ABSTRACT

Title of Document:	RECOGNIZING HIGH ACHIEVEMENT IN CONTEXT: A MULTILEVEL ANALYSIS OF FRIENDS' VALUES AND INDIVIDUALS' MOTIVATION AND BACKGROUND AS ASSOCIATED WITH THE IDENTIFICATION OF TENTH GRADERS BY TEACHERS AND TEST PERFORMANCE
	Carolyn Elizabeth Barber, Doctor of Philosophy, 2007
Directed By:	Professor Judith Torney-Purta Department of Human Development

The relationships of school context, motivation, and individual background to receiving teacher nominations for advanced work and/or scoring in the top decile on a standardized test of achievement were examined in both English and mathematics using survey data collected from a nationally-representative sample of tenth grade students as part of the Educational Longitudinal Study of 2002. This study builds upon previous research examining the relationships between students identified as high-achieving by test score criteria and by teacher nomination criteria by exploring whether certain characteristics of students and their schools systematically make them more or less likely to meet them.

Students' individual perceptions of their school context were only associated with achievement criteria met in math. Students who perceived their friends to be the least

socially-oriented were most likely to meet both criteria. Further, male students who perceived their friends to be the least academically-oriented were the most likely to have high test performance but no teacher nomination. Students who were self-efficacious and intrinsically motivated were the most likely to meet both criteria in English and in math The relationship of intrinsic motivation in math to having high achievement recognized by teachers in this area was especially prominent for male students.

Further, students of Black or Hispanic ethnicity were more likely than were white students to be nominated as high achieving by teachers despite lower test performance, as were students from lower socioeconomic statuses. Male students, on the other hand, were more likely than females overall to have high test performance without being nominated as high-achieving by teachers. Specific aspects of these relationships vary between subject areas. In addition to several associations with individual characteristics, the proportions of students identified as high-achieving only by teachers differ systematically among schools. This variation can be explained by several school-level variables, including school socioeconomic status and minority composition.

These findings affirm that there are systematic differences between students identified as high-achieving by teacher nominations and by test scores. Learning more about these differences will help teachers and administrators to consider explicitly these factors when identifying adolescent students for special programs and other recognitions.

RECOGNIZING HIGH ACHIEVEMENT IN CONTEXT: A MULTILEVEL ANALYSIS OF FRIENDS' VALUES AND INDIVIDUALS' MOTIVATION AND BACKGROUND AS ASSOCIATED WITH THE IDENTIFICATION OF TENTH GRADERS BY TEACHERS AND TEST PERFORMANCE

By

Carolyn Elizabeth Barber

Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
2007

Advisory Committee:
Professor Judith Torney-Purta, Chair
Professor Patricia Alexander
Associate Professor Robert Croninger
Professor Kathryn Wentzel
Professor Allan Wigfield

DEDICATION

To Mark, for everything.

And to Nancy Hauser (1924-2005), for believing.

ACKNOWLEDGEMENTS

Note: This research is supported by a grant from the American Educational Research Association, which receives funds for its "AERA Grants Program" from the National Science Foundation and the National Center for Educational Statistics of the Institution for Education Sciences (U.S. Department of Education) under NSF Grant #REC-9980573. Opinions reflect those of the author and do not necessarily reflect those of the granting agency.

I begin by trying my best to express in words the thanks I have for my husband Mark. He has seen me though this process since I first began it here, only a week and a half after our wedding. I cannot imagine having completed this without his patience, support, understanding, and especially his good humor. In addition to being a source of emotional strength, his willingness to share with me his thoughts and immense expertise in the "real world" of teaching continues to inspire me to further understand and make a difference in education.

I thank my grandfather and my mother for instilling in me their passion for education. At the same time, I also thank them along with my father and my brother Andrew for keeping me down-to-earth by reminding me of the good things in life outside of graduate school.

As my advisor, Judith Torney-Purta receives my heartfelt gratitude both for introducing me to the field of human development research and for allowing me to explore it on my own terms. Her financial and moral support for my work allowed me opportunities and professional connections I would not have dreamed possible when I

first came here. Her respect for the unique contributions of each member of our research team has taught me both how to be a leader and how to learn from others' diverse backgrounds. She is both a fine advisor and my most admired collaborator.

Each member of my dissertation committee has also contributed uniquely to my experiences the past four years and to this study, and I am grateful to them all. Patricia Alexander has encouraged me throughout to "follow my passion" by applying my study of development and education to the students capable of the highest levels of achievement. Kathryn Wentzel has been an inspiration in bringing together the social and academic aspects of schooling. Allan Wigfield's admirable work in the field of motivation has encouraged me to consider in great detail the role that it has on the success of students. Finally, special thanks are extended to Bob Croninger for introducing me to the world of hierarchical linear modeling, which was truly a turning point in my academic career.

My thanks also extend to my teachers, especially those in the Departments of Human Development and of Measurement, Statistics, and Evaluation. I am particularly grateful to Amy Hendrickson, my EDMS Masters advisor, for her guidance on the measurement techniques used in this analysis. Thanks also to my mentors and colleagues at Johns Hopkins University and the Center for Social Organization of Schools for initially instilling in me an interest in educational research.

The collaborations that I have formed on the IEA Civic Education Study and many related projects have provided me with some of the most valuable experiences of all: thanks to Jo-Ann Amadeo, Wendy Richardson, Gary Homana, Britt Wilkenfeld, and Vera Husfeldt. I have learned so much from each one of you.

I also consider myself lucky to be part of such a wonderful cohort of graduate students, who served as every sort of support system imaginable. Thanks to Jessica Luke, Allison Tarkow, Heather Rogers-Haverback, T'Pring Westbrook, Meghan Parkinson, Bella Guner, Alexis Williams, Jessica Vick, and Jeff Greene, among many others.

I am indebted to the AERA Grants Program for funding this study, and I thank them for recognizing the value inherent in large-scale survey research. I am also thankful for the recognition that this work received as part of the first Graduate Student Research Gala at the annual conference of the National Association for Gifted Children. More specifically, the feedback and comments of Betsy McCoach, David Dai, Frank Worrell, Barbara Kerr, and Rena Subotnik were instrumental in developing and interpreting this current analysis. Special thanks to Rena for her initial encouragement in learning more about this professional community of researchers on giftedness and talent. I am honored to consider myself now a contributor to that same community.

.

TABLE OF CONTENTS

List of Tables

List of Figures

CHAPTER 1[i]

Introduction

In *National Excellence: a Case for Developing America's Talent*, a major policy report on the state of education for gifted and talented students, the United States Department of Education (1993) called for more challenging curricula for students showing the highest levels of potential and performance. Almost a decade later, follow-up analyses of states' gifted education policies showed great disparities in the availability of such programs for various groups of students and large differences in policies used to determine who is eligible for these programs even within a single state (e.g., Baker, 2001, in an analysis of policies in Texas). Today, the means by which students are identified as "gifted and talented," and eligible for such programs, are of interest to policymakers and researchers alike.

While scores on a variety of tests of aptitude and achievement have often been used in order to determine students' eligibility for programs aimed at the gifted and talented (discussed by gifted education researchers in Plucker & Barab, 2005; discussed by practitioners in Peine, 1998), schools often employ other forms of identification criteria as well. One common criterion used in addition to test scores is a teacher's nomination of students as being eligible for such programs. The use of tests of achievement, tests of aptitude, and teacher nominations all raise questions about how each identifies gifted and talented students for the purpose of selection for advanced work. In particular, there is considerable interest in the fact that the students identified as gifted or talented may differ depending on which particular identification criteria are used. Tests of achievement and aptitude have been questioned regarding the extent to which they perform similarly for students of different ethnic and socioeconomic backgrounds. As a result, some scholars argue that the use of other criteria, such as teacher nominations, could be helpful in identifying students who do not typically perform well on tests (Baldwin, 2002). To contrast, nominations by teachers are thought to be influenced by other factors as well, in particular a variety of student characteristics that may or may not be related to potential achievement. These include students' work ethic (Siegle & Powell, 2004) and their gender or ethnic background (Elhowereis, Mutua, Alsheikh, & Holloway, 2005). As a result, it is important to look carefully at which students each identification criterion is likely to nominate, and especially important to see if teacher recommendations result in the identification of students that tests overlook, and vice versa. In addition, it is also useful to consider whether teacher nominations appear to be more in concordance with other criteria within groups of schools that share certain contextual characteristics. While it is important to understand how and why multiple criteria may be important in identifying diverse groups of gifted and talented students, the explicit consideration of school context is useful in determining whether the combined use of these criteria should be used differently by different schools depending on aspects of schools' policies and contexts.

In summary, an in-depth exploration of the extent to which different nomination criteria identify gifted and talented students differently is important in ensuring that high-achieving students receive sufficient opportunity to develop their potential. It has important policy implications in that it will help to understand how the two criteria of test scores and teacher nominations can be used together in order to ensure that gifted and talented students are appropriately recognized.

Purpose

Much of the research conducted on the identification of high achievement maps the opportunities that are opened once high achievement has been recognized. Students whose high achievement is officially recognized become eligible for advanced programs, which provide both a more difficult academic curriculum and a peer group of students with similar abilities and interests. It is widely recognized that such programming can help unmotivated students become engaged by involving them in appropriately challenging coursework, and can help students who come from disadvantaged home backgrounds by placing them in an academically supportive peer group (as illustrated in a series of ethnographic studies by Hébert and Reis: Reis & Dìaz, 1999; Hébert & Reis, 1998). However, the benefits of such programs can only be gained if a high-achieving student is recognized as such. Therefore, the most important purpose of this study was to understand how the use of different criteria differentially identifies students as high-achieving. This general purpose was descriptive in nature, designed to identify significant associations for the purpose of developing avenues for further research and theoretical considerations rather than for forming a predictive model of achievement identification.

Comparisons of identification criteria are a common area of study among researchers of the gifted and talented. It is well documented that different nomination procedures identify different students as gifted or talented (McBee, 2006; Niederer, Irwin, Irwin, & Reilly, 2003), To a lesser extent, researchers have also addressed whether students selected for advanced coursework using different criteria perform similarly once in these classes (Hunsaker, Finley, & Frank, 1997; Van Tassel-Baska, Johnson, & Avery, 2002). However, none of these studies seeks to explore exactly *which* students are more likely to be identified using each criterion. The primary purpose of this study was to contribute to the understanding of the identification of high achievement by describing the characteristics of students who are more likely to be nominated using different criteria. Particularly important was whether certain criteria were more likely to identify students who were especially motivated or who had especially strong support systems, and whether certain criteria were likely to identify high achievement in students of one gender or a specific socioeconomic and ethnic background. In particular, looking at the interaction of motivation and school context with background characteristics as they predict nomination has implications for policies that might engage high-achieving students from a variety of backgrounds in advanced programs. It is not possible for policymakers to change individual students' motivational orientations or socioeconomic statuses; however, it would be possible to encourage the surrounding conditions in schools that can help students to be motivated and engaged in their schoolwork.

A second main purpose of this study was to consider how these multiple factors may relate to the identification of high achievement differently in different schools. Many researchers of the gifted and talented acknowledge the importance of considering school structure, policies, and context when looking at who is considered gifted and talented (e.g., ethnographic studies of gifted students who are less successful because of school organization, discussed in Hébert, 2001). However, studies in this area are limited to schools in narrowly-defined geographic locations, and rarely take into account characteristics of students and schools in a single study. This is due in large part to the small sample sizes, taken from few schools, which are employed in many studies of the gifted and talented. By employing data from a large scale survey of students, their teachers, and their schools, analytical techniques were used that take advantage of the fact that students are nested into schools with various characteristics. This addressed the way in which characteristics of schools influence the relationship between characteristics of students and the identification of high achievement. Further, the use of a large data set allowed for the use of advanced measurement and scaling techniques.

In this study, the relationship of student and contextual characteristics to the identification of students as high-achieving were analyzed using data from the first wave of the Educational Longitudinal Study of 2002 (ELS: 2002). The Educational Longitudinal Study of 2002 is a nationally-representative survey of students who were in tenth grade in the year 2002, focusing on their attitudes, motivation, and behaviors in a variety of areas as well as on their academic achievement. The following sections provide a conceptualization of high achievement and its relationship to giftedness and talent, and outline the relationship of motivation and context to high achievement. Race and ethnicity, gender, and socioeconomic status will also be discussed.

Current Issues in the Identification of High-Achieving Students

Studies focusing on the identification of high-achieving students, and on the identification of gifted and talented students more broadly, are varied. Some scholars in this field have conducted literature reviews in order to understand how samples of "gifted and talented" students may be different in different research studies (e.g., Ziegler & Raul, 2000). Others have been interested in assessing the abilities of students and the attitudes of teachers through surveys and quasi-experimental studies, in order to gain insight into how teachers' attitudes may influence nomination. Some studies have used information on actual students (e.g., D. Chan, 2000; Niederer et al., 2003), while others have focused on how teachers rate hypothetical students (Elhowereis, et al., 2005). Still another group is interested in analyzing the policies actually employed by schools to guide the nomination of students. Some of these take broad looks at these policies across schools by surveying school administrators (Brown, Renzulli, Gubbins, Siegle, Zhang, & Chen, 2005), while others consider identification criteria in fewer schools in order to gain more focused insight into how these policies influence which students are identified (Grantham & Ford, 1998; Hébert, 2001). Together, all three types of research can help to form a background for this study about how students are identified as high-achieving.

Some key findings related to the selection of talented students are as follows:

- In identifying gifted and talented students at the high-school level, multiple criteria are most often used (Ziegler & Raul, 2000). More specifically, Ziegler and Raul identify six categories of criteria: tests of ability, tests of achievement, teachers' global nominations, or specific assessments of motivation, creativity, or behavior.
- Of these multiple criteria, the role of teacher nominations has been of particular recent interest to researchers of the gifted and talented (Brown et al., 2005; Siegle & Powell, 2004). This is in part because teacher measures may take into account characteristics of students not captured by tests of achievement or aptitude (Baldwin, 2002, also described as "subjective criteria" by Plucker & Barab, 2005). However, these measures have been criticized on the grounds that teachers lack specific training in identifying high-achieving students (Maitra, 2000; Niederer et al., 2003).

- When compared to peers or parents, however, students identified as high-achieving by teachers' nominations are more likely to be the same students identified by test scores. Teachers are especially likely not to nominate those students who do not meet test-score criteria of high achievement. (D. Chan, 2000; Niederer et al., 2003). However, they also fail to nominate as gifted and talented many other students who have met test criteria (Niederer et al., 2003). In other words, although teachers have a lower rate of "false positives" by nominating few students who do not meet psychometric criteria, they also have a higher rate of "false negatives," meaning that they fail to nominate many students who actually do meet psychometric criteria.
- At the secondary level, advanced programming is likely to be focused on providing students with enrichment in particular subjects in which students show ability and/or motivation (as discussed in Moon & Dixon, 2006). Separate criteria, whether based on test scores or teacher nominations, may then need to be met in order to be identified as being gifted and talented in more than one area or domain. To contrast, advanced programming in elementary schools is more likely to be broadly focused, identifying students who are expected to benefit from enrichment in a variety of areas.
- Inclusion of ethnic minority students and students of low socioeconomic status continues to be a central issue in the identification of students, particularly with the use of tests that some observers see as culturally biased (Baldwin, 2002; Grantham & Ford, 1998; Ortiz & Gonzalez, 1991).

- There is disagreement as to whether teacher nominations contribute to bias by race and ethnicity. Some believe that nominations by teachers are one way in which culturally-diverse students, who may perform lower on tests, can have their talents recognized (Baldwin, 2002). On the other hand, some argue that teachers hold their own preconceptions about students' talents, and may assume that students from racial or ethnic minorities are less likely to succeed in special programs aimed at gifted and talented students (Elhowereis et al., 2005).
- Lack of motivation among some gifted and talented students may lead to difficulties paying attention to or completing assignments in school, which has the propensity to mask the expression of potential high achievement (Beckley, 1998). To contrast, students who *are* selected as high-achieving are seen by parents and teachers alike as being highly motivated (D. Chan, 2000).

Concepts Related to the Identification of High Achievement

Of primary importance to consider when looking at the selection of students is the consideration of exactly which characteristics of students weigh in the identification. This study focuses on those students who are high-achieving; or, those students who have demonstrated ability in a specific subject area through exceptional performance. The examination of high achievement is particularly important when discussing gifted education, particularly given the centrality of high achievement to federal definitions of giftedness (United States Department of Education, 1993; discussed in a review of identification procedures by Feldhusen & Jarwan, 2000). Students are considered to be high-achieving for various reasons; however, this study will be limited to considering how high achievement is discussed in terms of, and measured by, tests and by teacher nominations.

Test Scores

One of the most common criteria relates to students' performance on tests: they are considered high-achieving if they score at or over a certain threshold percentile, as compared to peers of similar age, on an assessment of material which students can be expected to have already learned (see Feldhusen & Jarwan, 2000; Gagné, 2004). These tests may include tests of prior achievement, and are to be distinguished from tests of "aptitude," or students' potential for future performance (e.g., tests of intellectual functioning). High grade point averages may similarly be used as a numeric criterion for high achievement. However, students may also be considered high-achieving if they gain a certain level of recognition from peers and teachers. From this perspective, high-achieving students are those who are nominated for honor rolls, awards, or for special academic programs. In essence, then, the purpose of this study is designed to explore the congruence of two different methods of recognizing high achievement.

The importance of high achievement to conceptions of giftedness means that test performance is often used as an indication of giftedness. In fact, a review of all studies published in five major empirical gifted education journals from 1997 to 1998 conducted by Ziegler and Raul (2000) found that tests of *achievement* are the single most common criteria used for identification of *gifted* students across all studies. However, while these terms refer to highly related concepts, it is particularly important to define clearly the population of students of interest in this study. The use of the term "high achievement" indicates a focus on the competencies demonstrated in a given area, rather than a student's potential in developing further in an area. As a result, students who meet the "test criterion" for high achievement in this study can be said to demonstrate exceptional performance on a test designed to capture their mastery of material already learned.

The distinction between this definition of high achievement and other related concepts will be discussed further in Chapter 2. Research using conceptions of giftedness that consider these terms interchangeably will be considered when reviewing relevant theory and research; however, special attention will be paid throughout to the specific criteria used to identify students in the cited studies.

Teacher Nominations

Relation of Teacher Nominations to Achievement Tests

While achievement test scores are one of the most common tools for identifying high achievement, another method often used is nomination of students by teachers. Teachers nominate students whom they believe meet their definition of high achievement; however, this definition may actually be based on factors other than performance in a given academic subject. On one hand, teachers might believe that other factors besides subject performance are important to consider, particularly if they are reflecting more generally on students "giftedness." This is generally referred to as a teacher's implicit theory of intelligence. Although some researchers have made an attempt to identify overarching factors guiding individuals' implicit theories of giftedness (e.g., Sternberg & Zhang, 1995), the focus of research on implicit theories is more related to how individuals construct and apply their own unique definitions of giftedness, talent, and achievement (see Dweck, Chin, & Hong, 1995, for a discussion of individual differences in implicit theories). Very recent work has begun to revisit the notion of implicit theories of giftedness as it may inform how teachers interact with and evaluate high achieving students (e.g., Miller, 2006). However, this perspective has overall fallen out of use in the field of gifted education in favor of more “explicit” theories of intelligence outlined by gifted education researchers and educational psychologists (discussed by Pyryt, 2006, when comparing and contrasting the first and second edition of the book *Conceptions of Giftedness* (Sternberg & Davidson, 2004)).

Although the concept of “implicit theories” is somewhat rarely mentioned in gifted education, researchers in a variety of education-related disciplines have commented more generally on how teachers’ beliefs and test scores result in different groups of students being identified as high achieving. Teachers provide what some researchers refer to as “subjective” criteria, refers to the consideration of factors other than the potential for further high achievement (such as motivation or engagement) in making judgments about students (Hallinan, 1994; Plucker & Barab, 2005). These nominations stand in contrast to the more “objective” test scores, which only consider students’ performance on a standard set of questions designed to measure academic achievement.

Teacher Nominations for Advanced Programs

One situation in which teachers nominate high-achieving students is the opportunity to recommend them for advanced work in areas in which they have demonstrated high achievement. In this study, “advanced programs” refers to any set of classes offered to students that provides them with a challenge over and above what they would receive in a collegiate preparatory class. While schools may designate a variety of challenging classes as “honors,” there are two programs in particular that deserve special mention. Advanced Placement (AP) and International Baccalaureate (IB) have each been identified as programs that can help high-achieving students (and gifted students in particular) to develop their talents further (Curry, MacDonald, & Morgan, 1999; Tookey, 1999).

Issues surrounding the nomination of students to advanced programs, particular in high schools, bear a strong resemblance to more general issues relating to selection of students into classes of any level. A consideration of how students are selected into such classes, and how this selection in turn influences students, is therefore important. Historically, students were placed in classes with similar difficulty across multiple subjects, or "tracks." For instance, students thought to show potential for postsecondary education were put in a "college track" focusing on more advanced skills while other students were put into a "vocational track." Recently, research on the social organization of schooling has more broadly considered the "curricular positioning" of students, recognizing that the courses that students take have an effect even when students are not organized into formal tracks. Several studies analyzed survey data from the nationally-representative High School and Beyond study and found differences not only in characteristics of students selected for various tracks, but in the effects that various tracks had on both the academic and social development of students (e.g., Friedkin & Thomas, 1997; Kubitschek & Hallinan, 1998; Lucas & Berends, 2002).

Such research on the influence of tracking has become less frequent in recent years, as the findings from High School and Beyond have been well established and researchers have turned to examining the precursors and effects of coursetaking in specific subjects (e.g., Burkam & Lee, 2003). However, in a recent update to her seminal work on tracking conducted in the mid-1980s, Oakes (2005) acknowledged that tracking is still prevalent in American high schools in various forms. In particular, the continued existence of “de facto” tracking is important to consider in relation to the nomination of high-achieving students, since recommendations for classes to take in this informal system come primarily from counselors and teachers (Lucas & Berends, 2002). This illustrates the importance of considering issues of schools’ organization in examining nomination of students for advanced classes. It also illustrates the appropriateness of examining these issues using a large dataset, which contains a wealth of information about both schools and students.

Summary: Use of Teacher Nominations in This Study

In this study, “teacher nominations,” or the use of teachers’ judgments to identify some students as high-achieving, is of interest for two reasons. On one hand, comparing students nominated by teachers to students meeting test-score criteria for high achievement can provide insight into the beliefs that teachers have about which students are really the most deserving of recognition for their achievement. On the other hand, such comparisons may also reveal teachers’ biases about which groups of students should be nominated as high-achieving because they can benefit advanced work.

Concepts Relating to Factors Associated with High Achievement Identification

This study focused not only on the use of various criteria for identifying high achievement, but also on several sets of factors which might be associated with which students are recognized as high achieving. The factors of interest in this study come from a conceptual model of giftedness proposed by Gagné (2004). In his Differentiated Model of Giftedness and Talent (DMGT model), Gagné states individuals’ development of high achievement is associated with characteristics of their surroundings and of themselves, which he refers to as “catalysts.” This study considers Gagné’s catalysts in terms of their more specific relation to whether students in certain social contexts, with certain motivation levels, and with specific individual backgrounds are more likely to be considered high achieving based on certain criteria than they are based on others. The broadness of Gagné’s model is useful in this study because it includes the consideration of characteristics that are often considered part of giftedness (e.g., motivation) as well as characteristics that speak more to stereotypical assumptions that teachers have about achievement capabilities (e.g., individual background and context). It should be noted that Gagné’s model is used in this study more to suggest important independent variables than to provide a definitive theoretical frame for the influence that these factors have on achievement identification. Chapter 5 will return to Gagné’s framework in order to suggest ways in which the results of this study can help refine consideration of the interrelations of these variables.

