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The Role of Diversity in Peer Influences on Students' Academic Engagement

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The Role of Diversity in Peer Influences on Students' Academic Engagement

by

Hyuny Clark-Shim

A thesis submitted in partial fulfillment of the
requirements for the degree of

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in
Psychology

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Abstract

Children's classroom engagement is important for their learning and academic achievement. Extending Kindermann's (2007) study of peer influence on adolescents' engagement to an ethnically homogeneous sample, the current study examined how different aspects of diversity affect the peer influence process. Three types of diversity were considered: *ethnic diversity* existing at the school level, *relational diversity* at the peer network level, and *motivational diversity* at the group level. Ethnic diversity was observed in the student body as well as among school teachers and staff. Relational diversity was measured by z -scores resulting from binomial tests reflecting how closely two pair of individuals were connected in the peer network. Finally, motivational diversity was measured as the dispersion (SD) around peer group mean engagement levels, thereby reflecting the diversity of engagement within each peer group.

The results indicated that adolescents in this ethnically diverse middle school were overall highly engaged; their engagement patterns were comparable to previous findings from homogeneous samples consisting largely of European American adolescents. Also consistent with prior findings, the mean engagement levels of students' peer group members were a significant predictor of changes in adolescents' own engagement, which suggests peer influence on adolescents' classroom engagement. Although previous literature suggests that individuals in diverse settings tend to be less well connected to one another, the adolescents in this ethnically diverse school were well connected with their peers. Unexpectedly, almost all students' peer groups were ethnically diverse.

When the impact of relational diversity was examined to see whether strongly connected individuals exerted more influence on each other than weakly connected individuals (*differential influence hypothesis*), the results indicated that the strength of connections among peer group members did not appear to play a significant role in the magnitude of their influences on each other's changes in engagement. Nevertheless, the present study suggested new pathways and methods to examine differential peer influences.

Finally, the impact of motivational diversity of peer groups was examined using a moderated model based on an interaction effect between peer group motivational diversity and individuals' initial engagement. The results indicated that the positive impact of peer group motivational diversity was moderated by individuals' initial engagement status, such that initially low engaged adolescents benefited from diversely engaged peer groups, whereas peer group motivational diversity had a comparatively small negative effect on initially highly engaged students.

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Introduction

Classroom engagement is the manifestation of students' motivation and involvement in class, and is important for their learning and achievement (Fredricks, Blumenfeld, & Paris, 2004). Although classroom engagement is important for academic development, unfortunately, many children seem less and less excited about their school work as they grow older (Wang & Eccles, 2012; Molly, Gest, & Rulison, 2011; Véronneau & Dishion, 2011; Eccles, Midgley, & Adler, 1984). This is especially the case during the transitions to middle school and to high school where students lose some of their interest in and enthusiasm for academics (Wigfield, Eccles, Schiefele, Roeser, & Davis-Kean, 2006). By the time students reach high school, their engagement tends to become relatively stable, but at a lower level.

Losses in motivation and engagement may be one reason behind the low rates of school completion in the U.S. (Anderman, Maehr, & Midgley, 1999; Anderman, 2003). The National Center for Education Statistics (NCES, 2011) reported that in 2011, 89% of 25- to 29-year-olds in the U.S. had a high school diploma or its equivalent, and only 32% of 25- to 29-year-olds had completed a 4-year college degree. Children from low socio-economic backgrounds and ethnic minorities disproportionately suffer from even lower rates of academic success and achievement (NCES, 2011). Given the continuing increase in the proportion of the U.S. population represented by ethnic minorities, it is vital to find what factors could promote their academic engagement and success. The present study examined adolescents' engagement in an ethnically diverse middle school, and how peers influenced their

motivational development.

Peer Influence on Engagement

Academic engagement is a malleable factor that can be shaped and influenced by environmental factors, such as parents, teachers, and peers (Wang & Eccles, 2012; Vollet, 2012; Skinner, Kindermann, Connell, & Wellborn, 2009; Connell, Spencer, & Aber, 1994). While much research suggested that teacher and parental support had a positive impact on adolescents' motivational development (Wang & Eccles, 2012; Wentzel, Battle, Russell, & Looney, 2010), the effects of peers were the least understood. Although there is a growing consensus that peers play an important role in students' academic success, a great deal of the research upon which these conclusions are based has serious methodological limitations. Much of the previous research examining peer influence relied on self-reports of friends and self-reports of academic engagement, and even then "peer influence" was often estimated based on correlations between self-reported friendship dyads and self-reported academic outcomes gathered at a single time point (e.g., Woolley, Kol, & Bowen, 2009; Nelson & Debacker, 2008). While useful in some ways, these methods suffer from several limitations when estimating peer influence on academic motivation.

In general, self-report studies suffer from biased answers from participants. People may not always recall their behaviors accurately. For example, people tend to view themselves more favorably than might be warranted (*self-enhancement*). This tendency can raise issues regarding students' self-reports of engagement and self-reports of friends and peers. Students may report themselves as more engaged than

they are in reality. Children may also report their peer network more favorably by selectively including popular and high-achieving peers while omitting low-achieving peers (Leung, 1996).

Attempting to measure peer influence based on a single time point correlation between individuals' and their peers' outcomes can complicate the interpretation of the results. Adolescents may choose similar others as their peers (*selection effect*), rather than influence each other (*socialization effect*). The similarity between adolescents and their peers based on a single time point correlation comes from a mixture of selection and socialization effects. Selection effect needs to be accounted for when evaluating the socialization effect of peer influence.

Strategies to study the effects of peer influence on student engagement. A set of strategies has been suggested to overcome the methodological limitations found in prior studies of peer influence (Kindermann, 1996). In order to avoid the self-enhancement bias in children's self-reports of their own engagement, Kindermann utilized teacher-reports of children's engagement. Children's homeroom teachers reported each student's classroom engagement based on his/her actual classroom behaviors and emotions in class. Similarly, instead of solely relying on self-reported friendship data, Kindermann (2003; 2007) employed *socio-cognitive mapping* (SCM) to identify each child's peer network. In SCM, students can report other students' peer groups as well as their own peer groups. Based on this compiled peer group information, more comprehensive peer networks can be mapped out. Finally, Kindermann used longitudinal data on student engagement with two time points in

order to partial out selection effect when estimating peer influence.

Limitations of current strategies. Although the longitudinal data provided by SCM and teacher-reports of student engagement offered valuable ways to evaluate peer influence on adolescents' engagement, there were some limitations to these studies as well. Most of the studies examined peer influence on adolescents' engagement in a relatively homogeneous setting where most participants were European American adolescents (Fredricks et al., 2004). It is difficult to know whether the findings would be applicable to adolescents from more diverse backgrounds, such as ethnic minority and immigrant children with low socio-economic status (SES) who are most at risk for underachievement.

Secondly, not only overall peer group characteristics but peer group composition may also matter for adolescents' motivational development. When examining peer influence, Kindermann (2003; 2007) used peer group mean engagement to predict individuals' engagement change. While Kindermann accounted for peer group size and gender make-up, he did not account for variation among peer group members' engagement levels. For example, even though two students' peer group mean engagement can be identical, their peer group engagement composition can be very different: One peer group's members could be all similarly engaged while another peer group's members can diversely engaged, i.e., including both highly and low engaged peers. This motivational diversity within peer groups can affect adolescents' motivational development through exposure to diverse peers.

Finally, when Kindermann (2007) examined peer group influence on

adolescents' engagement, he used a simple peer mean engagement score, which assumes that all the peer group members have *equal (homogeneous) influence* on adolescents' motivational development. However, it is possible that peers may have *differential influences* such that some peers may affect adolescents' development more than others.

Purpose of Present Study: The Role of Diversity

As an extension of Kindermann's work (2007), the overarching goal of the current study was to examine the impact of different types of diversity on the peer influence process. When examining the impact of diversity, it is important to note that there are different types of diversity, and they all can have different effects. Previous literature on '*work group diversity*' suggests that group diversity can come from various aspects, including demographic (e.g., gender, ethnicity), functional and educational attributes, as well as differences in values or attitudes (van Knippenberg & Schippers, 2007). They can be measured by either examining individual-to-group difference or using dispersion indices (e.g., *standard deviation*) to reflect the extent to which group members are different from one another. When van Knippenberg and Schippers reviewed the previous literature on the effect of diversity, they pointed out inconsistent, mixed findings of both positive and negative influences. They suggested examining not only the impact of a single type of diversity, but also how multiple kinds of diversity interact to influence group members. They also emphasize the need to examine different influences of diversity among sub-group members.

The present study examined the impact of three kinds of diversity. The three

kinds of diversity included *ethnic diversity* existing at the school level, *relational diversity* at the network level, and *motivational diversity* at the peer group level. Longitudinal data with teacher-reports of student engagement at two time points (Fall and Spring of a single school year) were used as well as SCM to assess an entire middle school's student peer networks at the first time point.

Ethnic diversity. The first type of diversity considered was ethnic diversity existing at the school. While it is important to understand children's academic development from all ethnic backgrounds, most of the previous literature mainly focused on European American children's developmental patterns (Fredricks et al., 2004). The present study examined engagement patterns and peer influence on motivational development of ethnically diverse adolescents to see whether previous findings would be applicable in a diverse setting.

Relational diversity. The second type of diversity was *relational diversity* based on *strength of connection (SC)* among peer group members. Historically, there have been two contradicting perspectives on diversity. The social categorization perspective suggests that individuals in diverse settings tend to be less well connected with one another and have increased interpersonal conflicts due to in-group and out-group bias (Triandis, 2003). In contrast, the information/decision-making process perspective suggests that benefits of diversity often outweigh the drawbacks of heterogeneity, and diversity can lead to increased creativity and greater social capital from exchange of information (Kearney & Gebert, 2009).

The previous literature on adolescents suggests that there are benefits for

social and cognitive development from having dissimilar peers (e.g., Kawabata & Crick, 2011; Sosa, 2011). However, adolescents are more likely to associate with similar peers (McPherson, Smith-Lovin, & Cook, 2001, 2001; Hamm, 2000; Kandel, 1978). Even if they form friendships with dissimilar peers, these relationships are less likely to persist (Kawabata & Crick, 2011).

Based on the social categorization perspective, adolescents in an ethnically diverse setting may be less well connected. However, some literature suggests that when there are ample opportunities for cross-ethnic friendships, children can form more ethnically diverse peer groups (Knifsend & Juvonen, 2014). This study examined whether adolescents in this ethnically diverse middle school were well connected with one another and whether they tended to have ethnically diverse peer groups. At the same time, the impact of SC on peer influences was examined to see whether strongly connected peers exerted more influence than less well connected peers.

Motivational diversity. Finally, the impact of peer group motivational diversity was examined to see whether having diversely engaged peer group members was beneficial. As discussed earlier, each peer group can have different engagement composition among peers, such that some peer groups can have homogeneously engaged members (i.e., every member is similarly engaged); however, other peer groups can have diversely engaged members. It is important to examine peer group influence not only based on overall peer group engagement level but also based on within-group engagement variation. Are there benefits of having diversely engaged

peers? If so, for whom would it be the most beneficial?

Research on school children and adolescents suggests that they are more likely to become friends and peers if they have similar academic orientations (Kandel, 1978; Kindermann, 2007; Molly et al., 2011). Adolescents' tendency to associate with similar others can be further reinforced by institutional practices, such as academic ability grouping or tracking in school. However, this segregation can lead to detrimental impacts on low-achieving students (Eccles & Roeser, 2010; Oakes, 1986; Loveless, 2013). Eccles and Roeser (2010) suggested that widespread use of academic ability tracking in secondary schools might bind students to a particular and limited set of academic curricula, teachers, and peers, thereby limiting low-achieving students' learning opportunities. As a result, academic ability tracking can lead to greater academic disparities. It is important to know whether diversely engaged peers are beneficial for children's motivational development since that knowledge can provide insight about how to structure educational settings to promote children's academic development.

Summary. Building on strategies for capturing peer networks and their impact on adolescents' motivational development, the current study examined the roles of three kinds of diversity: ethnic diversity in school, motivational diversity within peer groups, and diversity in strength of connection between individuals. The current study hopes to expand our understanding of how peer group influences may or may not differ in diverse versus homogeneous settings, and how different types of diversity, beyond ethnic diversity, can affect peer influence processes on adolescents'

motivational development. Such knowledge has potential to provide insight into how educational settings could be (re)structured in order to accommodate the needs of all adolescents to become academically motivated and successful.

Chapter 1: Literature Review

This chapter will review the concept of students' academic motivation and engagement, and will discuss how environmental factors, including teachers, parents, and peers, can affect and shape children's motivational development. Particular attention will be given to peer influence on adolescents' motivational development, and how previous studies examined peer influence using social network analysis. The limitations of previous studies will also be discussed, as well as how the current study addressed some of those limitations by incorporating different types of diversity when examining peer influence processes.

Engagement

In recent decades, much attention has been given to promoting students' learning and academic success. Researchers and practitioners in educational settings alike sought to promote students' academic motivation and involvement (Chapman, 2003). In their attempt to promote students' learning, some researchers focused on understanding how environments affect students' motivational development. Others focused on internal motivational processes, and examined how students' emotions and belief systems affect their classroom behaviors or academic outcomes. While all these studies and theories have helped us better understand students' academic development, the area of children's motivation became filled with many different constructs (Skinner et al., 2009). Some of these constructs include school belonging, school affiliation, school community, school engagement, school motivation, and student commitment (Jimerson, Campos, & Greif, 2003).

Researchers recognized the need to create an overarching term that encompasses all these constructs so that researchers and practitioners could communicate with one another more effectively when developing an intervention program (Chapman, 2003). Jimerson and colleagues (2003) suggested "school engagement" as an overarching term. School engagement represents students' motivation for academic achievement and involvement (Fredricks et al., 2004). Thus, the concept involves not only students' performance and behavior, but also their extracurricular involvement and interpersonal relationships with school personnel (Jimerson et al., 2003). The authors suggested that school engagement includes students' affective, behavioral, and cognitive dimensions around the entirety of school-related activities and personnel. That is, students' school engagement includes how students feel and think, as well as what they do in school with their peers, teachers or staff members.

Furthermore, Skinner and colleagues (2009) provided an overarching framework regarding children's motivational development from an ecological perspective (Bronfenbrenner & Morris, 1998). Skinner and colleagues conceptualized engagement as a motivational construct. The construct of engagement involves internal motivational processes, and also incorporates reciprocal influences between children and their environments.

Classroom Engagement

While school engagement represents students' motivation and involvement in the entire school, classroom engagement represents students' motivation and

involvement in class. The construct of classroom engagement is also multidimensional, including behavioral, emotional, and cognitive engagement. Engaged students are motivated and actively involved in class, whereas *disaffected* students are passive and unwilling to participate in class. Engaged students show initiative and interest in academic materials.

Behavioral engagement involves classroom behaviors, including active participation in class by asking questions or contributing to class discussion. Engaged students show effort, attention, and absorption while disaffected students show passivity, withdrawal, and distractedness (Skinner et al., 2009, p. 227). *Emotional engagement* involves students' emotion in class. Engaged students show enthusiasm, interest, and genuine pleasure, whereas disaffected students show boredom, frustration, and anxiety. *Cognitive engagement* involves students' cognitive orientation. Engaged students are active learners who strive to learn, seek out challenges, and follow through questions or new academic materials, whereas disaffected students are aimless and passive in their learning, and tend to be motivated by external rewards, including praise or avoidance of punishment (Fredricks et al., 2004).

Engagement by age and gender. Although students' engagement is important for their learning and academic outcomes, many students seem to lose academic interest and motivation as they grow older (Wang & Eccles, 2012; Molly et al., 2011; Véronneau & Dishion, 2011; Eccles et al., 1984). Declining engagement is especially noticeable during the transition to middle and high school (Véronneau & Dishion, 2011; Eccles et al., 1984). During these school transitions, adolescents experience

many changes physically and socially. They also need to adapt to a new school setting which is often bigger than their previous school, involving classes taught by an increased number of teachers with less knowledge about individual students. At the same time, they are introduced to a larger peer group (Véronneau & Dishion, 2011; Molly et al., 2011).

On one hand, all these changes and academic demands can provide a new opportunity to grow. On the other hand, these changes and demands can add stress and lead to a loss of academic interest and enthusiasm (Véronneau & Dishion, 2011). In order to make adjustment to changes and demands, it may be beneficial to have thoughtfully-guided instructions from caring adults; however, teachers with less knowledge about individual students may be ill-equipped to build rapport and provide individualized guidance for each student.

As adolescents grow older, the kind of support and instruction they need is likely to change. Previous studies found that while young children require more structural instruction, adolescents require more autonomy support as they grow older so that they can learn to cope as autonomic agents (Roeser, Eccles, & Sameroff, 2004; Eccles et al., 1996; Skinner, Furrer, Marchand, & Kindermann, 2008). However, there seems to be a mismatch between what students need and actual practice. While students need more autonomy support in their academic work, their class material and homework are often pre-determined, which gives little room for students to work creatively or to be actively involved (Roeser et al., 2004).

Previous research suggests that academic engagement also varies across

students' gender (Wang, Willet, & Eccles, 2011; Véronneau & Dishion, 2011; Wang & Eccles, 2012; Molly et al., 2011; Kindermann, 2007). In general, girls tend to be more engaged than boys (Wang & Eccles, 2012; Molly et al., 2011; Kindermann, 2007). Wang, Willet, and Eccles also found that girls were more engaged than boys both emotionally and behaviorally. Interestingly, they found that students' cognitive engagement levels did not vary by gender. While research suggests that students' academic engagement tends to decline as they progress in grade level, (Eccles et al., 1984; Van de gaer, Pustjens, Van Damm, & De Munter, 2009) this decline may be more pronounced among boys than girls (Van de gaer et al., 2009).

Environmental Factors Affecting Students' Engagement

Students' engagement is a malleable factor that can be shaped and influenced by environmental context (Skinner et al., 2009). Students' engagement and disaffection can be communicated to their teachers and peers in class. Not only can teachers and peers observe whether a student is engaged, but student engagement can affect classroom interactions. For example, if a student shows interest and actively participate in class, a teacher may give praise. However, if a student looks bored and unwilling, peers and teachers may notice this student's disaffection and inattentiveness. Student engagement in class can affect teachers' and peers' responses, and those responses in turn can reinforce or reshape students' motivational outcomes.

According to the bioecological model, human development is influenced by multiple social relations, and these social relations can have multiple layers influencing each other (Bronfenbrenner & Morris, 1998). A pattern of direct interaction

between children and others can affect children's development. Previous studies found that teacher, parental, and peer support affect children's motivational development (Roeser et al., 2004; Klem & Connell, 2004; Eccles et al., 1996; Wentzel et al., 2010), and each source of support has a different effect (Wentzel, 1998; Woolley et al., 2009; Wang & Eccles, 2012). Wentzel (1998) found that social support provided by parents, teachers, and peers affected different domains of students' academic motivation. For example, teacher support affected students' class and school interest and their pursuit of social responsibilities, while family support and cohesion had a positive influence on students' learning by encouraging students to have mastery goal orientations. Perceived peer support affected students' pro-social goals, such as helping others and cooperating with one another. Furthermore, peer and parental support indirectly affected students' interest in school by mediating their emotional distress. Each of these social relations (i.e. teachers, parents, and peers) with whom children directly interact is a *microsystem*, and their direct interactions influence children's academic development.

Sometimes two or more microsystems can interact with one another to influence children's development. For example, teachers and parents can coordinate their effort to promote children's academic development. Here, two microsystems (parent-child relationship and teacher-child relationship) form a larger system called a *mesosystem*, and this mesosystem can have a greater impact on children's development. Woolley and colleagues (2009) found that the teacher-parent relationship is especially important for Latino students' academic engagement, and coordinated support between

parents and teachers based on their shared understanding about cultural meanings and expectations of *education (educacion)* promotes children's motivational development.

Children can also be influenced by people with whom they do not directly interact. For example, a teacher may miss a class to take care of her sick baby at home, and children in her class will be affected by the absence of the teacher. Here, children do not interact with their teacher's sick baby; nonetheless, the baby can affect children. The sick baby is an *exosystem* for children where they are only *indirectly* connected through the teacher. Yet, they can still influence each other.

Finally, neighborhoods, policies, and cultures are an overarching system (*macrosystem*) that can affect all the subsystems. For example, when a new educational policy is introduced in an educational setting, that can not only affect school teachers and administrators, but also can affect school children and their parents.

Proximal processes for motivational development. According to the bioecological model, proximal processes are engines of development (Bronfenbrenner & Morris, 1998). Proximal processes are a pattern of interaction between developing individuals and their environmental contexts. Students' engagement can be viewed as proximal processes that result from interactions between the students and their environment. Frequent interactions between individual students and their teachers and peers can affect students' engagement. All the proximal processes have reciprocal and bi-directional impacts on individuals and their environmental context (Skinner & Lendaris, 2007), thereby affecting individuals and their environment simultaneously

(Meadows, 2001; Skinner & Belmont, 1993; Eccles et al., 1993).

Skinner and colleagues (2009) articulated reciprocal processes of environmental influence on students' engagement as well as student engagement affecting their environment. Students' environmental contexts (such as parental, teacher, peer, and neighborhood support) impact students' self-perceptions (e.g., perceived competence, autonomy); students' perceptions then affect their actions (e.g., engagement, self-regulation). These actions not only influence individual students' motivational development, but also elicit different feedback from their environmental contexts; therefore, their actions ultimately reshape their environmental context. For example, when students are actively involved in class, teachers may provide compliments on their behavior; however if students are disruptive, teachers may request they refrain from disruptive behavior. Students' behavior not only affects their own learning experience, but also alters their teachers' perceptions and behaviors.

