield, S. A. (1987). *Instructional consultation*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.
- Rosenfield, S. A., & Gravois, T. A. (1996). *Instructional consultation teams: Collaborating for change*. New York: Guilford.
- Rudasill, K. M., Reio, T. J. Jr., Stipanovic, N., & Taylor, J. E., (2010). A longitudinal study of student-teacher relationship quality, difficult temperament, and risky behavior from childhood to early adolescence. *Journal of School Psychology, 48*, 389-412.
- Saft, E. W., & Pianta, R. C. (2001). Teachers' perceptions of their relationships with students: Effects of child age, gender, and ethnicity of teachers and children. *School Psychology Quarterly, 16*, 125-141.
- Thijs, J. T., Koomen, H. M. Y., & van der Leij, A. (2008). Teacher-child relationships and pedagogical practices: Considering the teacher's perspective. *School Psychology Review, 37*, 244-260.
- Tschannen-Moran, M., & Hoy, A.W. (2001). Teacher efficacy: capturing an elusive construct. *Teaching and Teacher Education, 17*, 783-805.
- Virginia State Department of Education (2010). *Virginia Standards of Learning assessments technical report: 2008-2009 administration cycle*. Richmond, VA: Author.
- Wellborn, J. G., & Connell, J. P. (1987). *Rochester assessment package for children*.

Rochester, NY: University of Rochester.

- Wentzel, K. R., (2002). Are effective teachers like good parents? Teaching styles and student adjustment in early adolescence. *Child Development, 73*, 287-301.
- Werthamer-Larsson, L., Kellam, S. G., & Wheeler, L. (1991). Effect of first-grade classroom environment on child shy behavior, aggressive behavior, and concentration problems. *American Journal of Community Psychology, 19*, 585-602.
- Wu, J., Hughes, J. N., & Kwok, O. (2010). Teacher-student relationship quality type in elementary grades: Effects on trajectories for achievement and engagement. *Journal of School Psychology, 48*, 357-387.
- Yiu, H. L. (2011). The influence of student and teacher characteristics on student-teacher closeness. (Master's thesis, University of Maryland, College Park, 2011). (Retrieved from <http://hdl.handle.net/1903/11618>).