School Context

Gagné theorizes that various characteristics of a person’s context have an important relationship to high achievement. Even in limiting the focus to school, however, “context” is a multi-dimensional construct that takes into account culture or climate, structure, policies, and individuals’ perceptions of their experiences as related to their surroundings. In a discussion of how schools serve as a context of development for students, Eccles and Roeser (2005) outline a model of how context influences individuals. The model, which draws upon concepts of Bronfenbrenner’s more general ecological model of human development (Bronfenbrenner, 1979), outlines a series of assumptions about how schools influence students. According to Eccles and Roeser, school processes are multilevel, ranging from national policy to one-on-one interactions between teacher and student. These processes are constantly interwoven with one another, and it is through interactions between various processes that a student's development is influenced. They also argue that different school-related processes change over the years of a student's schooling. The way that a school influences a secondary student is different from the way that a school influences an elementary student. This study will take into account the complexity of what Eccles and Roeser describe as "context" by observing both aspects of context that vary among individuals within a school (i.e., relationships with peers, friends, and teachers) as well as characteristics of schools themselves (i.e., school structure). Large-dataset analysis is an especially appropriate methodology for considering context, as relevant data are collected from several sources at both the individual and school levels.

Individual Perceptions of Peer, Teacher, and Friendship Contexts

Eccles and Roeser's model makes explicit how complex the consideration of school context must be. At any level of the model, a variety of psychological and sociological processes can be used to explain why context may influence the likelihood that students will be identified as high-achieving. For example, at the most proximal level to the student, students' interactions with other individuals in the school, including friends, peers, and teachers, each have influences on students' engagement in school. This study focuses especially on students' individual perceptions of these contexts, or students' self-reports of their attitudes toward their relationships with other people in the school.

Researchers interested in adolescent social development differentiate between the effects of peers (i.e., others the same age as the individual who interact with the student of interest) and their friends (i.e., individuals to whom the student feels close) (Rubin, Bukowski, & Parker, 1998; Wentzel, 1998). The attitudes of students' peers can influence students' perceptions of the overall context of school, including school safety and the academic press in the school (demonstrated by ethnographic case studies in Reis & Dìaz, 1998).

However, it is the students' friends, those closest to students, who have a stronger direct influence on their motivation (Wentzel, Barry, & Caldwell, 2004). In particular, Wentzel (1998) discusses the potential conflict between social and academic goals in a school. More specifically, she discusses how the values of a student's friends may influence motivation to succeed in school. This attention to the potential conflict between academic achievement and social acceptance has been discussed extensively in the gifted education literature as related to the "stigma of giftedness" (Coleman & Cross, 1988). To contrast, students may feel fewer effects from a negative *peer* climate in school if their *friends* are academically oriented (see Reis & Dìaz, 1998). In the context of this study, students who experience conflict between meeting the social goals set forth by their friends and the academic goals set forth by the school may appear to teachers less willing to take on the work of advanced programs, and would therefore be less likely to be nominated by teachers.

Students' relationships with teachers also contribute uniquely to the context of school. A positive perception of teachers related positively to middle school students' motivation to achieve (Wentzel, 1997). In this sense, teacher-student relationships may be associated with the likelihood of student nomination due to its influence on students' motivation to achieve in school, which in turn influences the likelihood that teachers will see the student as high-achieving.

Structure

More distally, "context" can refer to the school structures and policies that channel the ways in which students interact with their peers and with teachers. Characteristics of the school such as its size, its location, and its enrollment of students in advanced programs can all an influence in how students are tracked across all achievement levels, and in particular how students are selected for the top programs (as summarized in a review of sociological and psychological literature by Dornbusch, Glasgow & Lin, 1996). The overall socioeconomic status of a school will also be an important characteristic of context to consider, as schools that are more privileged will have more resources to devote to additional programs, including advanced programs (Hart, Atkins, & Ford, 1998; Soloranzo & Ornelas, 2004).

Motivation

Gagné's DMGT model is unique in its consideration of motivation as related to giftedness and talent. Unlike other theorists, who consider motivation as an integral part of giftedness itself (e.g., Renzulli, 2005), Gagné considers motivation as a condition for high achievement. It is hypothesized in this study that students who do not demonstrate motivation will be less likely to be identified as high-achieving, particular by teachers. Previous surveys of gifted students' teachers in Hong Kong using the Scales for Rating the Behavioral Characteristics of Superior Students (SRBCSS), for example, found that on average, teachers rated the motivation of their students even higher than students' ability (D. Chan, 2000).

More specifically, this study will focus on the roles of intrinsic motivation and self-efficacy as aspects of students' motivation. Each of these two constructs has been researched extensively in the field of gifted education, with exceptional intrinsic motivation often related to teachers' conceptions of giftedness (e.g., Gottfried & Gottfried, 2004; Miller, 2006) and efficacy related to a lowered risk of underachievement. While other aspects of motivation are interesting to consider in relation to gifted students' behavior (such as goal orientations), they bear less relationship to students' recognition as high achieving and are therefore not of interest here.

Self-Efficacy

Dai, Moon, and Feldhusen (1998) consider self-efficacy, or students' perceptions of their capability for performance within specific settings, in their social-cognitive perspective on gifted students' motivation (see also Bandura, 1986). Self-efficacy beliefs are particularly important to consider in a study of adolescents, because these beliefs have been shown to be lower among adolescents when compared to younger students (Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002). Further, efficacy beliefs may be interesting to consider because of the relationship of perfectionism to giftedness and talent. Students who perform at a very high level may not necessarily believe that they are highly competent if they hold extremely high performance standards for themselves (Parker & Mills, 1996).

Intrinsic Motivation

Intrinsic motivation, or students' own, internalized reasons why they want to perform an activity, has also been considered by educational psychologists interested in gifted and talented students in several ways. Dai and colleagues (1998) consider intrinsic motivation in presenting their social-cognitive model of how aspects of students' motivation in a subject may mediate the relationship between gifted students' background characteristics or their social contexts and their academic outcomes. In other words, they theorize that even in the best of contexts, students' potential can only translate into high levels of academic achievement if students have a certain level of intrinsic motivation to do exceptionally well. To contrast, Adele and Allan Gottfried have begun in recent years to develop a conceptualization of what gifted motivation means. Building on Csikszentmihalyi's (1990) work on "flow," they note an internal drive, or "rage to master," present among high-ability students (A. E. Gottfried & A. W. Gottfried, 2004). This leads them to associate an exceptional level of intrinsic motivation with giftedness and talent.

In recent years, large-scale survey programs including the Program for International Student Assessment (Adams & Wu, 2002) and the Educational Longitudinal Study have begun to include scales to assess students' intrinsic motivation levels and self-efficacy, in line with current research on students' motivation (as discussed in the ELS:2002 technical report by Ingels, Pratt, Rogers, Siegel, & Stutts, 2004). The large sample of students for whom information is available allows for the use of more advanced measurement techniques, such as item response theory, which are better able to assess students' motivation using only a few items than are more traditionally-used classical test theory methods.

Individual Background Characteristics

Gagné's model does not provide much explicit guidance in considering how high achievement may be recognized differently in different populations of students. However, he has recently adapted his model in order to introduce the concept of "chance" into his model (Gagné, 2004). This is a concept which had been previously been discussed in other theories of giftedness and talent (e.g., Tennenbaum, 1983). Even given optimal conditions of aptitude, motivation, and context, not all gifted students will be recognized as high-achieving. According to Gagné and other theorists, it is possible to think of issues of being born a particular race, a particular gender, or growing up in a particular socioeconomic status as a sort of "chance." The stereotypes associated with gender and race, the cultural differences associated with ethnicity, and the risk factors associated with socioeconomic status or a set of values may all have an influence on whether giftedness actually becomes identified as high-achieving. Thus, each of these factors is important to consider separately as a potential moderator of the relationships between perceptions of context and high-achievement identification and between motivation and high-achievement identification. In this study, such factors are referred to generally as "individual background characteristics," capturing general demographic variables of interest such as racial/ethnic background, home socioeconomic status, and gender.

Race and Ethnicity

Like distinguishing giftedness from high achievement, distinguishing between the constructs of "race" and "ethnicity" can be difficult. In general, race refers to sociallyderived categories of people based on phenotypic differences, while ethnicity refers to a series of categories based on various cultural practices. Both race and ethnicity are extremely complex constructs, and students who might be considered in the same group by an outside judge may indeed have very different racial or ethnic identities themselves. This is especially true for gifted and talented minority students for whom an identity as gifted may conflict with a minority identity (Grantham & Ford, 2003). However, from a sociological perspective, issues of culture, race, and ethnicity play extremely important roles in what a society labels as high-achieving, and *whom* a society labels as high-achieving. As such, it is a crucial construct to consider in this study.

While the terms race and ethnicity are considered together in this study in order to match the wording of the question posed by the data set being used, the reasons why this construct is important are due in part to cultural issues and in part due to assumptions that individuals may hold about certain racial groups. Racial stereotypes on the part of teachers may result in differential nomination of students from racial/ethnic minorities to various programs. Some researchers have concluded that African American or Hispanic students are assumed by teachers to be less capable of high achievement (Elhowereis et al., 2005), while Asian American students may be *more* likely to be nominated based on their “model minority” stereotype, particularly in math (Plucker, 1996). To contrast, differences in cultural background may explain why tests of achievement may be less likely to identify high-achieving minority students than teachers. A certain amount of “cultural capital” (Bourdieu, Passeron, & Nice, 1990) or knowledge about and experience with common practices of the dominant cultural group, might be necessary to perform well on large-scale achievement tests (discussed in Baldwin, 2002). In this sense, teacher nominations may actually be a more culturally-sensitive criterion for identification as high achieving (Baldwin, 2002). It is not surprising, then, that underrepresentation of students from Hispanic and African American ethnic minority backgrounds in gifted programs is prevalent in schools in regions throughout the United States (Oakes, 2005) and in schools with widely different socioeconomic backgrounds (Soloranzo & Ornelas, 2004).

The consideration of racial and ethnic differences in students' schooling is an important consideration of many large-scale surveys, and survey methodologists develop sampling procedures that have the explicit purpose of allowing for comparisons of students across ethnic backgrounds. Thus, the use of nationally-representative data from a large-scale dataset allows for a more in-depth analysis of talented minority students than is usually possible in a small convenience sample of local gifted programs.

Socioeconomic Status

Given the relationship between race/ethnicity and socioeconomic status observed in the United States, it is crucial that both constructs are considered in order to separate their effects as much as possible. Indeed, a student's individual socioeconomic status, defined in terms of the level of financial and educational resources available in the home, may influence the expectations that schools and teachers have for students, based on assumptions about high achievement or motivation to complete advanced work (e.g., Hébert, 2001). This also may be an issue of cultural capital, if the "dominant ethnic group" is more specifically defined as middle-class white Americans. Students from low-socioeconomic status home backgrounds may not have the same range of experiences as their peers from homes with more resources.

The consideration of socioeconomic status is complicated by the relationship between individuals' socioeconomic statuses and that of the school that they attend (or its neighborhood). This consideration of the predominant socioeconomic status of students in a school as an aspect of structure is particularly important when considering the identification of students who come from low-socioeconomic status home backgrounds. An analysis that takes into account socioeconomic status as an aspect of school structure separately from socioeconomic status as an aspect of students' home background can help to separate these confounded effects. This can help to clarify whether high-achieving students from low-resource home backgrounds are considered "at risk" for not participating in advanced programs, or whether students in a school with low resources are at a disadvantage regardless of their own home background. This has important policy implications.

Gender

Finally, students may also be differentially selected into programs based on gender. The term "gender" is preferable to "sex" in this study, as the focus will be on the social implications and assumptions of being seen as a young man or a young woman rather than on the biological differences that exist between males and females. In particular, there is an assumption that girls are more adept in more verbal subjects, such as English and social studies, and that boys have greater potential for advanced work in subjects like math and science (Reis & Park, 2001). Given the importance of identifying high achievement in specific subject areas once students reach high school, the gender stereotypes associated with each subject are necessary to consider. Further, there is much research on how efficacy beliefs may be different in male and female adolescents, and between gifted male and female adolescents in particular (e.g., Dai, 2000, 2002). Because of this, the relationships of gender and motivation to the identification of high achievement will be important.

Summary

In summary, while it is well-established that various criteria used for identifying high achievement will identify different groups of students, there is less known about what other factors might be associated with specific identification criteria met. Models of giftedness like Gagné's DMGT model provide some guidance to thinking about the factors associated with the identification of high achievement by outlining an association between achievement and motivation, contextual factors, as well as other "chance" factors. Given that teachers often consider aspects of students' motivation and engagement in school in addition to their academic achievement when evaluating students, exploring the characteristics of teacher nominations as compared to test criteria has important implications for both gifted education researchers (who are interested in examining appropriate schooling practices for high-achieving students) as well as for educational psychologists. By combining concepts of motivation and engagement in the school context discussed in educational psychology with the considerations of school organization more commonly discussed in educational sociology, a more complete understanding of how characteristics of individuals and schools together influence the identification of high achievement can be developed.

Looking at whether students' motivation and their own experiences with peers, friends, and teachers in schools are associated with the identification of high achievement has important implications for choosing nomination procedures and preparing those teachers who are likely to be in a position to identify students. The further exploration of how race/ethnicity, class, and gender influence the relationship between these factors and high-achievement criteria met is necessary in order to develop policies to increase the enrollment groups that are currently under-represented in advanced programs. Finally, the consideration of how the effects of these processes may differ in schools with various structures and backgrounds has important implications for developing specific nomination procedures tailored to the unique situations of individual schools and for generating further research on topics relevant to specific school contexts.

Motivation, perceptions of context, and other individual and school characteristics will be used to investigate the likelihood of membership in one of four categories of students: those who are considered high-achieving by both teacher nomination and test performance, those only considered high-achieving by teacher nomination, those only considered high-achieving by test performance, and those who do not meet either criterion. More specifically, these influences on achievement identification will be addressed as outlined by the research questions that follow.

Research Questions

1. How are *individual characteristics* associated with the likelihood of meeting a particular set of high-achievement identification criteria?
    a. Are characteristics of students' relationships with peers, teachers, and friends associated with the likelihood of being nominated as high-achieving *only* by test performance, *only* by teacher recommendation, by both criteria, or by neither criterion?

b. Are intrinsic motivation and self-efficacy associated with the likelihood of belonging to one of the four high-achievement identification groups?

c. Do race, class, and/or gender influence the relationship between students' perceptions of their context, domain-specific intrinsic motivation, or self-efficacy and the likelihood of belonging to one of the four high-achievement identification groups?

2. How are *school characteristics* associated with the likelihood of meeting a particular set of high-achievement identification criteria?

    a. Are characteristics of school size, socioeconomic status, or overall frequency of advanced program nominations associated with the likelihood of belonging to one of four high-achievement identification groups?

    b. Are characteristics of school size, socioeconomic status, or frequency of advanced program nominations associated with the strength of relationship between individual characteristics of social relationships, motivation, or background characteristics and the likelihood of belonging to one of four high-achievement identification groups?

These questions will be addressed using a series of hierarchical generalized linear models (HGLM), which allow for the likelihood of belonging to various categories in a multinomial outcome to be determined by a combination of individual and school characteristics. Separate analyses will be conducted for high-achieving students in math and high-achieving students in English, in order to assess whether certain motivational, contextual, or individual background factors relate more to the identification of high achievement in one subject area or another. Each of the two outcome variables consist of four categories of students: those not identified as high-achieving, those identified as high-achieving by teachers only, those identified as high-achieving by tests only, and those identified by both criteria. The predictor variables in these analyses included scales of self-efficacy and intrinsic motivation; students' perceptions with peers, friends, and teachers in the context of school; and items relating to students' race, class, and gender; and school's size, socioeconomic status, urbanicity, control (public, private, or Catholic), and frequency of advanced program nomination. A more thorough discussion of this study's methodology is presented in Chapter 3.

CHAPTER 2

Theory, Conceptual Frameworks, and Related Research

The purpose of this study was to determine the extent to which different criteria for considering students as high achieving is associated with students' perceptions of social relationships within the school, their motivation, or by other background characteristics; and to explore how these associations may differ in schools with different structures. In particular, it used data from a nationally-representative, large-scale survey to focus on the differences between students who were considered high-achieving based on teacher nominations and/or test performance. The current chapter summarizes the previous research relevant to the study of identification of high-achieving adolescents. The concept of high achievement is considered both as defined by teacher nominations and by achievement test scores. More specifically, the consideration of such judgments for Advanced Placement (AP) and other programs tailored toward high-achieving students.

Following this discussion, the importance of studying gifted adolescents is considered within the frameworks of developmental psychology, educational psychology, and sociology. This focus on the cognitive, social, and personal factors leads into a discussion of Gagné's Differentiated Model of Giftedness and Talent. This provides a conceptualization of the contextual, motivational, and interpersonal factors that can be thought to be associated with the recognition of high achievement. To begin, Gagné's DMGT model is outlined in depth, and is accompanied by a discussion of critiques made of the theory by other prominent researchers in the field of gifted education. While the DMGT model appears to be most appropriate for the current discussion of how individual and contextual factors influence the identification of high achievement, it is also important to acknowledge the limitations of this model, as well as how this current study might address them.

A review of the literature pertinent to understanding each component of Gagné's DMGT model is then presented as it relates to the unique experiences of gifted adolescents. The DMGT model is especially appropriate for studying adolescents because it acknowledges that high achievement can be demonstrated in subject-specific ways and because it explicitly takes into account social context. The first section reviews the literature on the *context* in which gifted education takes place, from educational policies surrounding gifted education to the characteristics of gifted adolescents' peer relationships in the school environment. In order to provide a more complete analysis of the variety of school contextual factors that must be considered, literature will draw from the fields of both educational sociology and psychology. Next, the concept of *motivation* is reviewed, divided into several relevant concepts that educational psychologists have identified. This section serves two purposes: first, to identify those aspects of motivation most regularly associated with high achievement, and to review how they have been applied to the study of gifted adolescents. Finally, this section concludes with a discussion of how gifted adolescents of different racial and ethnic backgrounds, from different socioeconomic statuses, and of different genders may differ in their school experiences. Throughout, the primary focus of the discussion will be on gifted/talented adolescents; however, research literature relating to younger students will also be considered when appropriate (primarily in discussing giftedness/talent and reviewing nomination criteria).

High Achievement

Immense variations in state and local policy result in a variety of different criteria for identification as gifted across schools. Given the many criteria by which students can be considered gifted or talented, it is not surprising that a national survey of gifted/talented teachers, administrators, and consultants found that most throughout the nation favored the use of what Brown and colleagues refer to as “multiple criteria.” This refers to the consideration of high achievement in multiple domains as reported by multiple sources (Brown et al., 2005). Similarly, in research on the gifted and talented, students are identified for inclusion in research studies by various means. In a meta-analysis of publications from four of the major journals focusing on gifted and talented research, Ziegler and Raul (2000) identified five categories of identification: intelligence, achievement, creativity, behavioral characteristics, and nomination (by teacher, self, peer, or parent). In research on adolescent students (i.e., those students in middle school or high school), researchers overwhelming used a combination of multiple criteria in order to identify the gifted and talented.

This section will take a look at two of the most common criterion for identifying high achievement in adolescent students: test scores and teacher nominations. First, a review of literature on the use of tests in identifying high-achieving students (or, in many cases, potentially high-achieving students) is presented in order to gain a deeper understanding of what is being measured by tests. Then, literature relating teacher nominations to the use of test score criteria will be reviewed an analyzed in light of why teachers and tests may judge different students to be high-achieving. By considering the similarities and differences between how teachers and test scores identify high-achieving students, more information can be gained about how teachers' "implicit theories" of high achieving students may contain concepts other than achievement itself.

General Literature on the Uses of Different Identification Criteria

Before examining work on the use of test scores and teachers in identifying high-achieving students, it is useful to consider the different ways in which identification criteria are, and should, be used. Recent attention has been paid to identification criteria in empirical studies. A recent special issue of the journal *Psychology Science* contained empirical studies and theoretical articles from researchers in several countries relating to the identification of students using varied criteria (Heymans & Mönks, 2004; Ziegler & Stoger, 2004). Despite the range of identification procedures that exist, there has been a call to consider more carefully which criteria are appropriate to use in which situations, and in particular the differences between test criteria and teacher nomination criteria (Baldwin 2002; Plucker & Barab, 2005). In a review of identification procedures, Heller (2004) outlined four questions related to choosing a set of criteria. The first question is *what* is to be identified. This is especially relevant to the discussion of using tests versus teacher nominations, as different criteria may be capturing different characteristics of students. The second question relates to *why* the identification is attempted. This is particularly relevant for distinguishing between the identification of students for an in-school program and the identification of students for individual counseling (as mentioned in a methodological discussion of different gifted/talented identification by Heller, 2004). The third question asks *how* students can be identified. The multitude of criteria that schools and researchers employ demonstrates the variation in how identification can occur, and the decisions made often depend on the answer to the first two questions.

Finally, the fourth question is *when* the identification should be attempted. By focusing on adolescence, we are assuming that identification can continue to take place throughout one's academic career (and indeed, throughout one's life span), and not only at the elementary school level as is typically discussed among gifted education practitioners and researchers.

High Achievement as Identified by Tests

Tests of achievement, and standardized tests of achievement in particular, are designed to measure what a student has learned, as opposed to what he or she is capable of (as outlined by Crocker & Algina, 1986 in an introduction to educational assessment). Achievement tests are particularly popular tools for identifying gifted and talented students. As acknowledged by Plucker and Barab (2005), most of the tests used by schools are statistically reliable and their scores are easily interpreted, particularly when the tests are norm-referenced. Most of the literature on the use of standardized tests for the identification of gifted/talented students focuses on the use of aptitude or "intelligence" tests. Such tests often come with a series of instructions specifically tailored to using these assessments for the identification of high-ability students, and researchers have assessed the reliability and validity of these instruments specifically for this use on this population of students (e.g., Ablard & Mills, 1996, for the Raven's Progressive Matrices; Lohman, 2005, for the Cognitive Abilities Test; Volker, Guaranaccia, & Scardapane, 1999 for the Stanford-Binet; and Watkins, Greenawalt, & Marcell, 2002, for the Wechsler Intelligence scale). Although all of these tests measure underlying aptitudes that influence academic success, they each employ slightly different conceptualizations of intelligence (e.g., a focus on nonverbal aptitudes in the Raven's

Progressive Matrices, or the distinction between Fluid vs. Crystallized in the Stanford-Binet), which make them useful for different purposes.

There is a strong relationship between potential as measured by tests of intelligence or aptitude and demonstrated achievement as measured by tests of achievement. Pyryt (2004) explored such a relationship between giftedness and talent in his secondary analysis of data from Pegnato and Birch's seminal study (Pegnato & Birch, 1959) of identification criteria. In their original study, Pegnato and Birch considered "gifted" junior high-school students as those who scored in the top percentile on the Stanford-Binet intelligence test, and tested the effectiveness of different identification criteria in identifying this group one at a time. Using a discriminant function analysis to consider how multiple predictors function simultaneously in discriminating between a group of 87 "gifted" students and 68 "non-gifted" students, Pyryt found that achievement tests, along with group-administered IQ tests, were the best predictors of whether a student was identified as gifted. Using more recent data of over 700,000 elementary-school students in Georgia, McBee (2006) found that nominations based on scoring above the 90th percentile on an achievement test were more accurate than any other nomination criteria used in the state for identifying those students who would go on to meet additional psychometric criteria for giftedness after screening.