Peer Relationships and Their Influence

Following friends south of the river

(Korean Proverb)

Friendship is one of the first intimate peer relationships that children experience outside of family. In these relationships, children can negotiate and relate to one another more equally and autonomously (Coleman, 2011). By the time they reach adolescence, they are embedded in a complex network of relationships (Dunphy, 1972).

Friendship usually involves small and intimate relationships. Friends help

each other and share trust and intimacy, as well as provide emotional security and validation (Cotterell, 2007). Meanwhile, peers and peer groups tend to be somewhat larger and they tend to be organized around shared activities or interests (Molly et al., 2011, Coleman, 2011; Kindermann, 2007). Names of peer groups often reflect their common activities or shared interests, such as “nerds”, “brains”, “jocks”, and so on (see Kindermann's composite map of 6th graders' peer network: <http://web.pdx.edu/~thomas/>).

Both friends and peers provide emotional support for adolescents to feel accepted and validated, and at the same time, these peer relationships allow them to integrate into a larger social network (Steinberg, 2008). Adolescents learn social skills, such as self-regulation and self-disclosure, through the experiences of building and maintaining these peer relationships (Kawabata & Crick, 2011; Coleman, 2011). These social skills can allow adolescents to have positive interactions with their teachers and peers in a classroom setting. At the same time peers can provide emotional and instrumental support for children to become motivated in school (Skinner et al., 2008). Peers may also help each other with class projects or other school work as well as help each other feel comfortable to participate in class. Both instrumental and emotional support from peers may promote adolescents' academic motivation and engagement by facilitating their sense of belonging in school and encouraging active involvement in class.

Peer Influence on Adolescents' Academic Development

While much research examining the effects of parental and teacher support

seems to suggest a clear and positive impact on children's motivational development, research on friends and peers suggests a somewhat complicated story about their influence (Wang & Eccles, 2012; Wentzel et al., 2010). When Wang and Eccles (2012) examined the simultaneous influence of parental, teacher, and peer support on children' engagement, they found that while supportive parents and teachers promoted adolescents' engagement in every dimension they examined, supportive peers had both positive and negative influences on engagement. Peer support positively predicted adolescents' increased participation in extracurricular activities, sense of belonging in school, and focus on learning. However, peer influence on compliance with school rules varied depending on peer group norms and characteristics. When their peer groups valued pro-social behaviors, adolescents were more likely to comply with school rules. However, when their peer groups valued antisocial behaviors, adolescents were less likely to comply with school rules.

Other research also suggests that peers play an important role for adolescents' academic engagement in both positive and negative ways (Altermatt & Pomerantz, 2003; Kindermann, 2007; Rubin, Bukowski, & Parker, 2006; Molly et al., 2011; Véronneau & Dishion, 2011). On one hand, peers can play a positive role in adolescents' academic engagement and achievement by helping them feel connected and promoting positive interactions with peers and teachers in class (Woolley, Kol, & Bowen, 2009, Deci, 1985; Skinner et al., 2009; Faircloth & Hamm, 2005). On the other hand, peers can have negative influences by encouraging each other to engage in deviant behaviors (e.g., Burk, Kerr, & Stattin, 2012; Popp et al., 2008). Furthermore,

negative interactions with peers can lead into poor academic outcomes. Peer discrimination negatively affected ethnic minority students' sense of belonging in school (Brown & Chu, 2012, Wang & Huguley, 2012; Wong, Eccles, & Sameroff, 2003), and the negative impact of racial discrimination was especially pronounced among African American youths (Wang & Huguley, 2012; Wong et al., 2003).

However, it is important to note that formation of friendship or peer influence do not happen in isolation (Coleman, 2011). Parents or teachers can affect children's friendship formation by influencing their children's choice of peers. Parents often choose which school their children go to as well as the extra-curricular activities in which their children get involved, and this can again affect children's peer group choices. Teachers in class may influence classroom interactions among children by introducing a seating arrangement, thereby affecting children's peer networks. There can also be simultaneous influences from parents, teachers, and peers, and at the same time these influences may interact with one another to affect children's academic development. Wang and Eccles (2012) found that overall children who have supportive relationships with their parents and teachers tend to have supportive relationships with their peers.

Methodological Limitations of Previous Research Examining Peer Influence

Although most studies examining peer influence claim that peers play an important role in students' academic development, a great deal of the research upon which these conclusions are based has serious methodological limitations. Much of the previous research examining peer influence relied on self-reports of friends and self-

reports of academic engagement, and even then "peer influence" was often estimated based on correlations between self-reported friendship dyads and self-reported academic outcomes gathered a single time point (e.g., Woolley et al., 2009; Nelson & Debacker, 2008). These methods raise some concerns involving biases in self-reported data as well as limitations of using a single time point correlation to infer "influence."

Self-reports of engagement. Many of the studies examining peer influence on students' academic engagement are based on students' self-reports of engagement (e.g., Wang & Eccles, 2012; Brown & Chu, 2012; Wang & Huguley, 2012). In general, however, self-report studies suffer from biased answers from participants. People may not always recall their behaviors accurately. For example, people tend to view themselves more favorably than might be warranted (*self-enhancement*. Sedikides & Gregg, 2008), and this tendency increases when they are in a good mood. Participants sometimes selectively recall behaviors that reflect themselves positively and fail to report negative and unflattering behaviors. This positive illusion of self can lead into inflated ratings of positive behaviors. Participants may also respond to survey questions about themselves in such a way that they can be viewed more favorably by others (*social desirability bias*. Thompson & Phua, 2005). Social desirability bias can result in over-ratings of positive behaviors and under-ratings of negative behaviors. Both self-enhancement tendency and social desirability bias pose a serious problem for self-report questionnaires. Students may report themselves more engaged than they are in reality.

However, cross-cultural research has suggested that some cultures do not

exhibit this self-enhancement tendency, but instead evaluate themselves more accurately (Markus & Kitayama, 1991; Markus, H., & Wurf, 1987). Indeed, in East Asian countries, including China, Korea, and Japan, humility is an important cultural value and people are encouraged to be humble and not to "show off" (Nisbett, 2004). This cultural difference can further complicate the issues of dealing with self-reported data from an ethnically diverse sample by introducing a systematic variability among different cultural groups.

Self-reports of peers. There are also methodological problems with using self-reports of peers when identifying children's friends or peers. As with other self-reported data, self-reports of peers can suffer from biased answers from participants. Self-enhancement tendency may not only be limited to over-rating positive behaviors, but may also extend to social affiliates. Leung (1996) found that when children were asked to report their peers, they tend to over-report peers with positive characteristics and neglect to report peers with negative characteristics. This biased peer reporting can result in inaccurate peer networks.

In addition, self-reported peer data have methodological issues with regards to identification of peer networks. In self-reported peer studies, participants are asked to nominate their best friends, usually ranging from three to twenty nominations in rank order (e.g., Hamm, 2000; Popp et al., 2008). Researchers then use these self-reports to identify dyadic friendships. Only when two participants co-nominate each other's name in their friend list can these reciprocal friendships be potentially considered as friend-dyads. These reciprocal friendship studies can be effective at examining close

friends' influence on each other. However, this method includes friendship information about only the study participants. Insufficiency of friendship information is aggravated by losing further friendship information about the friends of the absentees. When students are absent during data collection, they cannot reciprocate friend nominations to their friend(s); thereby friendship information of absentees' friend(s) is also lost.

Furthermore, these self-report peer studies can create artificially high rates of isolates in the network even for participants who actually have friends. For analysis of dyadic friendship influence, individuals are allowed to have only one reciprocal friend since each individual can be included in the analysis just once (e.g., Popp et al., 2008). If participants receive more than one co-nomination, only the highest rank co-nomination is considered as a friend dyad, and any lower rank co-nomination dyads will not be accepted in the friend-dyads for data analysis. This method can lose dyadic friendships that exist in the networks, thereby leading to artificially high rates of isolates in the network even for participants who actually have friends.

Given that the self-report peer studies can result in artificially high rates of isolates along with rather simplified modeling of friendship (just one friend for each individual), the self-report method has a somewhat limited ability to draw conclusions about peer influence from naturally occurring peer groups.

Cross-sectional designs. Drawing conclusions about peer influence based on a single time point correlation between adolescents' and peers' behaviors complicates the interpretation of the results (e.g., Kawabata & Crick, 2011). Using a single time point study, it is impossible to distinguish how much of the similarity between individuals

and their peers is based on choosing similar peers in the first place (selection effect) as opposed to influencing one another (socialization effect).

People tend to choose similar others as their friends or peers. This phenomenon is referred to as *selection effect*, *homophily*, or *assortativeness* (Kandel, 1978; Hamm, 2000; Kindermann, 2007). Adolescents tend to choose peers who share similar academic orientation and have similar academic motivation and engagement (Hamm, 2000; Molly et al., 2011; Kindermann, 2003; 2007). This initial similarity between individuals and their peers needs to be taken into consideration when measuring peer influence on adolescents' motivational development. Peer influence can be measured by estimating the similarity in engagement between individuals and their peers above and beyond the selection effect of initial similarity. In order to partial out the selection effect, we need to use longitudinal data with at least two time points. Only after accounting for the selection effect is it possible to measure the socialization effect of actual peer influence.

Strategies to Study Peer Influence on Student Engagement

A set of strategies has been suggested to overcome the methodological limitations found in prior studies of peer influence (Kindermann, 1996). The strategies include use of teacher-reports on student engagement (instead of self-reports). Instead of solely relying on self-reported friendship data, Kindermann (2003; 2007) employed *socio-cognitive mapping* (SCM; Cairns, Perrin, & Cairns, 1985) to map out peer networks by utilizing both self-reports and *observed* information about students' peer groups. Finally, the use of longitudinal data allows measurement of peer influence

after controlling for selection effect.

Teacher-reports of student engagement. As discussed earlier, self-reports of student engagement can be misleading. Some students may inflate their levels of engagement due to a self-enhancement tendency of either viewing themselves more positively or reporting in a way that others may view more positively. Again, bias in self-reports may be more prevalent in the mainstream culture in the U.S., while less prevalent or uncommon in certain ethnic groups, such as Asian-American cultures (Nisbett, 2004). This cultural difference may cause additional problems with self-reported engagement data.

To overcome these biased ratings of self-reports, Kindermann (2003;2007) used teacher-reports of student engagement. Children's homeroom teachers who interacted with students on a daily basis reported each student's engagement level. Teacher-reports of student engagement made it possible to examine each student's engagement level more reliably.

Socio-cognitive mapping. In order to identify a more comprehensive peer networks, Kindermann (2003; 2007) employed socio-cognitive mapping (SCM). This method addresses the shortcomings of biased self-reporting of peers by combining students' self-reported information about their own peer groups with reports made by students regarding *other* peer groups they *observed*. Based on all the peer group reports, researchers can test whether each pair of children belong to the same peer group at a significant level.

In SCM surveys, participants are asked to report who is "hanging out" with

whom in a group (e.g., Cains, Garipey, & Kindermann, 1989; Cairns, Leung, Buchanan, & Cairns, 1995), including their own peer groups as well as *other* students' peer groups they *know*. Children are the "experts" of peer groups that exist in school. By encouraging them to report peer groups they observe on a daily basis, it is possible to collect more complete peer group information. By asking participants about other students' peer groups, SCM also enables us to collect peer group information beyond the study participants. Even if some students are absent during the data collection, other participants may report the absentees' peer groups; therefore, the peer group information about the absentees can be included. A combination of children's self-reports of their own peer groups and observed information of other students' peer groups enables us to draw a more complete peer network.

SCM made it possible to evaluate complex patterns of peer influence by mapping a comprehensive peer network that resembles naturally occurring peer groups. Adolescents build complex peer networks. They often spend time with various individuals from different peer groups. When relying solely on self-reports of peers, researchers can only draw a relatively simplified and limited peer network, whereas SCM allows researchers to identify a more comprehensive peer network that reflects the complexity of children's peer groups. Based on peer group information collected by SCM, children can have multiple peers, and belong to multiple peer groups (As an example, see Kindermann's (2007) peer network map of the entire 6th grade in a suburban school: <http://web.pdx.edu/~thomas>).

However, there can be potential limitations to using SCM. SCM may make it

difficult to identify "secret friends." For example, some adolescents might start romantic relationships in early adolescence, and these romantic relationships may not be known to their peers. Secret relationships may not be observed by others; therefore these relationships may not be included in the peer networks; this in turn makes it difficult to estimate the developmental influence of these relationships on individuals.

Significance test for peer connection. SCM allows researchers to test whether each pair of children belong to the same peer group at a significant level. Often an individual child's peer groups are reported multiple times, since students are encouraged to report not only their own peer groups but also other students' peer groups. Based on all the peer group reports, researchers can test whether two individuals' connection is statistically significant. If two individual students are reported in the same peer group more frequently than expected by chance, they will be considered as peers. However, if two individuals are reported in the same peer group less frequently than by chance, these two will not be considered to be members of the same peer group. After the evaluation of *significance of connections* between each pair of nominations, researchers can determine each student's peer group as consisting of all the *significant connections*, and then map out the entire peer network for every student.

This significance test for peer connection also provides a way to control for self-enhancement bias from self-peer nominations, i.e., students' tendency to nominate other popular children as their peers even when they are not actually peers (Leung, 1996). When a child reports other popular children as peers, but does not interact

frequently with those popular children, other students will not nominate them in the same peer group. This will result in a non-significant peer connection, thereby effectively accounting for self-enhancement bias while revealing peer groups that actually exist.

The determination of a significant connection among each pair of children (peers) involves *binomial z-tests* on the *conditional probabilities* of co-nominations (Kindermann, 1993). The resulting *z-scores* from the test represent *strength of connections* (SC) between each pair of children. High co-nomination frequencies between two peers relative to their total nomination frequencies lead to high SC, which reflects a strong connection between these two children. Meanwhile, relatively infrequent or zero co-nominations between two children leads to a weak SC or *non-significant* connection.

The z-test comes from a z-score *normal approximation* to the binomial distribution as follows:

$$z = \frac{P(A) - P(A|B)}{\sqrt{\frac{P(A) * (1 - P(A))}{N}}}$$

This z-test was modified by Bakeman (1976), Sackett (1979) and Gottman (1979; 1980) to evaluate lagged dependence between a couple, and was later formulated by Allison and Liker (1982) as follows:

$$z = \frac{P(A|B) - P(A)}{\sqrt{\frac{P(A) * (1 - P(A))}{(N - K) * P(B)}}}$$

Note. N is adjusted to $(N - K)$ by Allison and Liker to represent the fact that these are observed frequencies in small chunks of data.

Kindermann (1993) adapted this test to evaluate significance of connections for non-sequential peer data. The goal was to evaluate, in sets of observations of peer group affiliations, the significance of co-nominations between pairs of children.

$$z = \frac{P(B|A) - P(B)}{\sqrt{\frac{P(B) * (1 - P(B)) * (1 - P(A))}{P(A)(N - 1)}}$$

Note. Here A and B represent children A and B. N is total number of peer groups nominated by all the participants in a setting.

The binomial z -test examines whether given that a child has a group, the likelihood that another child can be found in the same group. The conditional probability is compared to the probability that the other child is listed in any group (Kindermann, 1993, p.972). The resulting z -score represents the *strength of connection* (SC) between the two children.

A hypothetical case illustrates how the z -scores are calculated and how high co-nomination frequencies result in high SC. Assume that there are 150 participants reporting a total of 600 peer group nominations. Among the 600 peer groups, student A is nominated 35 times as a group member. Student B is co-nominated 25 times in groups containing student A, which leads to a conditional probability of being co-nominated with A of .71 ($25/35 = 71.43\%$). Meanwhile, student B is nominated 30 times among all the 600 groups. Therefore, the expected probability of student B being in a group compared to the total number of groups is .05 ($30/600 = 5\%$). The z -score

calculation leads to $z = 18.57$. The high co-nomination frequency between students A and B is expressed by the significant and high SC (18.57).

Now let us compare a case when low co-nomination frequency leads to low SC. Assume we are looking at the same peer data, with a total of 600 peer group nominations. Here student C is co-nominated 3 times in groups containing student A, which leads to a conditional probability of being co-nominated with A of .09 ($3/35 = 8.57\%$). Meanwhile, student C is nominated 40 times among all the 600 groups. Therefore, the expected probability of student C being in a group compared to the total number of groups is .07 ($40/600 = 6.67\%$). Students A and C's low co-nomination frequency (3) relative to their high baseline nomination frequencies (35 and 40 respectively) results in low z -score of .47. Students A and C have a much lower SC of $z = .47$ as compared to the high SC of $z = 18.57$ between students A and B. Furthermore, this resulting $z = .47$ is *not statistically significant*; therefore, student C will *not* be considered to be in A's peer group when mapping out the peer network.

Longitudinal designs. Kindermann (2007) employed a longitudinal design with two time points to study peer influence on children's classroom engagement. Evaluating peer influence based on a cross-sectional design is problematic, since similarity between individuals and peers could come from two sources: One is the selection effect of choosing similar peers and the other is the socialization effect of peer influence. In order to measure peer influence, the selection effect needs to be taken into consideration.

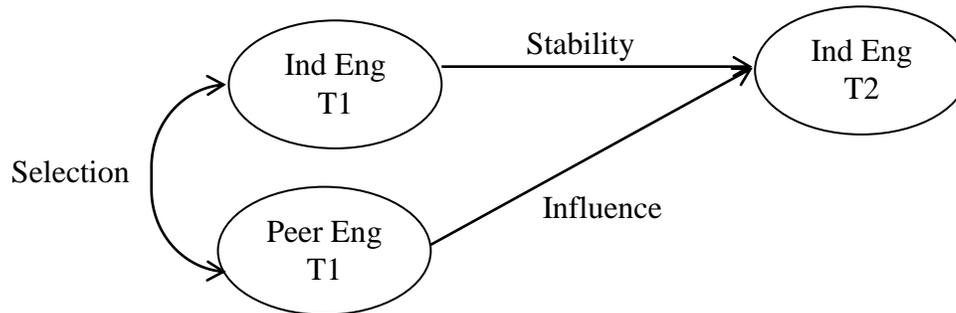
Kindermann (2007) examined peer influence using a longitudinal design with

two time points after accounting for *selection effect* as well as *stability*. Selection effect refers to children's tendency to choose similar others as their peers (*assortativeness*; Kindermann, 2007). This initial similarity between individuals and their peers needs to be taken into consideration prior to estimating peer influence. Kindermann (2007) estimated selection effect by examining the correlation between an individual's engagement and his/her peers' engagement at time 1 shown in Figure 1.

Another factor that needs to be considered when evaluating peer influence is *stability*. Stability refers to how individuals' initial status tends to affect their later condition. For example, initially motivated children are more likely to be motivated later on whereas initially disaffected children are more likely to stay disaffected. This stability within individuals is also called *auto-correlation* in longitudinal data analysis. This *within-person stability* was calculated based on the correlation between individuals' engagement at time 1 and time 2 (Kindermann, 2007; See Figure 1).

Kindermann examined how peers' initial engagement level affected individual children's engagement change over time. Peer influence was measured after accounting for the initial similarity between individuals and their peers, as well as within-person stability for each individual.

Figure 1. Peer influence after controlling for selection effect and stability



Note. Ind Eng refers to an individual's engagement score, Peer Eng refers to a peer's engagement, T1 refers to time 1, and T2 refers to time 2.

Summary. Kindermann (2007) was able to measure each student's engagement level more reliably by using teacher-reports of student engagement instead of using self-reports. At the same time, SCM captured the naturally occurring peer groups for each student and allowed examination of peer group influence on students' classroom engagement. Finally, Kindermann used a longitudinal design to evaluate peer influence on children's motivational development by effectively controlling for selection effect and within-person stability.

Limitations of Current Strategies

Although Kindermann's (2007) study provided a valuable framework to examine peer influence, there are still limitations to this framework. The limitations include the use of a relatively homogeneous sample, as well as assumptions about *peer group homogeneity* and *homogeneous peer influence*.

Homogeneous sample. Most participants from Kindermann's (2007) study were European American children from middle-class families. Additionally, much of the previous literature examining peer influence on children's engagement involved

relatively homogeneous samples, consisting mainly of European American children (e.g., Molly et al., 2011; Kindermann, 2003; 2007). It is difficult to know whether the findings from these studies would be applicable to ethnic minority children with low SES who are most at risk for underachievement.

Assumption of homogeneous peer influence. Kindermann (2007) used peer group average engagement to predict individuals' engagement change. The use of peer group mean engagement assumes that all the peers have *equal (homogeneous) influence* on individuals' motivational development. It is possible that some peers may play a more important role for adolescents' development than others. For example, strongly connected peers may affect each other's development to a greater extent than weakly connected peers (*differential peer influence*). Peers who interact more frequently can potentially influence each other's development more so than others who interact less frequently (Bronfenbrenner & Morris, 1998).

Assumption of peer group homogeneity. While peer group mean engagement can be a useful indicator to summarize overall peer group characteristics, using mean engagement ignores within-group difference in engagement (i.e., it is unlikely that all the peers have the same engagement level). This within-group *motivational diversity* can be estimated based on the *dispersion* of engagement around the mean within each student's peer group. For example, a student can have a *diversely* engaged peer group by having both highly and low engaged peers, whereas, another student may have a relatively *homogeneously* engaged peer group wherein all the peers have more or less the same engagement level.

While Kindermann (2007) accounted for peer group size and gender makeup of peer groups to control for potential gender or popularity effects, he did not account for *peer group motivational diversity*. Not accounting for this within-group motivational diversity assumes that peer group motivational diversity has no impact. The current study posits that peer group motivational diversity can influence students' motivational development by providing an opportunity to interact with diversely engaged peers.

Chapter 2: Purpose of the Present Study

The Roles of Diversity

The overarching goal of this study was to examine the roles of diversity when evaluating peer influences on adolescents' academic engagement. Three aspects of diversity were examined: *ethnic diversity* in the school, *relational diversity* between individuals in the peer network, and *motivational diversity* within peer groups.

This study utilized longitudinal data of teacher-reports on student engagement. The data were collected twice in a single school year, once at the beginning and again at the end of the school year (Fall and Spring, respectively). An entire school's peer network was assessed based on students' SCM surveys at the beginning of the school year.

The current study had three goals. The first goal was examine whether previous findings about student engagement and peer influence from ethnically homogeneous settings were also applicable to an ethnically diverse setting. The second goal was to examine the impact of *relational diversity* to see whether strongly connected peers exerted more influence than weakly connected peers (*differential peer influence*). *Relational diversity* was captured based on *z*-scores representing *strength of connection* (SC) between any two peer group members in their peer group. Finally, the third goal was to examine the impact of *motivational diversity* within students' peer groups to see whether diversely engaged peer groups were beneficial for students' motivational development, and if so, to whom it would be most beneficial.

Motivational diversity was captured by an index of *dispersion (SD)* of engagement scores within each student's peer group.

The Impact of Diversity

Van Knippenberg and Schipper's (2007) literature review on *work group diversity* suggests that there are different types of diversity and each type of diversity can have different impacts on different sub-groups. In previous literature, diversity was typically conceptualized as and referred to differences among group members. These differences can come from various sources, including demographic characteristics (e.g., gender, ethnicity, age), functional and educational attributes, and differences in values or attitudes. Much of the previous literature measured diversity either by examining individual-to-group differences or using dispersion indices (e.g., *standard deviation*) to reflect the extent to which group members are different from one another (van Knippenberg & Schipper, 2007).

Social categorization perspective. In order to understand the impact of diversity, two approaches - social categorization perspective and information/decision-making process perspective - have been employed to explain both positive and negative impacts of diversity. The social categorization perspective (Triandis, 2003) suggests that people tend to associate with similar others and feel comfortable around them while they feel uncomfortable around dissimilar others. Based on the social categorization perspective, people tend to view their in-group members more favorably than out-group members. At the same time, people tend to view out-group members as homogeneous with more negative traits than warranted, which can lead to

bias and prejudice (Hornsey, 2008; Markus & Kitayama, 1991). Based on the social categorization perspective, diversity is viewed as a potential source of conflict that can hinder group members from becoming cohesive and connected.

Homophily. Previous literature on school children and adolescents also suggests that they tend choose similar others as their peers, and this phenomenon is referred to as selection effect, homophily, or assortativeness (Mcpherson et al., 2001; Kandel, 1978; Kindermann, 2007). They tend to choose their peers based on shared characteristics, including academic interests and orientations (Hamm, 2000; Kindermann, 2007; Molly et al., 2011; Véronneau & Dishion, 2010). These similar peers may help adolescents to feel connected and belong to their groups, as well as promote their connections to other peers and teachers in class, which in turn can promote their academic development (Skinner et al., 2009; Connell et al., 1994).

Information/decision-making perspective. This perspective views group diversity as a potential source of gains and increases in social capital (Eagle, Macy, & Claxton, 2010; Kearney & Gebert, 2009) as well as increases in creativity and cooperation (Kawabata & Crick, 2011; Harell, 2010; Levitan & Visser, 2008; Sosa, 2011). Based on information/decision-making perspective, group diversity can produce more resources and divergence in thinking. Furthermore, experiences of building and maintaining these relationships with dissimilar peers can promote social skills and opportunities for growth.

Network diversity. The existing literature on adolescents and early adults suggests that there are benefits of having dissimilar peers. Kawabata and Crick (2011)

found that adolescents with cross-ethnic peers showed more leadership skills and less aggression compared to adolescents with the same-ethnic peers. The authors suggested that cross-ethnic friendships may provide an opportunity to develop social skills by learning to negotiate differences while maintaining relationships. Similarly, Harell (2010) also found young adults with cross-ethnic peers tend to be more sensitive towards racial issues and more mindful about their communication. Furthermore, individuals whose peers have diverse attitudes or worldviews engage in more critical and logical thinking (Levitan & Visser, 2008). They are also more open to new ideas and willing to change their attitudes when opposing viewpoints make logical sense. Sosa (2011) found that frequent interaction with diverse peers promotes creative thinking. Interactions with dissimilar peers can promote increased social skills, which in turn can help adolescents to relate with various peers and teachers in school. At the same time, these interactions may help adolescents to develop cognitive skills, such as creative thinking or logical thinking, which are essential for academic success.

Although much of the literature suggests benefits of having diverse peers, adolescents are more likely to associate with similar peers (McPherson et al., 2001; Hamm, 2000; Kandel, 1978). Even if they build friendships with dissimilar peers, these relationships are less likely to persist. Kawabata and Crick (2011) found that although cross-ethnic friendships promote positive development, these relationships are less likely to endure as compared with same-ethnic friendships.

Summary. The previous research examining the impact of diversity shows both positive and negative effects - positive effects explained by an

information/decision-making perspective and negative effects explained by a social categorization perspective. Many of these studies show how a particular aspect of diversity plays a role in a setting, but they do not address how different aspects of diversity can interact to affect individuals' development. The current study examined the effects of three different aspects of diversity - ethnic diversity, relational diversity, and motivational diversity - and how these different aspects of diversity can interact to affect students' motivational development.

Ethnic Diversity

The middle school where this study took place had an ethnically diverse student body, including many first-generation immigrant children from all over the world (9.1% African American, 24.1%, Latina/o, 17.9% Asian, 3.3% Native American, 41.5% European American, 3.3% multiple ethnicities, 0.7% unspecified). Faculty and staff were also ethnically diverse, including an African American principal as well as teachers and staff with varied ethnic backgrounds. The majority of children came from low socio-economic family backgrounds. This study evaluated whether previous study findings on student engagement and peer influence from a relatively homogeneous setting were applicable in this diverse middle school.

Heterogeneity across- and within-ethnic groups. Although the National Center for Education Statistics (2011) reports that ethnic minority children with low SES show poor academic achievement, research suggests that these children are not necessarily less engaged than European American children (Sciarra & Seirup, 2008; Wang & Eccles, 2012; Hao & Woo, 2012). Furthermore, research suggests that there

is substantial heterogeneity of academic outcomes across different ethnic groups and country of origin (Garcia Coll, 1996; Washbrook, Waldfogel, Bradbury, Corak, & Ghangro, 2012; Pong & Landale, 2012), as well as within ethnic groups (Garcia Coll, 1996; Pong & Landale, 2012; Hao & Woo, 2012).

Although some ethnic minority children tend to perform more poorly than European American children, there appears to be relatively small or inconsistent differences in academic motivation and engagement across different ethnic groups. Sciarra and Seirup (2008) examined three sub-dimensions of engagement - behavioral, emotional, and cognitive engagement - across five ethnic groups - Indigenous, Asian, African American, Latino, and European American children - and the results indicated descriptively rather small and inconsistent differences across the sub-dimensions of engagement across different ethnic groups. Descriptively, Asian and European American children showed slightly higher levels of behavioral and cognitive engagement compared to Indigenous, African American, and Latino children; however, all ethnic groups showed more or less the same emotional engagement level. Similarly, Wang and Eccles (2012) found inconsistent differences in sub-domains of engagement between African American and European American children using longitudinal data for students in grades seven to eleven. They found that African American children showed higher levels of school identification and subjective valuing of learning in 7th grade as compared to European American children, while European American children showed higher levels of extracurricular involvement and compliance with school rules and regulations. There were no differences in rates of change in

engagement from 7th to 11th grades when developmental trajectories between African American and European American children were compared. Overall children's engagement declined as they grew older.

While engagement level differences across different ethnic groups appear to be relatively small or inconsistent across different sub- dimensions of engagement, within group differences appear to be more pronounced, such that recent immigrant children report higher levels of academic engagement and aspirations than U.S.-born counterparts (Hao & Woo, 2012; Clotfelter, Ladd, & Vigdor, 2012). Garcia Coll and her colleagues (1996) coined the term *immigrant paradox* to refer the substantial heterogeneity of outcomes within ethnic groups, such that many immigrant children perform better academically, emotionally, and socially than U.S. born counterparts, and they are often physically healthier as well, even when they appear to face greater economic disadvantages (Washbrook et al., 2012). Thomas (2009) also found that African immigrant children academically performed better than African American children. Many of the first generation children not only perform better than their U.S. born counterparts, they also perform equally well in virtually all academic domains, except reading, when compared to European American children (Washbrook et al., 2012; Hao & Woo, 2012; Kao, 2004).

While most first generation immigrant children show higher academic motivation and achievement compared to their U.S. born counterparts as well as European American children, Mexican-born immigrant children show somewhat different patterns. Although Mexican- born children show higher academic aspiration

and engagement compared to their U.S. born counterparts, Mexican born children show lower academic achievement than their U.S. born counterparts (Pong & Landale, 2012; Hao & Woo, 2012). Pong and Landale (2012) suggests that Mexican-born children may perform poorly due to a language barrier which is reinforced by tracking practices in ELS class so that they mainly interact with other Spanish-speaking children in school (Clotfelter et al., 2012).

Relational Diversity

The current study examined whether children in this ethnically diverse middle school were well connected to their peers as compared to children in an ethnically homogenous school (Kindermann, 2003; 2007). Based on the social categorization perspective, adolescents in an ethnically diverse setting could be less well connected with one another. However, a small portion of literature suggests that when there are ample opportunities for cross-ethnic friendships to form, children can nonetheless form cross-ethnic friendships as well as the same ethnic-friendships, and therefore they tend to have more ethnically diverse friends (Knifsend & Juvonen, 2014). Similarly, children from the current study may have ethnically diverse peer groups since this school is ethnically diverse and therefore provides ample opportunities to build cross-ethnic peer relationships. In this school, there was no single dominant ethnic group (9.1% African American, 24.1% Latina/o, 17.9% Asian, 3.3% Native American, 41.5% European American, 3.3% multiple ethnicities, 0.7% unspecified), which could lead to more equal power distribution across different ethnic groups and reduce conflicts, which in turn could promote positive cross-ethnic peer relationships

(Knifsend & Juvonen, 2014). All of these factors could help adolescents to be well connected with one another throughout the entire peer network.

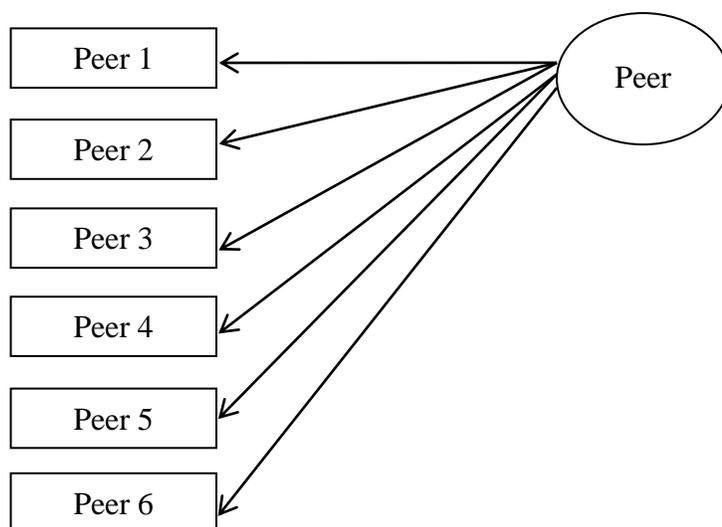
In order to identify a comprehensive peer network of all the participants, socio-cognitive mapping (SCM) was employed. Previous studies examining peer influence using SCM first identified all the peer group members for each student. All the peer group members' engagement scores were then averaged to calculate each student's peer group mean engagement score, and this mean engagement score was used to predict an individual's engagement change (e.g., Kindermann, 2007; Molly et al., 2011). The use of the peer group mean engagement assumes that all peers exert an *equal (homogeneous) influence* on an individual's motivational development.

Differential peer influence. Not all peers may exert equal influence; instead it is possible that some peers may exert more influence than others (*differential peer influence*). For example, peers who interact more frequently may influence each other more by engaging in more frequent proximal processes which could lead into a greater influence on each other's development over time (Bronfenbrenner & Morris, 1998). The current study explored whether strongly connected peers exerted more influence than weakly connected peers based on *strength of connection* (SC) between two individuals. In order to examine this *differential peer influence* hypothesis, the present study employed three methods: One was the use of *weighted peer mean engagement score*, and another was to compare each peer's *influential power* (based on *factor loadings*) using structural equation modeling (SEM). Finally, *reciprocal differential influence* was examined using multi-level modeling.

Structural equation modeling. One of the common uses of SEM is to create a *latent factor* from a set of *observed items* which consist of an *overarching construct*. This is referred to as a *measurement model*. For example, researchers may use a number of survey questionnaires to estimate students' engagement. A latent factor *engagement* can be created based on the answers from multiple items which represent the engagement construct. Here, all the answers to each question are observed items which in combination create a latent construct of engagement. Usage of SEM in a measurement model allows us to estimate a latent construct after partialling out measurement error. In SEM, we can also evaluate how suitable each item is for a latent construct based on each item's *factor loadings*. In addition, the content of each item needs to be properly addressed such that it measures what it is supposed to measure (*validity*).

Latent peer factor. In order to test the *differential peer influence* hypothesis, a *latent peer factor* was created from all of the individual's peers and each peer was ordered by the rank order of strength of connection (SC). The diagram for the latent peer factor is as follows:

Figure 2. Latent Peer Factor



Note. Peer 1 represents the peer who has the highest strength of connection (SC) with an individual child. Peer 2 represents the peer who has the second highest SC with the individual, and so forth.

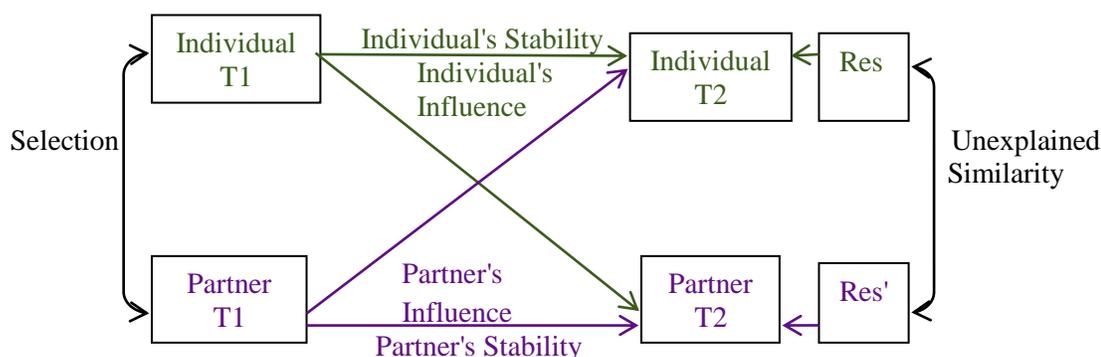
A latent peer factor was created not to evaluate whether each peer is relevant to an 'overarching peer construct', but instead to test the *differential peer influence* hypothesis to examine the magnitude of each peer's influence. In order to examine differential peer influence, factor loadings of all peers were compared. Peers with higher SC were expected to have greater factor loadings than peers with lower SC, suggesting that peers with higher SC exert more influence.

Reciprocal differential influence. Peers have reciprocal relationships in that adolescents can both influence and be influenced by their peers (Coleman, 2011). The current study examined *differential peer influence* as well as individuals' *reciprocal differential influence* on their peers. Again, individuals were expected to exert more

influence on strongly connected peers as compared to weakly connected peers (*reciprocal differential influence*). In order to examine individuals' reciprocal differential influence, multi-level modeling (MLM) was used.

Most prior studies examined peer influence in one of two ways: One is to examine how peer groups affect individuals' change over time (e.g., Kindermann, 2007; Molly et al., 2011), and the other is to examine reciprocal influence between friendship dyads. In order to examine reciprocal influence, researchers first identify friend dyads, and then simultaneously examine each friend's influence on the other after controlling for their initial similarity (selection effect) and stability, as well as the other friend's influence, using an *actor-partner interdependence model* (APIM, Kenny & Cook, 1999).

Figure 3. Actor Partner Interdependence Model



While the APIM is a useful tool to evaluate dyads' influence on each other, it is hard to evaluate how individuals affect each peer group member's change over time. In order to overcome this methodological limitation and to measure individuals' reciprocal influence on their group members, the current study employed MLM by

using a nested structure of all peer group members within an individual. Individuals' reciprocal differential peer influence was measured after accounting for all the peer group members' nestedness within individuals at time 1, and each peer group member's engagement at time 2 was predicted by the individual's engagement at time 1 after controlling for each peer's engagement at time 1.

Peer Group Motivational Diversity

Finally, the current study examined the impact of peer group motivational diversity in an ethnically diverse school. Previous literature suggests that children tend to associate with similar others based on their shared characteristics, such as ethnic backgrounds or academic orientations (McPherson et al., 2001; Hamm, 2000; Kandel, 1978).

Academic tracking. Adolescents' tendency to associate with similar others can be further reinforced by institutional practices, such as ability grouping or tracking in school (Eccles & Roeser, 2010), and these practices can lead into greater academic disparity (Oakes, 1986). Reflecting these concerns, academic tracking fell out of trend by the 1990s (Loveless, 2013). Recently, however, there has been a resurgence of academic ability grouping and tracking in educational settings (Loveless, 2013). The author suggested that policies in recent years, such as "No Child Left Behind", may have encouraged teachers to use these practices to meet educational requirements and standards set by the policy.

Eccles and Roeser (2010) suggested that academic ability tracking in secondary schools tends to bind students into a particular and limited set of academic

curriculum, teachers, and peers. Teachers in classrooms with low-achieving students may use relatively easy academic materials with the intention of scaffolding student learning; however, these curricula may be less challenging, thereby limiting learning opportunities for more engaging and challenging materials. Limitation of learning opportunities can lead to loss of motivation and engagement for adolescents.

At the same time, separate placement of students into different tracks can limit low-achieving students' opportunities to interact with high-achieving students. When they interact together, low-achieving students can observe high-achieving peers' active participation in class, and this may encourage low-achieving students to get more involved in class. It is also possible that high-achieving students may provide instrumental support by helping with class projects or working on assignments together. Segregation between high- and low-achieving students can limit opportunities for low-achieving students to interact and build relationships with high-achieving peers, thereby limiting instrumental and social support for low-achieving students.

Adolescence is a period in which children explore their identity (Erikson, 1980). Peer groups are an important resource for adolescents to get connected and feel they belong to a group, as well as to form and explore identities (Hornsey, 1981; Coleman, 2011). If low-achieving students only interact with other low-achieving students, they are likely to assume "low-achiever" as their self-concept, and this can lead into a self-fulfilling prophecy of performing poorly, thereby reinforcing a negative spiral of poor academic performance. However, if low-achieving students

have some high-achieving peers, it may buffer students' likelihood of considering themselves as "permanently" low-achiever. Instead, low-achieving students may explore a more positive academic identity along with their high-achieving peers by engaging in academic activities together or talking about pursuing further education or careers.

Peer group motivational diversity index. Previous studies examined peer group influence by using the simple peer group mean engagement score to predict individuals' engagement change. However, use of the peer group mean engagement score does not account for variability existing within peer group. The current study examined the impact of motivational diversity within peer groups.

Motivational diversity in peer groups was captured using the dispersion (SD) of peer engagement scores around the peer group mean to represent how diversely each peer group was engaged. For example, a student with a diversely engaged peer group will have peers with high dispersion (SD) around peer group mean, whereas another student with a relatively homogeneous peer group will have peers with low dispersion (SD) around peer group mean. A diversely engaged peer group represents a diverse peer network for a given child, whereas a homogeneous peer group represents a homogeneous peer network. The impact of peer group motivational diversity on adolescents' motivational development was examined to see whether diversely engaged peer groups were beneficial for initially less-engaged students' motivational development. Motivational diversity within peer groups was expected to have a beneficial impact by providing instrumental support for low engaged students from

highly engaged peers as well as promoting social and cognitive skills to negotiate differences among diverse peers.

Impact of diversely engaged peers. If low-achieving students are only interacting with low-achieving peers, they are less likely to engage in academic activities together or encourage each other to excel in their learning. However, if low-achieving students interact with high-achieving peers, these high-achieving peers may encourage low-achieving students to engage in academic activities or assist them with academic work. At the same time, high-achieving peers may help low-achieving students to get connected with other high-achieving peers or teachers in class. This may promote low-achieving students to become more motivated and engaged with classroom activities (Deci & Ryan, 1985; Connell & Wellborn, 1991; Skinner et al., 2008; 2009).

While diversely engaged peer groups might be beneficial for low-engaged adolescents, the benefits of diversely engaged peers may not be as pronounced for already high-engaged peers. It is unlikely that low-engaged peers would provide much instrumental support for high-engaged students nor encourage them to pursue academic interests. While it is unlikely for high-engaged students to get instrumental help from low-engaged peers, high-engaged adolescents may get an opportunity to practice or share what they know, thereby strengthening their knowledge and teaching skills. Additionally, building and maintaining relationships with dissimilar peers can promote development of social skills through experiences of negotiating differences (Kawabata & Crick, 2011; Harell, 2010). At the same time exposure to new and

diverse ideas can promote cognitive development of both high- and low-engaged students (Levitan & Visser, 2008; Sosa, 2011).