Most of the critical research on the use of achievement tests in identifying gifted students has focused on the use of tests designed for older, more advanced students on younger ones. There are several reasons why the traditional use of achievement tests used for the age group on which the test is normed as a measure of students' exceptional high achievement may be questionable. As VanTassel-Baska (1996) describes in a summary of the contribution of the Johns Hopkins “talent search” concept to gifted education (see Stanley, 1996), one is the fact that achievement test scores contain a great deal of measurement error at the highest and lowest ends of the achievement continuum. The solution adopted by the Study for Mathematically Precocious Youth was to provide a second achievement test normed to an older population of students that reports separate information on students’ achievement in several domains (VanTassel-Baska, 1996). In fact, such “off-level assessments” served as a prototype for the later development of a performance-based assessment of achievement by VanTassel-Baska, and colleagues (2002), which was designed especially to identify talented students who were from low-socioeconomic and ethnic minority groups.

This particular use of achievement criteria is quite rare in schools, however. A survey of officials from schools participating in the Northwestern University Talent Search found that most schools used Talent Search scores in order to encourage out-of-school enrichment opportunities for students, rather than in-school opportunities (Olszewski-Kubilius & Lee, 2005). In other words, while the research on the Talent Search model does provide insight into why (and how) achievement tests should ideally be used in the identification of high-achieving students, the results of these studies are not generalizable to the more common uses of age-normed achievement tests.

Despite the relative lack of measurement and assessment research available specifically on the use of achievement tests to identify high-achieving students, it remains a popular criterion, especially among researchers (Ziegler & Raul, 2000). In response to Heller’s first question about what is to be identified, it is interesting to note that achievement tests are used by researchers when defining giftedness based on performance rather than on interest or motivation. For example, a study of students' motivation by Hong and Aqui (2004) compared a group of "academically talented" high-school math students who scored above the 78th percentile on an achievement test to a group of "creatively talented" high-school math students who scored lower on the achievement test but reported high accomplishments and activity in the subject area.

In response to Heller's third question about how giftedness could be identified, it is also interesting to see that in certain studies, tests of aptitude or intelligence are the "definite" identification which other achievement tests are attempting to replicate. Niederer and colleagues (2003), for example, conducted a study of 9 to 11-year-olds in New Zealand on how well the identification of students using various cutoff points on the Progressive Achievement Test, a mathematics achievement test, matched the identification of students based on a mathematics problem-solving test. Niederer and colleagues (2003) argued that since they conceptualized giftedness as "the ability to solve difficult math problems" (p. 72), the mathematics problem-solving test could be considered the objective test of "ability." To contrast, the Progressive Achievement test, a standardized age-normed test administered annually to students through New Zealand, can be thought of as the test of achievement, since it is designed primarily to measure what students have learned in school (Niederer et al., 2003, p. 74). After testing several different cutoff points on the Progressive Achievement test, they found that a 90th percentile cutoff was most successful at maximizing the number of "gifted" students identified (as judged by the problem-solving test) while minimizing the identification of non-gifted students.

In summary, despite the extent to which achievement tests are used in research and in the practice of schools (Ziegler & Raul, 2000), little research has focused on *how* these tests are used in the most typical contexts. Experts in the field of measurement have commented on the ability of achievement tests to measure what students have learned, and have separated these tests from “intelligence tests” that measure students’ potential. More specifically, researchers in the field of gifted education research have focused on the advantage and pitfalls of using achievement tests in the identification of high achievement. Finally, theorists in the field of gifted education have commented on the use of achievement tests as “objective” measures of students’ achievement. Given this attention paid to tests as indicators of students’ achievement, they are interesting to compare to teacher nominations, considered more “subjective,” but which may be more sensitive to other important factors.

High Achievement as Identified by Teachers

The majority of practitioners surveyed in Brown and colleagues’ (2005) study opposed the sole use of IQ and/or achievement tests in identifying gifted or talented students. In many school districts, nominations are commonly used as criterion of giftedness/talent in addition to achievement or intelligence tests. In a commentary on the practical concerns of identification and programming for gifted/talented students, Peine (1998) described the identification process in the state of Tennessee as initiated by a nomination by a parent, peer, or teacher and followed up on by a team of school staff members who administer psychometric tests. While Peine notes that most of the nominations being initiated by parents (e.g., “my child asks really unusual questions”), she also reports some teacher referrals as well (e.g., “he gets straight A's and works hard”). This may be true for younger students; however, teachers play an especially important role in referring adolescent students in secondary schools for advanced programming. This is due in part to a notable decline over time in parental input in students’ curricular placement (discussed in an overview of middle-school students’ relationships with parents by Eccles & Harold, 1993).

Several of the concerns about teachers’ abilities to identify high-achieving students that Peine shares as a practitioner are mirrored by gifted education researchers. Researchers often consider teacher nominations as identifiers of high achievement in comparison to test scores; however, there are notable differences in how researchers view teachers as judges of students’ potential and demonstrated achievement.

Analysis of the Agreement of Teacher and Test Identification Criteria

Some researchers analyze the amount of agreement between teacher nominations and test scores (and in particular, IQ tests or other tests of giftedness) and consider any disagreement as a sign of error on the part of teachers. In a study of gifted secondary-school students nominated for participation in the German Pupils Academy for highly-able students, Neber (2004) found that teachers identified all students who met the psychometric criteria for giftedness (tested first as the top 3 percent of students, then as the top 14 percent of students). These teachers, however, also nominated many students who did not meet these psychometric criteria. To contrast, Niederer and colleagues (2003) found that teachers in New Zealand only “correctly” identified 9 to 11 year olds as mathematically gifted 50% of the time, and gave false positive identifications 20 percent of the time. Differences in educational context, age of students, standard of giftedness, or content area may account for this difference in the extent to which teacher nominations and test scores identify the same students in these two studies. It is notable, for example, that German teachers participating in a cross-national study of gifted educators nominated fewer students as gifted than did teachers in other participating countries. Teachers in Germany nominated 3.5% of their students as gifted, which was a lower proportion of students than were nominated by teachers in the United States (6%) or Indonesia (17%) (Dahme, 1996).

Other researchers argue, despite these discrepancies, that teachers are better able to identify students who meet test-based criteria for giftedness or talent than are other parties. McBee's (2006) study of elementary-school gifted nominations in the state of Georgia found teacher nominations to be the second most effective nomination criteria, behind standardized test criteria. Teachers were more efficient at nominating students who were identified upon further testing as gifted than were parents, peers, or students themselves. In other words, they identified more students who were eventually identified as gifted, and fewer students who were *not* eventually identified. This finding was also supported in Niederer and colleagues' study, which found parent and peer nominations considerably less efficient than teacher nominations.

Analysis of Teachers' Conceptualizations of Giftedness

While these studies illustrate that identifications of gifted/talented students made by tests and by teachers are different from one another, neither attempts to explain potential reasons *why* they differ. A second area of research on teacher nominations focuses on how teachers describe gifted students, in order to gain more insight into those characteristics of students that teachers find most important when recommending students. Researchers such as Renzulli and Delcourt (1986) have critiqued the view that difference between teacher nominations and students meeting psychometric criteria for giftedness or talent are indicative of a lack of efficiency (as conceptualized by Neber, 2004), or of "wishy-washiness" on the part of teachers (as discussed in a critique of test-based identification criteria Baldwin, 2002). Instead, these differences may reflect the fact that teachers are taking into account different, non-test-related criteria when nominating students. In other words, one could consider that their implicit theories of what a high-achieving student is take into account factors other than those measured by test performance. As Freeman (2005) states in a cross-national review of literature on the gifted and talented, identification by teachers or other people can be influenced by their definition of giftedness.

However, Freeman also goes on to state that differences between the students identified by teachers and test scores reflect not only teachers' beliefs about what high achievement means, but also reflect that teachers are more inclined to take into account characteristics of social context when judging students. As she states teachers' judgments are influenced by, "the interaction between the personalities of everyone concerned, what the children look and behave like… or even the percentages of ethnic representation demanded by educational authorities" (p. 81). Similarly, Plucker and Barab (2005) support the use of what they refer to as "subjective" identification procedures like teacher nominations, despite the negative connotation, because they are more likely to take into account context than would a test (p. 208). Baldwin (2002) similarly supports the use of what she refers to as a combination of both "standardized" and "unstandardized" criteria, particularly to increase the enrollment of culturally-diverse students in advanced programs. Empirical research on teacher identification explores many of these issues in greater depth.

Teacher nominations reflecting teachers' beliefs. In line with the view that differences between groups of students identified by psychometric criteria and those nominated by teachers are *not* simply due to a lack of efficiency, some argue that teachers may nominate students who do not meet psychometric criteria because they are judging students on characteristics which tests will not measure, but that are important to the teacher nonetheless. In this sense, nominations by teachers and others may be particularly salient if a program's definition of giftedness/talent (or even the implicit definition held by the individual teacher) extends beyond ability and achievement. Literature on teacher nominations suggests that teachers may be especially likely to consider motivation as a factor other than high achievement that is related to giftedness. When teachers in Hong Kong were asked to rate their secondary students using the Scales for Rating the Behavioral Characteristics of Superior Students (SRBCSS), teachers gave even higher ratings to these students' motivation (measured by questions about sustained interest and persistence in academic work) than to their success in specific subjects or their overall academic ability (D. Chan, 2000). Such motivation would not be captured in standardized tests of achievement or intelligence, but might very well be considered a characteristic of a high-achieving student by teachers. It is important to note, however, that David Chan's study examined teachers and students in Hong Kong. Researchers interested in the cross-national study of gifted and talented education and social organization of schooling have noted that in many Asian countries high achievement is viewed as more closely tied to motivation than in the United States and other western countries (as mentioned in a theoretical discussion of giftedness by Freeman, 2005). Therefore, it would be interesting to see if teachers similarly perceived their gifted students as highly motivated in national contexts outside of Asia.

Similarly, teachers may also be called upon to provide ratings of students' creativity and interest in the classroom, which are often considered by teachers to be central characteristics of giftedness (see Miller, 2006). In a review of the advanced science program in Evanston Township High School, Ngoi and Vondracek (2004) report that only a subset of students who meet the psychometric criteria for admission into honors classes are selected by teachers as "gifted." In this program, teachers select students who ask high-level questions about physics and mathematics in class, and are able to grasp the basic concepts in these subjects *without* an extensive amount of work or studying. Presumably, variations on this program exist in other schools.

Teacher nominations reflecting teacher biases. Others would argue, however, that teachers' nominations are influenced not by a difference in conceptualization of what is gifted, but instead by their own biases regarding certain groups of students. This is particularly the view that some researchers take when studying whether certain teachers *fail* to nominate students who are considered high-achieving based on achievement test scores because of other individual characteristics. In a quasi-experimental study using vignettes describing hypothetical students, Siegle and Powell (2004) found that classroom teachers (grade levels unspecified) were more likely to focus on negative aspects of a student than were gifted specialists, failing to nominate students who were described as having high ability but who did not do their work. Siegle and Powell interpreted this as a form of bias on the part of classroom teachers, or the teachers letting aspects of a student not related to ability negatively influence their nomination. This "bias" was only demonstrated when teachers were asked about hypothetical students in math classes; this difference between classroom teachers and gifted specialists was not observed when the vignettes described reading classes. The extent to which the sorting of hypothetical students corresponds to judgments about actual students has not be explored, but could be in the future.

It is also possible that teachers may not nominate certain high-achieving students because they believe that that the accelerated programs for which students are nominated will not be a good fit socially. A survey of Dutch secondary-school teachers conducted by Hoogeveen, van Hell, and Verhoeven (2005) found that teachers' perceptions of students in accelerated programs varied depending on their previous experiences with these students, and that many believed or perceived these programs to have negative consequences on students' social and emotional experiences in school. These views were most common among teachers who had a negative view of acceleration overall, and who had the least positive experiences with accelerated students. (No significant differences in views were found between teachers in different subject areas.)

The findings of this Hoogeveen and colleagues' study are similar to the findings in Siegle and Powell's (2004) study, in that many teachers tended to focus more on the negative aspects of these students (e.g., social problems, lack of attention paid in class, lack of motivation). In a follow-up intervention, however, Hoogeveen and colleagues (2005) also found that these teachers' attitudes became more positive after receiving additional information about acceleration and giftedness. Unlike Siegle and Powell, Hoogeveen and colleagues did not ask teachers to nominate students for advanced programs as part of the study, which may partially explain some of the differences in results of these studies. However, one can speculate that the attitudes toward acceleration demonstrated by these teachers would influence how they nominate students.

Regardless of how well teacher nominations correspond to other identification criteria, there is evidence to show that teacher nominations do positively relate to students' success in programs. A study of secondary-school students by Hunsaker and colleagues (1997) found that nominations from teachers based on two instruments (the SRBCSS and a second instrument designed especially to identify high-achieving ethnic-minority and low-income students) did relate to later school performance as measured by ratings from the same teachers. In particular, teachers' ratings of students' thinking abilities, demonstration of gifted behaviors, and learning skills positively related to later ratings of students' creativity, language abilities, and skills in working with a group.

In summary, while it has been well-established that teachers and tests do not identify precisely the same groups of students as gifted, there is mixed opinion as to whether this discrepancy is something that warrants concern. Researchers concerned with the underrepresentation of certain groups of students based on test score criteria (e.g., Baldwin, 2002) welcome teacher nominations as an alternative method of identifying high achievement. To contrast, gifted education specialists who focus on teachers' implicit theories note that there might be factors in addition to high test achievement that are important to consider when identifying the top students in a school. Other researchers, however, express concern that teachers are identifying too many "non-gifted" students, in essence watering down programs designed for advanced students. Overall, however, the largest concern seems to come from the possibility that relying solely on teacher nominations might exclude certain students who meet psychometric criteria for giftedness or high achievement (Niederer et al., 2003), but who show less motivation or are less serious about schooling (Siegle & Powell, 2004). This is especially important to consider if the opportunities for advanced work afforded to students identified as high-achieving serve to provide more motivating and interesting work to students who may not be engaged in more typical classroom contexts.

Advanced Programs

The studies by Hoogeveen and colleagues (2005), Hunsaker and colleagues (1997), and Siegle and Powell (2004) each focus on teacher nominations as they may influence students' selection into advanced programs. Researchers have found that students who are identified as gifted using psychometric criteria at a young age out-perform their peers later in life even without the intervention of these advanced programs (see Schofield & Hotulainen, 2004 for a longitudinal study of gifted Finnish students). However, it is believed by many that advanced programs are important in order to provide gifted students with an optimally challenging curriculum. Therefore, the identification of students who are eligible for enrollment in such programs is important.

At the same time, other scholars are more interested in how advanced programs may lead to inequity within a school, since students who are not enrolled in these programs are put at a relative educational disadvantage. The concerns of those who study advanced programs' effects on the social organization of schooling are acknowledged by gifted researchers. In a review of literature on selection for gifted programs, Borland (2005) acknowledged that many gifted programs under-represent students from ethnic minorities and of low socioeconomic status, often resulting in fewer educational opportunities for these students, especially when schools lack financial resources. Most interestingly, Borland cited a review of eighth-grade gifted education programs conducted as part of the National Educational Longitudinal Study of 1988 (United States Department of Education, 1991), which found that students who are enrolled in such programs come from more privileged socioeconomic backgrounds than those who do not. Without an appropriate curriculum to challenge them, students from less resourced socioeconomic backgrounds not in advanced programs ultimately achieve less.

Advanced Programs as Gifted Education

Since its inception in the 1950s, the Advanced Placement program (AP: see National Research Council 2002) has become one of the most common accelerated programs for gifted/talented adolescents in the United States (as discussed in Bleske-Reckeh, Lubinski, & Benbow, 2004; Curry et al., 1999; and Olszewski-Kubilius & Limburg-Weber, 1999). Lubinski and Benbow (2000) described it as a curriculum that provides an “appropriate developmental” placement for gifted/talented adolescents, as the faster pace of the class fits well to these students’ faster rate of learning. A survey of participants in the Johns Hopkins University Study for Mathematically Precocious Youth conducted by Bleske-Rechek and colleagues (2004) found that these students do participate in the AP program in large numbers, with over 75% of the participants reporting having taken at least one AP class. Furthermore, Bleske-Rechek and colleagues found that students who participated in AP programs reported being more satisfied with the intellectual rigor of their classwork than did other students, and ultimately achieved more.

Because AP classes exist for specific subjects, it is an especially appropriate curriculum for gifted adolescents, whose talents are developing in more subject-specific ways as compared to younger students (Moon & Dixon, 2006). For example, Ngoi and Vondracek (2004) reported specifically on an accelerated program for gifted/talented science students that combined AP Calculus and AP Physics. In addition, the recent online availability of AP courses (National Research Council, 2002) has the potential to extend opportunities for accelerated coursework to gifted/talented to students in more geographically remote areas. Cross and Burney (2005) described such a practice in a report on Project Aspire, a distance-education program which uses AP courses to provide curriculum options to gifted/talented students in low-socioeconomic, rural areas.

Other programs designed to provide high school students with an advanced curriculum in specific subjects are also available. The International Baccalaureate (IB) program in particular has gained similar attention from gifted/talented researchers and educators as a way to accelerate the learning of high-school students (National Research Council, 2002; also discussed by Tookey, 1999). Although the roots of the IB program are very different from those of the AP program, high schools and colleges in the United States tend to view these programs as very similar in their purpose (Poelzer and Feldhusen, 1997).

Although such programs are thought of as providing already high-achieving students with opportunities for advanced schoolwork, and are seen as essential to a challenging school curriculum overall, schools differ greatly in the extent to which they offer such programs. Soloranzo and Ornelas explored this variation in Advanced Placement programs available in schools throughout the state of California by creating the Advanced Placement Student Access Index, or the ratio of AP programs offered to the number of students in the school, to compare the availability of AP courses to students in different schools (Soloranzo and Ornelas, 2002, 2004). Soloranzo and Ornelas primarily used this index in order to compare the availability of programs to high-achieving ethnic-minority or low-income students.

Advanced Programs and School Structure

The presence of advanced programs in high schools influences to the curricular structure of the school. As a result, there is much that can be learned about the effects of advanced programs by reviewing the literature on social organization of schooling, which considers how curricular tracks and other organizational features of school impact students. Advanced programs like AP and IB can be thought of as providing schools with a form of "de facto" tracking (Lucas & Berends, 2002) by influence students' course-taking patterns.

Many of the findings from tracking research mirror the findings from research more specifically from advanced programs. For example, just as Bleske-Rechek and colleagues (2004) found that gifted/talented students in advanced programs achieve more than other students of similar ability, Friedkin and Thomas (1997) found, through secondary analysis of data from the High School and Beyond Study, that students in higher "curricular positions," or who took greater numbers of higher-level classes, achieved more overall in both math and English. Similarly, several of the findings on social impacts of tracking mirror what researchers found to be the social impacts of advanced programs. Qualitative case studies and semi-structured interviews of gifted/talented adolescent students in advanced programs in their schools found that their closest friendships were with students with whom they shared classes (Hertzog, 2003; Reis & Dìaz, 1998). This finding is also supported in the more general literature on tracking. A secondary analysis of data from the High School and Beyond study conducted by Kubitschek and Hallinan (1998) found that students were more likely to choose friends within their curricular tracks.

As a result, it is reasonable to believe that how students would "fit" in these tracks, both academically and socially, may influence whether they are selected into more advanced classes. In reviews of literature on the social organization of schooling, Dornbusch, Glasgow, and Lin (1996) and Kao and Thompson (2003) analyzed research on predictors of track placement. While academic achievement was the single greatest predictor of track placement, they also acknowledged that students who had similar academic achievement were often placed in different tracks. Various studies found that this discrepancy could be partially explained by students' socioeconomic status or ethnic background (e.g., Latino adolescents as discussed in Donato, Menchacha, & Valencia, 1991; or students from a low-socioeconomic status background as discussed in Hallinan, 1994). However, given the difficulty in disentangling achievement and social status, Dornbusch and colleagues also noted that several researchers were encouraging a shift from considering background characteristics as predictors of track placement to the social and self processes mediating them, such as motivation and peer relationships. Such an approach would be similarly beneficial in researching who is nominated more specifically for advanced programs.

To summarize, advanced programs serve two important functions. On one hand, they serve as a means for high achievement to develop by providing gifted students with a curriculum designed to cultivate their exceptional abilities into exceptionally high achievement (Lubinski & Benbow, 2000). The role of such programs as an environmental catalyst is the primary of interest of many gifted education researchers. At the same time, given that schools must nominate students for these programs using various identification criteria (Oakes, 2005), one can think of involvement in such programs itself as recognition of high achievement. In the latter view of advanced programs, it is particularly important to consider the research on the social organization of schooling, as it relates to the differential enrollment of certain subgroups of students in these programs.

Importance of Adolescence

Much of the research conducted in the field of gifted and talented education focuses on the experiences of elementary-school children. Far less research focuses on gifted adolescents (as discussed in a volume on theory and research related to secondary gifted education by Dixon and Moon, 2006). However, the focuses on test-score and teacher criteria of high achievement over other criteria and the consideration of advanced programs in a secondary-school context both speak to the importance of considering students of a particular developmental period. Dixon and Moon recently put forth a conceptual frame that serves to guide reviews of theory and research on gifted adolescents included in their *Handbook of Secondary Gifted Education.* This frame consists of three sections: cognitive, personal, and social. This frame serves as a bridge between the discussion of criteria commonly used to identify high-achieving students and the discussion of those factors that are thought to be associated with the recognition of high achievement.

Cognitive Factors

In describing the cognitive component of this conceptual frame, Moon and Dixon (2006) acknowledge that students' high achievement becomes more differentiated and domain-specific in adolescence. As a result, programs designed for encouraging high achievement in students become similarly more focused on their achievement in certain areas. Similarly, research on the cognitive development of gifted adolescents often focuses on students in specific academic areas. Discussion of advanced programs and identification of high ability in adolescence, then, should focus on domain-specific identification of high achievement, and advanced programming for high-achieving students in specific areas, whenever possible.

Personal Factors

Dixon and Moon discuss an enhanced sense of self-awareness and increased capabilities for self-regulation as part of the personal component of adolescent giftedness. Self-awareness has a particularly profound effect on the motivation of adolescents (as discussed in a review of achievement motivation literature conducted by Patrick, Gentry, & Owen, 2006), as they become more aware of how their performance measures up to the performance of their peers. With this awareness comes a decreased view of their own competence (discussed using a developmental psychology perspective in Wigfield, 1994; and in Wigfield & Eccles, 2000). Similarly, longitudinal analysis of students' academic intrinsic motivation from the Fullerton Longitudinal study conducted by Alan Gottfried, Fleming, and Adele Gottfried (2001) found that students' intrinsic value for schoolwork similarly decreased over the course of development. In other words, adolescents are less motivated than are younger students. This change in motivation may have a subsequent influence on how students' intrapersonal characteristics influence which adolescents are recognized as high achieving.

Social Factors

The third and final aspect of gifted adolescence that Dixon and Moon discuss is the increasing importance of social relationships, particular with peers of a similar age, among these students. This attention to the social relationships of gifted adolescence reflects the great importance of peers among all adolescents, regardless of their ability levels. Adolescents spend more time with a more diverse group of peers than children do. In particular, gifted adolescents spend more time in school than do younger students (as revealed in a survey of gifted/talented students' extracurricular activity participation by Olsewski-Kubilius & Lee, 2004), making the social relationships that develop within the school context even more important to consider. In a general discussion of peer interactions and relationships, Rubin and colleagues state that as more time is spent with peers in general, friendships in particular become a support system that is equal to or stronger than that provided by the family (Rubin, et al., 1998). Peers in general also become increasingly important as individuals develop, in part because of characteristics of their school contexts. In an analysis of peer "crowds" in adolescence, Brown, Mory, and Kinney (1994) discussed how the structure of typical middle schools and high schools, which requires students to move from class to class throughout the day, typically puts students in contact with a large social network of other students.