Hypotheses

Classroom engagement represents students' academic motivation and involvement in class, and it is important for their learning and achievement. Engagement is a malleable factor that can be shaped and influenced by environmental factors, such as parents, teachers, and peers. Children spend increasingly more time with their peers as they grow older and peers play an important role in adolescents' academic development (Kindermann, 2007).

The current study examined the roles of diversity when evaluating peer influences on adolescents' classroom engagement. As discussed earlier, previous studies examining the impact of diversity show inconsistent and mixed effects of diversity. Many of these studies often examined the impact of diversity from a single characteristic (e.g., ethnicity, SES). It is important to understand how different types of diversity interact to influence group members. The current study examined three types of diversity and how they may interact to affect peer influences on adolescents' motivational development. The three aspects of diversity that were incorporated in this study were ethnic diversity in school, *relational diversity* at the peer network based on *strength of connections* (SC), and *motivational diversity* within peer groups.

Ethnic Diversity. The first set of hypotheses examined adolescents' classroom engagement patterns in an ethnically diverse middle school where the majority of students came from low SES families to see whether previous findings from ethnically

homogeneous settings would be applicable to this ethnically diverse setting. Teacher perception of student engagement was measured using teacher reports, and the questionnaires were adapted from the Classroom Engagement measure of students' participation in academic activities (Skinner, Kindermann, & Furrer, 2009). Previous studies show that these engagement items reliably measure students' engagement and form an internally consistent indicator of engagement for ethnically homogeneous samples (Kindermann, 2007). The current study evaluated whether the engagement measure would reliably measure student engagement for an ethnically diverse sample, and whether the previous findings would be replicated in an ethnically diverse middle school.

Overall students' engagement patterns were expected to be comparable to those found in previous studies based on ethnically homogeneous samples. The engagement measure was expected to form an internally consistent indicator of engagement. Students' engagement was expected to be stable, and the engagement items would reliably measure student engagement over time. However, students would experience engagement decline over time, and students in higher grades were expected to be less engaged than students in lower grades. Kindermann's (2007) study only involved sixth graders and did not evaluate grade level differences; however, given student engagement decline patterns found within a school year as well as grade level differences found in other studies (Eccles et al., 1984; Van de gaer et al., 2009), students in higher grades were expected to be less engaged than students in lower grades. As found in previous literature, boys in general were expected to be less

engaged than girls.

Hypothesis Ia. All six engagement items will be significantly correlated to form an internally consistent indicator of students' engagement.

Hypothesis Ib. Students' engagement scores at time 1 will predict the students' engagement scores at time 2. Thus, students' engagement will be highly stable within the school year.

Hypothesis Ic. Overall, students will experience engagement decline from time 1 to time 2.

Hypothesis Id. Students at higher grade levels are expected to be less engaged than students at lower grade levels.

Hypothesis Ie. Girls are expected to be more engaged than boys at all time points, and experience less engagement decline than boys from time 1 to time 2.

The second set of hypotheses examined peer influence processes in an ethnically diverse setting to see whether previous findings (e.g., Kindermann, 2007) on an ethnically homogeneous sample would be replicated in an ethnically diverse middle school. The first question was whether adolescents in an ethnically diverse school were as well connected as adolescents from ethnically homogeneous settings. The second question was whether overall peer group engagement levels predict adolescents' engagement change over time as shown in previous studies (Kindermann, 2007).

Relational diversity. Based on the social categorization perspective, adolescents in an ethnically diverse setting would be less well connected with one another and experience increased conflicts. However, a small portion of literature suggests that when there are ample opportunities for cross-ethnic friendships to form, children tend to have more ethnically diverse friends (Knifsend & Juvonen, 2014). The participants in this study were from ethnically diverse middle school where there was no single dominant ethnic group (9.1% African American, 24.1% Latina/o, 17.9% Asian, 3.3% Native American, 41.5% European American, 3.3% multiple ethnicities, 0.7% unspecified), which could lead to more equal power distribution across different ethnic groups and reduce conflicts, which in turn could promote positive cross-ethnic peer relationships (Knifsend & Juvonen, 2014). All of these factors could help adolescents to be well connected with one another throughout the entire peer network.

Each student's peer group members were identified based on socio-cognitive mapping, and only the significant connections were considered to indicate peer group members. In order to examine the first question of whether adolescents in this ethnically diverse school were well connected to one another, overall peer group size for all adolescents was compared to the previous findings based on an ethnically homogeneous sample. Students in this ethnically diverse school were expected to have as many peers as found in Kindermann's (2007) study based on an ethnically homogeneous sample.

The second set of hypotheses also examined peer influence patterns in the ethnically diverse school to see whether peer groups played an important role on

adolescents' motivational development, as found in previous studies based on ethnically homogeneous samples (e.g., Kindermann, 2007, Molly et al., 2011). In order to examine peer influence patterns, *selection effect* and *socialization effect (peer influence)* were examined. Consistent with previous findings, students were expected to select peers who were similarly engaged as themselves (e.g., Kindermann, 2007, Molly et al., 2011). Also consistent with previous findings, the average engagement levels of peer group members were expected to predict children's own engagement change over time (e.g., Kindermann, 2007, Molly et al., 2011).

Hypothesis IIa. Students in an ethnically diverse school will be well connected to their peers as compared to students in an homogeneous school.

Hypothesis IIb. Students will select peers with similar engagement levels as their own (selection effect).

Hypothesis IIc. Peer group mean engagement at time 1 will significantly predict individuals' engagement at time 2, after controlling for the initial engagement similarity between individuals and their peer group (selection effect) and individuals' engagement stability.

The third set of hypotheses examined the impact of *relational diversity* among peer group members to see whether strongly connected peers exerted more influence than weakly connected peers based on *strength of connections (SC) (differential peer influence hypothesis)*. Not only can adolescents be influenced by their peer group members, but they can also influence their peer group members. Again, individuals

were expected to influence on peers to whom they were strongly connected (Individuals' *reciprocal differential influence*).

Hypothesis IIIa. Peers with higher SC will exert more influence on individuals' engagement change (*differential peer influence*).

Hypothesis IIIb. Not only are individuals influenced by their peers, they also influence their peers (*reciprocal influence*). This reciprocal influence is expected to be greater for strongly connected peers (*reciprocal differential influence*).

Motivational diversity. The final hypothesis examined the impact of peer group *motivational diversity* on adolescents' motivational development. The interaction effect between adolescents' initial engagement and peer group motivational diversity was examined to see whether the positive impact of motivational diversity was greater for initially low engaged students.

Hypothesis IV. Peer group motivational diversity will have a positive impact on students' engagement at time 2 for initially low engaged students.

Chapter 3: Research Designs and Methods

This study utilized part of a longitudinal data set collected for a larger study (Skinner, Chi, & the LEAG, in press). The study first launched in Fall 2007 and the data collection was completed in Spring 2012. The data were collected twice a year - once in the beginning of the school year and again at the end of the school year - for five consecutive years. For the current study, only data from year two (measurement points 3 and 4) were utilized.

Students and teachers from an urban middle school in the US Pacific Northwest participated in this study. Students were asked to complete surveys about their peer group composition and their school experience. Teachers were asked to complete questionnaires about their students' school experience.

Participants

There were 285 sixth, seventh, and eighth graders who participated in an SCM assessment at the beginning of the study. The participants included slightly more girls (54%), and younger students participated more than older students (112 sixth, 96 seventh, and 77 eighth graders).

Students reported peer groups they observed day to day in school. Six Science teachers at the school provided information on students' engagement through a survey questionnaire. All the Science teachers indicated that they knew each student well and interacted with their students on a daily basis. While all six teachers reported about their students' engagement ($N = 382$) in the beginning of the school year, one of the seventh grader teachers couldn't participate at the end of the school year survey, which

resulted in loss of student engagement data at time 2 ($N = 239$). 207 students had teacher engagement reports at both time points.

The age of the students ranged from 11 to 14 ($M = 12.38$, $SD = .94$) at the beginning of the study. The majority of students were ethnic minorities, including many first-generation immigrants: 58.5% in total (9.1% African American, 24.1%, Latina/o, 17.9% Asian, 3.3% Native American, 41.5% European American, 3.3% multiple ethnicities, 0.7% unspecified). Many of the students came from families with low SES (83.3% of students qualified for either free or reduced price lunch meals).

Design and Procedure

The larger longitudinal study had the support of Portland Public Schools and the school principal, and was reviewed by the Portland State University Human Subject Review Committee (HSRC). The current study was also reviewed by Portland State University HSRC. In the larger study, researchers invited all students to participate in the study by sending out a letter and a consent form for their parents to review. The letter explained the nature of the study. A consent form assured that students were free to choose to participate, and also there would be no penalty in withdrawal from participation. The letter and the consent form were written in both English and Spanish since the parents of many students in the school were first-generation immigrants. The school generally provided information on translators or a non-profit center to assist parents who required help. Only students who brought back their consent form with granted permission participated in the study.

Teachers were free to choose participation in the study. All the teachers

expressed their willingness to participate in the study; however, one of the teachers at the second time point could not complete the survey questionnaires due to schedule conflicts. Teachers completed their questionnaires and dropped them in a designated mailbox at school or handed them to the research assistants. As a small token of appreciation, the teachers received a gift card that was worth approximately 15 dollars which could be used in a local store.

The administration of the student surveys was planned and scheduled with the class teachers in advance. Questionnaires were administered to students during class time by two to four trained interviewers. Before students received their surveys, researchers introduced themselves and explained the nature of study and the goals of the study. Students were again assured that they were free to participate and only to share information they wanted to share. They were also assured that the information shared would be kept anonymous and no personal information would be shared.

There was no deception involved in this study, so there was no formal debriefing process. Students and teachers were thanked for their participation at the end of survey administration. Also, as part of on-going collaboration efforts between the middle school and the university, researchers visited the school or participated in collaborative presentations in public from time to time even after completion of the data collection to support students' learning and to provide feedback on the results of the studies.

Measures

The data included *teacher reports* on each student's classroom engagement

and *student observer reports* on peer groups of all the students in school.

Classroom Engagement

Students' engagement was measured via teacher reports. The teacher reports were adapted from the Classroom Engagement measure of students' participation in academic activities (Skinner, Kindermann, & Furrer, 2009). The original measure was designed to evaluate teachers' perception of each student's engagement level (Wellborn, 1991). The measure consists of two underlying dimensions of engagement: behavioral and emotional engagement. Previous studies showed that these two components of engagement (behavioral and emotional engagement) were moderately correlated ($r = .31$, $n = 144$; Kindermann, 2007), and they were reliably measuring student engagement with high internal consistency (Cronbach's $\alpha = .95$, $n = 185$, Wellborn, 1991).

The teacher survey was conducted twice, once in the beginning and again at the end of the school year. The teacher survey for students' engagement consisted of 6 items using a Likert scale (1: not at all true, to 5: totally true), and they included both positively- and negatively- phrased items. For example, a positively-phrased item was "In general, this student puts in a lot of effort," and a negatively-phrased item was "When faced with setbacks, this student gives up." Negative items were reverse coded and averaged with positive items to calculate each student's overall classroom engagement.

The teacher survey also included both *emotional* and *behavioral* engagement items. For example, an emotional engagement item was "In general, this student likes

school," and a behavioral item was "When faced with setbacks, this student works harder." Again, all the engagement items, both emotional and behavioral engagement, were averaged to create a composite mean engagement score for each student. The complete survey questionnaire can be found in Appendix A.

Socio Cognitive Mapping

The student peer survey was conducted in order to identify all of the students' peer networks using a *socio-cognitive mapping* (SCM) assessment. In the peer survey, students were asked to report peer groups they observed in school on a daily basis. The peer group was referred as "a group of children who were hanging out together or doing things together". In the survey, students could report up to 7 different peer groups, including their own peer group(s). During the administration of the peer survey, students were encouraged to report as many peer groups as they knew, including their own peer group(s). Students were allowed to report peer groups as small as a dyad. In the survey, the same individual could be reported multiple times in different peer groups. The complete student peer survey can be found in Appendix B.

Peer Data Input File (Peer Group Member Identification Process)

During the peer data collection, students were encouraged to report peer group members' names as accurately as possible, including both first and last names. Most peer group reports had complete information about peer group members. However, about 5 % of the peer group reports (167 out of 834 peer group reports) had at least one peer group member's information incomplete or not identifiable. Some of these reports included just a first name of a peer group member (*incomplete information*),

and others included students' peers from outside of school (*non-identifiable*).

In order to identify incomplete peer nominations, the following steps were taken. At first, any incomplete names were marked separately and compared with the entire school roster in order to search for potentially matching names. Any students with the same first name, for example, were considered potential "candidates" for the incomplete nomination

Students' peer surveys and friendship reports were then cross-referenced in the following manner. If a candidate student participated in the peer data collection and also reported his/her own peer group(s), these peer group data were first cross-referenced to confirm the candidate's identification. If a candidate reported the same peer group members as shown in the incomplete peer report, then the incomplete name was replaced with the candidate's name.

However, when a candidate's own peer group information was not available (either candidate did not participate in the study or participated but did not provide his/her peer group information), then other students' reports who were co-nominated in the same peer group with the candidate were examined. If any of these co-nominated students reported the candidate's full name in their peer group, again the candidate's incomplete name was replaced with the full name.

Although they were not used as core data for this study, students also reported a list of their friends as part of the larger data collection process (refer to the last page of the student survey in the Appendix B for students' own friend reports). Students' friendship reports were utilized in a similar manner to identify incomplete peer

nominations The candidate's friend data and the co-nominated peers' friendship reports were cross-referenced to identify the candidate's full name. When they included the full name of the candidate, again the candidate's incomplete name was replaced with the full name.

Finally, if neither the candidate(s)' nor the co-nominated students' own peer group or friendship reports were available, other students' peer group nominations were cross-referenced. If a student reported a candidate's full name with the same peer group members, the candidate's incomplete name was replaced with the full name. However, the decision was made more conservatively, such that there had to be at least two other students reporting the same peer group members with full names.

Even with all the procedures discussed above, not all peer group members were readily identifiable. For example, there were two students who had the identical first and last name. They happened to be in the same classroom as well. They also appeared to be in the same peer group based on their own peer group reports. Luckily, one of the students had a nick name. When students used this nickname, it was helpful to identify whom students meant to report. Furthermore, these two children were reported in the same peer group often together, which was also helpful to identify them. However, if one of them was reported in the peer group with the legal name, that posed a challenge. In this case, the two students were randomly assigned; therefore, it is possible that some of the nominations may be incorrectly assigned. However, since these two children belonged to the same peer group based on their own reports as well as other students' reports, this did not make much difference for

the final peer data.

Some of the nominations remained unidentified even after the identification procedure was completed. This happened when the candidate's last name was inconsistently reported among various informants, although this only accounted for less than 1% of the nominations. There were two other cases which included only the first names, and no other reports provided a clue to confirm whom these peers may be; therefore, these two cases remained unidentified as well.

Outside of school peers. During the peer data collection, the interviewers encouraged students to report school children's peer groups. However, some of the students nominated outside of school peers, such as former students from the participants' school, cousins, and neighborhood adults such as big brother/big sister program volunteers. Some of the students also nominated their school teachers.

The final data included students' peers of similar age from both within and outside of the participants' school, such as former students, relatives (e.g., cousins), and neighborhood friends. However, all the adults and unidentifiable peer groups were eliminated from the final peer data. When students clearly indicated adults, such as “adult Aaron” or a school teacher’s name "Ms. So-and-so", these adults were excluded from the final peer data. One student reported two peer groups including only cartoon heroes, including “Batman”, “Superman”, and “Spiderman”, and these two peer group reports were also excluded from the final peer data. The final data were used as input for the Netjaws software program to determine each student's peer group.

Netjaws Program

The Netjaws software program was used to evaluate the significance of each pair of nominations. Netjaws was developed by Mehess and Kindermann (<http://web.pdx.edu/~thomas/measures.html>). The program incorporated Kindermann's (1993) test to evaluate significance of connection using binomial probability statistics, and it produced a *z-score* output as an index of *strength of connection* (SC) between each pair of nominees. Following is a sample of *z-score* output produced by the Netjaws program among selected participants.

Table 1

Netjaws Binomial z-score Output (rounded) among Selected Participants

Names	Ana	Bee	Cat	Don	Eda	Fay	Han	Iru	Jun	Nomination count
Ana	_	10.89	8.62	4.26	2.87	7.93	-0.48	-0.39	-0.33	7
Bee	10.89	_	22.68	9.38	2.88	14.40	1.49	2.11	-0.63	24
Cat	8.62	22.68	_	9.38	1.14	14.40	1.49	0.69	-0.63	24
Don	4.26	9.38	9.38	_	3.14	8.62	1.92	2.45	-0.31	6
Eda	2.87	2.88	1.14	3.14	_	1.63	16.11	19.49	15.99	12
Fay	7.93	14.40	14.40	8.62	1.63	_	0.73	-0.60	-0.51	16
Han	-0.48	1.49	1.49	1.92	16.11	0.73	_	15.68	12.22	16
Iru	-0.39	2.11	0.69	2.45	19.49	-0.60	15.68	_	16.77	18
Jun	-0.33	-0.63	-0.63	-0.31	15.99	-0.51	12.22	16.77	_	13
No. of informants										285
Total nominations										4,235
No. of groups generated										834

Note. Higher z-scores indicate greater strength of connection (SC) between individuals.

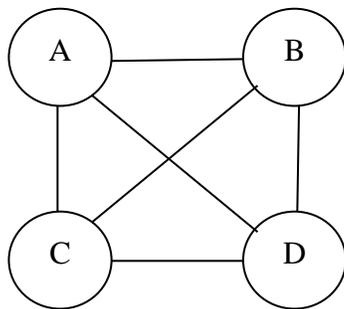
Bold-faced cells denote the significant connections between individuals at $\alpha = .01$.

Peer Group Mean Engagement

The entire school children's peer network was mapped based on the Netjaws output by including only the significant connections. The peer network included peers from both within and outside of school. Each student's peer group engagement was estimated based on the simple average of all the peers' engagement scores as a proxy to represent the overall peer group's engagement level (Kindermann, 2003; 2007). Here, engagement data of only the current students from the participants' school were used to estimate peer group mean engagement.

Even in the same peer group, each student's peer group score is different from the others' peer group scores, since peer group composition is different for each student. To illustrate how the simple peer mean engagement scores are calculated, consider a hypothetical peer group with individual students A, B, C, and D as group members. Although students A, B, C, and D are in the same peer group, their peer mean engagement score is different for each student. For example, student A's peer mean score is calculated from students B's, C's, and D's engagement scores. Student B's peer mean score is calculated from students A's, C's, and D's engagement scores, and so forth.

Figure 4. A peer group with individuals A, B, C, and D



Calculations for the simple peer mean engagement score for each individual are as follows:

$$\text{Student A's simple peer mean engagement score} = \frac{(B+C+D)}{3}$$

$$\text{Student B's simple peer mean engagement score} = \frac{(A+C+D)}{3}$$

(and so forth)

Note. The sums above refer to the sum of engagement scores, i.e. (A+B+C) is shorthand for (A's engagement score + B's engagement score + C's engagement score)

Simple versus Weighted Peer Mean Engagement Scores

Using simple peer mean engagement scores to estimate peer influence on an individual assumes that all the peer group members have an equal influence on the individual. However, when an individual student has multiple peers, some peers may have more influence than others. In order to evaluate this *differential peer influence*, *weighted peer mean* engagement scores were employed. Weighted peer mean scores were created by incorporating *strength of connection* (SC) based on the Netjaws binomial *z-score* output. When pairs of students are co-nominated frequently relative to their overall nomination frequencies, this frequency ratio leads to a higher *z-score* which indicates a stronger connection (SC) between the two. When an individual has multiple peers, some peers have a higher *z-score* than others with respect to that individual.

Weighted peer mean scores were created by weighting each peer's

engagement score by the SC between the individual and each peer. Weighted peer mean scores can be expressed mathematically as follows:

$$\frac{\sum_{i=1}^N \text{Pieng} * \text{SCi}}{\sum_{i=1}^N \text{SCi}}$$

Note. In the above equations, Pieng represents each peer's engagement score.

While the simple peer mean engagement score comes from a simple average of all the peers' engagement scores, the weighted peer mean engagement score comes from weighting each peer's engagement score by SC. The calculations of the simple peer mean engagement score and the weighted peer mean engagement score are as follows:

$$\text{Simple peer mean engagement score} = \frac{\text{P1eng} + \text{P2eng} + \dots + \text{PNeng}}{N} = \frac{\sum_{i=1}^N \text{Pieng}}{N}$$

$$\text{Weighted peer mean engagement score} = \frac{\text{P1eng} * \text{SC1} + \text{P2eng} * \text{SC2} + \dots + \text{PNeng} * \text{SCN}}{\text{SC1} + \text{SC2} + \dots + \text{SCN}}$$

$$= \frac{\sum_{i=1}^N \text{Pieng} * \text{SCi}}{\sum_{i=1}^N \text{SCi}}$$

Note. In the above equations, N is the number of peers for a given individual.

Motivational Diversity Index

In order to evaluate the impact of peer group motivational diversity on adolescents' engagement, a *diversity index* was created. The diversity index reflected the *dispersion (SD)* of engagement scores within each student's peer group. The diversity index for each student was calculated using the *standard deviation (SD)* around the simple peer mean engagement score. A higher diversity index indicates that

a student has a more diversely engaged peer group.

The following example shows how the diversity index was calculated and how each student's peer group could be considered as a relatively *diversely* or *homogenously* engaged peer group. Here, student A has two peers, students B and C. The engagement scores for students B and C are 2.2 and 4.8, respectively. Student A's simple peer mean engagement score is 3.5 ($M = (2.2+4.8) / 2 = 3.5$) and the dispersion around this mean is 1.3 ($SD = 1.3$). Now, let's compare this with student D, who has two different peers, students E and F. The engagement scores for students E and F are 3.3 and 3.7, respectively. Student D's simple peer mean engagement score is also 3.5 ($M = (3.3+3.7) / 2 = 3.5$), while the dispersion around this mean is .2 ($SD = .2$). While students A and D have the same peer group mean engagement ($M = 3.5$), student A has a more diversely engaged peer group ($SD = 1.3$) than student D ($SD = .2$).

Chapter 4: Analysis Plan & Results

The data analyses involved examining students' overall classroom engagement patterns and then evaluating the impact of peers and peer group characteristics on classroom engagement. Prior to the data analyses, missing data patterns on classroom engagement were examined.

Missing Data on Academic Engagement

Each student's engagement score was constructed based on the composite mean of all six engagement item responses. In order to create the composite mean for students with incomplete responses, missing data patterns were first examined. Missing values were examined both variable-wise and case-wise to evaluate whether the missing data were missing completely at random (MCAR), missing at random (MAR), and missing not at random (MNAR).

The results indicated that student engagement data were missing not at random (MNAR) since one of the sixth grader teachers ("Teacher A") did not report all her students' engagement scores at time 2. Preliminary analyses were conducted to see whether engagement of Teacher A's students were different from the rest of the students at time 1. The results indicated that Teacher A's students were slightly more engaged ($M = 3.97$, $SD = .92$) compared to the rest of the students ($M = 3.93$, $SD = .98$); however, this difference was not significant ($p = .87$). While less than 6 percent of students were missing their engagement scores at time 1, about 40 percent of students were missing their engagement scores at time 2. However, only 1.36 percent of students were missing engagement scores at both time points.

Although the preliminary results indicated that the missing data appeared comparable to the rest of the data, the missing data could not be considered missing at completely at random. Therefore, overall classroom engagement patterns were examined based on both imputed data and non-imputed data using case-wise deletions, and both results were compared. For imputation, expectation maximization (EM) methods were used from SPSS missing value analysis (MVA). The EM methods use variance and covariance information among variables to estimate the missing patterns and to replace the missing values (Tabachnick & Fidell, 2007). The EM methods were used to estimate missing data only if teachers provided some of the responses on students' engagement for least at one time point. However, for students without any engagement responses at either time point (1.36%), their engagement scores were not imputed.

For evaluation of peer influence on student engagement, missing values were estimated using a full information maximum likelihood procedure (FIML) when SEM was employed for hypothesis testing using AMOS software. However, when individuals' reciprocal influence on peers was evaluated using R software program, case-wise deletions were used.

Classroom Engagement Analyses

The teacher surveys were used to evaluate students' classroom engagement. The survey was designed to measure the responding teacher's perception of each student's engagement levels. These teacher-reported student engagement items included both behavioral and emotional engagement items, with a total of six items.

The first set of hypotheses aimed to examine classroom engagement patterns in a diverse setting using the statistical program SPSS.

To examine classroom engagement patterns, composite mean engagement scores were created for each student using all six items. Prior to creating the composite mean engagement scores, Cronbach's α was examined in order to evaluate the internal consistency of the engagement measure. Previous research suggested a high internal consistency of these engagement items, implying that they were measuring students' classroom engagement reliably; however, the previous research took place in a relatively homogeneous setting where most of the participants were European American children from middle-income families (e.g., Kindermann 2003; 2007). The current study took place in an ethnically diverse setting where a majority of students were ethnic minorities, including many first generation immigrants with low SES. Therefore, the reliability of this engagement measure was reevaluated in this new setting prior to the hypothesis testing.

Hypothesis Ia. All six engagement items will be significantly correlated to form an internally consistent indicator of students' engagement.

In order to test *Hypothesis Ia*, Cronbach's α was examined for all six engagement items at both time points. The results indicated that the engagement measure was indeed reliably measuring classroom engagement of ethnically diverse adolescents (Cronbach's $\alpha > .90$ for time 1 and 2 using both imputed and non-imputed data), which would suggest the adequacy of using composite mean engagement scores.

All of the inter-item correlations among all six items were greater than .50, and significant at $\alpha = .05$. The tables below show the results based on both case-wise deletion and imputation. Both results were overall comparable.

Table 2-1

Summary of Student Engagement in Fall and Spring Using Case-Wise Deletion

Number of items	Cronbach's α		Fall (T1)		Spring (T2)		r T1 & T2	Sig P
	T1	T2	M	SD	M	SD		
6	.93	.94	3.93	.98	3.80	1.05	.61	< .001

Note. T1 $N = 382$, T2 $N = 239$. Scores ranged from 1-5, 5 being the most engaged.

Table 2-2

Summary of Student Engagement in Fall and Spring Using Imputed Data

Number of items	Cronbach's α		Fall (T1)		Spring (T2)		r T1 & T2	Sig
	T1	T2	M	SD	M	SD		
6	.93	.94	3.93	.96	3.76	.81	.70	< .001

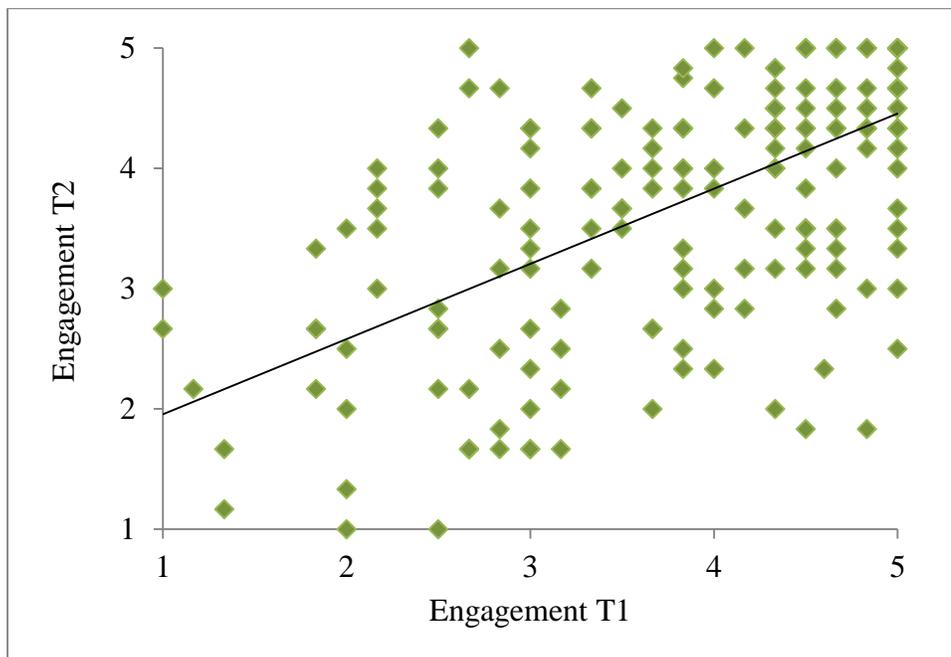
Note. $N = 408$ for both time points. Scores ranged from 1-5, 5 being the most engaged.

Sixth, seventh, and eighth graders in this ethnically diverse middle school were overall highly engaged across time ($M = 3.93$ at T1, $M = 3.80$ at T2 using case-wise deletion on a 5-point scale, 5 being the most engaged). These results were fairly comparable to previous findings based on an ethnically homogeneous sample of mostly European American sixth graders from Kindermann's (2007) study ($M = 3.25$ at T1, $M = 3.09$ at T2 on a 4-point scale, 4 being the most engaged).

Hypothesis Ib. Students' engagement scores at time 1 will predict the students' engagement scores at time 2. Thus, students' engagement will be highly stable within the school year.

To test *Hypothesis Ib*, a correlation of student engagement at Fall (T1) and Spring (T2) was examined. Student engagement at time 1 significantly predicted engagement at time 2, and this positive relation was stronger using imputed data ($r = .70, p < .001$), as compared to case-wise deleted data ($r = .61, p < .001$). Overall, students who were engaged at time 1 were also engaged at time 2. The following is a scatterplot illustrating the relation between students' engagement at time 1 and time 2.

Figure 5. Correlation of Engagement at Fall (T1) and Spring (T2)



Note. $N = 208$ at both T1 and T2. Scores ranged from 1-5, 5 being the most engaged.
Hypothesis Ic. Overall, students will experience engagement decline from time 1 to

While students were overall highly engaged at both time points, in general they experienced a decline in engagement during the school year (engagement at T1: $M = 3.93$, $SD = .98$; engagement at T2: $M = 3.80$, $SD = 1.05$, $\Delta_{T1-T2} = .13$; scores ranged from 1-5, 5 being the most engaged), and this pattern was significant ($t(207) = 2.27$, $p < .05$).

Hypothesis Id. Students at higher grade levels are expected to be less engaged than students at lower grade levels.

In order to evaluate student engagement differences by grade levels, the mean differences were evaluated using one-way analysis of variance (ANOVA). The mean scores (M) and dispersions around the means (SD) for each grade level were compared across different grade levels. The analyses were conducted using both imputed data and case-wise deleted data, and the resulting patterns based on these two data sets were fairly comparable, but the results of the significance testing were somewhat different.

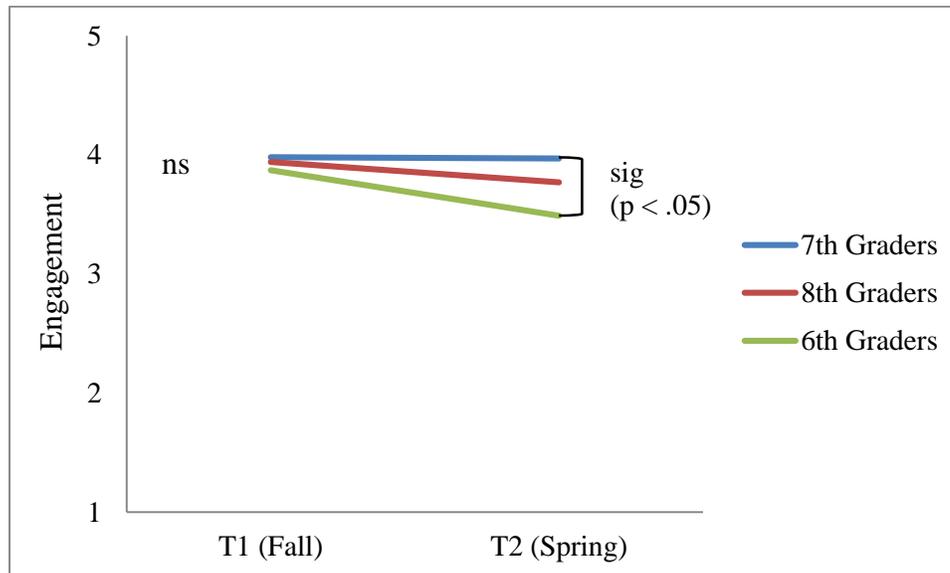
Using imputed data, the results indicated that at time 1 in Fall, although the differences were not significant, the seventh graders ($M = 4.01$, $SD = .91$) were unexpectedly the most engaged, followed by the eighth graders ($M = 3.90$, $SD = 1.02$), and then finally the sixth graders ($M = 3.89$, $SD = .95$) were the least engaged. Again although not significant, this unexpected pattern was consistent at time 2, such that the seventh graders ($M = 3.87$, $SD = .87$) were the most engaged, followed by the eighth graders ($M = 3.76$, $SD = 1.00$), and then finally the sixth graders ($M = 3.64$, $SD = .78$)

were the least engaged.

Based on data using case-wise deletion, the results indicated that at time 1 in Fall, although the differences were not significant, the seventh graders ($M = 3.98$, $SD = .97$) were unexpectedly the most engaged, followed by the eighth graders ($M = 3.94$, $SD = 1.00$), and then finally the sixth graders ($M = 3.87$, $SD = .98$) were the least engaged. This unexpected pattern was significant at time 2 ($F(2,236) = 3.29$, $p < .05$). Again, the seventh graders ($M = 3.97$, $SD = .94$) were the most engaged followed by the eighth graders ($M = 3.77$, $SD = 1.10$), and finally again, the sixth graders ($M = 3.49$, $SD = 1.06$) were the least engaged. A Bonferroni follow-up test suggested that there was a significant difference between the seventh and sixth graders ($p < .05$), in that seventh graders were significantly *more* engaged than sixth graders. Other differences were not significant.

Figure 6 represents grade level differences for student engagement at time 2 using case-wise deletion. Although the grade level difference between the seventh and sixth graders was significant, it is important to note that the mean difference was rather small ($\Delta_{M7th - M6th} = .48$).

Figure 6. Mean Engagement Differences by Grade Levels



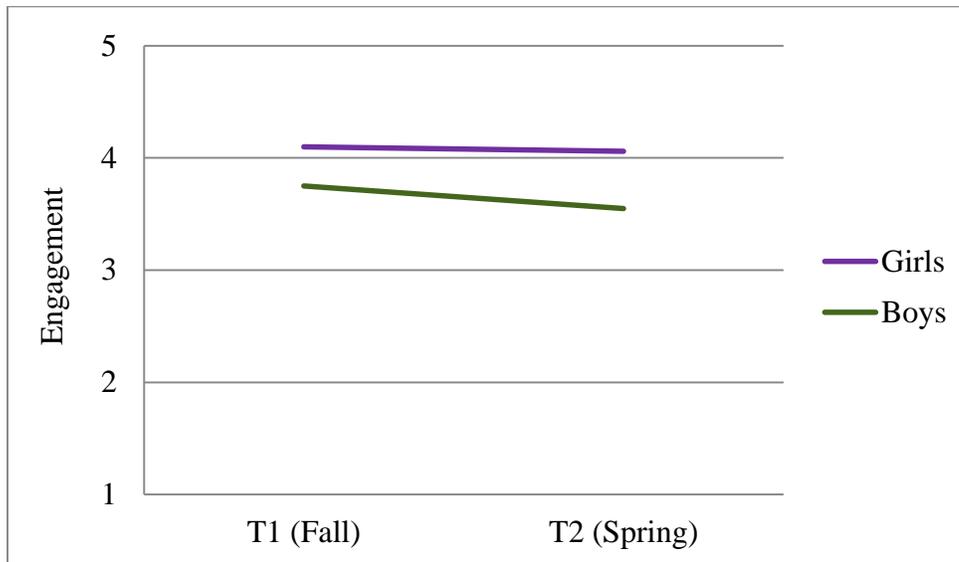
Note. $N=238$ at time 2. Scores range from 1-5, 5 indicating the most engaged.

Hypothesis 1e. Girls are expected to be more engaged than boys at all time points, and experience less engagement decline than boys from time 1 to time 2.

To test *Hypothesis 1e*, girls' engagement scores were compared to boys' engagement scores at both time points using an independent-samples t -test. The results using both imputed and non-imputed data were very close. Here the reported results were based on data using case-wise deletion. On average, girls ($M = 4.10$, $SD = .94$) were more engaged than boys ($M = 3.73$, $SD = .99$) at time 1, and this gender difference was significant ($t(365) = 3.83$, $p < .001$). Again, at time 2, girls ($M = 4.06$, $SD = .87$) were in general significantly more engaged than boys ($M = 3.55$, $SD = 1.14$) ($t(226) = 3.91$, $p < .001$).

While both girls and boys were expected to experience engagement declines, boys were expected to experience a sharper decline. Decline patterns between boys and girls were compared by predicting their engagement scores at time 2, after controlling for their initial engagement using multiple regression. The results indicated that students' initial engagement level and gender significantly predicted their later engagement level ($F(2, 205) = 64.30, p < .001, R^2 = .39$). Student initial engagement was a significant predictor their later engagement after controlling for gender ($t(205) = 10.61, p < .001$), and gender was also significant after controlling for initial engagement ($t(205) = 1.94, p = .05$). On average, boys (engagement at T1: $M = 3.73, SD = .99$; engagement at T2: $M = 3.55, SD = 1.14, \Delta_{T1-T2} = .18$) experienced slightly more engagement decline than girls (engagement at T1: $M = 4.10, SD = .94$; engagement at T2: $M = 4.06, SD = .87, \Delta_{T1-T2} = .04$). A scatterplot illustrating the relation between students' engagement at time 1 and time 2.

Figure 7. Gender Difference in Engagement



Note. $N = 205$ at both T1 and T2. Scores ranged from 1-5, 5 being the most engaged.

In sum, engagement patterns in this ethnically diverse school were fairly comparable to previous findings based on the ethnically homogeneous sample from Kindermann's (2007) study. Furthermore, the Classroom Engagement measure employed in the current study seems to measure students' engagement levels reliably in an ethnically diverse sample (Cronbach's $\alpha > .90$ for time 1 and 2).

Students in this ethnically diverse middle school were fairly engaged across all grade levels ($M = 3.93$ at T1, $M = 3.80$ at T2 on the 5-point scale, 5 being the most engaged) compared to the sixth graders who were mostly European Americans in Kindermann's study ($M = 3.25$ at T1, $M = 3.09$ at T2 on the 4-point scale, 4 being the most engaged), and they experienced only a small engagement decline during the school year ($\Delta_{T1 - T2} = .13$). Although the seventh graders were more engaged than

sixth graders at time 2, the mean difference was relatively small ($\Delta_{M7^{th} - M6^{th}} = .48$). In general, girls were more engaged than boys at both time points, and they experienced slightly less engagement decline compared to boys. Overall, given the relatively small engagement decline patterns, as well as the grade level engagement differences, students in this school seemed to stay relatively engaged as they progressed through grade levels.

Hypothesis Testing for Peer Influence

The second set of hypotheses examined peer influence processes in an ethnically diverse setting to see whether previous findings based on an ethnically homogeneous sample (Kindermann, 2007) would be replicated in an ethnically diverse setting. Prior to evaluating peer influence, the current study examined whether ethnic diversity played a role in students' connectivity and peer network composition.

While the social categorization perspective suggests that adolescents in an ethnically diverse setting would be less well connected with one another, a small portion of literature on school children suggests that children can nonetheless be well-connected with one another in an ethnically diverse school by having both the same- and cross-ethnic friends when there are ample opportunities for cross-ethnic friendships to form (Knifsend & Juvonen, 2014). Given that the participants' school was ethnically diverse with no single dominant ethnic group (9.1% African American, 24.1% Latina/o, 17.9% Asian, 3.3% Native American, 41.5% European American, 3.3% multiple ethnicities, 0.7% unspecified), there could be more equal power distribution

across different ethnic groups and reduce conflicts, which in turn could promote positive cross-ethnic peer relationships (Knifsend & Juvonen, 2014). These positive cross-ethnic relationships could help adolescents to be well connected with one another throughout the entire peer network in school.

Hypothesis IIa. Students in an ethnically diverse school will be well connected to their peers as compared to students in an homogeneous school.

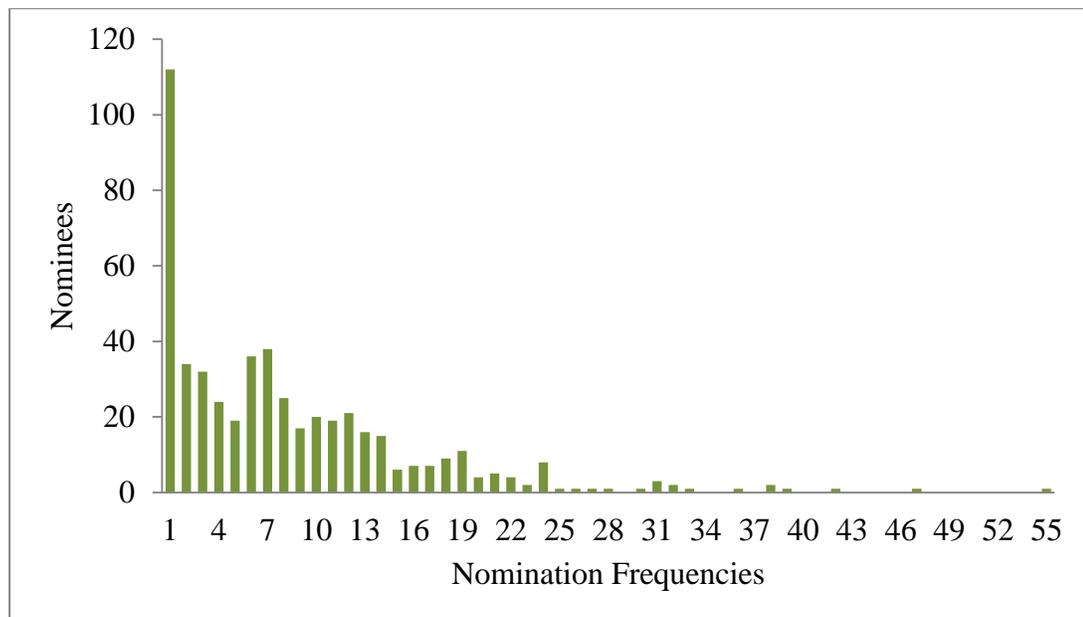
In order to examine how well adolescents were connected to one another, every student's peer network was mapped out using socio-cognitive mapping and overall peer group size was compared to the previous findings based on the ethnically homogeneous sample from Kindermann's (2007) study.

Among a total of 419 students, 285 students participated in SCM as a participant-observer by providing peer group information (68%). More girls (54%) participated in SCM and younger students participated more than older students (112 sixth, 96 seventh, and 77 eighth graders). On average, each student reported three peer groups. Students not only reported their own peer groups, but also reported other students' peer groups. This allowed the researchers to collect peer group information for students who did not participate in the study. Having a majority of students participating in SCM provided sufficient information to capture the entire peer network of all the students in the school.