There are, however, many questions about whether the peer relationships of high-achieving students differ from those of other students. In particular, there is mixed support for the "stigma of giftedness" paradigm (Coleman & Cross, 1988), which posits that the gifted label makes it harder for these students to develop friendships because of the negative connotations (e.g., “nerdy” or “snobby”) associated with the label. Further, school provides an age-segregated context for all adolescents, regardless of achievement (Hogan & Astone, 1986). This is important to consider when discussing high achieving students’ social interactions within a school, as many make a distinction between “age peers,” who would be in the same grade as these students, and “cognitive peers,” who have more similar interests and achievements to gifted/talented students but who would have less contact with them in a typical school context. Therefore, any discussion of gifted adolescents in the school context should include a discussion of how students’ relationships with their peers may influence their experiences.

Overall, many of the issues that Dixon and Moon raise about gifted adolescents correspond to aspects of the DMGT model. Just as Dixon and Moon indicate that high-achievement becomes more domain-specific as children become adolescents, Gagné (2004) acknowledges the importance of considering on a subject-by-subject basis how various factors are associated with the identification of high achievement. Additionally, Dixon and Moon stress the importance of considering how gifted and talented adolescents’ motivation is changing during this developmental period, much in the same way that Gagné encourages the consideration of how motivation might influence whether giftedness does actually manifest into talent. Finally, all three of the researchers stress the importance of considering context, and in particular, how social relationships might have the ability to help or hinder the development of gifted students’ potential.

Factors Associated with the Recognition of High Achievement: Gagné's Differentiated Model of Giftedness and Talent

Although Gagné's Differentiated Model of Giftedness and Talent (DMGT model) does not explicitly address adolescence, its stress on the importance of individual and contextual characteristics in transforming giftedness into talent makes it useful for research focusing on this developmental period. In fact, Moon and Dixon (2006) considered characteristics of the DMGT model with three other prominent theories of giftedness and talent (Renzulli, Feldhusen, and Sternberg: see Sternberg & Davidson, 2005) to create their own framework for considering the unique situation of gifted adolescents.

This section presents a discussion of the DMGT model in its entirety. In particular, it focuses on the roles of "catalysts" such as contextual and individual factors in high achievement, in preparation for a discussion of how these factors may influence whether adolescent students meet certain criteria for high achievement.

Components of Gagné's Model

Gagné's model has been developed and refined over a number of years, and summarized in a number of theoretical papers (see Gagné 1995, 2004, 2005; Gagné & Schader, 2006). Following the suggestion of other gifted education researchers, it is used here primarily to provide a theoretical conceptualization of giftedness and talent suitable for conducting basic research rather than one suitable for serving as the basis for developing gifted education programs (see a critique of the DMGT model by Moon & Dixon, 2006, and acknowledgement of the DMGT model as an influential model for gifted education research by Feldhusen & Jarwan, 2000). Two of the most prominent parts of this model are his view of how giftedness transforms into talent as aided by a series of catalysts, and his use of different percentile cutoffs for forming categories of students who can be considered gifted or talented to varying degrees.

Development of High Achievement

The most central aspect of Gagné's DMGT model is a conceptualization of the process of transforming potential into actual achievement. Gagné (2004, 2005) states that this separation of the two concepts differentiates the DMGT model from many other conceptualizations of giftedness, which use the words "gifted" and "talented" interchangeably. "Gifts" are general, underlying aptitudes with which individuals are born. To contrast, "talents" (which is Gagné's term for demonstrated high achievement) are the manifested, subject-specific abilities that individuals develop over time. Gagné stresses the importance of repeated, deliberate practice in a given domain in the development of general gifts into subject-specific talents.

Although this study does not explicitly address the development of gifted potential into high achievement, this component of Gagné's model is useful in framing this study for two reasons. First, it stresses the importance of considering how high achievement might come to be recognized differently in different subject areas. Second, it outlines a relationship of high achievement, rather than potential, to a series of individual and contextual factors that he calls "catalysts"

Catalysts to Transform Ability into High Achievement

Gagné's latest conceptualization of his model (first introduced in Gagné, 2004) describes giftedness as developing into talent through the means of three categories of catalysts. The first category consists of environmental factors. Some aspects of context that he considers include the social and cultural “milieu” in which students reside, the influence of significant people in their lives, programs which have served as “provisions” for talent development (i.e., those experiences which are likely to foster the development of gifts into talent), and important life events.

The second category of catalysts is intrapersonal factors. Gagné further divides this category into characteristics and processes, with characteristics referring to traits (e.g., personality or temperament), and processes referring to self-management (or self-awareness), motivation (i.e., goal setting behaviors), and volition (i.e., goal attainment behaviors). This distinction between intrapersonal factors reflect a recent change in his conceptualization of this catalyst (see Gagné, 2004) in order to fit the framework of self-processes set forth by Kuhl and Beckmann (1985) and considered in an educational context by Corno and Randi (1999).

The third catalyst is chance. While chance has long been a component in models of adult giftedness (notably Tennenbaum, 1983), it has more recently been added as an explicit consideration in the DMGT model. Some of Gagné’s most recent work has been focused on further conceptualizing chance factors as catalysts (Gagné & Schader, 2006). By “chance,” the authors refer to those aspects of students’ situations over which they have no control. For example, students cannot control the families and social situations into which they are born (including ethnic minority or socioeconomic status: Gagné, 2005). In including chance as an explicit component of the DMGT model, the researchers are acknowledging that two similar students (in terms of either individual characteristics or school context) may develop differently because they were born into and live in different situations.

Prevalence of Gifted and Talented Students

Gagné's model is also unique in relation to many other models in that it gives percentile cutoffs for who should be considered either gifted or talented. According to Gagné, students who have higher potential than 90% of their peers of the same age can be considered gifted, while students who are higher achieving than 90% of their peers of the same age can be considered talented. Further subcategories of gifted or talented students can be made by using more conservative criteria (Gagné, 1998b, 2005). According to Gagné (2005), the creation of the "mildly gifted" and "mildly talented" categories consisting of the top 10% of students separate this use of cutoff scores from their use in more traditional, one-dimensional conceptions of giftedness based on IQ, which instead looked exclusively at the top percentile in IQ (e.g., Pegnato & Birch, 1959; Terman & Oden, 1959).

Criticisms of the Differentiated Model of Giftedness and Talent

This theory is currently both frequently discussed and controversial in the field of gifted education, so much so that *High Ability Studies* devoted an issue to researchers' critiques of the DMGT model as it was presented by Gagné (2004). The researchers, who come from various backgrounds including educational psychology and gifted curriculum and instruction, raise several important questions about the DMGT model that warrant discussion. One of the largest concerns relates to how realistically potential can really be separated from demonstrated ability (addressed in critiques by Baer & Kaufman, 2004 and Porath, 2004). As Dai (2004) addressed in his review of the DMGT model, tests of "giftedness" such as IQ require skills in reading and computation; therefore, a high IQ score reflects not only high ability but high demonstrated performance as well. In a separate response, Guenther (2004) comments that since it can be difficult for individuals to detect potential in a way that separates it from achievement, the two are confounded in practice if not in theory.

Questions are also raised about the three catalysts that Gagné describes. Notably, Dai (2004) questions the separation of motivation from what he describes as a more “ability-centric” conceptualization of giftedness. Rather than a catalyst, Dai argues that motivation is instead an “essential quality” inseparable from giftedness, especially when defining motivation in terms of intrinsic motivation for academic work (also discussed in A. E. Gottfried & A. W. Gottfried, 2004). This is reflected in other conceptualizations of giftedness and intelligence. In Renzulli’s three-ring conceptualization of giftedness (Renzulli, 2005), for example, he identifies superior intrinsic motivation to succeed as an aspect of giftedness just as important as intelligence. Similarly, motivation is a prominent component many other multidimensional conceptualizations of talent (see Sternberg & Davidson, 2005). This difference between considering motivation as a catalyst for giftedness and motivation as a characteristic of giftedness will continue to be considered through this review, particularly as related to how teachers may link motivation to high-achievement when evaluating students.

Further related to the intrapersonal catalysts in Gagné’s model, there is also a call among some gifted researchers for a more refined conceptualization of what self processes are involved. In his critique of Gagné’s model, Feldhusen (2004) suggests how the work of several eminent researchers in the fields of motivation and self processes, including Bandura’s work on self-efficacy (e.g., Bandura, 2001) can help advance understanding in this area. This will also be considered in later discussion of relevant work on motivation by considering exactly which aspects of motivation appear to relate most to the identification of high achievement.

Finally, the critiques of Baer and Kaufman (2004) and Porath (2004) both call into consideration the DMGT model's use of cutoff scores in determining who is gifted and who is talented. While Baer and Kaufman (2004) suggests further and careful consideration of the implications of using various cutoff criteria, Porath (2004) recommends that the focus be put instead on ensuring that all students are placed in an "optimal match" between the context and the person. In the case of the current study, there are several methodological advantages to the use of cutoff scores, which will be discussed further in Chapter 3. At the same time, the questions that these researchers raise about Gagné's model show the diversity of opinion and importance of being clear about definitions and criteria when reviewing literature on gifted students.

High-Achieving Students in the School Context

According to the DMGT model (Gagné, 2004), schools serve as an important environmental catalyst. It is an extremely complex catalyst, as Gagné acknowledges, and a student's environment can be influenced by everything from macrostructural characteristics of the *milieu*, or students' surroundings, to one-one-one interactions with other people. Recently, researchers of the gifted have advocated using ecological approaches (e.g., Bronfenbrenner, 1979) to take into the broadness of environmental factors which Gagné acknowledges as important to the development of gifted students (see Olszewski-Kubilius, 2003). More generally, Eccles and Roeser (2005) offered such a model tailored toward the school context that can be used to consider the experiences of high-achieving students, consisting of a series of nested relationships from school policy and location to relationships with peers and teachers. By thinking of the school context at multiple levels, from the structural to the personal, a more complete picture of the school context as it is related to the recognition of high achievement can be gained.

School Structure and Environment

Researchers in the fields of gifted education and sociology have each mentioned the importance of socioeconomic status, urbanicity, school size, and minority composition in shaping the school context of students. Although they are known to be highly correlated, empirical research in the fields of gifted education, developmental and educational psychology, and sociology has attempted to separate these effects from one another.

Socioeconomic Status

Socioeconomic status of the school and the community in which it resides has been given more attention in the literature than any other school-level factor. Although highly correlated with urbanicity and minority status (discussed in Ambrose, 2002 and Baldwin, 2002), it is thought that many educational risk factors stem from the lack of economic and educational resources in a given school. Analysis of data from the nationally-representative National Longitudinal Survey of Youth by Hart, Atkins, & Ford (1998) has shown that low-socioeconomic schools, which direct their limited resources to only the most necessary and basic needs of the school, may not pay as much attention to programs not considered central to meeting their academic goals in the school as a whole. Although not explicitly identified, programs for gifted students already succeeding in school and after-school activities not tied to the formal curriculum could fall into this definition of inessential programs. Additionally, while low-income schools may be less likely to offer special programs for the gifted, the students attending these schools may be most in need of the additional social and academic support provided by the interactions with others with similar interests that occur in these activities (Bailey, 2000).

Information on the influences on gifted students' academic and social experiences in low-socioeconomic schools comes from a series of ethnographic studies by Reis (Reis & Dìaz, 1999) and Hébert (Hébert, 1998; Hébert, 2001; Hébert & Reis, 1999). In this study of gifted and talented students in a low-socioeconomic, urban high school, the researchers observed and interviewed participants and their friends, families, and teachers, in order to learn more about the mechanisms that made some students succeed in spite of their situation, and some to underachieve despite their noticeable ability. In this case, the focus on this school as "low-socioeconomic" was defined less by the amount of resources that the school itself had, and more on the amount of resources in the surrounding community. The level of resources in the community influenced the peer culture in these schools, which created low expectations for and valuing of academic success that in turn negatively influenced the gifted students' achievement. This view of community socioeconomic status as an important predictor of students' achievement is common in the sociology of education field (see Dornbusch et al., 1996).

Urbanicity

Differences in socioeconomic status of communities are not the only reason for differences between urban, suburban, and rural schools. Most of the research done on school location independent of socioeconomic status has focused on schools in remote rural locations. In Gagné's (2004) discussion of the *milieu,* or surroundings, as it serves as an environmental catalyst, he offers an example of the gifted student who lives too far away from a city to access learning resources such as magnet schools (p. 127). Indeed, although many of the effects of socioeconomic status described pertain to urban schools, rural schools may have their own unique complications in providing opportunities for talented students. An interview-based study of talented students in Appalachia by Howley, Pendarvis, and Gholson (2005) revealed that while the state required the schools to provide gifted education until grade 8 (i.e., through to early adolescence), many teachers did not nominate students because of a reluctance to require students to take a long bus ride to attend the program.. The availability of new technologies for distance education may help to alleviate some of these complications associated with the remote locations of some rural schools (see Cross & Burney, 2005, in their discussion of Project Aspire). However, it is still reasonable to believe that due to scarcity of resources that these schools may nominate fewer students to advanced programs.

School Size

Tracking and course-taking patterns may have especially large substantial effects in larger schools. For example, in Kubitschek & Hallinan's analysis of High School and Beyond data, the effect of tracking on students' friendships was most pronounced in the largest schools (Kubitschek & Hallinan, 1998). Kubitschek and Hallinan posit that tracks and classes are a way of organizing students within a school into smaller groups in which students can more easily find friends.

Differences between Public, Private, and Catholic Schools

Differences might also exist between public schools and different types of private schools. In particular, Catholic high schools differ notably in their social organization from public schools. Research using large-scale data sets has found that more students in

Catholic schools participate in college-preparatory curriculum, in part because fewer lower-level classes are offered. Lee and Bryk (1993) and Hoffer, Greeley, and Coleman (1985) explored these possibilities while analyzing data from data from the High School and Beyond survey. It would be interesting to see whether these effects are similarly mirrored in differential enrollment and representation of certain subgroups of students in advanced programs in these schools.

Individual Perceptions of School Context

Within-school characteristics of school context also play an important role in shaping gifted and talented students. While aspects of school location, control, and composition may influence the contextual *milieu,* interactions that students have with other important people in their life within this context can also influence whether students come to be seen as high-achieving.

Peer Influences

In considering the social aspects of education, schools become not only places where students learn, but where students interact with peers as well. Students who are accepted by peers who have similar values to those of the school, especially as related to academic achievement, do better in school than students for whom social and academic goals are at odds with one another. In a longitudinal survey following two samples of students from grades six to eight, Wentzel and Caldwell (1997) more specifically found that peer relationships influence achievement indirectly, through the mediating influence of prosocial behavior. In other words, the extent to which peers act as if they value the social and academic goals set forth by the school more generally can influence individual students' own engagement in school.

More particularly, there are some reasons to think that gifted and talented students may perceive their relationships with peers differently from other students. In particular, Cross and Coleman (2001) believe that giftedness may serve as a "stigma" which impedes these students' abilities to find satisfying peer relationships, as these students' academic abilities lie in opposition to the goals of the peer culture overall. Building from Goffman's (1963) work on the stigma experienced by groups marginalized by race or disability, Coleman and Cross state that gifted adolescents may see their talents as a negative label and a social disadvantage. In interviews with these adolescents, Cross, Coleman, and Stewart (1993) found evidence of perception of such a stigma. Empirical support for this paradigm since then, however, has been somewhat mixed. An exploratory focus-group study revealed that gifted students in the United States do experience many of these negative aspects of labeling (Moulton, Moulton, Housewright, & Bailey, 1998), including more negative experiences of peers, (perhaps including bullying), while a mixed-method study found stronger evidence of stigma from responses to open-ended questions than to multiple-choice survey questions (Manor-Bullock, Look, & Dixon, 1995). Notably, Manor-Bullock and colleagues found strongest evidence of the stigma of giftedness when respondents, who were attending a residential school for the gifted in the United States at the time when they were interviewed, were asked to comment on their social relationships in the more typical schools that they previously attended. Perhaps this indicated that students are contrasting their current and former school contexts.

In most extreme cases, where peers actively disrupt the learning process, students may address this "stigma" by underachieving in an attempt to disassociate from their giftedness. A series of case studies of underachieving young men demonstrated the many ways in which peer relationships may have a negative effect on students' performance in advanced programs. For two students, disruptive peer relationships were related in part to their lack of involvement in honors programs. While "Diego" used avoidance of gifted programs to "manage his image" with his peers, "Skip's" interaction with "disruptive" peers was attributed to grades so poor that he did not qualify for an honors program.

Friendship Influences

Researchers interested in social relationships differentiate between peer relationships and friendships as having distinctive characteristics and purposes (Rubin et al., 1998; Wentzel & Caldwell, 1997). In particular, Hartup and Stevens describe friendship as a close, reciprocal relationship that provides "cognitive and social scaffolds" that non-friends cannot (Hartup & Stevens, 1999). This difference between friends more specifically and peers more generally is demonstrated in further longitudinal analysis following sixth grade students through to eighth grade by Wentzel and colleagues (Wentzel, Barry, & Caldwell, 2004). Looking at reciprocated friendships (i.e., a pair or set of individuals who indicate each other as friends), the relationship between friends' prosocial behavior and individual's prosocial behavior was mediated by a change in the individual's own goals. Comparing the process of friends' effects on individuals to the process of more distant peer effects on individuals (analyzed in Wentzel & Caldwell, 1997), friendship effects appear to involve a more direct effect on individuals' social goals.

Looking more specifically at research pertaining to the gifted and talented, results tend to show that close friendships with others in the school, and in particular with other high-achieving students, helps to improve both feelings of belonging and academic achievement. A study that surveyed gifted 9th grade Canadian students on their social self-concepts before and after participation in a year-long special program found significant increases in self-ratings of romantic appeal and close friendship as measured by subscales of the Harter Self Perception Profile for Adolescents (Wright & Leroux, 1997). Similarly, a study of United States adolescents in a college-sponsored summer program found that preadolescents and adolescents ages 9-17 who enjoyed such programs rated their connection to peers (gifted and “nongifted”) higher than students who did not, as judged by answers on a survey developed by the researchers (Feldhusen & Dai, 1997). Such results were also obtained using other research methodologies. In a qualitative retrospective study of United States college students ages 17-22 identified as gifted throughout high school, Hertzog (2003) found that students in general talked positively about their relationships with others in the program. At the same time, many wished that there was a more diverse group of students in the program with whom they could develop friendships. Overall, such friendships are especially important as a source of resilience for gifted and talented students. Kitano and Lewis (2005) noted that many empirical studies demonstrated the importance of supportive relationships in helping gifted students to cope with social and academic pressures.

However, friendships may not encourage students to meet academic goals if their friends do not support their desire to become high achievers. Using an individual student from an ethnographic study of low-income gifted students as an example, while “Claire” often interacted with peers through sports and was successful in school (Hébert & Reis, 1999), “Skip’s” interactions with his peers and friends on his football team, who valued achievement less, were less conducive to continued achievement in his classes (Hébert, 2001). More recently, Assouline and Colangelo (2006) reported that while 93% of gifted adolescents surveyed felt that their parents were happy about their academic ability and 78% thought that their teachers were happy about it, only 30% felt the same way about their friends.

Teacher Influences

In addition to peers and friends, students also interact with teachers in the school context. Positive interaction with teachers has been shown to relate positively to student achievement as well as to interest and to positive behavior in the classroom (Wentzel, 1998). The concept of a "positive interaction" with teachers, however, is multidimensional. In an analysis of middle-school students in two suburban schools, Wentzel (1997) found that students perceived teachers to be caring when they talked to and paid attention to students, when they had expectations for students that took into consideration individual differences, when they were perceived to care about their own work, and when they provided constructive feedback.

In this sense, just as it is important to explore how peers and friends may influence gifted and talented students' engagement in school and subsequent nomination into advanced programs, it is important and interesting to consider whether students' relationships with their teachers have a similar affect. Compared to the literature on peer relationships and friendships among gifted and talented adolescents, the literature on teacher/student relationships among this group is considerably more limited (Barbara Kerr, personal communication). Most of the evidence for the importance of positive teacher-student relationships among gifted education comes from a series of ethnographic case studies focusing differences between successful and unsuccessful gifted students in a low-income urban high school. In Hébert's (2001) discussion of an underachieving, artistically-gifted young man, he points to the lack of communication between the student and his teachers and counselors as a reason why his achievements went unrecognized. In contrast, a common theme in analyzing the social relationships of successful students in this school was a close relationship to one or more teachers in the school (Hébert & Reis, 1999). However, this one study is too limited to draw any overarching conclusion about the effects of teachers on high-achieving students, which suggests the need for further research on this topic.

Social Relationships and the Identification of High Achievement

In the context of considering high achievement identification, the question becomes how characteristics of students' peer relationships, friendships, and relationships with teachers may influence teachers' nominations of students. In turn, a second question relates to how such characteristics can help to explain why teacher criteria and test-score criteria result in different groups of students being nominated. For example, in Hoogeven and colleagues' (2005) survey of Dutch secondary-school teachers, respondents indicated that they felt that advanced programs had negative effects for students' peer relationships. If teachers perceive that students are already experiencing negative relationships with peers, they may not wish to exacerbate the problem by enrolling them in a gifted program. However, there is some evidence that teachers may not consciously consider these social experiences of students when judging who is high-achieving. In her study of elementary school teachers' conceptions of giftedness, Miller (2006) found that teachers least often used social characteristics such as "makes social bonds easily" or "prefers the company of adults and/or older students" in describing a gifted student. However, given the increased importance of social context to older students discussed earlier in this chapter, these relationships are important to consider nonetheless.

On the other hand, case studies conducted by Hébert and Reis find that advanced programs seem to encourage close friendships among academically-oriented students. From this perspective, perhaps teachers would also want to give special opportunities to students who appear to have difficulty relating to peers in school more generally. Advanced programs could be seen as providing a protective environment to high-achieving students at risk.

Summary: Contextual Influences

In sum, “context” is a multidimensional concept, taking into account societal as well as interpersonal influences on an individual. School context in particular is especially important to consider for high-achieving students. As teachers are also involved in school, they can take into account students’ experiences in the school context when identifying high-achieving students. Such experiences cannot be captured by achievement tests. On one hand, economic or geographic restrictions may play a role in whether students are identified as high achievers. On the other hand, students’ experiences in the school context have a complex influence on teachers’ perceptions of high-achieving students. If students feel that there is a conflict between the “social goals” and the “academic goals” of the school, and they adapt their behavior in a way that helps them to meet the social goals, then teachers may not view them as academically engaged enough in school to warrant selection into an advanced program.

Motivation

One of the advantages of advanced programs for gifted/talented students is that more challenging coursework is thought to motivate students to learn in a more effective manner (Bleske-Rechek et al., 2004). Individual motivation has been a topic of particular interest to researchers of gifted and talented adolescents, both as a characteristic of individuals and as an outcome of a particular advanced program (Clinkenbeard, 1996, in an overview to a special issue on giftedness and motivation in *Gifted Child Quarterly*). Furthermore, teachers may also make judgments about students' motivation for learning when they make decisions about whom to nominate for advanced coursework. In researching motivation among high-achieving students generally and in its influence on teacher nominations more specifically, however, it is necessary to consider what characteristics of motivation are most important. The empirical studies reviewed in this section largely focus on two motivational concepts: self-efficacy and intrinsic motivation.

Motivation and High-Achieving Students

In a review of empirical literature on the motivation of gifted and talented students, Dai and his colleagues (1998) outlined what they referred to as a social-cognitive model of gifted achievement motivation. In their model, motivational self-processes such as efficacy beliefs and intrinsic/extrinsic values mediated the relationship between social context and individual factors such as personality on academic achievement. Because of its focus on motivational processes as a mediator of the relationship between background factors and achievement, this model bears a strong resemblance to several key models of achievement motivation discussed in the field of educational psychology, including Bandura's social-cognitive theory (Bandura, 1986) and the expectancy-value theory of achievement motivation (Wigfield & Eccles, 1994; 2000). Although many different motivational constructs have been explored as related to gifted and talented students (demonstrated in a review of empirical literature on the topic conducted by Patrick, Gentry, and Owen, 2006), two constructs which have particular relevance to the study of talented students are efficacy beliefs and intrinsic interests.