The final data included 834 peer group nominations. On average, five peers were observed in each group. While students reported a total of 837 peer groups, three

peer groups were eliminated from the input data since these groups were made up of either completely fabricated peer group members ("Batman", "Superman", and "Spiderman") or just adults (school teachers). The final data included 509 nominees (out of 4,235 total nominations). Among them, 113 were peers from outside of school. On average, each nominee was nominated eight times ($M = 8.26$, $SD = 7.89$, $Min = 1$, $Max = 55$).

Figure 8. Nomination Frequencies



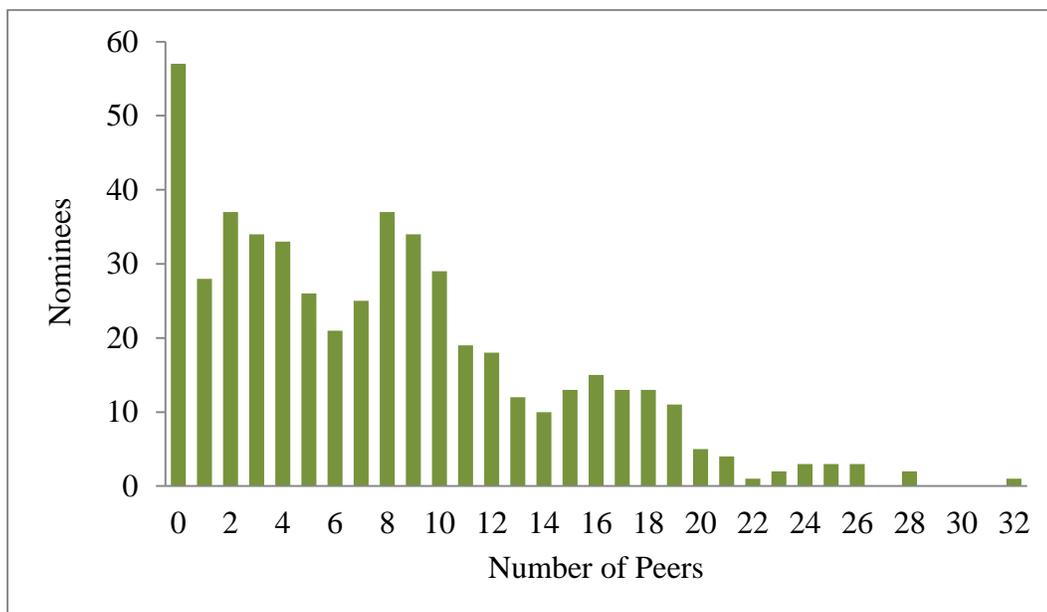
Note. $N = 509$ nominees, $N = 4,235$ total nominations.

The final data were analyzed using the Netjaws program to evaluate significant connections between each pair of nominees. Out of 509 nominees, 452 had at least one significant connection with other(s) at $\alpha = .01$. On average, nominees had

eight significant connections ($M = 7.94$, $SD = 6.36$). Note that significant connections were only accepted if each of them were nominated at least twice. Any nominees who were nominated just once were eliminated from the final peer network to avoid potentially spurious relationships among pairs of nominees.

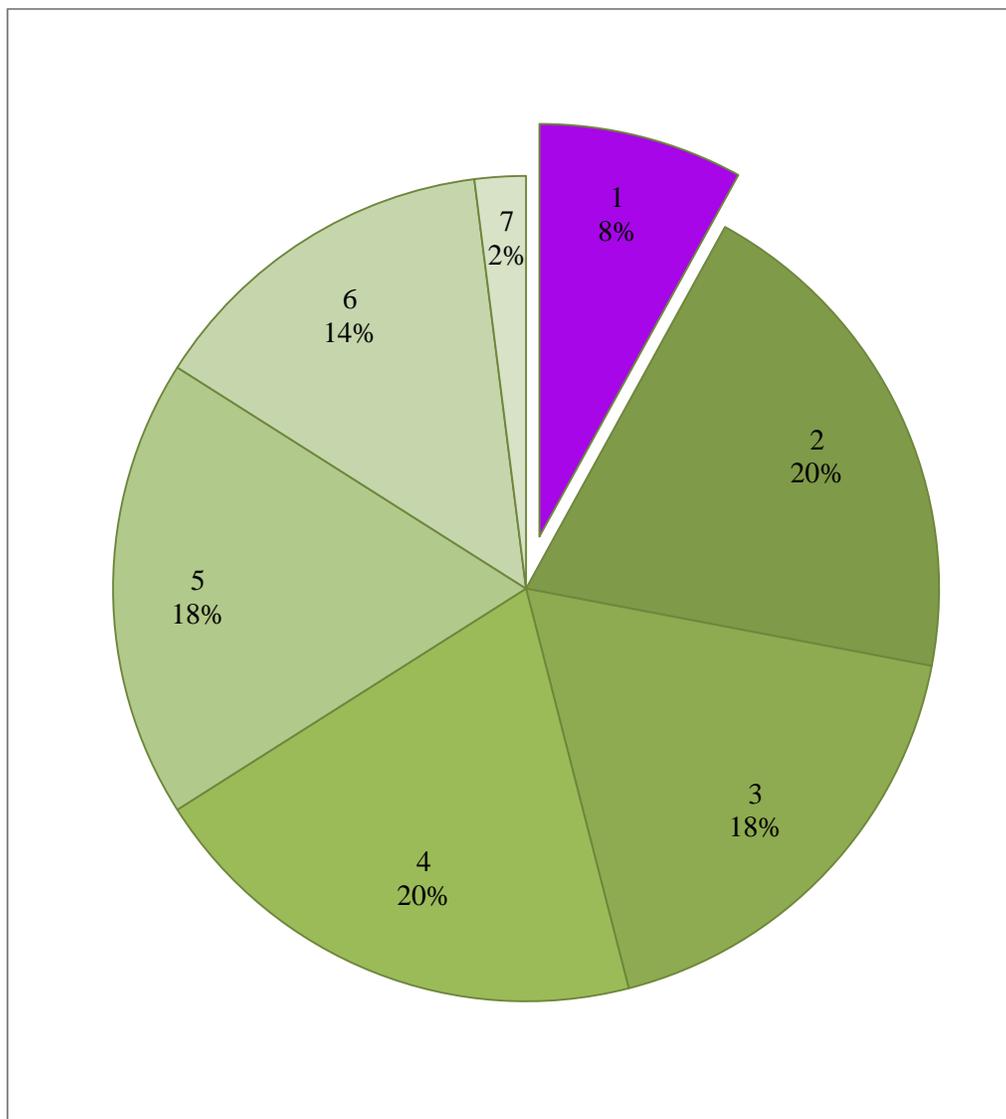
Out of 509 nominees, 396 were current students of the participants' school. Among those 396 students, 369 of them had at least one significant connection $\alpha = .01$, with an average of almost ten peers ($M = 9.92$, $SD = 6.13$, $Max = 32$, $Min = 1$). Students in this ethnically diverse school were well connected with their peers. A typical student had almost ten peers on average ($M = 9.92$) compared to previous findings on average number of peers for a typical student ($M = 4.9$) in ethnically homogeneous middle school from Kindermann's study.

Figure 9. Significant Connections (Peers)



Students tended to have peers that were of the same gender (78%) and from the same grade level (74%) as themselves. While students tended to have more peers with the same ethnic backgrounds, only a small portion of peer groups (less than 8%) were ethnically homogeneous.

Figure 10. Ethnic Diversity within Peer Groups



Note. The proportion of peer groups containing the number of ethnicities shown

The second question examined whether students tend to choose similar others as their peers. Consistent with previous findings, students were expected to select peers who were similarly engaged as themselves (selection effect).

Hypothesis IIb. Students will select peers with similar engagement levels as their own (selection effect).

In order to test *Hypothesis IIb*, a correlation between adolescents' engagement scores and simple peer mean engagement scores at time 1 was examined. Consistent with previous findings, the results indicated that adolescents' initial engagement was positively and significantly correlated with their peer group's mean engagement scores at time 1 ($r = .34, t(1,341) = 6.63, p < .001$). In general, highly engaged students were more likely to have highly engaged peers and low engaged students were more likely to have other low engaged peers. These results suggested that adolescents tended to choose peers who have similar engagement.

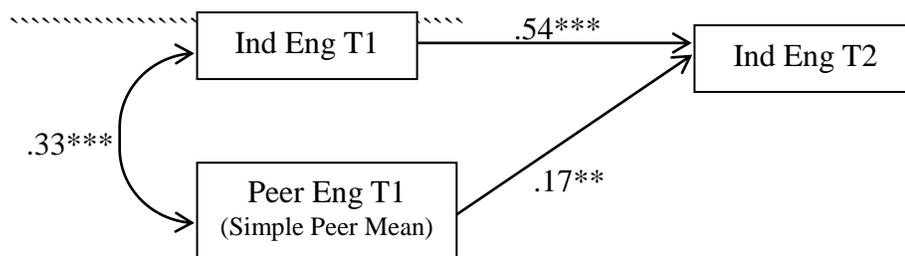
The last question from the second set of hypotheses involved whether overall peer group engagement levels predict adolescents' engagement change over time as shown in previous findings based on ethnically homogeneous samples. Consistent with previous findings (e.g., Kindermann, 2007; Molly et al., 2011), the average engagement levels of peer group members were expected to predict students' own engagement change over time (peer influence).

Hypothesis IIc. Peer group mean engagement at time 1 will significantly predict

individuals' engagement at time 2, after controlling for the initial engagement similarity between individuals and their peer group (selection effect) and individuals' engagement stability.

In order to test *Hypothesis IIc*, individuals' engagement scores at time 2 (DV) was predicted from simple peer mean engagement scores at time 1, after controlling for their initial similarity (selection effect) and stability within individuals (the correlation between time 1 and time 2 for individuals' engagement scores). The results indicated that peer group mean engagement at time 1 significantly and positively predicted individual students' engagement at time 2 (standardized $\beta = .17, p < .01$) after controlling for selection and stability effects. These results were fairly comparable to previous findings from Kindermann's (2007) study that peer group mean engagement at time 1 significantly and positively predicted individual students' engagement at time 2 (standardized $\beta = .13, p < .05$). Adolescents chose similar others as their peer group members (selection effect), and overall peer group initial engagement level affected adolescents' motivational development during the school year (peer influence).

Figure 11. Peer Influence after Controlling for Selection and Stability Effect



Note. $N = 375$. *** $p < .001$; ** $p < .01$; * $p < .05$.

In sum, adolescents in this ethnically diverse middle school were well connected with one another. Peer group influence patterns in this ethnically diverse setting were consistent with previous findings based on ethnically homogeneous samples (e.g., Kindermann, 2007; Molly et al., 2011). While adolescents in this ethnically diverse setting chose peers with diverse ethnic backgrounds, nonetheless, they still tended to choose similar peers based on academic engagement and orientation. Furthermore, overall peer group engagement levels were still an important predictor for adolescents' motivational development, and this peer influence pattern was consistent with previous findings based on ethnically homogeneous samples.

Hypothesis Testing for Differential Peer Influence

The third set of hypotheses examined the impact of *relational diversity* to see whether strongly connected peers exerted more influence than weakly connected peers (*differential peer influence*) based on *strength of connections* (SC) between individuals. Not only could adolescents be influenced by their peers, but they also could influence their peers (*reciprocal influence*). Individuals' reciprocal influence on their peers was also examined. Again, individuals were expected to exert more influence on peers with whom they were strongly connected (*reciprocal differential influence*).

Hypothesis IIIa. Peers with higher SC will exert more influence on individuals' engagement change (*differential peer influence*).

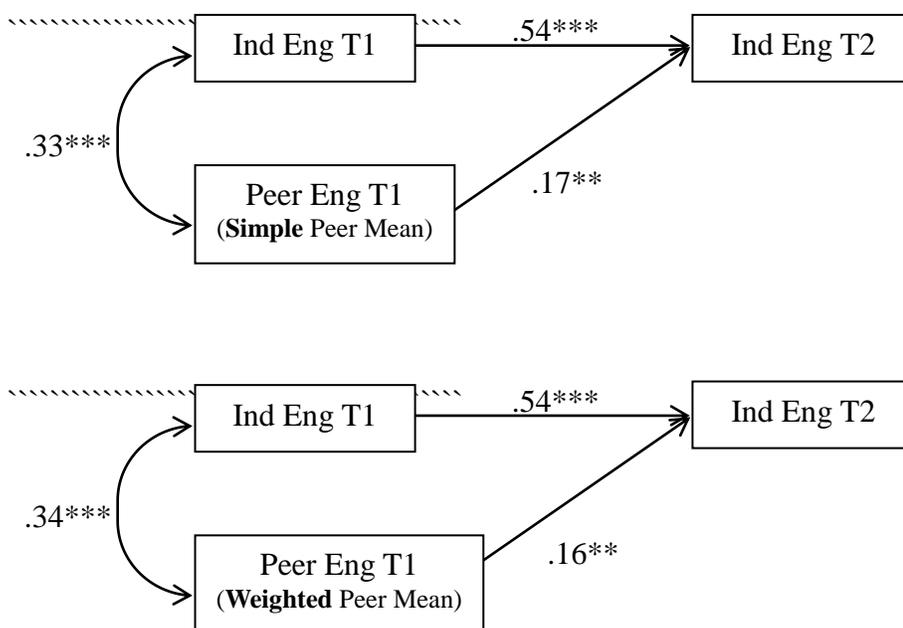
In order to examine *differential peer influence*, two methods were used. One

was comparing the predictive powers (β) between simple peer mean engagement and weighted peer mean engagement in predicting individuals' engagement change. The other method was based on a latent peer factor created using SEM. Peers with higher SC were expected to have higher factor loadings on the latent peer factor in predicting individuals' engagement at time 2.

The first method involved comparing predictive powers (β) between simple peer mean engagement at time 1 and weighted peer mean engagement at time 1 in predicting individuals' engagement at time 2, after controlling for selection effect and individuals' stability effect. Simple peer mean engagement was an average engagement score among all the peers, and assumed *equal (homogeneous) influence* of all peers. By contrast, the weighted peer mean engagement incorporated strength of connection (SC) between individuals and each peer, thereby assuming that peers with high SC disproportionately exerted more influence (*differential peer influence*).

Based on the results, the differential peer influence hypothesis was not supported. There was not a significant difference in predictive powers between simple peer mean engagement and weighted peer mean engagement in predicting individuals' engagement change. Instead, predictive powers between the two models were rather similar ($\beta = .17$ for simple peer mean engagement, $\beta = .16$ for weighted peer mean engagement) in predicting individuals' engagement at time 2, after controlling for selection effect and individuals' stability.

Figure 12. Non-significant Findings on Differential Peer Influence



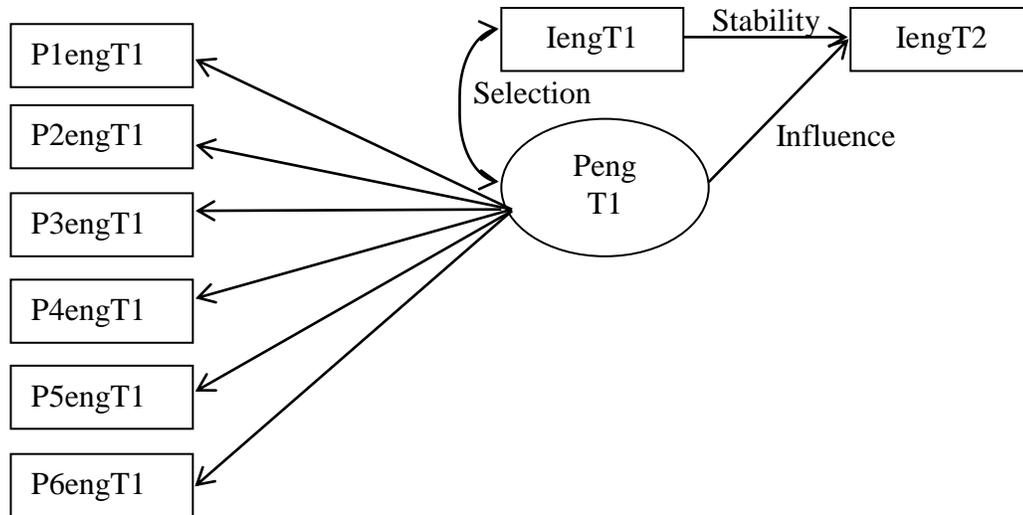
Note. $N = 375$. **** $p < .001$; ** $p < .01$; * $p < .05$.

Differential peer influence was also evaluated by comparing the factor loadings (λ) of each peer on a latent peer factor. Structural equation modeling (SEM) was conducted using the statistical program AMOS to compare the factor loadings of each peer on the latent peer factor.

All the peers were ordered reflecting *strength of connection* (SC) between the individual and each peer. "P1" represents the peer with the highest SC, "P2" represents the peer with the second-highest SC, and so forth. Up to six peers with the highest SC were included, and any further peers were excluded. Some of the adolescents had fewer than six peers. For those, missing peers' engagement scores were imputed using FIML in AMOS. Based on these 6 peers' engagement scores, a latent peer factor was constructed as "PengT1" reflecting the overall peer group's engagement at time 1. In

this analysis, selection effect was included by correlating "PengT1" and individuals' engagement at time 1. Stability effect was also included by correlating individuals' engagement at time 1 and time 2.

Figure 13-1. Latent peer factor (PengT1)



Note. Here Ieng represented an individual's engagement. Peers were ordered by their strength of connection (SC), "P1" indicating the peer with highest SC. "P1eng" therefore represented engagement of the peer with highest SC.

To examine *differential peer influence*, each peer's factor loading on the latent peer factor "PengT1" was examined. The factor loading was expected to be greatest for "P1engT1", second-greatest for "P2engT1", and so forth. Firstly, model fit was evaluated by examining χ^2 and other fit indexes. χ^2 examines the exact model fit to data. Ideally, χ^2 would not be significant, which means there is no significant difference between observed data and the hypothesized model, thereby indicating a good model fit. In reality, however, χ^2 can be often significant when the model fit is reasonable or even good (based on other fit indices), since χ^2 is fairly sensitive to

sample size or violations of the multivariate normality assumptions. Therefore, often other fit indexes are examined as well to evaluate the model fit.

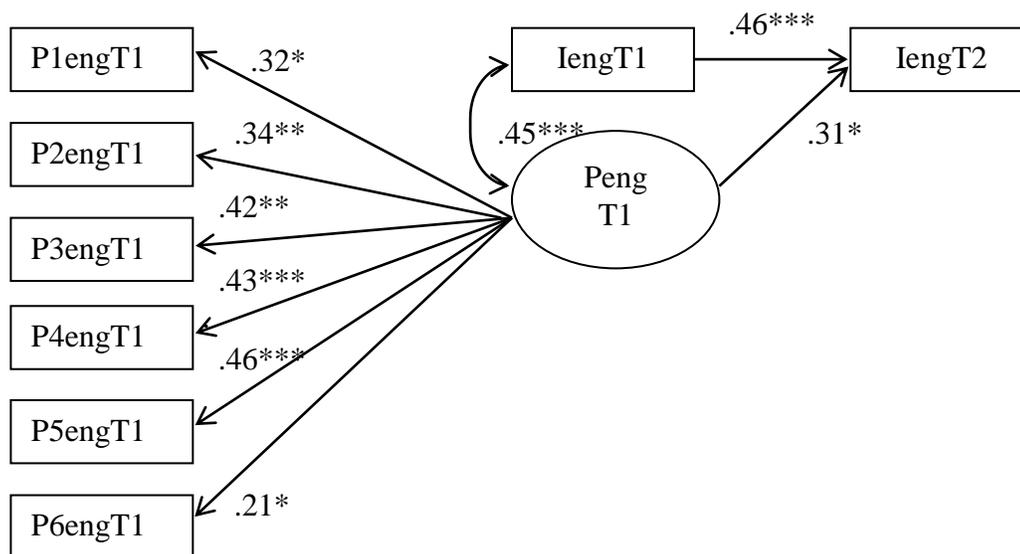
The CFI stands for the *comparative fit index*. Although the CFI and χ^2 both evaluate model fit index by examining the discrepancy between observed results and the hypothesized model, the CFI accounts for sample size. The CFI ranges from 0 to 1, and usually $CFI > .95$ is considered as indicating a good fit. The RMSEA is the *root mean square error of approximation*. The RMSEA implies the discrepancy between the data and the model per degree of freedom. Therefore, RMSEA not only accounts for sample size but also accounts for model complexity by penalizing a complex model. Here a smaller RMSEA is desirable, $RMSEA < .05$ indicates a "close fit" and $RMSEA > .10$ indicates a "poor fit", and $.05 < RMSEA < .10$ indicates a somewhat adequate fit.

The results indicated that the hypothesized model had a good fit to the data. When χ^2 was examined to evaluate model fit, the results indicated a non-significant discrepancy to the exact model ($\chi^2_{M(19)} = 22.989, p = .24$). Other fit indexes also indicated a good fit of the hypothesized model to the data ($CFI = .977, RMSEA = .024$).

However, the *differential peer influence* hypothesis was again not supported based on latent peer factor analysis results. The differential peer influence hypothesis assumed that the factor loading would be greater for peers with higher SC, which would suggest that strongly connected peers exert more influence on adolescents' engagement change. The analysis results indicated that the factor loadings of each peer

for the latent peer factor (PengT1) did not necessarily increase as SC increased. On the contrary, in general peers with lower SC had descriptively somewhat greater factor loadings. But this pattern was not always consistent either. For example, the peers with lowest SC (P6engT1) had the lowest factor loading ($\lambda = .21, p < .01$).