Self-Efficacy

Both expectancy-value theory and social-cognitive theory posit that students' beliefs in whether they will be successful are an important characteristic of motivation, which has a subsequent influence on students' achievement development. However, while Eccles and Wigfield focus on the importance of "expectancy beliefs," or attitudes that students have toward what they will accomplish in the future, Bandura's social-cognitive theory focuses on both beliefs about what will happen in the future (or "outcome expectations") and beliefs that students can perform the tasks necessary to achieve (or "efficacy beliefs"). Efficacy beliefs, which Bandura considers more specifically as self-efficacy (e.g., Bandura, 2001), are of particular interest to researchers on the gifted and talented.

Much of the research on self-efficacy among gifted students has focused on whether it can help to explain why some achieve and some underachieve. Results from the research appear somewhat mixed, with several studies reporting no relationship between efficacy beliefs and achievement. In a study designed to determine whether perceived competence, self-regulation, goal valuation, and attitudes toward school can predict the likelihood of underachievement, McCoach and Siegle (2003) found that perceived competence, as measured by the School Attitude Assessment Survey-R did not significantly predict whether an individual was an achiever or an underachiever over and above these other factors. Similarly, a survey of students who were accepted for enrollment in a gifted high school conducted by Lorna Chan (1996) found no relation between overall perceived cognitive competence and achievement in the domain of reading.

Many researchers, however, stresses that self-efficacy is not global, but rather applies to beliefs about abilities in certain areas or situations (Bandura, 2001; Pajares, 1996a). Perhaps this explains why research looking more generally at competency beliefs finds no significant relation to achievement, while research looking more specifically at self-efficacy in particular areas does find a significant relationship to achievement. For example, Malpass, O'Neil, and Hocevar (1999) found that high-school students in Advanced Placement math classes who had higher math self-efficacy scores (based on measures adapted by the authors) achieved more in these classes. This relationship is also found in younger adolescents: in a study of gifted/talented middle-school students, Pajares (1996b) found that self-efficacy specifically related to math predicted performance on math problem-solving tasks over and above math GPA, sex, self-efficacy for self-regulation, and overall cognitive ability.

In addition, several studies note higher efficacy beliefs in gifted/talented students as compared to students not identified as gifted/talented (L. Chan, 1996; Hong & Aqui, 2004; Pajares, 1996b). There do not appear to be differences between students who were identified as talented based on different definitions and achievement, however. In a survey comparing "academically gifted" students identified using achievement tests, to "creatively gifted," math students identified by their involvement in math activities, Hong and Aqui (2004) found no differences in perceived competence. Based on their responses to Hong's Self-Assessment Questionnaire, both groups of students had higher perceptions of their own math ability than did the "nongifted" group.

Intrinsic Motivation

Also prominent in the discussion of gifted/talented motivation is the concept of value beliefs. While general models of motivation such as expectancy-value theory discuss how several types of value beliefs can influence academic achievement (e.g., utility value vs. interest: Eccles, Wigfield, & Schefle, 1994), it is intrinsic motivation that students have in certain areas that is of most interest to researchers of the gifted and talented. In outlining conditions necessary in order to be "optimally motivated" for talent development, Rea (2000) lists "undivided interest" as one of the three necessary factors. Similarly, Adele and Alan Gottfried's current conceptualization of "gifted motivation" is centered on concepts related to students' interest, including extremely high academic intrinsic motivation (A. E. Gottfried & A. W. Gottfried, 2004). They cite evidence from the Fullerton Longitudinal Study that children who were identified as gifted by IQ scores demonstrated higher academic intrinsic motivation (as measured by various forms of the Children's Academic Intrinsic Motivation Inventory) throughout their development, including during adolescence (also reported in A. E. Gottfried & A. W. Gottfried, 1996).

Further, they find that "academic intrinsic motivation" is related to achievement, measured by GPA, after controlling for intelligence (A. E. Gottfried & A. W. Gottfried, 2004). This contradicts the finding of another study of the effect of intrinsic motivation and IQ on GPA conducted by Gagné and St. Père (2002), which found no independent effect of intrinsic motivation, as measured by the *Echelle de Motivation en Education,* beyond IQ. The Gottfrieds note in their discussion of academic intrinsic motivation that the Gagné and St. Père study focused only on students in private schools, which likely resulted in lower variability in achievement and motivation. The issue of variability may also explain why Malpass and colleagues (1999) did find that students who had a strong intrinsic value placed on mathematics (as measured by a scale adapted by authors) showed higher achievement. The students in Malpass and colleagues' study who had higher intrinsic value in mathematics did have higher self-regulation in the subject than those who valued it less and, interestingly, worried more about their performance in the subject.

This higher value for learning among gifted/talented students appears to hold regardless of how they came to be identified. In a survey comparing "academically gifted," "creatively gifted," and "nongifted" math students, Hong and Aqui (2004) found that the high-achieving "academically gifted" students and the involved, critically thinking "creatively gifted" math students each valued learning about math more than did their nongifted peers, as measured by responses to a survey created by one of the authors.

However, intrinsic motivation among gifted/talented students may be influenced by school context. In a survey of Australian secondary students in grades 7 through 12, Hoekman, McCormick, and Gross (1999) found that perceptions of the quality of school life (as measured by the Feelings about School Inventory) were positively correlated with intrinsic motivation. In other cases, interest in a subject inside of school may not translate into motivation in classes related that subject inside of school. For example, one of the students interviewed in Hébert's (2001) study of boys at a low-socioeconomic school demonstrated great interest in art, but this did not translate into involvement in art classes in his school.

Teachers' Perceptions of High-Achieving Students' Motivation

The majority of research on gifted and talented students' achievement motivation focuses on how it influences levels of achievement. However, as previously discussed, empirical research examining what teachers are considering when nominating students has found evidence that they take students' motivation into account. This has important implications for teacher nominations of students into advanced programs. Siegle and Powell's (2004) quasi-experimental study of teachers found that their nominations of hypothetical students into advanced math programs depended on whether students did their work. In this sense, we can say that teachers were basing their decisions based on whether students were amotivated, or "work avoidant." To contrast, teachers in David Chan's study of talented high-school students participating in advanced programs rated their students as having very high motivation for work (D. Chan, 2000).

Other research has demonstrated that teachers are sensitive to students' motivations in other ways as well. The study of the effects of IQ and intrinsic motivation on students' in-school achievement by Gagné and St. Pere (2002) also included information on the correspondence of motivation ratings by teachers, parents, and students. Mean ratings by these three groups were very similar, with teachers rating the students as being slightly more intrinsically motivated than the students rated themselves. Similarly, Adele and Alan Gottfried, in a review of analyses conducted as part of the Fullerton Longitudinal Study, reported that teachers' views of students' academic intrinsic motivation are highly positively correlated with students' reports, with the highest correlations being reported as related to general academic intrinsic motivation and math-related academic intrinsic motivation (A. E. Gottfried & A. W. Gottfried, 2004). These teacher studies were conducted with students in grades 5 through 8, meaning that teachers' views of students' intrinsic motivation was highly related to student reports in early adolescence. Finally, when Miller (2006) explicitly asked elementary-school teachers to rank a series of student characteristics according to their relation to giftedness, "enjoys discovery," "enjoys complexity in learning," and "enjoys experimenting" were among the highest-ranked.

In summary, self-efficacy and intrinsic motivation each influence whether students are motivated to develop their giftedness into talent. How this motivation is manifested in the context of school, however, may also depend on students' interactions with teachers and their involvement with work presented by teachers in classes. In addition, teachers may also take into account students' motivation when making decisions about whether to the student should be nominated as gifted. As a result, the motivation that students demonstrate in the context of school may help to explain why teachers' nominations differ from nominations based on psychometric criteria. Teachers who consider motivation as part of "giftedness" may not see an unmotivated student as likely to benefit from advanced work; to contrast, a student who has slightly lower demonstrated achievement but who is more motivated to achieve may be recommended for such work by teachers.

Differences by Individual Background

Not all students perceive a given context in the same way. It is also important to consider whether gifted students in certain "minority" groups (e.g. ethnic minorities, females, and students from lower socioeconomic backgrounds), which differ in status in the larger society and assumptions about academic ability, may have different perceptions of their peer relationships (as discussed in a review of the social-emotional development of gifted and talented students by Reis & Renzulli, 2004). Research comparing various subgroups of gifted adolescents found a diversity of perceptions relating to their relationships with peers. In some cases, these differences may reflect quantitatively more positive or negative assessments of experiences with others. These differences in assessments are important to consider, given the extent to which underrepresentation of various subgroups is an issue in gifted education policy in the United States (discussed specifically in the State of Texas by Baker, 2001; in the United States more generally by Landrum, Katsiyannis, & DeWaard, 1998).

Ethnicity

Literature related to the social organization of schooling has long considered how school organization influences the available of educational opportunity across students of various backgrounds. A study of course-taking patterns of students in a Hawaiian high school conducted by Heck, Price, and Thomas (2004) found a strong relationship between course-taking behavior and ethnic background. The two highest academic profiles, which were comprised of students who took advanced classes, consisted predominantly of Japanese students, while other course-taking profiles had higher proportions of students from Filipino, Hawaiian, or Caucasian ancestry. The results of this study reflect the unique ethnic composition of Hawaii; studies looking more broadly at the United States also came to similar conclusion that higher-status groups were more likely to be in advanced classes than lower-status groups. Friedkin and Thomas' (1997) study using nationally-representative data from the High School and Beyond study found that that more White and Asian students could be classified as belonging to "high curricular positions," with the highest proportion of Asian students found in the positions which provided students with the most advanced coursework in math and science.

Similar patterns are observed when matching students based on achievement test data. In a study of a large, tracked high school in Rockford, Illinois, Oakes (2005) found that while 92% of the majority (i.e., White and Asian) students who had achievement scores above the 90th percentile were enrolled in regular and advanced classes, only 63% of minority (i.e., African American and Latino) students at the same decile were enrolled in these programs. Oakes also found similar results in school districts in Wilmington, Delaware and San Jose, California.

These issues of disproportionate representation may be especially pronounced in schools with "magnet" gifted programs. These programs were originally conceived as a form of school desegregation, as their purpose was to attract White students to predominantly minority schools with special programs. An 18-month ethnographic study of an urban school with a magnet program conducted by Staiger (2004) revealed that while White students comprised only 20% of the student body, they comprised over half of the students in the magnet program. Further, students from this program, who were selected by their scores on intelligence tests, were physically separated from other students in the school (i.e., their classes were held in their own wing of a school). In addition, many teachers and staff members who were interviewed commented that they felt "protective" of students in the magnet program. When interviewed, students in the magnet program commented on feeling separated from other students in the school.

Staiger argues that such organization within the school equates “giftedness” with “whiteness.”

Special Issues for Ethnic Minority Students by Subgroup

Gifted education researchers are aware of this disproportionate representation of ethnic minority groups, both in practice and research and several have worked to identify procedures to address these gaps (e.g., VanTassel-Baska et al., 2004). Even taking into account these efforts, however, there are still unique considerations for students from different backgrounds that may influence their experiences in the school context as well as their motivation to achieve.

Black students. Researchers have focused on the extent to which Black (or African American) students have access to accelerated programs (e.g., Oakes, 2005), and how this access differs from that of students from White students (and more recently, from Hispanic and Asian students as well). In an analysis of California high schools, Soloranzo and Ornelas (2004) reported that African American students were less likely than were White and Asian American students to be enrolled schools with high scores on the authors’ AP Student Access Indicator, which is the ratio of students in the school to AP courses offered. Looking more specifically within the Los Angeles Unified School District, the researchers noted that while African American students comprised 14% of the district’s student enrollment overall, they comprised only 8% of the students of the students participating in Advanced Placement classes. In their follow-up analyses of specific schools within the district, this trend was seen in three of the four schools examined. (Only the medical magnet school, where 4% of students enrolled were African American, was there proportionate representation in the AP courses).

Looking at peer relationships within school, the conflict between "social goals" and "academic goals" of African American students is thought by researchers to be especially relevant, with high-achieving students rejected by their peers for "acting white" (see Ford & Harris, 1996; Ogbu, 1982). Loneliness resulting from this peer rejection could in turn cause gifted African American students to focus more on establishing friendships than on schoolwork, leading to underachievement (Grantham & Ford, 2003). A case study of a 15-year-old African-American female by Grantham and Ford (1998) revealed complex interactions of peer relationships and programs. "Danisha's" core group of friends consisted of the other African American females in enrolled in her advanced program. However, she still felt difficulty when interacting with her European-American peers in the classes, who greatly outnumbered her African American friends. She discussed how she adapted two different styles of communication: a more proper style of English to use with her European American peers, and one to use with her African American friends. This difficulty relating to the majority of her classmates accompanied Danisha's increasing underachievement in her classes. Without the supportive context for the collaboration of peers with similar levels of achievement, interests, background, and motivations, she was unable to escape the risk factors of her surroundings.

Grantham (2004) finds the opposite situation in the case of "Rocky Jones," the only Black male student nominated for a rural Virginia's high school program in the ninth grade. Using a participation expectancy-value model, Grantham interviewed Rocky to study his motivation to participate in this program. Grantham found Rocky's interactions with his predominantly White classmates to be positive, with Rocky reporting that he felt liked and appreciated by his peers. More importantly, according to Grantham, Rocky felt comfortable answering his White peers' questions about being Black. Grantham mentions that "being singled out as an expert" often alienates students and inhibits students' further participation in these programs; therefore, Rocky's acceptance of and comfort with this role contributed to his success. This supportive environment led Rocky to expect success in his program. This, coupled with his valuing of academic achievement, led to his motivation to participate in gifted programs.

Hispanic students. Similar research has also been conducted on high-achieving Hispanic (or Latino) students. Many of the issues surrounding access to Advanced Placement classes that are pertinent to the study of high-achieving African American students are similarly important to consider for Latino students. Like African American students in the state of California, Soloranzo and Ornelas (2004) found that Latino students are less likely to be enrolled in schools receiving high scores on the AP Student Access Indicator. Additionally, while 66% of students in the Los Angeles Unified School District were Latino according to the study, they comprised only 49% of the students in AP classes. This trend was seen, to varying extents, in each of the four schools in which researchers conducted follow-up analyses. In an earlier analysis, Soloranzo and Ornelas (2002) found low enrollment of Latino students in AP programs both in schools located in predominantly Latino communities as well as in schools with greater levels of ethnic diversity.

Issues relating to the students' social relationships within the school context also exist for Latino students, who are often confronted with stereotypes about Latinos' ability, particularly as related to potential for achievement in English classes. Reis and Dìaz

(1999) considered such issues when interpreting qualitative data about the experience of a successful, gifted young Latina in a large urban high school. When Reis and Dìaz asked "Rosa" about her experiences as a Puerto Rican female in a gifted program, she admitted that she felt that her peers held negative stereotypes toward Latin-Americans, particularly those in a gifted program. She did distinguish, however, between the stereotypes that she felt her *peers* held and the support that she felt from her *friends* in classes with her, and revealed that the stereotypes she did experience "made [her] work harder" (Reis & Dìaz, 1999). For students like Rosa, the friendships formed with program members enabled students to be resilient against the negative stereotypes and risk factors. As such, supportive friendships may be especially important for the success of gifted students from ethnic-minority backgrounds.

Asian American students. Unlike Black or Hispanic students, Asian American students are not considered an "at risk" ethnic group. In fact, many analyses focusing on educational inequality place Asian American students in a "majority" group along with White students, to be distinguished from "minority" African American, Latino, and Native American students (e.g., the analyses of ethnic-minority representation in academic tracks conducted by Oakes, 2005). Other discussions more specifically related to Asian American students report that these students are stereotypically referred to as the "model minority" group, referring to the high average level of academic success (see Plucker, 1998; R. Woliver & G. M. Woliver, 1991).

Unlike other minority groups, Asian American students are not under-represented in advanced programs. In the Los Angeles Unified School District, for example, Soloranzo and Ornelas (2004) reported that while Asian American students comprised only 9% of the student population overall, they comprised 21% of AP enrollment. In follow-up studies in individual schools, Soloranzo and Ornelas found that this trend continued to exist in schools to varying extents regardless of the school's neighborhood or AP Student Access Indicator score.

In part because of this high enrollment of Asian American students in advanced programs, research on this group of students is limited. In a discussion of the research that does exist on this group, Plucker (1998) identifies several issues specific to this group that warrant additional consideration. In particular, Plucker cautioned that assumed limitations about Asian American students' verbal abilities may keep them from receiving advanced programming if English proficiency is a prerequisite. Related to identification procedures, Plucker acknowledges that tests of both aptitude and intelligence may be culturally biased, and encourages practitioners to examine whether this subgroup of students was explicitly considered in the development and norming of these tests. In order to guard against cultural bias, he further recommends multiple identification criteria (including nominations or performance assessments) in order to gain a complete picture of these students' abilities, talents, and needs.

Ethnicity as a Factor in Teacher Nominations

There are mixed results as to whether teachers demonstrate bias in their nomination of ethnic minority students to advanced programs. In a study of elementary-school teachers presented with hypothetical vignettes, Elhowereis and colleagues (2005) found that, while teachers' recommendation for placement in a program did *not* differ based on the ethnicity of the hypothetical students, teachers were less likely to agree that African American students should be referred for further evaluation for *possible* placement than other students. In another study, Hughes, Gleason, and Zhang (2005) found that differences in teachers' perceptions of first-graders' ability by student ethnicity could be explained by teachers' perceptions of teacher-student relationships with African American students. Given differences in the relationships and responsibilities of elementary and secondary-school teachers (discussed in Eccles & Harold, 1993; Eccles & Roeser, 2005), these results may or may not be different for high-school teachers.

Similarly, Plucker (1998) called for the use of multiple criteria (including teacher nominations) in identifying the needs of gifted Asian American students. However, in an earlier discussion of gifted Asian American students, Robert Woliver and Gail Murakana Woliver (1991) cautioned that cultural differences in the norms of teacher/student interactions may keep gifted Asian American students from being properly identified by teachers. Robert and Gail Woliver posit that since students in this group are often quiet in class and minimally interact with adults, teachers could overlook their talents in favor of the more outspoken students who demonstrate their abilities and talents through interaction with the teacher. While Plucker (1998) also acknowledged this differences in teacher/student interaction norms, neither author cited research demonstrating that this did indeed influence teachers' perceptions of students.

Researchers involved in these studies and reviews approached this study with the hypothesis that teacher identification procedures would put ethnic-minority students at a disadvantage, as teachers would be less likely to nominate these students as gifted. Other researchers, however, share the opposite viewpoint: teachers' recommendations would actually benefit minority students by providing a less "standardized" criterion for identifying students. Baldwin (2002) reports that teacher nominations were an important component of her system for identifying ethnic-minority students of all ages for enrollment in advanced programs.

Teachers and staff in the gifted magnet program whom Staiger (2004) interviewed commented on the ethnic representation of students in their classes, although they had no role in nominating students to the program. For example, when asked to comment on her students, an English teacher described her Asian (and especially Filipino) students as being enrolled in the program at the insistence of their parents, her Mexican students as not interested in education, and her African American students as more interested in sports. The director of the program similarly commented that Latino and African American students often fell behind because they felt as if they could rely on affirmative action for admission into college. According to Staiger, such attitudes toward ethnic minority students (including Asian American students) reinforce the attitude of an unconditional "naturalized White giftedness" (Staiger, 2004: p. 171-172). By this, Staiger refers to the tendency of teachers and staff to question or rationalize the placement and/or success of ethnic minority students in the program, but not the placement of enrolled White students.

Finally, there is evidence that teachers may consider different criteria for certain ethnic-minority students than for others. This is especially true when asked to rate students for whom English is not a native language. Fernandez, Gay, Lucky, and Gavilan (1998) asked elementary-school teachers to rate a series of student characteristics in order of importance, either for a "gifted" student or for a "gifted Hispanic LEP [Limited English Proficient]" student. Teachers completing the survey for a "gifted Hispanic LEP" student rated language issues as more important than those completing the survey for "gifted" students. A similar focus on verbal skills was also found in a qualitative study of teacher nominations for gifted programs conducted by Peterson and Margolin (1997). These language issues may also be especially relevant for teachers nominating Asian American students (Plucker, 1998).

Socioeconomic Status

Social Influences on High-Achieving Students from Low-Resource Backgrounds

The effects of peer support (or lack thereof) appear to be common themes in studies of high-achieving students from low-socioeconomic backgrounds (see Reis & Dìaz, 1999; Hébert, 2001). A common characteristic of high-achieving gifted students in low-socioeconomic areas was their involvement with a group of peers who were similarly successful in advanced and gifted programs within the school. Hébert and Reis identified these groupings of peers within the academic school context as "culture[s] of achievement," and attributed them to the academic success of students growing up in poverty (e.g., Reis & Dìaz's discussion of "Rosa" the gifted young Latina student in a low-socioeconomic environment).

In addition, evidence from case studies of low-income gifted adolescents suggested that many students hold too many other responsibilities to be able to participate in many school-related activities. In particular, struggling families may rely on the gifted adolescent to hold a job in order to support family income. This job, while important to the family, limits the amount of time interacting with peers in the school outside of the classroom (Hébert, 2001). How these differences in average levels of activity relate to different impacts on peer relationships, however, has not been studied.

To contrast, as part of the same study Reis, Colbert and Hébert (1999) analyzed factors that led to academic resilience of many of these low-income students. Students who were the most successful had strong friendships with other academically-oriented students, participated in school-based extracurricular activities, and had a strong belief in their academic abilities. Reis and colleagues also found that that students' participation in advanced programs also related to higher achievement.

Socioeconomic Status and High-Achievement Identification

Like students from ethnic minority backgrounds, students from low socioeconomic statuses are thought to be under-represented in gifted programs. As related to issues of identification, tests of achievement are thought to be poor identifiers of their talent. Programs designed to increase the identification of high-achieving students from these backgrounds focus less on standardized tests of achievement or aptitude and more on complex nomination processes involving the use of multiple criteria. Evidence for such nomination programs has come from students of varying ages (e.g., for kindergarten students: Borland & Wright, 2004).

Part of the effect of socioeconomic status on the identification of high achievement may be due to differences in parental support for education. Parent education in particular, an important component of socioeconomic status, has an especially noticeable effect on enrollment in more advanced coursework. Kelly's (2004) analysis of data from the National Educational Longitudinal Study of 1988 revealed that parent education influenced track placement. Having one parent with a college degree made an eighth grader five times more likely to be enrolled in the top mathematics track, and twenty percent more likely to be enrolled in one of the top two mathematics tracks.

Alternately, socioeconomic status may moderate the relationship between parental involvement and course placement, especially for minority students. An analysis of over 2000 Latino adolescents conducted by Valaez (2002) revealed that parental involvement was not significantly related to advanced coursetaking in mathematics among Latino students from low-socioeconomic backgrounds, although the relationship was significant among students from more resourced backgrounds.

Gender

Differences in the prevalence and performance of high-achieving male and female students throughout a variety of academic domains continue to be a heated and controversial topic of interest. In fact, a special issue of *High Ability Studies* included literature reviews, program evaluations, and experimental studies conducted by gifted researchers throughout the world in order to gain a more complete understanding of gender differences among high-achieving students (Leder, 2004). This cross-national perspective in the similarities and discrepancies in gender differences provides a great deal of evidence as to how social contexts may influence the identification of males and females as high achieving differently.