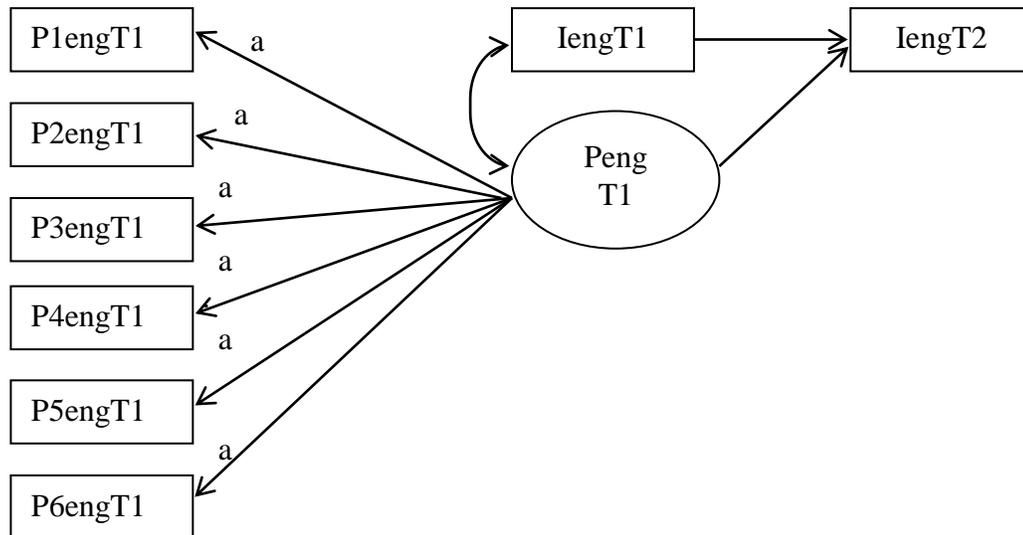
Figure 13-2. Non-significant Findings on Differential Peer Influence



Note. $N = 370$. $\chi^2_{M(19)} = 22.989, p = .24$; CFI = .977, RMSEA = .024 (90% CI: .000 - .054), *** $p < .001$; ** $p < .01$; * $p < .05$.

Further analyses showed that there was *not* a significant difference in peer influence levels among all the peers. In these further analyses, all the peers' factor loadings were *constrained to be equal* to one another, which would assumed *homogeneous* peer influence (equal influence of all the peers). If there was differential peer influence among peers, this *artificial constraint* should result in a significantly poor model fit, as compared to the model where each peer's factor loading was free to be estimated separately.

Figure 14. Constraints on Peers' Factor loadings



Again, the results did not support differential peer influence. With the differential peer influence hypothesis, the artificial constraints of all the peers' equal factor loadings was expected to result in a significantly poor fit of the model; however, the results indicated that these artificial constraints did not result in a significantly poor fit ($\chi^2_{M(24)} = 28.194, p = .25$). The results examining model fit difference between this constrained model and the earlier model where each peer's factor loadings were free to estimated separately indicated a non-significant difference between these two models ($\Delta\chi^2_{M(5)} = 5.205, p = .39$).

Based on the results of differential peer influence testing using both a comparison of simple peer means and weighted peer means as well as a latent peer factor model all the peers seem to have more or less the same levels of influence. Relational diversity based on SC did not seem to affect peers' levels of influence on adolescents' classroom engagement.

Hypothesis IIIb. Not only are individuals influenced by their peers, they also influence their peers (*reciprocal influence*). This reciprocal influence is expected to be greater for strongly connected peers (*reciprocal differential influence*).

Peers have reciprocal relationships in that adolescents can both influence and be influenced by their peers (Coleman, 2011). Again, individuals were expected to exert more influence on strongly connected peers as compared to weakly connected peers (*reciprocal differential influence*). In order to evaluate reciprocal differential influence, multilevel modeling (MLM) was conducted using the statistical program *R*. The data were organized as follows to account for all the peers' nestedness within individuals.

Table 3

Sample Peer Data Illustrating Peers' Nestedness within Individuals

Ind. ID (Iid)	Ind. gender (Isex)	Ind. engagement at time 1 (IengT1)	Peer ID (Pid)	Peer gender (Psex)	Peer engagement at time 1 (PengT1)	Peer engagement at time 2 (PengT2)	Strength of connection (SC)
Ana	F	3.5	Jun	F	4.0	3.67	10.35
Ana	F	3.5	Lea	F	5.0	4.5	4.99
Ana	F	3.5	Bea	F	5.0	3.7	3.61
Jay	M	2.8	Wei	M	4.2	3.7	20.56
Jay	M	2.8	Que	M	3.0	2.3	12.43
Jay	M	2.8	Sam	F	5.0		2.87

Note. $N = 315$ individual students. $N = 1897$ nested peers within individuals. Here all the peers, and SC between individuals and each peer, were nested within the individuals (Iid).

Each peer's engagement at time 2 (PengT2, DV) was predicted from each peer's engagement at time 1 (PengT1), the individual's engagement at time 1 (IengT1), SC, and the interaction between SC and the individual's engagement at time 1 (IVs). A significant interaction effect was expected, meaning that individuals would exert more influence on strongly connected peers (with high SC) than less well connected peers (with low SC). IengT1 was a level 2 predictor, while SC and PengT1 were level 1 predictors in predicting PengT2, a level 1 dependant variable. All the peers with engagement scores at both time 1 and 2 were included in the analyses. Any peers who missed at least one engagement score were omitted from the data analysis. *R* script for this analysis was as follows.

```
lme (PengT2 ~ IengT1 * SC + PengT1, random = ~1 + SC | lid,
control=lmeControl (opt="optim", msVerbose=T))
```

The results indicated that individuals' reciprocal differential influence was not supported either. The interaction effect was not significant (Unstandardized $B = .004$, $p = .23$), suggesting that individuals did not exert more influence on strongly connected peers. The only significant predictor in this model was peers' initial engagement at time 1 for predicting their engagement at time 2 ($B = .60$, $p < .001$). None of the other predictors were significant. Individuals' engagement at time 1 was also not a significant predictor for each peer's engagement at time 2, after controlling for other factors ($B = .05$, $p = .13$). Strength of connection (SC) was also not significant in predicting each peer's engagement at time 2, after holding other variables constant ($B = .0005$, $p = .88$).

Based on results examining overall peer group influence and differential peer influence, overall peer group engagement level was a significant predictor for adolescents' motivational development; however, strongly connected peers did not necessarily exert more influence than weakly connected peers. Although it is possible that some other characteristics may make certain adolescents more influential than others, SC was not a deciding factor for differential influence.

Hypothesis Testing for Peer Group Motivational Diversity

The last hypothesis examined the impact of *peer group motivational diversity* on adolescents' engagement. A *diversity index* was created to represent *motivational diversity* within each peer group based on *dispersion (SD)* around peer group mean engagement. The impact of peer group motivational diversity was examined based on a diversity index. The *interaction effect* between *individuals' initial engagement* and *peer group motivational diversity* was also examined to see for whom the positive impact of peer group motivational diversity was greater.

Hypothesis IV. Peer group motivational diversity will have a positive impact on students' engagement at time 2 for initially low engaged students.

In order to examine the impact of peer group motivational diversity, adolescents' engagement at time 2 was predicted using a *diversity index*. The diversity index was calculated for every student using a peer group engagement *dispersion (SD)* among all their peers. A higher diversity index indicated that a given student had a

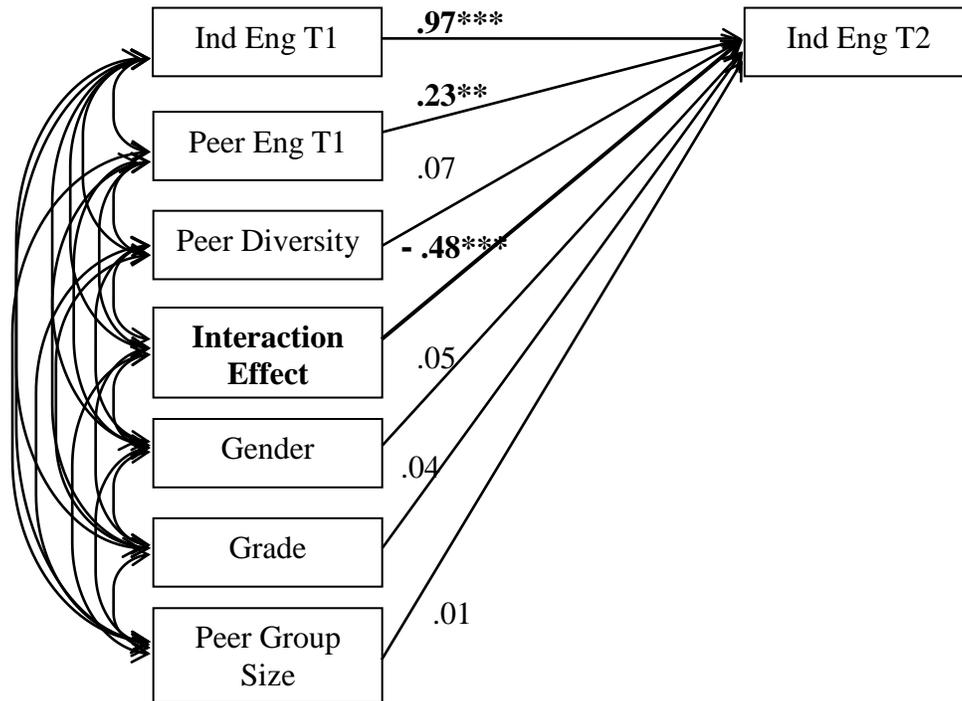
more diverse peer group.

The *interaction term* between *individuals' initial engagement* and *diversity index* was also included to evaluate whether the impact of peer group motivational diversity would be mediated by students' initial engagement levels, such that initially low engaged students were expected to become more engaged when they were with diversely engaged peers. The impact of peer group engagement diversity and the interaction effect were examined using structural equation modeling (SEM). In this analysis, individuals' engagement at time 2 was predicted from the diversity index and the interaction term, after controlling for individual and peer group engagement at time 1, as well as individual's gender, grade level, and peer group size. In order to reduce multicollinearity among independent variables by introducing an interaction term, individuals' engagement scores at both times (T1 and T2), peer group mean engagement at time 1, individuals' gender, and peer group size were mean-centered.

The results indicated that overall the model significantly predicted individuals' engagement at time 2 ($F = 29.39, p < .001, R^2 = .44$). After controlling for other variables, individuals' initial engagement was a significant positive predictor for their engagement at time 2 (Standardized $\beta = .97, p < .001$), as was initial peer group mean engagement ($\beta = .23, p < .01$). Although peer group diversity index was not significant, the interaction effect was significant ($\beta = -.48, p < .01$), which suggested that having diversely engaged peers was only beneficial for initially low-engaged students. Initially highly engaged students did not benefit from having diversely engaged peers. Neither individuals' gender nor grade level was a significant predictor for their

engagement at time 2, after controlling for other variables. Peer group size also did not affect students' engagement at time 2.

Figure 15. Significant Interaction Effect

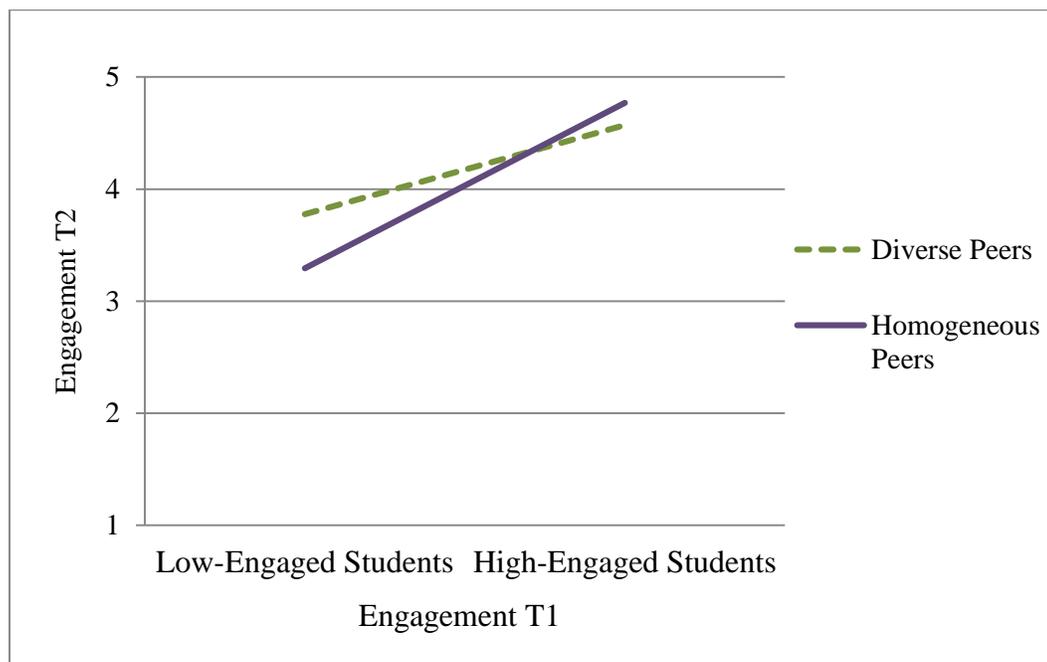


Note. $N = 370$. *** $p < .001$; ** $p < .01$; * $p < .05$.

An interaction plot was created to assist interpretation of the results. In order to create the interaction plot below, high-engaged individuals were defined as those students 1 *SD* above the mean engagement level at time 1, whereas low-engaged individuals were 1 *SD* below the mean engagement level at time 1. Similarly, diversely engaged peer groups were defined as those groups 1 *SD* above the mean diversity index, whereas homogeneously engaged peer groups were 1 *SD* below the mean diversity index at time 1. The interaction plot illustrates how peer group motivational diversity (either having diversely- or homogeneously engaged peer groups) had

differing impacts on students depending on their initial engagement level (whether they were initially high- or low-engaged). Students' engagement at time 2 was predicted based on their initial engagement levels as well as their peer group motivational diversity after controlling for other variables.

Figure 16. Interaction Plot

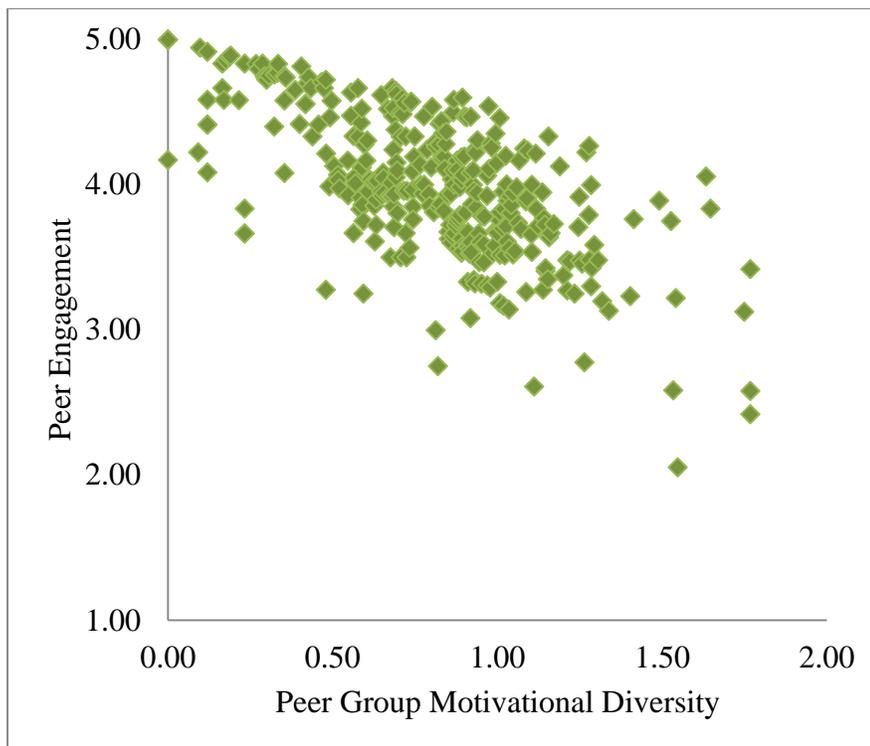


Note. $N = 370$. Scores ranged from 1-5, 5 being the most engaged.

It is worthwhile noting that there was a *cooperative suppression effect* (Tu, Gunnell, & Gilthorpe, 2008). Using simple regression, the correlation between individuals' engagement at time 1 and time 2 was $r = .61$; however, in the structural equation model, the correlation between individuals engagement at time 1 and time 2 is $\beta = .97$. This cooperative effect came from a strong correlation between individuals' initial engagement and the *interaction term* between initial engagement and peer group engagement diversity even after centering the initial engagement ($r = .91, p < .001$).

There was also an unexpected strong correlation between peer group engagement diversity and peer group mean engagement ($r = -.70, p < .001$), which suggested that homogeneous peer groups tended to be overall highly engaged whereas diverse peer groups tended to be less engaged.

Figure 17. Relation between Peer Group Mean Engagement and Diversity



Note. $N = 328$. Scores ranged from 1-5, 5 being the most engaged.

This strong negative relation between peer group mean engagement and peer group engagement diversity was unexpected. Overall, students were expected to associate with peers who were similar to themselves, such that initially low-engaged students were expected to associate with other low-engaged peers regardless of their peer group engagement diversity. However, in this school, regardless of adolescents'

initial engagement levels, more homogeneous peer groups were overall more engaged; there were hardly any low-engaged homogeneous peer groups. By contrast, for adolescents with diversely engaged peers, by nature of the diversity existing within peer group engagement levels, the overall peer groups were somewhat moderately engaged. Following is the combined correlation and covariance matrix among all the variables used to predict individuals' engagement at time 2.

Table 4

Correlation and Covariance Matrices

	Engage- ment T1 (EngT1)	Peer Engagement (PEng)	Diversity Index (Diversity)	Interaction Effect (Interaction)	Gender	Grade	Peer Group Size (Count)
EngT1	.950	.172	-.059	.818	.105	.021	-.162
PEng	.329	.288	-.130	.168	.047	.004	-.476
Diversity	-.176	-.704	.118	-.062	-.013	-.002	.411
Interaction	.912	.340	-.195	.845	.084	-.003	.084
Gender	.216	.175	-.075	.182	.249	-.020	-.145
Grade	.026	.010	-.006	-.004	-.048	.675	1.761
Count	-.027	-.145	.195	.015	.015	.350	37.529

Note. $N = 370$. Lower left triangle reports correlations among variables. Upper right triangle and main diagonal report covariances and variances among variables.

To further examine these findings, *Hypothesis IV* was also evaluated by

comparing developmental trajectories across four sub-groups of students: high-engaged students with diverse peer groups, high-engaged students with homogeneous peer groups, low-engaged students with diverse peer groups, and low-engaged students with homogeneous peer groups. The median split was used to create four sub-groups. Students above the mean engagement at time 1 were considered to be high-engaged while students below the mean engagement at time 1 were considered to be low-engaged. Similarly, students who had peer groups with above-mean diversity index were considered to have diversely engaged peer groups, whereas students who had peer groups with below the mean diversity index were considered to have homogeneously engaged peer groups.

The resulting four subgroups included: 1) high-engaged students with diverse peer groups ($n = 94$), 2) high-engaged students with homogeneous peer groups ($n = 97$), 3) low-engaged students with diverse peer groups ($n = 84$), and 4) low-engaged students with homogeneous peer groups ($n = 48$).

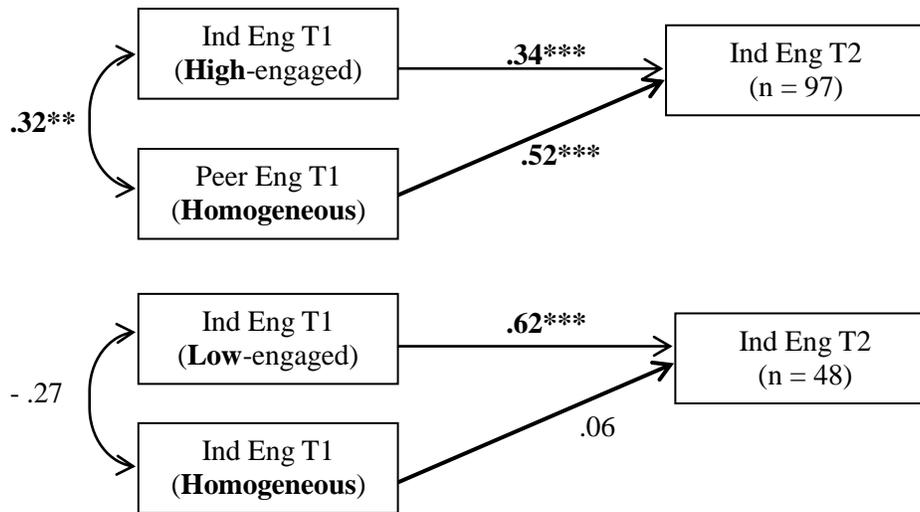
The developmental trajectories among the four subgroups were compared using SEM. The results indicated that homogeneously engaged peer groups' engagement significantly and positively predicted initially highly engaged students' engagement change ($\beta = .52, p < .001$), whereas, homogeneously engaged peer groups' engagement level did not predict initially low-engaged students' engagement change.