Ability Differences versus Motivational Differences

A prominent question in research on giftedness and gender is whether achievement gaps in certain subjects in certain subjects are due to differences in innate abilities, or are due to more socially determined characteristics. Freeman (2004) took a cross-national approach to this topic, reviewing literature examining differences in gender gaps in achievement, perceived competence, and social expectations across countries. Freeman notes that in many countries, including the United Kingdom, Australia, and the Netherlands, female students' achievement has surpassed male students' achievement in every subject, including math and science. In other countries, notably the United States, more stereotypical achievement gaps continue to exist, favoring male students in math and science and female students in the language arts. In a study of high-achieving mathematics and science eighth-grade students in the United States, for example, Reis and Park (2001) used data from the nationally-representative National Educational Longitudinal Study of 1988 to explore which factors discriminated between high-achieving males and females. They found in each subject that scores on standardized achievement test discriminated between high-achieving male and female students, with male students receiving higher scores than did females. Freeman acknowledges that these national differences may in part due to fewer female students participating in advanced math and science programs in United Kingdom and other countries, as compared to the United States. In these countries, the female students that do participate are those who are have the most potential for high achievement. Indeed, Reis and Park (2001) also found that locus of control and academic self-concept significantly discriminated between high-achieving male and female students. However, Freeman also comments on many researchers in the United States who cite the achievement gaps in exhibited in the country as evidence for innate differences without examining cross-national research.

While support for gender gaps in achievement is mixed across countries, Freeman (2004) finds somewhat more consistent support for differences in perceived competence between male and female students. She supports her argument by citing several large-scale, cross-national studies of achievement. For example, analysis of the Third

International Mathematics and Science Study (TIMSS) in 1999 revealed mixed results for gender achievement gaps when looking specifically at the top 25% of students in each country (Fox, Engle, & Paek, 2001). Only in Tunisia, Israel, and the United States was male students' mathematics achievement higher than that for female students. In commenting on this research, Freeman (2005) concludes that these gaps are due to cultural and educational factors that serve to encourage male participation and discourage female participation in these subjects. However, gender gaps in perceived math competence more reliably favored male students. Similar findings are found in research in other domains as well. In an analysis of data from the IEA Civic Education Study, actual gender differences in students' civic knowledge vary in both size and direction across countries, but are overall relatively small (Torney-Purta, Lehmann, Oswald, & Schulz, 2001). However, male students consistently rate themselves as having higher internal political efficacy, or confidence in their own knowledge about political topics, than do female students (Husfeldt, Barber, & Torney-Purta, 2005; Torney-Purta & Barber, 2006).

Even these gender differences in perceptions of abilities found across countries may be subject in part to school influences, particularly for gifted and talented students. In a study comparing results on a translated version of Marsh's Self-Description questionnaire between Chinese tenth-graders in a school for high-ability students and those enrolled at a more comprehensive school, Dai (2001) found no gender differences in math or verbal (Chinese) self-concepts among students at the high-ability school. However, gender-stereotypical differences in subject-specific self-concept were found among students at the regular school, in the sense that males had higher math self-concepts and females had higher verbal self-concept. In a follow-up study (also reported in Dai, 2001), Dai found that Chinese students who attended special honors-type classes *within* a regular school demonstrated the same gender-stereotypical differences in subject-specific self concept as did students attending regular classes in that school. Male students had higher perceptions of their abilities in math, while females had higher perceptions of their abilities in Chinese. In a later discussion of the article, Dai (2002) speculated that the lack of gender-stereotypical perceptions of ability, particularly on the part of females, may help to explain why China has more female participants in international math competitions than other countries.

Schober, Reimann, and Wagner (2004) examined differences in gender gaps in both achievement and perceived competence among gifted German students (as defined by score on a test of ability) who were in regular Gymnasium programs and who were in an accelerated program within a Gymnasium. While gender gaps in the regular setting varied in size and direction, with gaps in some subjects favoring male students and some gaps favoring female students, gender gaps in the accelerated program uniformly favored female students. However, in looking at gender gaps in students' subject-specific self-concept, gifted females in each context had lower math self-concepts than did the gifted males.

Gender Differences in Social Experiences

Gifted and talented males and females also differ in how they perceive their social contexts. Wright and Leroux (1997) found a program by gender interaction effect on ratings of close friendships. While males appeared to feel significantly more positive about their friendships after participation in a homogenous gifted program, the increase was considerably smaller among females. This program interaction demonstrating a smaller impact of programs on females' self-perceptions is especially troubling given some evidence that gifted females tend to have less positive self-perceptions of their social support overall regardless of program (significant in a survey of students by VanTassel-Baska, Olszewski-Kubilius, & Kulieke, 1994; not significant in surveys by Feldhusen & Dai, 1997). Once again, however, qualitative case studies on programs illustrated how females may have different sorts of peer pressures than males that may limit the social effects of programs: As Claire, an achieving gifted African-American female, commented, "Girls go dumb when they get to this high school. It must have something to do with the boys" (Hébert & Reis, 1999).

Gender as an Influence on Teacher Perceptions

Differences in achievement, motivation, and interaction with others in the school context might in turn influence how teachers perceive students' suitability for advanced programs. In a review of literature on teachers' perceptions of gifted students, Reis (2006) noted that many empirical studies found that teachers were better able to identify gifted male students than they were gifted female students. This was particularly true when the teachers were asked specifically to nominate students who showed exceptional promise and performance in the field of math. Reis also reported that teachers held gender-stereotypical views of why high-achieving students were so successful, as many attributed male students' success to their innate abilities and female students' success to working hard.

Much of the literature that Reis reviews on this topic, however, was published in the mid-1980s. Since that point, gifted education researchers interested in gender issues have acknowledged that male students may now be the ones overlooked by their teachers (e.g., Kerr & Cohn, 2001). This is particularly the case if teachers focus on issues of in-class conduct and engagement: a study using data from the National Educational Longitudinal Study of 1988 conducted by Lundy and Firebaugh (2005) found that anti-studious attitudes are greater among males than females.

Even if teachers do not identify a disproportionate numbers of males or females as gifted or talented, their perceptions of male and female gifted students may qualitatively differ. In a survey of teachers and gifted students (identified by teachers) in grades 4 through 8 (i.e., through to early adolescence), Siegle and Reis (1998) found that teachers rated females as having higher-quality work and exerting more effort in the classroom. Further, while male students rated their abilities in math, science, and social studies as higher, there were no significant differences in how teachers rated male and female students' ability in these subjects. Teachers, however, did rate females as having higher ability in the language arts than did males—a view shared by the students. Across all students, the ratings that teachers gave to students' ability, effort, and quality of work were more highly correlated than were the ratings that students gave themselves in these areas. There were no notable effects of grade level on teachers' perceptions of students.

To summarize, the consideration of gender differences in teacher nominations are interesting for several reasons. Most notable are the issues surrounding gender-stereotypical assumptions relating to gaps in academic achievement, favoring male students in mathematics and female students in English. While it is already important to consider how the identification of high achievement may work differently in different subject areas because of the focus on adolescence, it is *essential* to consider subject-specific differences when taking into account the effects of gender. Associations between motivation and high achievement appear to fall along gender-stereotypical lines, making the identification of high achievement in verbal content areas more likely among females and making such recognition in math content areas more likely among males. Looking cross-nationally, the gender differences in motivation appear more pronounced than gender differences in achievement. In considering the effects of social context, however, evidence is mixed. Some studies (including several that conduct analyses of large-scale surveys) indicate that males are, in fact, more likely to be affected by peers and friends who do not value academics, and are more likely to be perceived by teachers as exerting less effort in class. At the same time, girls are typically thought of as being more sensitive to social expectations, and more likely to underachieve if they perceive negative attitudes toward their giftedness.

Contributions of this Study

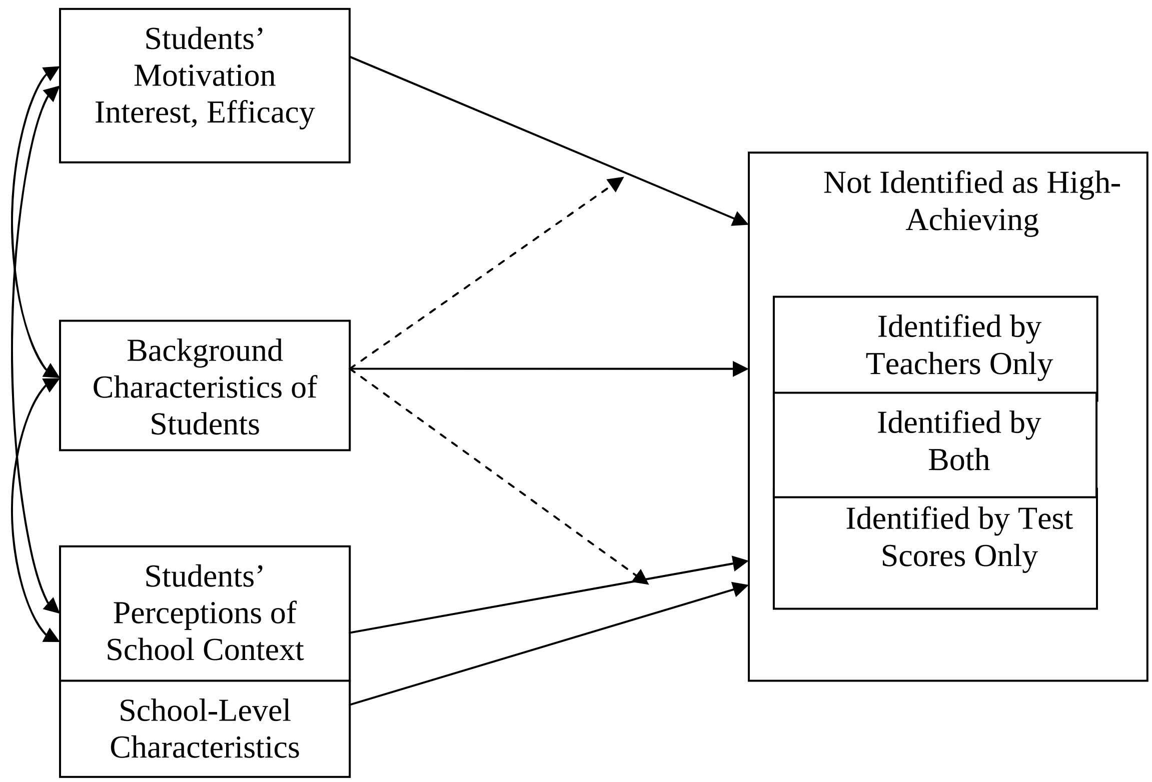
In considering this literature as a whole, it becomes apparent that the methodologies used to study the education and experiences of gifted and talented students differ vastly from the methodologies used to study the social organization of schooling. Research applying educational psychology to the study of gifted/talented students tend to use smaller, convenience-sampled groups of students in cross-sectional study designs, with only a few notable exceptions (e.g., A. E. Gottfried & A. W. Gottfried, 1996; Reis & Park, 2001). Even when students from a wider variety of contexts are examined, however, there is little consideration of how more structural aspects of school context (such as location and socioeconomic status) might influence the relationship between motivation, individual social experiences, and whether students are recognized as high-achieving.

In contrast, the social organization of schooling literature more commonly examines data from large-scale surveys (often nationally-representative) in order to examine issues primarily surrounding tracking, race/ethnicity, and socioeconomic status, (e.g., Oakes, 2005). These researchers look less often at how context might influence self-processes (such as motivation) that have important effects on student outcomes. This study can contribute to the study of high achievement identification by using a large-scale survey methodology in order to address organizational and psychological correlates to the identification of high achievement simultaneously in a nationally-representative group of students. As a result, the findings from this study can be generalized more readily to a variety of locations and contexts within the United States.

This study can also contribute to the study of high achievement identification by directly modeling the differences between those students identified as high achieving by teachers and those identified based on an achievement test criterion. Several studies (McBee, 2006; Neber, 2004; Niederer et al., 2003) indicate that teachers' nominations of high-achieving students do not correspond perfectly to those student who meet test criteria achievement, but do not elaborate further on the nature of these differences. Other studies explore how teacher nominations may differ based on students' racial or ethnic background (e.g., Elhowereis et al., 2005; McBee, 2006), gender (Siegle & Reis, 1998), or motivation (Siegle & Powell, 2004), but do not consider whether these students would have been identified by other criteria. Similarly, research from the social organization literature primarily considers one aspect of students at a time (i.e., racial/ethnic background *or* gender *or* motivation), and do not consider how these different aspects of students influence one another and characteristics of student context in order to influence how students are identified for advanced programs. By considering a model in which motivational characteristics, contextual factors, and “chance” factors of racial/ethnic background, socioeconomic status, and gender simultaneously influence the identification of high achievement, a more complete picture can be gained of the ways in which teacher nominations differ from test criteria as identifiers of high achievement.

Together, these factors can be combined to form a conceptual model to guide the analysis of factors associated with students meeting various criteria for high achievement. This model, presented in Figure 1, outlines how a series of factors may be associated with whether a student meets one, both, or neither of the criteria for high achievement most commonly discussed among adolescent students. Taking a cue from Gagné’s DMGT model, this model considers both contextual and intrapersonal factors along with individual background characteristics beyond the control of the individual. Individual social relationships and motivation, and most particularly intrinsic motivation and efficacy, may be associated with students meeting the teacher nomination criteria because teachers may include characteristics of motivation in their implicit theory of high achievement. Given the assumptions that teachers have about the abilities of certain groups of diverse students (or, alternately, about the importance of including students who would be underrepresented if only using test-score criteria), context and motivation may relate differently to achievement criteria met in different students. In particular, this model will consider whether the relationship of context and motivation to achievement criteria met is different in students of one gender, of certain ethnicities, or from certain socioeconomic status backgrounds... Finally, school context may relate to meeting different achievement criteria based on school-level expectations about who is high-achieving, and who needs to be included in advanced programs. The curved arrows in Figure 1 indicate that all factors are correlated with one another to a certain extent. The straight “path” arrows do not indicate a causal relationship; rather, they represent that several characteristics of students and the schools that they attend are all thought to be associated with one central variable of interest (in this case, achievement identification criteria met).

Figure 1. *Heuristic Model Guiding the Current Analysis*



CHAPTER 3

Methodology

The purpose of this study was to investigate how characteristics of students' motivation and their schools' contexts influence whether they are identified as high-achieving using test and/or teacher nomination criteria. In addition, the potential roles of race/ethnicity, class, and gender as moderators of these relationships were considered, as was the extent to which these relationships are similar across schools differing in structure and socioeconomic status. The research questions posed in Chapter 1 were addressed using a quantitative analysis of nationally-representative data from schools and students collected by the National Center for Education Statistics in their Educational Longitudinal Study of 2002 (ELS:2002) program. The use of a large database allowed for sophisticated measurement techniques such as confirmatory factor analysis and item response theory to create high-quality scales that then served as predictors of which achievement identification criteria were met. In addition, the collection of data from hundreds of schools and thousands of students allowed for the simultaneous consideration of school and student characteristics using multilevel modeling techniques.

This chapter provides an overview of the ELS:2002 study and its use in this current study as well as the measurement and statistical analysis methods used to analyze these data. In line with the mission statement of the AERA Grants Program, which funded this study, the results from the analysis of this large-scale survey were considered in light of their implications for policy relating to identifying and educating gifted and talented students. In particular, this analysis provided information on how a combination of test-score and teacher-nomination identification criteria can be used to provide an appropriate education to a wider group of students, regardless of their background or their social experiences in school. Moreover, the consideration of school characteristics as they are associated with identification provides further information as to how such policies can be tailored to the situations present in individual schools.

Secondary Analysis of High-School Data

One of the largest limitations in the study of the identification and psychological characteristics of high-achieving students is the use of small samples of students, often the result of convenience samples, in cross-sectional research designs. Even among those studies which use somewhat larger samples (e.g., A. E. Gottfried & A. W. Gottfried, 1996, which has the added advantage of a longitudinal design), the students surveyed are often from a limited geographical area. This means that results cannot be generalized to the population of United States as a whole. Further, while ethnographic studies provide great detail about how school context may influence the experiences of talented students, no quantitative studies reviewed in the field of gifted education systematically took into account characteristics of schools as they influence student outcomes.

The use of nationally-representative samples and the inclusion of predictors at multiple levels of analysis require large, carefully-selected samples, and cannot be considered when using small convenience samples. This study addresses these limitations and enhanced research in this area through the use of the Educational Longitudinal Study of 2002, the most recent national database on United States high-school students available through the National Center for Educational Statistics. While the previous review of literature on the social organization of schooling has demonstrated how these databases have been used by educational sociologists, additions made to this current survey in the fields of social perceptions and student motivation have increased the utility of this dataset for answering questions related to the field of educational psychology. Although these analyses only looked at the base-year data from the survey and therefore is still limited by its cross-sectional design, its use to conduct a multilevel, nationally-representative study of tenth graders signifies a substantive contribution to the fields of gifted education and educational psychology.

Background on the Educational Longitudinal Study of 2002

In order to fulfill its mission to “collect and disseminate statistics and other data related to education in the United States,” the National Center for Education Statistics (NCES) implemented its National Educational Longitudinal Studies program. As described by the ELS:2002 User’s Manual and Technical Report (Ingels, Pratt, Rogers, Siegel, & Stutts, 2004), the purpose of this program is to gain information on the “educational, vocational, and personal development” of students at various stages of their lives. To this date, four studies have focused specifically on high-school students. Three completed studies, the National Longitudinal Study of 1972 (NLS-72), the High School and Beyond study of 1980 (HS&B), and the National Educational Longitudinal Study of 1988 (NELS:88), focused on the experiences of students in the 1970s, 1980s, and 1990s, respectively. Each of these completed studies was designed to focus not only on adolescents’ experiences in school, but also in later waves on how they transitioned into postsecondary education and into the workforce. ELS:2002, the fourth study in this group, is currently in progress and is designed to focus on high-school students in the 2000s. To date, two waves of this study have been completed, with participants surveyed in both tenth grade (in 2002) and twelfth grade (in 2004). Like previous studies, subsequent waves of ELS:2002 will turn their focus to these students' experiences in postsecondary education and the workforce.

In particular, Ingels and colleagues (2004) list several policy areas that were thought to be of primary concern in the first waves of ELS:2002. These include academic achievement, academic attainment (including dropping out of high school), the role of family background in student success, the features of effective schools, patterns of high-school coursetaking and its subsequent effects, the equitable distribution of educational opportunities among students from different subgroups, and the preparation of students for postsecondary education or for work. This analysis focused on several of these general recommended avenues of research and policies, notably the recognition of academic achievement and the equality of educational opportunity among diverse groups of students. In addition, the focus on selection for advanced programs has important implications for students' coursetaking and its later potential influences on success in school. Further, although ELS:2002 is primarily designed as a longitudinal study in which changes in individuals can be analyzed over time, its design also allows for the cross-sectional study of high-school sophomores (in the base-year study) and seniors (in the follow-up wave).

Sampling Procedure

The Educational Longitudinal Study of 2002 focused on the cohort of students who were in tenth grade at 2002. By conducting initial assessments and surveys when students are in tenth grade, researchers could focus on how experiences throughout the high-school years influence students as they transition into young adulthood and the workforce. In the context of this analysis, tenth-graders are interesting to study because they are in the middle of their high-school careers, meaning that while they are currently in a context in which subject-specific honors classes are common, they still have two additional years in which they can be selected for advanced programs.

ELS:2002 employed a two-stage sampling procedure, selecting groups of students within schools. In the first stage, 1,221 public, Catholic, and other private schools were selected from a population of approximately 27,000 schools using a stratified sampling frame (with stratifications made by region and urbanicity) and probability in proportion to size (PPS). Of these 1,221 schools, 752 participated in the study (for a school response rate of 68.7%). Once these schools were selected, clusters of approximately 26 tenth graders per school (excluding foreign exchange students) were selected for participation in the spring of 2002. At the student level, Hispanic and Asian students were oversampled, with researchers using information from the NCES' Common Core of Data and Private School Surveys in order to set oversampling rates. Altogether, 87.3% of the students recruited for participation in these 752 schools completed the student survey required for inclusion in the study, for a total student sample of 15,362 students.

Due to the sampling design employed, students and schools had unequal chances of being selected for inclusion in ELS:2002. To compensate for this, a series of weights adjusted both for unequal selection probabilities and for nonresponse. Additional detail about these weights is available in the Base Year Data File user's manual. A more in-depth discussion of how weights are employed in this particular context appears in the discussion of analytic techniques used. In addition, because ELS:2002 employed a stratified cluster sampling procedure, the standard errors that one would find in typical analyses of these data would be under-estimated. ELS:2002 therefore provides information on strata and primary sampling units (PSU) which may be used in a Taylor series approximation of variance to correct for these design effects. Further discussion of design effects is related to the specific analysis used in this study.

Instrument Development and Administration

The first wave of ELS:2002 consisted of seven components: assessments of students' achievement in reading and mathematics; surveys of students, teachers, parents, administrators, and librarians; and a facilities checklist based on survey administrators' observations of the school. NCES commissioned a series of content specification documents for each of these surveys; however, the content specifications were largely based upon those from NELS:88 as well as those developed for the National Assessment of Educational Progress (NAEP) and the Program for International Student Assessment (PISA).

Each survey went through an eight-step process of development and review: sharing of draft data elements, review by the Technical Review Panel of subject and methodological experts, review by NCES, revision of the questionnaire based on recommendations of the Technical Review Panel and NCES, justification of survey components, review by the Office of Management and Budget, revision of the questionnaire based on Office of Management and Budget recommendations, and field testing (with final revisions). In creating the instrument for the base-year survey of ELS:2002, developers gave first priority to those items that would be most useful in predicting outcomes that would be assessed in future waves of the study (e.g., later academic achievement, or postsecondary or vocational attainment). Developers gave second priority to those items that could provide comparisons to previous NCES high-school studies (i.e., NLS-72, HS&B, NELS:88) and to other NCES studies (e.g., NAEP, the Schools and Staffing Survey) as well as to international studies (e.g., PISA). Finally, test and survey developers also gave priority to items that could address new theoretical advances and policy concerns in the field of education (i.e., educational technology, new scales of self-efficacy). Although this analysis was cross-sectional in design (i.e., *not* using multiple waves), the inclusion of items from other studies and related to new conceptualizations of student motivation proved to be useful in developing measures used here.

This analysis used information from three of the seven instruments used as part of ELS:2002: the assessments of student achievement, the student survey, and the teacher survey. Assessments (or tests) of *student achievement*, conducted for both reading and mathematics, measured “the status of individuals at a given point in time” (Ingels et al., 2004) and were designed to study how individuals and groups differ in their academic achievement. In the base-year wave of ELS:2002, measures of achievement are also thought to provide baseline information about students’ achievement that can itself be used to predict student outcomes in subsequent waves. The student achievement tests were administered in a two-stage format, with students completing a 15-item “routing test” in the first stage and, based on the results of the routing test, a second test (approximately 25 items for mathematics and 16 items for reading) tailored to their performance in the first stage. (The second-stage tests were created using measurement techniques that allowed for scores to be compared across test forms). The *student survey* contained seven categories of questions: location information (including information on race/ethnicity, socioeconomic status, and gender), school experiences and activities, plans for the future, non-English language use, money and work, family, and beliefs and opinions about self. Students completed all tests in one day. The routing tests of achievement were administered first, followed by the student survey, and (after a short break) concluded with the more second set of achievement tests. In most schools, tests were administered during the school day in a group setting; however, some schools only allowed students to be surveyed during off-school hours. In these schools, researchers used additional monetary incentives to encourage participation.

The *teacher survey* consisted of two parts: teacher evaluation of students (which were used in this analysis) and teacher background (which were not used). Surveys were solicited from the current English and mathematics teachers of the surveyed students; however, in many cases only one (or neither) teacher was able to fill out a survey. The teacher questionnaires were mailed to participants, and participants were responsible for mailing their responses back to the survey center.

In addition, this study considers some of the archival data that ELS:2002 researchers collected from the Common Core of Data and the Private School Study. Information about schools' locations, control (public, private, or Catholic), and urbanicity came from these data sets.

Variables and Measures

All measures included in this study were developed from items appearing in the ELS:2002 dataset. Appendix A lists the specific ELS:2002 items used in analyses.

High Achievement Identification Groups

Following from the literature reviewed in Chapter 2, high-achievement identification simultaneously considered students' performance on an instrument specifically designed to measure achievement with teachers' judgments of students, which may take into account high achievement along with other characteristics of a student. In order to determine whether identification was associated with different factors in different subject areas, math and English were considered separately. Appendix A1 reports the specific ELS:2002 items used in creating these outcome variables.

Achievement Test Scores

The two-stage reading and mathematics tests in ELS:2002 emphasized practical application and problem solving in their given domains, rather than underlying aptitudes that might relate to future success in these areas. Therefore, these tests are better characterized as tests of achievement rather than tests of aptitude. More specifically, the reading test contained questions relating to the reproduction of detail, comprehension, and inference/evaluation, while the math test contained questions categorized as relating to skill/knowledge, understanding/comprehension, and problem solving. Test scores were computed using item response theory (IRT) techniques that took into account items' difficulty, discrimination, and the possibility that students guessed the correct answers to provide comparable scores regardless of the test form used. These scores were available on the ELS:2002 Base-Year user's file.

Students were considered to meet the test criterion of high achievement in a particular subject area based on their standardized score of achievement. In ELS:2002, standardized scores, or T-scores, provided norm-referenced assessments of a student's performance on the achievement test. Following the common interpretation of achievement test performance relative to the others, as discussed in Chapter 2, the use of these standardized scores was ideal. Each test was set to have a mean score of 50 and a standard deviation of 10.

In this set of analyses, students scoring in the top decile (standardized score at or above 62.74) of the reading achievement test were considered to meet the test criterion of high achievement in reading/English. Students scoring in the top decile of the mathematics achievement test (standardized score at or above 62.54) were considered to meet the test criterion of high achievement in mathematics.

Teachers' Recommendations

Teachers' recommendation of students was the second criterion for determining whether a student was considered high-achieving. As part of ELS:2002, teachers responded to items pertaining to students' suitability for advanced programs specifically in math or in English. The items (BYTE19 for English, BYTM19 for Math) asked teachers whether they have "ever recommended the student for AP/honors classes/academic honors." Students whose teachers responded "yes" to this item were considered to meet the teacher criterion for high achievement; students whose teachers responded "no" to this item were not considered to meet this criterion. The combination of considering teacher and test-score criteria for high achievement results in the creation of four groups of high achievement, as illustrated in Table 1.

Table 1. *Summary of Achievement Groups*

	Recommended for AP/IB/Academic Honors by Teacher	Not Recommended for AP/IB/Academic Honors by Teacher
Top decile of achievement	Meet Both High-Achievement Criteria	Meet the Teacher Criterion of High-Achievement Only
Not in top decile of achievement	Meet the Test-Score Criterion of High Achievement Only	Meet Neither High-Achievement Criterion

In addition, the use of a teacher variable meant that only those students who had a teacher complete the survey about them can be included in this study. Altogether, 3376 students did not have an English teacher respond to the question about recommendation, while 2940 students did not have a math teacher respond to the question about recommendation. At the same time, teachers of 1122 students reported that there was no advanced English program for which to recommend the student, and teachers of 1146 students reported that there was no advanced math program for which to recommend the student. This decreased the number of eligible students in the analysis of high achievement in English to 10,864 (in 697 schools) and the number of eligible students in the analysis of high achievement in talent to 11,276 students (in 723 schools). Comparisons of students included and excluded from the math and English samples in terms of gender, ethnicity, and socioeconomic status are illustrated in Table 2.

Table 2. *Characteristics of Students With and Without Teacher Data for the Math Analytic Sample and the English Analytic Sample.*

	Math Sample		English Sample	
	Teacher Data *(N=10,864)*	No Teacher Data *(N=1122)*	Teacher Data *(N=11,276)*	No Teacher Data *(N=1146)*
% Female in sample	49.0%	50.0%	49.0%	51.0%
% African American in sample	13.1%	17.8%	13.7%	16.0%
% Asian in sample	3.8%	5.3%	3.7%	5.4%
% Hispanic in sample	14.3%	20.3%	14.9%	18.2%
Average Socioeconomic Status	0.02	-0.08	-0.01	-0.03

Small differences can be seen between students for whom teacher data was or was not available. On average, students who had data available from math teachers scored .10 SD higher on the ELS:2002 measure of socioeconomic status than students without data available from a math teacher. Although this difference is statistically significant ($t(388)= 4.51$, $p < .001$), the low effect size means that it is not of enough practical significance to warrant concern. There was no significant difference in socioeconomic status between students who do and do not have data available from English teachers. Moreover, there appears to be little difference between students included in the English sample compared to those compared in the math sample.

Variables from the ELS:2002 Dataset

Control Variables

One possible limitation to a study of high achievement among tenth-grade students is that many of them will have been involved in programs designed to recognize and encourage further high achievement. Therefore, in analyzing how contextual, motivational, and individual factors were associated with meeting certain criteria for high achievement it was important to control for these previous experiences. In particular, ELS:2002 included a series of dichotomous items in which students reported previous school experiences. Three of these items captured previous experience related to the current analysis: Previous participation in an Advanced Placement program (BYS33A), previous participation in the International Baccalaureate program (BYS33B), and previous reception of academic honors (BYS23).Missing data on these variables were imputed using the median of nearby cases (i.e., of students in similar schools and/or sampling units). Given differences between the four groups in proportions of students responding “yes” to each of these items, they were included as controls in the statistical analysis. A report of the proportion of students in each achievement identification group responding that they had participated in each activity is presented in Table 3.

Table 3 also includes a report of the means and standard deviations for each group on the achievement tests administered as part of ELS:2002. Because test performance was used in creating these groups, it cannot be included as a control variable in the general analysis. However, taking into account differences between the groups in average achievement was useful in follow-up analyses comparing the two groups of students whose members scored above the 90th percentile (or, similarly, in comparing the two groups of students whose members score below this cutoff).

Table 3. *Background Descriptive Statistics for Each Achievement Group*

	Meet Neither Criterion	Meet Teacher Criterion Only	Meet Test Criterion Only	Meet Both Criteria
English Achievement	*N=8104*	*N=1650*	*N=480*	*N=630*
% in AP	12.36%	29.19%	28.22%	41.11%
% in IB	1.49%	1.94%	2.61%	3.56%
% receiving academic honors	24.61%	61.11%	45.10%	75.57%
Average Standardized Achievement Scores (SD)	47.15 (8.41)	53.91 (6.57)	66.35 (3.02)	66.70 (3.63)
Math Achievement	*N=8946*	*N=1106*	*N=568*	*N=656*
% in AP	13.34%	29.10%	25.37%	41.02%
% in IB	1.64%	1.70%	3.58%	3.40%
% receiving academic honors	26.63%	62.01%	55.68%	76.17%
Average Standardized Achievement Score (SD)	47.68 (8.40)	55.04 (6.60)	65.93 (3.29)	67.57 (3.99)

Student-Level Individual Background

Three sets of variables, described in Appendix A1, indicated students' gender, socioeconomic status, and racial/ethnic identification. Gender (FEMALE) was indicated by a composite sex variable included in ELS:2002. Missing values were imputed as part of the ELS:2002 base-year analysis using student transcript data (if available); if this was not available, NCES researchers assigned gender based on either logical imputation based on the student's first name, or statistical imputation if gender could not be discerned from the name.

Socioeconomic status (SES) was included in the ELS:2002 database and was based on five components: father's/guardian's education (BYFATHED), mother's/guardian's education (BYMOTHED), family income (BYINCOME), father's/guardian's occupational prestige score (from BYOCCUFATH), and mother's/guardian's occupational prestige score (from BYOCCUMOTH). Each component contributes equally to the composite, and all variables were standardized prior to the formation of the composite in order to take into account different metrics for different items. Each of these items was obtained from a parent survey if possible. If parent reports were unavailable, however, data were imputed using student reports on these variables.

The composite student race variable available as part of the ELS:2002 dataset (RACE) consisted of seven categories: American Indian/Alaska Native non-Hispanic, Asian/Hawaii/Pacific Islander non-Hispanic, Black/African American non-Hispanic, Hispanic (no race specified), Hispanic (race specified), Multiracial non-Hispanic, and White non-Hispanic. The race/ethnic status was obtained primarily from student reports; if unavailable, researchers used information from parent reports, school sampling roster (as race/ethnicity was considered in selecting students within schools), or logical imputation based on students' last name.

For the purposes of this analysis, however, fewer race/ethnic categories were needed, and several categories were collapsed. According to the ELS:2002 User's Manual (Ingels et al., 2004), the oversampling of students was conducted taking into account four groups of students: Asian, Hispanic, Black, and Other. Following this, the Hispanic (no race specified) and Hispanic (race specified) were combined into one "Hispanic" group large enough to consider in statistical analyses (see Ingels et al., 2004, pp. 44-46). The "other" group, which included American Indian/Alaska Native, Multiracial, and White students, was used to consider White students separately from Multiracial and American Indian/Alaska Native students. This category of "other" students (N = 873) was too small to meet the stringent sample size requirements set by NCES for racial/ethnic subgroups; however, it was important to consider White students separately from students of other racial/ethnic backgrounds in order to gain a more precise estimate of racial/ethnic gaps. The Asian and Black categories remained unchanged from the composite race variable, resulting in a five category race variable. The variable was then re-coded in a series of four dichotomous variables for use in further analyses (HISPANIC, BLACK, ASIAN, and OTHER, with White students serving as a reference group).

School-Level Variables

Literature on the social organization of schooling and on gifted education have suggested several school-level factors that could influence the extent to which students in a school are identified as high-achieving, particularly related to their selection for advanced programs. Information from the school file and from aggregated student data was used to provide school-level variables to include in analysis. Specific variables used in this analysis are described in Appendix A2. First, information about whether the school is under public, private, or religious control (BYSCTRL) and their urbanicity (BYURBAN) available from ELS:2002 was taken from the NCES' private and public school universe files and included in the school file. For their use in this analysis, each was transformed into a set of dummy-coded variables. Two dichotomous variables were created from the school control variable, indicating whether a school was Catholic (CATHOLIC) or was a non-Catholic private school (PRIVATE). Public schools served as the reference group for these variables. Two other dichotomous variables indicated whether a school was located in an urban or rural area (URBAN and RURAL), with suburban location serving as the reference group.

In order to judge how the number of students in a school may influence selection, the number of tenth-grade students as reported in the school roster was considered as a variable (BYG10EP). This is preferable to a measure of school size because the schools in which students were surveyed as part of ELS:2002 had different grade spans. Almost half of the schools reported having tenth-grade classes with between 0-99 students in them. Therefore, this variable was recoded to reflect whether a school had a tenth grade that was larger than 100 students (SIZEDIC). This dichotomized variable was included in the analysis.

Although school administrators were asked to comment on the proportion of students enrolled in a variety of classes and special programs in their school, they were not asked about the proportion of students enrolled in AP or other advanced or honors programs in the school. As a proxy, teacher recommendations for advanced programs were aggregated to the school level, to create a proportion of students that the teachers surveyed recommended for AP, IB, or other advanced programs in either English (PCTAPENG) or math (PCTAPMAT). Neither of these variables had a normal distribution; therefore, two categorical variables (one for each subject) with three levels each were created to capture the proportion of students in a school. The first category in each of these variables indicated schools in which no students were recommended for advanced work (NORECENG for ENGLISH: and NORECMAT for math). The second category indicated schools in which teachers recommended a proportion of students that was greater than the overall proportion of students recommended across the entire sample. In English, because 21.9% of students were nominated for advanced work in the entire sample, the category HIRECENG indicated those schools in which teachers nominated over 21.6% of their students for advanced work. In math, where 15.6% of students were nominated for advanced work, the category HIRECMAT indicated those schools in which teachers nominated over 15.6% of their teachers for advanced work.

Similarly, another important school-level variable considered here was the average level of academic achievement within a school. This was measured by aggregating the standard scores on students' test of English achievement (SCHEACH) and Math achievement (SCHMACH) to the school level.

The socioeconomic status of a school was measured by aggregating parent reports of socioeconomic status to the school level (AVESES). This was thought to be preferable to using proxies for socioeconomic status available from the administrator questionnaire, such as the proportion of students receiving free/reduced lunch. The student socioeconomic status employed in ELS:2002 captured more aspects of class, including occupational prestige, education, and income, than did one-dimensional proxies for socioeconomic status (such as free/reduced lunch proportion).

Finally, given the extensive literature on the experiences of high-achieving students from racial and ethnic minority backgrounds, a variable was created at the school level to capture the proportion of minority students within a school. This was created by aggregating student reports of whether they were White or Asian (coded 0) or Hispanic, Black, or from another background (coded 1). This resulted in a school-level variable indicating the proportion of non-White, non-Asian students in a school. This variable was dichotomized, and a school was considered to have high minority enrollment if it had above the median proportion (15.6%) of minority students in the school (HIMINOR).

Scales Created from Items in the ELS:2002 Dataset

Several of the predictor variables analyzed required scales to be created from items in the ELS:2002 dataset. A two-stage scaling process was employed to create measures from these items, first using confirmatory factor analysis to confirm the hypothesized dimensionality of these sets of items and then using item response theory to further analyze how these items fit together to form a scale. Once item fit was established, item response theory techniques were again used in order to create scale scores for each individual, using their responses to items in the scale. This procedure was used to create variables to measure both students' perceptions of context and their motivation in English and in math, respectively.

The wording of each item as it appears in ELS:2002 is included in Appendix A, while descriptive statistics for each of these items are available in Appendix C1 (for school context perception items) and Appendix D1 (for motivation items). An in-depth description of the confirmatory factor analysis and item response theory procedures used to create these scales appears in Appendix B. The follow section reports on how scales were formed from these individual items

Students' Perceptions of School Context

In the main report based on the ELS:2002 base year data, Ingels, Burns, Charleston, Chen, & Cataldi (2005) reported on students' perceptions of their school environment by indicating the percent of students who agreed or strongly agreed with each item presented. However, no attempt was made to form scales of students' perceptions of context from these variables. Ingels and colleagues (2005) divided their discussion of students' school experiences into five sections: students' perceptions of their school and teachers, perceptions about safety and experiences with crime and bullying at school, perceptions of school rules, perceptions of the importance of good grades, and reasons for going to school. Of these, students' perceptions of their school and teachers, and of crime/bullying (which can be thought of as a negative perception of peer relationships), are most salient to the discussion of contextual influences on motivation and achievement discussed by educational psychologists.

As is common in assessing the plausibility of models, initial analyses of the social context items revealed that considering only two dimensions in line with the Ingels et al. report did not satisfactorily capture students' patterns of response. Therefore, several changes were made to the model. These changes were acceptable in this analysis because the ultimate purpose of this analysis was to create psychometrically-sound scales, rather than to demonstrate fidelity to the first model tested. First, the "peer context" dimension was specified (based on exploratory analyses conducted in Barber, 2006) to include two separate dimensions: one relating to students' perceptions of peer disruptions (DISRUPT in Appendix A5: 3 items), and one relating to students' perceptions of fighting in their school (2 items). Two additional items, in which students reported whether they felt put down by students in class and whether they felt safe in the school, were not hypothesized to fit into this adapted model. Second, an item that asked students the extent to which they agreed that students in their school get along with teachers, which was thought to relate to students' perceptions of teacher-student relationships, was removed from analysis due to a weak loading on the hypothesized teacher-student relationships factor. The final three-factor confirmatory factor analytic model demonstrated acceptable fit, and is illustrated in Appendix C2. Further item response theory analyses were based on this three-factor model, but focus only on teacher-student relationships and perceptions of disruptive peers.

Factor 1: Teacher-student relationships. The three items relating to teacher-student relationships that were retained in the confirmatory factor analytic model demonstrated good fit to the generalized partial credit model during IRT analyses, and were therefore all used in creating the scale of teacher-student relationships. Average tenth graders agreed that teachers in their school are interested in the students and praise their effort. They also agreed that the teaching in their school is good.

Response options for items pertaining to students' perceptions of teacher-student relationships were originally coded such that lower numbers indicated *stronger* agreement with the statements presented in the survey. Given that the items presented related to teacher-student relationships were all positive, this scale was reverse-coded (i.e., scale scores were multiplied by a value of -1) such that *higher* scale values indicated *stronger* agreement with positive statements about teacher-student relationships. This aided in the scale's interpretation considered in analyses involving other variables.

Factor 2: Perceptions of disruptive peers. In addition, the three items pertaining to students' perceptions of disruption in the school were further analyzed using IRT techniques in order to create a scale. (Separate consideration of the "fighting in the school" factor was considered to be beyond the scope of this study and was not analyzed further.) However, this additionally analysis found that an item asking students the extent to which they felt that other students often disrupted class discriminated little among students (a = .491), and demonstrated poor fit to the generalized partial credit model. Therefore, the item was dropped from the scale of students' perceptions of disruptions, and the scale was developed using the two remaining items. According to the results of the final generalized partial credit model analysis, the average tenth-grade student disagrees with the statement, "misbehaving students often get away with it," but agrees with the statement, "Disruptions often get in the way of learning."

Since more disruption is thought to negatively relate to students' chances of success in school, this scale was not reverse coded, meaning that higher scores continued to indicate more disagreement with the presented statements. As a result, higher scale values indicated *fewer* disruptions. In other words, we would expect students with positive views of the peers in their schools to have high scores on this scale of "infrequent" disruption perceptions.

Students' Perceptions of Friends' Values

Researchers interested in social development and the social aspects of schooling distinguish the roles of distant peers and closer friends (Rubin et al., 1998; Wentzel, 1997). Thus, students' perceptions of their friends in school are important to consider separately from their perceptions of other students (peers) in general. A series of questions in ELS:2002 relating to students' perceptions of what is important to their friends had not yet been analyzed in any of the major reports on the study. However, a two-factor model was proposed when looking at this set of item items in light of literature on students' goals in the context of school. The first factor related to students' perceptions of their friends' academic goals (ACADFR: see Appendix A6), and included Likert-scale items related to attending classes regularly and getting good grades. The second factor related more to students' social goals (SOCIALFR: see Appendix A7), and included Likert-scale items related to being popular and having a steady boyfriend or girlfriend.

Unlike the items on the student survey asking tenth graders about their perception of context more generally, which provided respondents with four possible response options (strongly agree, agree, disagree, and strongly disagree), the items asking students about what their friends find important had only three possible responses (not important, somewhat important, very important). Given that confirmatory factor analyses of dimensionality assume that responses to single items are continuous, items with only three possible response options are difficult to use in this technique. While there was some evidence supporting the hypothesized dimensionality of the items based on confirmatory factor analyses, they did not reach the guidelines for "good model fit" recommended by Hu and Bentler (1999). However, a decision was made to use these groups of items in the IRT generalized partial credit model analysis even without meeting the original standards of the confirmatory factor analysis of dimensionality. Because IRT techniques do not have the same assumption of continuity that confirmatory factor analysis does, it can more easily be adapted to analyze items with a limited number of response options.

Factor 1: Perceptions of friends' academic orientations. IRT analyses confirmed that all five items (see Appendix A8) fit the hypothesized model well. Overall, the average tenth grader reported that their friends find attending classes regularly, studying, and getting good grades to be "somewhat important." However, the average student also believed that their friends find finishing high school and going onto further education to be "very important," based on the item parameters presented.

Factor 2: Perceptions of friends' social orientations. This model proposed that perceptions of friends' social orientations was best considered separately from, rather than in opposition to, students' perceptions of their friends' academic orientations. The four items (see Appendix A9) fit the model well in IRT analyses (results found in Appendix C3). The average tenth grader reported that their friends found it "somewhat important" to be popular with students, have a steady boy/girlfriend, or to attend parties, but "very important" to "get together" with friends.

Motivation

Appendix D2 illustrates the four-factor confirmatory factor analytic model tested to assess the hypothesized dimensionality of students' motivation. The only adaptation from the original hypothesized model was made to allow error terms of two indicators of

English self-efficacy ("I can understand difficult English texts" and I can understand difficult English classes") to covary. The addition of this error covariance term resulted in the model meeting the recommended standards of model fit. Because the error covariance was added between two similarly-worded items, it was thought to represent a wording effect in answering the question and was not considered a credible threat to the dimensionality of items. With the hypothesized dimensionality of students' motivation supported by the confirmatory factor analyses, IRT analyses were conducted in order to analyze each dimension further.

Self-Efficacy. Items pertaining to students' self-efficacy originally appeared in PISA 2000 (according to Ingels et al., 2004; see Adams & Wu, 2002). Whereas researchers in the PISA study developed perceived self-efficacy scales relating to classroom activities across domains, ELS:2002 developed separate sets of each items for classroom activities English and math separately (reported here in Appendix A10). Compared to the PISA 2000 measure, the subject-specific measure of self-efficacy employed in ELS:2002 are better in line with Bandura's own conception of self-efficacy, in which efficacy beliefs are specific to a particular topic and a particular context (Bandura, 2001).

Further, while the PISA scale of self-efficacy contained only three likert-scale items (relating to texts, assignments/exams, and skills), in ELS:2002 there were five likert-scale items which relate to students' self-efficacy in each of the two different domains (texts, assignments, exams, skills, and class performance). Therefore, although the analysis of the self-efficacy scale conducted by PISA indicated good fit to the data based on results of confirmatory factor analyses and item response theory analyses

(Adams & Wu, 2002), a new analysis of the self-efficacy items was needed in order to confirm that scales composed of these adapted items asked in the context of ELS:2002 have similarly satisfactory psychometric properties. In particular, two factors of perceived self-efficacy were tested. The first factor pertained to students' self-efficacy as it related to perceptions of performance English class (ENGSEFF), while the second pertained to students' self-efficacy as it related to perceived performance in math class (MATHSEFF).

IRT analyses of the five items hypothesized to indicate students' self-efficacy in English gave further support to the credibility of the model suggested by the initial confirmatory factor analysis. Overall, the average tenth-grade student reported that they could "often" understand difficult English texts and difficult English classes, could "often" do excellent jobs on English tests or class assignments, and could "often" master English skills.

IRT analyses of the five items hypothesized to indicate students' self-efficacy in mathematics also further supported this model. All five items were found to fit to the generalized partial credit model and were included in the scale of math self-efficacy. Overall, average tenth graders were less efficacious about their performance in math than they were in English. The average students reported that they could "sometimes" do an excellent job on math tests, understand difficult math texts, understand difficult math classes, or do an excellent job on math assignments; but could "often" master math skills.

Intrinsic motivation. ELS:2002 used a series of six items asking students to report their enjoyment of math and reading as a measure of intrinsic motivation, with three items pertaining to math interest and three pertaining to reading interest (Ingels et al., 2004). These items are reported in Appendix A11. This series of likert-type items was based on items from PISA 2000 relating to what they refer to as “interest” in reading or math, which formed two three-item scales (one for each subject), each of which had acceptable psychometric properties as judged by both classical and modern (item-response) test theory criteria (Adams & Wu, 2002). (In PISA 2003, a later study, they also adopt the label “intrinsic interest” for these two scales.) The intrinsic items in ELS:2002 were very similar to those in PISA 2000: there were three items administered for each subject area (reading and math) referring to the extent to which students enjoy the subject, “get absorbed” in the subject, and think the subject is fun. The items in ELS:2002 relating to whether students think that math or reading is “fun” had been adapted somewhat from the versions presented in PISA. Whereas the ELS:2002 items asked students whether they agree that reading or math is “fun,” PISA 2000 asked students the extent to which they agree with the statement, “Because [reading/math] is fun, I wouldn’t want to give it up.”

However, was necessary to re-analyze this scale to be certain that the change in wording did not influence the psychometric quality of the scale, and to validate these scales in the context of ELS:2002 with this population of tenth-graders in the United States. Similarly to the PISA 2000 analysis, two factors of intrinsic motivation were tested. Given the inclusion of new items related to students’ perceptions of the importance of mathematics, the general “intrinsic motivation” label was thought to represent the construct better than the older label of “intrinsic interest” adapted by PISA. The first factor is reading intrinsic motivation (INTREAD), and the second was math intrinsic motivation (INTMATH).