However, the opposite patterns appeared for diversely engaged peer groups. Diversely engaged peer groups significantly predicted initially low-engaged students'

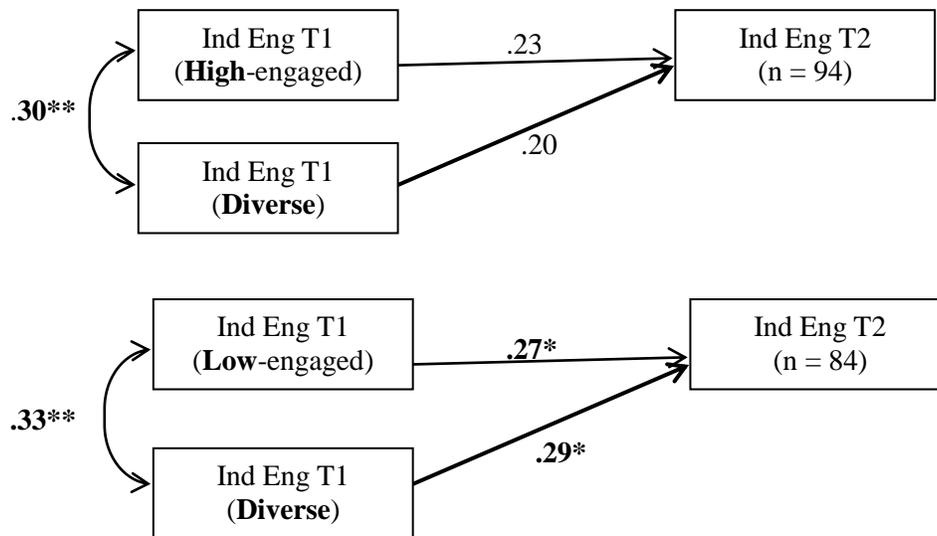
motivational development ($\beta = .29, p < .05$), whereas they did not predict initially high-engaged students' engagement change ($\beta = .20, p = .14$).

Figure 18. Comparison of Developmental Trajectories among Subgroups

(Initially High- and Low-engaged Individuals with Motivationally Homogeneous Peer Groups)



(Initially High- and Low-engaged Individuals with Motivationally Diverse Peer Groups)



Note. $N = 233$. *** $p < .001$; ** $p < .01$; * $p < .05$.

In order to better understand the impact of peer group motivational diversity on students' motivational development, students' engagement changes among the four subgroups were further compared using ANOVA. In this model, students' engagement change was measured using *difference scores* in engagement (i.e., subtracting their engagement at time 1 from time 2).

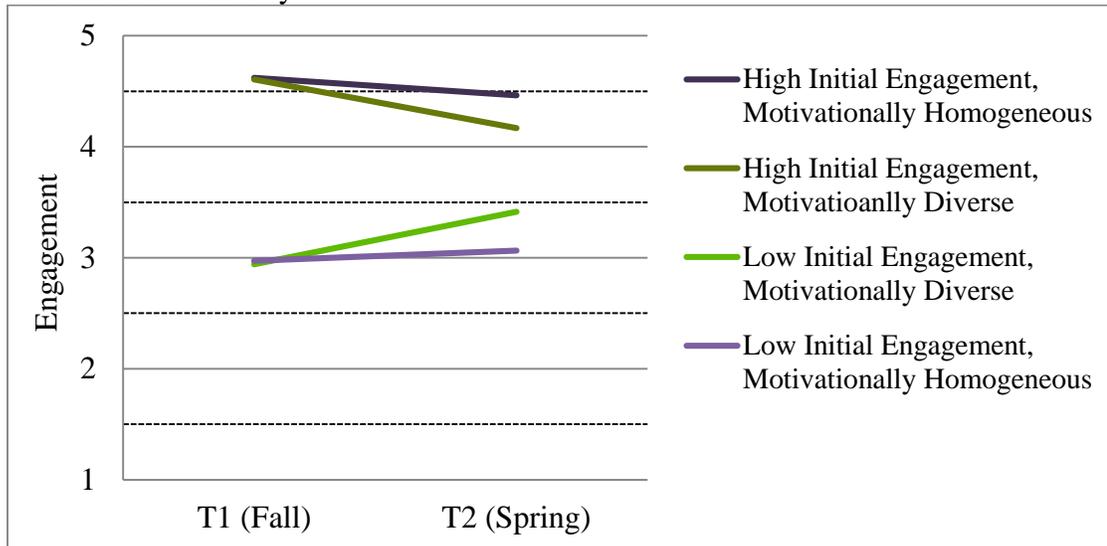
The ANOVA results indicated that there was a significant difference in engagement change among the four sub-groups ($F(3,183) = 11.93, p < .001$). The results indicated that initially low-engaged students with diversely engaged peer groups gained the most motivational development ($M = .47, SD = 1.05$), followed by low-engaged students with homogeneous peer groups ($M = .19, SD = .83$). However, initially high-engaged students in general became less engaged. The engagement loss for high-engaged students was more pronounced for students with diversely engaged peer groups ($M = -.44, SD = .72$) than students with homogeneously engaged peer groups ($M = -.16, SD = .65$).

Table 5

Comparison of Developmental Trajectories among Four Subgroups of Students

Individuals' Initial Engagement - Peer Group Motivational Diversity	N	Mean Change	SD	95% CI for Mean	
				Lower Bound	Upper Bound
High-engaged - Homogeneous Peers	51	-.16	.65	-.34	.03
Low-engaged - Homogeneous Peers	22	.09	.83	-.28	.46
High-engaged - Diverse Peers	55	-.44	.72	-.63	-.24
Low-engaged - Diverse Peers	59	.47	1.05	.20	.75
Total	187	-.01	.91	-.14	.12

Figure 19. Engagement Change by Individuals' Initial Engagement and Peer Group Motivational Diversity



Note. $N = 187$.

Follow-up tests were conducted using Dunnett's C methods since the homogeneity of variance assumption was violated ($F(3, 183) = 5.22, p < .01$). The results indicated that there was a significant difference between initially low- and high-engaged students with diverse peer groups (95% CI: .46 - 1.35), which indicated that peer group motivational diversity was significantly more beneficial for initially low-engaged students than initially high-engaged students. There was also a significant difference in engagement change between initially low-engaged students with diversely engaged peer groups and initially high-engaged students with homogeneously engaged peer groups (95% CI: .19 ~ 1.06).

These results were interesting in that initially low-engaged students seemed to benefit more by having diversely engaged peer groups than homogeneously engaged

peer groups, even though these homogeneously engaged peer groups were overall more highly engaged compared to the diversely, but moderately engaged peer groups. Initially high-engaged students became less engaged over time regardless of their peer group motivational diversity. Results from SEM and ANOVA indicated the positive impact of peer group motivational diversity was moderated by individuals' initial engagement level, such that initially low-engaged students benefited from having a diversely engaged peer group, whereas initially high-engaged students did not benefit from peer group motivational diversity.

Summary. The impact of peer group motivational diversity was analyzed using a mediation model based on SEM as well as comparing developmental trajectories among sub-groups of students by their initial engagement level and their peer group motivational diversity. The mediation model showed a differing impact of peer group motivational diversity based on students' initial engagement, such that diversely engaged peers were only beneficial for initially low engaged students, after controlling for other variables, including peer group mean engagement at time 1. This model was helpful to understand the impact of peer group motivational diversity after controlling for other factors, especially given that there were confounding issues that diversely engaged peer groups were in general less engaged than homogeneously engaged peer groups.

Meanwhile, comparisons of the developmental trajectories among sub-groups of students showed the combined effects of overall peer group mean engagement and peer group motivational diversity. Given that overall peer group mean engagement at

time 1 was a significant, positive predictor for students' engagement at time 2 ($\beta = .23$, $p < .01$) as well as a significant interaction effect between students' initial engagement and peer group motivational diversity ($\beta = -.48$, $p < .001$), it is not surprising that initially low engaged students with diversely engaged peer groups became significantly more engaged compared to initially high engaged students with diversely engaged peer groups when comparing developmental trajectories among four sub-groups. The results based on all these analyses and follow-up tests indicated that both peer group motivational diversity and overall peer group mean engagement are important in predicting students' motivational development.

Chapter 5: Discussion

This study expanded our understanding of peer influence on adolescents' motivational development and the roles of diversity in peer influences. The three kinds of diversity examined in this study were ethnic diversity in school, motivational diversity within peer groups, and relational diversity based on strength of connection (SC) between individuals.

While it is important to understand all the factors affecting adolescents' motivational development, much of the previous work examining peer influence on adolescents' engagement were based homogeneous samples in which most participants were European American adolescents. This study examined engagement and peer influence patterns in an ethnically diverse setting. The results were fairly comparable to previous findings (Kindermann 2003; 2007). Adolescents in this ethnically diverse middle school were overall fairly engaged. Many students in this middle school were first generation immigrants, and perhaps as Garcia Coll and her colleagues (1996) noted, it may be typical for first-generation immigrant adolescents to be highly motivated and engaged in school (*immigrant paradox*). Furthermore, many of the students in this school may also have had a positive influence on one another's academic development. As found in many previous studies (Kindermann, 2003; 2007; Wang & Eccles, 2012; Molly et al., 2011; Véronneau & Dishion, 2011), girls were also more engaged than boys. Although previous literature suggests that children's engagement declines in their school years, students in this school did not clearly exhibit engagement declines as they advanced in grade level.

This school had not only an ethnically diverse student body, but also an ethnically diverse school staff, including many teachers and an African American principal. The teachers and the principal in this school encouraged students to respect and celebrate their ethnic identities and cultures. For example, on the school wall, a student drew a picture of Bob Marley with one of his songs' lyrics. Acknowledgement of diverse cultures was not only shared by ethnic minority teachers, but also by teachers with European cultural heritage. One teacher shared Irish folk songs in class and shared his cultural background from Ireland with his students. This positive and validating environment may have promoted adolescents to feel comfortable and get connected with teachers and peers, which is known to be an especially important factor for ethnic minority adolescents' academic engagement (Ogbu, 1985; Sua´rez-Orozco, Sua´rez-Orozco, & Todorova, 2008; Wang & Huguley, 2012) .

Another promoting factor for student engagement in this school may come from the ongoing collaboration efforts between the school and university. Students had opportunities to interact with undergraduate and graduate students as well as professors from university during the data collection process, as well as through other community-based programs that involved collaboration between university and the families of the school children. Through these programs, adolescents in this school and their families had opportunities to work and learn from university students and faculty members in the school as well as in the nearby Learning Garden. These points of contact may have also promoted adolescents' academic aspirations and interest in going to college as well. Many of these factors may have helped adolescents in this

school become more motivated and engaged.

Perhaps all these promoting factors may help adolescents be motivated and well connected with one another in school. Students were well connected with same-ethnic peers as well as cross-ethnic peers. The fact that there was not a single dominant ethnic group in this school may have led to more equal power distribution and reduced conflicts across different ethnic groups. At the same time, a school culture celebrating diversity along with having ethnically diverse faculty and staff may also promote adolescents' positive interactions with cross-ethnic peers, thereby providing ample opportunities for adolescents to form cross-ethnic peer relationships as well as the same-ethnic relationships.

While adolescents tended to have ethnically diverse peer groups, nonetheless, adolescents tended to choose similar peers in terms of their academic motivation and engagement as found in previous studies based on ethnically homogeneous samples (e.g., Kindermann, 2007). Also, consistent with prior findings, overall peer group engagement levels were still an important factor for students' motivational development in an ethnically diverse sample as well. Overall peer group engagement influenced adolescents' engagement change over time, after controlling for selection effect. Having a highly engaged peer group was beneficial for adolescents to become more engaged, whereas adolescents with a low-engaged peer group were more likely to become disaffected.

The ethnic diversity combined with culturally inclusive practices in the school seem to promote adolescents to be well connected with cross-ethnic peers as well as

same-ethnic peers. Adolescents in this ethnically diverse setting were well connected with their peers compared to ethnically homogeneous settings. The current study also examined the impact of relational diversity based on strength of connection (SC) between individuals, and it was hypothesized that strongly connected peers would exert more influence than weakly connected peers. However, this hypothesis of differential peer influence was not supported; all their peers exerted similar influences on adolescents' engagement.

It may be possible that SC is not the best measure of relationship *quality*. Instead, SC may reflect how commonly two individuals are seen together or how saliently they are known as peer group members by others. The binomial z-score outputs were used to represent how strongly two individuals were connected in the current study. However, the z-score was originally designed to evaluate whether two individuals were likely to be in the same peer group above and beyond chance (*significance* test). In retrospect, the z-score output may not have the *content validity* of representing quality or strength of connection in a relationship (or friendship), but instead may be only a *reliability* index to measure whether two individuals are significantly likely to belong to the same peer group.

Although the differential peer influence hypothesis based on SC was not supported, the current study suggested a couple of useful tools - namely, the use of a weighted peer mean and the use of a latent peer factor to measure the magnitude of each peer's influence. These methods can help researchers estimate differential peer influence based on a variety of peer characteristics, and to evaluate whether certain

peers influence each other more so than others. If certain peer characteristics can make individuals more influential than others, these methods can then help evaluate peer influence more reliably by accounting for this differential peer influence. For example, researchers may be interested in examining whether more similar peers exert more influence on each other. Conversely, would peers who are the least similar from individuals have a drastic impact on a certain behavior or perspective changes? The use of the weighted peer mean and the latent peer factor allows researchers to evaluate such questions empirically.

For students' motivational development, it was important to have not only overall highly engaged peers but also diversely engaged peers. Although having only low engaged peers would have negative consequences for adolescents' motivational development, if adolescents had both highly and low engaged peers, this diversely engaged peer group had a significant beneficial impact on some students. For initially low engaged students, having diversely engaged peer group seems to be a key factor to becoming more engaged. For these initially low engaged students, when they have a homogeneous peer group, even if all their peer group members were highly engaged, they did not benefit as much as from diversely engaged peer groups containing both highly and low engaged peers. However, there was a comparatively small negative effect of motivational diversity for initially highly engaged students.

The positive impact of peer group motivational diversity for initially low engaged adolescents may have resulted from a combination of having both similar peers and dissimilar peers in their peer group. For low engaged adolescents, even if all

their peers were highly engaged, if their peer group was homogeneous (most of their peers were quite different from themselves), this homogeneous peer group was less beneficial than having a diversely engaged peer group, which included at least some peers who were similar to themselves (low engaged).

Perhaps, having a diversely engaged peer group may allow low engaged students to interact with similar peers to an extent for them to feel comfortable in class and be ready to learn, while interacting with dissimilar peers provides an opportunity for them to develop social and cognitive skills that can promote their academic development. The experiences of negotiating differences while maintaining relationships may promote social skills (Kawabata & Crick, 2011; Harell, 2010). At the same time, exposure to different ideas and values may also promote adolescents' creativity and critical thinking skills, which are essential for their academic development (Levitan & Visser, 2008; Sosa, 2011). Furthermore, highly engaged peers may promote low engaged adolescents' becoming more engaged over time by providing instrumental support to complete class projects and promoting their academic interest by exploring academic materials or topics together. By contrast, initially highly engaged students may not benefit as much from having diversely engaged peer groups since low engaged peers would be unlikely to provide instrumental support for them.

Potential Implication in Educational Settings

Given the positive impact of peer group motivational diversity identified in the current study, it may be wise to structure educational settings to encourage highly

and low engaged students to interact with each other. For example, creating cooperative learning environments where high- and low-engaged students are encouraged to collaborate on class projects may provide an opportunity for them to build relationships and to provide support for one another (Paluck & Green, 2009; Aaronson, Blaney, Stephan, Sikes, & Snapp, 1978). Collaborations among diversely engaged students can also help students develop positive social skills to navigate their differences. The increased social skills may help them to interact constructively with their teachers and peers to get needed support and feedback, which in turn can encourage them to be actively involved in class and take initiative for academic work. It is also possible that some of the low-engaged students may not have as many resources to promote their learning in home environments. Having engaged peers may provide not just emotional support to become connected with their teachers and peers, but also provide instrumental support to complete class projects or assignments.

It may be also wise to reduce the use of academic ability tracking practices in educational settings. Having a homogeneously engaged peer group had negative consequences for low engaged students. Academic ability tracking might be especially troublesome for low engaged students and make them completely disaffected over time. This is even more worrisome given the resurgence in recent years of academic ability grouping and tracking in K-12 educational settings (Loveless, 2013; National Assessment of Educational Progress (NAEP), 2011).

Allowing students to interact with diversely engaged peers appears to be an important leverage point for low-engaged adolescents to become engaged. In order to

build relationships with diversely engaged peers, students need an opportunity to interact with one another. Academic ability tracking tends to bind students with similar others, and this reduces opportunities for low engaged students to interact with other engaged students. It is hard to intervene effectively in educational settings when major systematic structural practices are at odds with desirable intervention goals (Oakes, 1986; Riger, 1993; Dalton, Elias, & Wandersman, 2007). If educational goals are to maximize students' learning and involvement in the classroom, it is important to have a system that provides an opportunity for children to interact with diverse peers so that they can be exposed to different perspectives and learn from one another.

Limitations and Future Studies

Students' engagement was recorded based on teachers' perceptions of students. However, it will also be worthwhile examining how students perceive their own engagement. In addition, it will be helpful to evaluate the correlation between teacher perception and student perception to better understand student engagement.

The teacher reports on student engagement were collected twice, once in the beginning and again at the end of the school year. This helped us understand student engagement and its change over time. However, the peer group information was collected only once at the beginning of the school year. While peer influence was measured by examining how peer affiliations at time 1 influenced adolescents' motivational development, it is unlikely that individuals would have all the same peers by the end of school year as compared with the beginning of the school year. This cross-sectional peer group information limits an assessment of peer group composition

change over time. Future studies can examine peer influence on student engagement change using longitudinal peer group data for both stable and unstable peers and evaluate whether this leads to any differences in peer influence.

When examining the impact of peer group motivational diversity, the dispersion (*SD*) around peer group mean engagement was used as a diversity index. It may also be instructive to examine how individual-to-group differences - i.e., differences in an individual's engagement compared with the peer group members - affect students' engagement change. Furthermore, the participants' school is an ethnically and culturally diverse setting; it may be helpful to examine how peer group ethnic diversity affects student engagement change and their academic development as well.

Confounding Variable Issues

This study may not have properly controlled for all the factors that can influence students' engagement. This study examined student engagement change based on peer influence. However, other factors can influence student engagement. For example, parental and teacher involvement are important factors for directly shaping student engagement. Parents and teachers can also indirectly affect peer influence as well by affecting peer group composition through introduction of new peers at after-school activities, or changing classroom seating charts. Future studies can examine how multiple environmental factors (teacher, parents, peers) can interact and simultaneously affect adolescents' academic development.

It will also be helpful to examine possible underlying processes or

mechanisms for the observed phenomenon of the positive impact of peer group motivational diversity. Although previous research suggested some potential mechanisms why diversely engaged peer group would be beneficial (e.g., Kawabata & Crick, 2011), it will be helpful for future studies to examine the mechanisms or underlying processes of how peer group motivational diversity promotes students' academic development.

Finally, the results for student outcomes were based on a single middle school where the students were ethnically diverse with generally low SES. In this school, school staff and teachers were also ethnically diverse and implemented many culturally-responsive teachings. In order to increase generalizability of the findings, the results need to be replicated in multiple settings using multiple methods. However, the participants of the current study can also be of particular interest for understanding how to promote ethnic minority children's learning and academic success. Having ethnically diverse teachers and staff, including the school principal, may have a positive impact on ethnically diverse adolescents' academic aspirations and confidence. The school teachers and staff encouraged students to celebrate their ethnic and cultural diversity, while providing culturally appropriate support for students who suffered from challenging situations (i.e., neighborhood violent crime victimization). These factors may have influenced the findings, including that students were in general highly motivated and engaged in class.

Until confirmed by replication, the results might be only applicable to this particular school. However, given that ethnic composition is becoming increasingly

diverse in the U.S., the current findings may provide valuable insight as to how to assist students' learning and promote their academic development in a diverse educational setting.

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Appendix A

Teacher Survey on Student Engagement

①-----②-----③-----④-----⑤	
Not at all true A little bit true Somewhat True Fairly true Totally true	
Student name _____	Sex ___M ___F
In general, this student...	When faced with setbacks, this student...
• likes school.	① ② ③ ④ ⑤
• puts in a lot of effort.	① ② ③ ④ ⑤
• acts like school doesn't matter.	① ② ③ ④ ⑤
• bounces back.	① ② ③ ④ ⑤
• works harder.	① ② ③ ④ ⑤
• gives up.	① ② ③ ④ ⑤

Appendix B

Student Survey on Peer Network (Socio-Cognitive Mapping Reports)

GROUPS OF CHILDREN WHO DO THINGS TOGETHER OR HANG OUT IN YOUR GRADE

Are there groups of children who do things together or hang out in your grade?

- Remember:**
- People in groups can do activities together (soccer, basketball, band, clubs, gardening), or can just do things together (hang out, play).
 - Even two people can be a group.

EXAMPLE	GROUP 1	GROUP 2	GROUP 3
Hermione Granger			
Ron Weasley			
Harry Potter			
Ginny Weasley			
 			
Is there a name for this group? Can you give them a name? Gryffindor friends	Is there a name for this group? Can you give them a name?	Is there a name for this group? Can you give them a name?	Is there a name for this group? Can you give them a name?
What do they do together? They have adventures together	What do they do together?	What do they do together?	What do they do together?
Is there a leader? (circle)	Is there a leader? (circle)	Is there a leader? (circle)	Is there a leader? (circle)

WHO ARE YOUR OWN FRIENDS?

You may have some friends in your class, some in school who are not in your class, and others who do not go to your school.

Thinking about ALL of them, who are your closest friends?

FRIENDS' NAMES <i>(Please PRINT their first and last names)</i>	WHERE DO YOU HANG OUT?				HOW GOOD OF A FRIEND? <i>(Mark ONE)</i>		
	in class	in school	In the gardens	outside of school	very good friend	good friend	sort of good friend
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

We have provided 8 spaces, but you do not have to use all of the space. Just the most important friends are fine.

WHO IS YOUR VERY BEST FRIEND?

THANK YOU!!!