Further analysis using the generalized partial credit IRT model revealed that only two of the three items thought to assess students' intrinsic motivation in reading fit the hypothesized model. As a result, the non-fitting item, which assessed the extent to which students agreed that they "enjoyed reading in their spare time," was removed from analysis, and the two remaining items formed scales of students' intrinsic motivation in reading. The average tenth-grade was most likely to disagree that they think reading is fun and to disagree that they get "totally absorbed" in reading.

Because the response options for items pertaining to intrinsic motivation in reading were originally coded such that *lower* numbers indicate greater agreement with the statements presented, the final scale was reverse-coded such that higher scale scores indicated higher intrinsic motivation in reading.

IRT analyses of the three items hypothesized to indicate students' intrinsic motivation in math found that only two of the three items demonstrated satisfactory model fit. The third item, which asked students the extent to which they agreed that they "got totally absorbed in mathematics," did not fit the data and was removed from analysis. The two remaining items were retained to create a scale of students' intrinsic motivation in mathematics. Overall, average tenth-grade students did not appear to be intrinsically motivated in math; they disagreed that mathematics is fun and important.

As was described when summarizing the reading intrinsic motivation score, items capturing students' intrinsic motivation in math were originally coded such that lower scores indicated greater agreement with the presented items. Given the wording of the presented items, students who were intrinsically motivated in math would have given these items lower ratings. In order to aid interpretation once this scale was included in the statistical model, the scale of math intrinsic motivation was reverse-coded such that higher scale scores indicated greater motivation in the subject.

Missing Values

One of the advantages of using IRT techniques in scale creation is that scales scores can be estimated as long as the student has \data on at least one of the items in the scale. This means that as long as a student responded to one question in the scale, a scale score was created. However, several students were missing data on all items in a given scale, and scale scores were not calculated. The percentage of students missing a scale score ranged from 4.3% on the scale of perceptions of teacher-student relationships, to 30% on the perception of friends' social orientations. In these cases, a scale score was calculated using the EM single-imputation algorithm in SPSS 15.0 Missing Values Analysis (SPSS Incorporated, 2006).

Statistical Analysis of Research Questions

Univariate Statistical Analyses

Because the major scales of interest to this study were standardized to have a mean of 0 and a standard deviation of 1 during the IRT scaling process, it is not meaningful to talk about overall descriptive statistics beyond what has already been discussed when summarizing scale development. However, because the outcome variables in this analysis are categorical, it is useful to compare descriptive statistics across the four achievement groups in order to see whether there are differences among the four groups on average. Means and standard deviations were calculated using AM statistical software (American Institutes for Research, 2006), a software program designed for use with NCES large-scale studies (including ELS:2002) that takes into account weighting and design effects using Taylor series approximation techniques. In addition, a series of t-tests were conducted to compare averages of the group meeting both criteria to the other groups, using a p-value of .05 with a Bonferroni correction for multiple comparisons ($.05/3 = p < .016$). Chapter 4 includes a summary of the variables for the four achievement groups in English, and in mathematics.

Bivariate Statistical Analyses

All variables were also included in a two-level multinomial logistic regression analysis to predict which students are more likely to meet certain identification criteria. This analysis considered how context, motivation, and chance factors were each associated with the recognition of high achievement. The suggested relationship between these variables according to this model was illustrated in Figure 1, presented at the end of Chapter 2.

A multilevel approach was necessary in this analysis for two reasons: it took into account that students are nested within schools when calculating the standard errors of estimates (making Taylor series approximations of variance unnecessary), and it allowed for the inclusion of school variables in addition to student variables. This allows for the simultaneous consideration of Research Questions 1 (relating to student-level variables) and 2 (relating to school-level variables).

Model

A multinomial logistic regression model was appropriate for this analysis because it allowed for a combination of continuous and categorical variables to be associated with membership in to one of three or more groups. In particular, this model analyzed the likelihood with which a student belonged to each high-achievement group in order to determine which group the student was most likely to belong: identification by both criteria, identification by teachers only, identification by test scores only, or non-identification. In other words, it allowed for expected group membership to be determined based on contextual, motivational, and background characteristics.

More specifically, a multilevel multinomial logistic regression model was used here in order to consider student-level and school-level characteristics as they are associated with achievement identification group membership. This analysis was conducted using Hierarchical Generalized Linear Modeling (HGLM), a module available in HLM 6.02 software (Raudenbush, Bryk, Cheong, & Congdon, 2004) for the purposes of analyzing non-linear models, including logistic regression models. The HGLM module calculates expected group membership by considering the likelihood of belonging to each group given responses to a series of predictors. Calculations of likelihood are preformed through the use of the logit link, meaning that it is the natural logarithms of the odds rather than the odds of group membership themselves that are analyzed. In other words, the outcome is expressed the log of the odds of belonging to a particular group; or, the log of the ratio of the probability of belonging to that group versus not belonging. HGLM represents this as the logit link function η:

$$\eta_{mij} = \log\left(\frac{\phi_{mij}}{\phi_{Mij}}\right) \quad [1]$$

where ϕ_{mij} is the probability that person *i* in group *j* belong to response category *m* (either identified by test only, identified by teacher only, or not identified), relative to the probability of being in the reference response category *M* (identified by both criteria), which is expressed as:

$$\phi_{Mij} = 1 - \sum_{m=1}^{M-1} \phi_{Mij} \quad [2]$$

or 1 – the probability of belonging to each other group (such that the total probability sums to one).

Three sets of analyses were conducted for each outcome (math achievement identification and English achievement identification). Each compared the chance of being identified as high-achieving by both test and teacher criteria against the chance of belonging to one of the other categories by computing the log-odds of group membership. Additional transformations of these coefficients were then required in order to determine how these predictors influence the odds (or, with further transformation, the probability) that students belong to different categories. When considered together, the three analyses reflect that each student will be most likely to belong to one of the four identification categories.

More specifically to the multilevel multinomial logistic regression model, the two-level multinomial HGLM can be divided into two components: a within-school (person-level) component and a between-school (school-level) component. For the student-level component, the log-odds of person *i* in school *j* belonging to a category *m* can be expressed as follows:

$$\eta_{mij} = \beta_{0j(m)} + \sum_{q=1}^{Q} \beta_{qj(m)} X_{qij} \quad [3]$$

where $\beta_{oj(m)}$ is the average log-odds of membership in response category *m* for school *j*, and $\beta_{qj(m)}$ is the change in log-odds of belonging to that category due to predictor *q*, for each of *Q* predictors. In other words, the chance that a student in a particular school belongs to a certain identification category can be increased or decreased once additional characteristics (such as contextual characteristics, motivation, or individual background) are taken into account. Because each coefficient β will have a different value for each response category *m* (i.e., because there will be a different base likelihood of belonging to each category, and because predictors will influence likelihood of group membership differently for each category), separate equations result for each category being analyzed.

In the school-level component, a β coefficient of the change in log-odds associated with predictor *q* indicated in the student-level model can be further expressed as follows:

$$\beta_{qj(m)} = \gamma_{q0(m)} + \sum_{s=1}^{S_o} \gamma_{qs(m)} W_{sj} [+u_{qj(m)}] \quad [4]$$

where $\gamma_{q0(m)}$ is the grand (overall) mean of the β coefficient across all schools for category m, $\gamma_{qs(m)}$ is the change in log-odds of β due to predictor *s* for each of *S* predictors, and (if β varies between schools) $u_{qj(m)}$ is the random effect associated with belonging in school *j*. In other words, the base likelihood of belonging to a particular category may differ as a function of certain characteristics of a school (e.g., its size, whether it is public or private, or its level of resources). Additionally, the effect that any student-level predictor has on the likelihood of belonging to a particular category may also differ as a function of certain school characteristics. Like the within-school portion of the model, separate equations will result for each category being analyzed.

The division of student-level and school-level variability also requires that each level be weighted separately. The student-level design weight available in the ELS:2002 sample is for use in statistical analyses being conducted only at one level (e.g., the CFA and IRT analysis conducted earlier), and as a result includes aspects of both the sampling of schools and the sampling of students within a school. To contrast this analysis will employ both a school-level weight, available in the ELS:2002 to take into account disproportionate sampling probabilities of schools (BYSCHWT) as well as a within-school weight to take into account disproportionate sampling probabilities of students within a single school (WITHINWT = BYSTUDWT/BYSCHWT). At both the school and student levels, weights were re-normalized to reflect schools and students that were dropped for missing achievement identification criteria.

Statistical Analysis

Predictors of the log-odds of group membership will be entered in blocks, with student-level contextual variables entered first, followed by student-level motivational variables, then student background variables, and finally the school variables. This analysis is summarized in Table 4.

Table 4. *Summary of Decision Rules for Variables Included in Each Step of Analysis.*

Step	Procedures
1.	Test a fully unconditional model for significant random effects at the intercepts (i.e., test whether the proportion of students meeting certain achievement criteria is different in different schools. a. Retain random effects if chi-square test of variance component is statistically significant, $p < .05$ b. Remove random effect if variance component is not statistically significant
2.	Introduce variables related to students' prior participation in Advanced Placement or International Baccalaureate programs and previous reception of academic honors as control variables, centered on their grand means
3.	Introduce individual-level social context variables into the model. a. Retain in model if the variable is a significant predictor of belonging to at least one of the high-achievement groups. b. Remove variables from the model that are not significant predictors of belonging to any of the achievement groups. c. Once the set of significant context variables is established, test for significant random effects of one predictor at a time (i.e., test to see whether the relationship of the predictor to achievement criteria met is different in different schools). i. The variable whose random effect is being tested is centered at its group mean; all other variables remain centered at the grand mean. ii. If the random effect associated with the predictor is significant, retain the random effect and leave group-mean centered iii. If the random effect associated with the predictor is not significant, do not retain the random effect and re-center the predictor at its grand mean
4.	Introduce motivation variables into the model, using the same procedure as described in step (3).
5.	Introduce individual background variables into the model, using the same procedure as described in step (3). a. *Note*: If one dummy-coded ethnicity variable is significant, then all ethnicity variables are retained, regardless of their significance, in order to aid in the interpretability of coefficients
6.	Introduce student-level interaction terms into the model (i.e., interactions among student variables), centered on their grand mean. Retain only if significant.
7.	Introduce school-level variables into the model, centering when appropriate to ease interpretation. School-level variables are only included as predictors when there is a significant level of variance in the achievement criterion met at the school level.

In the first set of analyses after adding the control variables, only the contextual variables were added as predictors. Perceptions of teacher/student and peer relations in their school as well as the academic and social goals of their friends were added to each model, with this model repeated for each of the other categories in math achievement identification and for all categories in English achievement identification. In the second set of analyses, students' motivational variables were added to the analysis. If any of the four perception variables was not significant across any of the identification criteria categories in a subject area (i.e., across all math identification categories or across all English categories), then it was removed from the analysis for parsimony.

In the third set of analyses, students' race/ethnicity, socioeconomic status, and gender were added to each model as a series of covariates, with the model repeated for each category and each outcome. In order to test the homogeneity of regression among those demographic covariates found to be significant, interaction terms with motivation or context perception variables were tested in a following step and included if necessary.

At this stage, random effects for each predictor variable were tested to see whether the magnitude of the β coefficient was different in different schools (i.e., whether the relationship of a given variable to the likelihood of meeting particular achievement criteria was different in different schools). This resulted in the addition of additional *u*, or school-level error terms, being added for each predictor thought to vary. In addition, predictors with random effects were centered on their group mean, rather than their grand mean, in order to better facilitate interpretation. If the variance component associated with the added *u* term was significant ($p < .05$) according to a χ^2 goodness-of-fit test with *j-1* degrees of freedom, then this random effect was retained and modeled using school-level variables in the fourth series of analyses. If the variance component was not statistically significant, then it was removed and the predictor remained as a fixed effect (and the variable centered again on its grand mean).

The final set of analysis introduced school-level variables of class size, proportion of students nominated for in advanced classes in the subject, school socioeconomic status, minority composition, locale (urban or rural vs. suburban), and control (private or Catholic vs. public) into the model, with parallel analyses for each category in each of the two domains. These school-level variables were used to model the random effects of predictor variables if they are found to be significant. School-level variables were considered after the student-level portion of the model has been finalized in line with the suggestions for building multilevel models discussed by Raudenbush and Bryk (2002).

Strengths and Limitations of the Analysis Technique

There were several benefits and drawbacks to using a multilevel, multinomial logistic regression analysis to answer the research questions central to this study. As previously discussed, this technique is particularly suited for the data upon which this analysis was based, since both school and student variables were associated with a categorical outcome. Further, logistic regression techniques in general (with dichotomous or polytomous outcomes, single-level and multilevel) are particularly suited for large-scale data sets. Because of the technique's reliance on maximum likelihood estimations of coefficients, large sample sizes are needed to use it successfully (Pedhazur, 1997). It is generally agreed that it is more difficult to find significant effects with this analysis. A common question when analyzing large data sets with other techniques is the extent to which the large sample sizes result in very small effects being statically significant.

Given this difficulty in finding significant effects, this concern over possible Type I error is less of a concern.

At the same time, there are also several ways in which this analysis limits the interpretability of the findings to be presented in Chapter 4. First, because the outcome variable was categorical, there is no variance at level 1. Therefore, the descriptive statistics that rely on level 1 variability, such as the intraclass correlation (i.e., ratio of between-group to within-group variance) or effect sizes, could not be reported in this analysis (Luke, 2005). Similarly, because there is no level-1 variability, there is no way to discuss the extent to which the addition of variables into the model "reduces variability" seen in the outcome. Although it is possible to calculate "pseudo r-squares" to approximate these statistics (see Pedhazur, 1997), there is disagreement in the field about the effectiveness of these approximations. This is especially true for analyses involving multiple levels and outcomes with more than two categories. A second technique typically used for determining the effectiveness a model, a "classification table" comparing actual and expected group membership, is more often recommended for predictive models than it is for descriptive models (Long, 1997). The purpose of this analysis is to identify factors associated with identification rather than to predict identification; therefore, a classification table is not as useful here.

In summary, although this technique was appropriate given the structure and amount of data analyzed, there were limitations inherent in the analysis that limit the ability to assess the completeness of the model overall. Therefore, the discussion of results in Chapter 4 focuses on the nature of associations among individual variables rather than the effectiveness of the whole model.

Summary

The combination of item response theory and hierarchical generalized linear modeling techniques took full advantage of the wealth of data available in the ELS:2002 data set to examine the characteristics of students identified as high-achieving in different school contexts. The creation of IRT scales resulted in high-quality measures that best fit the categorical items used in ELS:2002. The multilevel analysis allowed for the simultaneous consideration of both school and student characteristics to determine a student's likelihood of membership in each of the four high-achievement identification categories outlined. In each analysis, the use of nationally-representative data allowed for the generalization of findings across all United States tenth graders in 2002. As a result, the findings from this analysis can be used to inform policies in schools with very different characteristics across the country.

CHAPTER 4

Results

The purpose of this study was to determine the extent to which certain contextual, motivational, and background factors related to whether students met test-based or teacher-based criteria for high achievement, both in mathematics and English. The results from statistical analysis relating to these issues comprise the main part of this chapter. First, a series of descriptive statistics summarizes whether the groups of students meeting different criteria for high achievement differ in terms of their perceptions of teachers, peers, and friends; their self-efficacy and intrinsic motivation in the subject; or in terms of important demographic characteristics such as ethnicity, socioeconomic status, and gender. Descriptive data are also presented to gain information about the schools that students in ELS:2002 attend, in preparation for more complex multilevel analysis. In addition to the material presented in this chapter, Appendix F and Appendix G provide bivariate correlation tables for student and school variables, respectively.

Following these descriptive analyses, multilevel, multinomial logistic regression analyses of data from ELS:2002 assessing the likelihood that students are identified by teachers as high-achieving, by test scores as high-achieving, by both, or by neither are presented first for English, and then for math. In addition, follow-up multilevel logistic regression analyses are conducted to gain additional insight into whether the findings hold after controlling for students' exact level of achievement in a subject, as determined by their score on the ELS:2002 subject achievement tests.

Descriptive Statistics

Descriptive Statistics for English Achievement Groups

As was discussed in Chapter 3, four groups of students were identified based on their achievement in English: students who were recommended by their English teacher for advanced programs or honors, students who were in the top decile of students in the ELS:2002 English achievement test, students who met both of these criteria simultaneously, and students who met neither criterion. Table 5 illustrates descriptive statistics for each of these four groups.

Table 5. *Descriptive Statistics of Students Meeting High-Achievement Criteria in English.*

	Meet Neither Criterion (N = 8140)		Meet Teacher Criterion Only (N = 1650)		Meet Test Criterion Only (N = 480)		**Meet Both Criteria (N = 630)**	
	Mean	SD	Mean	SD	Mean	SD	**Mean**	SD
Teacher-Student Relationships[1]	-0.051*	0.993	0.163*	0.927	0.112*	0.893	**0.293**	0.888
Disruptions by Peers[1]	-0.017*	0.973	0.022*	0.975	0.148	0.951	**0.223**	0.913
Friends' Academic Orientations[1]	-0.065*	0.865	0.192*	0.818	0.128*	0.819	**0.3**	0.819
Friends' Social Orientations[1]	0.039*	0.845	-0.054	0.843	-0.115	0.856	**-0.086**	0.846
English Self-Efficacy[1]	-0.15*	0.839	0.265*	0.845	0.464*	0.896	**0.649**	0.885
Intrinsic Motivation in Reading[1]	-0.132*	0.855	0.164*	0.87	0.421*	0.989	**0.691**	0.886
Ethnicity: Black[2]	0.162*	0.368	0.093*	0.291	0.028	0.164	**0.017**	0.129
Ethnicity: Hispanic[2]	0.171*	0.376	0.113*	0.316	0.032	0.175	**0.055**	0.229
Ethnicity: Asian[2]	0.032	0.176	0.056	0.23	0.039	0.195	**0.037**	0.189
Ethnicity: Other[2]	0.054*	0.227	0.044	0.205	0.049	0.216	**0.026**	0.16
Socioeconomic Status[1]	-0.116*	0.677	0.204*	0.726	0.422*	0.704	**0.625**	0.679
Gender: Female[2]	0.463*	0.499	0.616	0.486	0.39*	0.488	**0.607**	0.488

* Average for group is significantly different from the average for the group that meets both teacher and achievement criteria, p < .016.

[1] Standardized across the complete ELS:2002 sample, mean = 0, SD = 1

[2] Dichotomous variable: mean indicates the proportion of students in a given category

As indicated above, students who were identified as high-achieving both by teacher nomination and by test scores had more positive perceptions of teacher-student relationships in the school and perceived their friends as more academically-oriented than students who met only one or none of the criteria. In addition, they had higher English self-efficacy and higher intrinsic motivation in reading than did students in any of the other three groups. Students meeting both criteria perceived fewer disruptions from other students than did students who meet neither criterion, or who were identified by teachers only; but showed no significant difference in these perceptions from students who only met the test score criterion.

There were also several demographic differences among these four groups of students. Students who met both the test and teacher criteria for high achievement in English were of higher socioeconomic status than were students in any of the three other groups. There were also fewer Black and Hispanic students in this group than there were in the groups of students meeting neither criterion or the teacher-nomination criterion only, and more female students in this group than in the groups meeting neither criterion or the *test* criteria only. (In other words, there were more male students in the two groups not nominated by teachers as high-achieving.)

Overall, the most dramatic differences could be seen when comparing the group of students meeting both criteria to the group of students meeting neither criterion. Students meeting neither criterion perceived less positive student-teacher relationships and more disruptions from peers; and perceived their friends to be less academically-oriented and more socially-oriented. Students meeting neither criterion were also less motivated in this subject area, reporting lower self-efficacy in English and lower intrinsic motivation in reading. There were also several interesting demographic differences: when compared to students meeting both criteria, there were higher proportions of Black and Hispanic students, students from “other” ethnic backgrounds, and males meeting neither criterion. Students meeting neither criterion were also, on average, of lower socioeconomic status.

Descriptive Statistics for Math Achievement Groups

In analyzing high-achieving math students, four similar groups of students were also created based on teacher nominations and test performance. Differences among these four groups are illustrated in Table 6.

Table 6. *Descriptive Statistics of Students Meeting High-Achievement Criteria in Math.*

	Meet Neither Criterion (N=8946)		Meet Teacher Criterion Only (N=1106)		Meet Test Criterion Only (N=568)		**Meet Both Criteria (N=656)**	
	Mean	SD	Mean	SD	Mean	SD	**Mean**	SD
Teacher-Student Relationships[1]	-0.058*	0.989	0.205	0.902	0.151*	0.898	**0.305**	0.925
Lack of Disruptions by Peers[1]	-0.012*	0.977	0.068	0.989	0.075	0.964	**0.177**	0.915
Friends' Academic Orientations[1]	-0.044*	0.861	0.213	0.801	0.048*	0.884	**0.248**	0.833
Friends' Social Orientations[1]	0.022*	0.853	-0.019*	0.822	-0.078	0.840	**-0.137**	0.830
Math Self-Efficacy[1]	-0.141*	0.828	0.416*	0.851	0.539*	0.944	**0.857**	0.844
Intrinsic Motivation in Mathematics[1]	-0.086*	0.868	0.267*	0.900	0.147*	0.956	**0.526**	0.973
Ethnicity: Black[2]	0.150*	0.357	0.115*	0.318	0.016	0.126	**0.010**	0.098
Ethnicity: Hispanic[2]	0.158*	0.365	0.128*	0.334	0.055	0.228	**0.035**	0.183
Ethnicity: Asian[2]	0.028*	0.166	0.069	0.253	0.064	0.244	**0.088**	0.283
Ethnicity: Other[2]	0.056*	0.230	0.048*	0.213	0.027	0.163	**0.027**	0.162
Socioeconomic Status[1]	0.494*	0.500	0.609*	0.488	0.326*	0.469	**0.433**	0.495
Gender: Female[2]	-0.078*	0.685	0.192*	0.740	0.514	0.660	**0.621**	0.689

* Average for group is significantly different from the average for the group that meets both teacher and achievement criteria, $p < .016$

[1] Standardized across the complete ELS:2002 sample, mean = 0, SD = 1

[2] Dichotomous variable: mean indicates the proportion of students in a given category

As illustrated in Table 6, students meeting both identification criteria perceived more positive student-teacher relationships and reported having friends who were more academically oriented than did students who were not nominated by teachers, regardless of whether they met the test criterion. They also perceived significantly fewer disruptions than did students who met neither criterion, and perceived their friends to be significantly less socially-oriented than students who did not meet the test-score criteria, regardless of whether they were recommended by teachers for advanced programs. Students meeting both criteria were also significantly more intrinsically motivated in math and more self-efficacious in math courses than were students in other groups.

Several demographic differences also existed among the four math achievement groups. There were fewer Black or Hispanic students in the group meeting both teacher and test criteria of high achievement than there were in the groups meeting neither criterion or the teacher criterion only. Students in these two groups were also of lower socioeconomic status, on average, than the group meeting both criteria. Interestingly, there were more females in the two groups of students not meeting the test score criterion for high achievement in math, but fewer females (i.e., more males) in the group who was not recommended by teachers for advanced programs despite meeting the achievement criterion.

Descriptive Statistics for School-Level Variables

As described in Chapter 3, school-level variables were also taken into account in this study. Descriptive statistics at this level are reported in Table 7.

Table 7. *Descriptive Statistics for School-Level Variables*

	N	Mean	SD
Average SES[1]	752	-0.041	0.406
Average Reading Achievement Test Score[2]	752	49.76	5.55
Average Math Achievement Test Score[2]	752	50.36	5.44
Teacher Nominations in English: No Students[3]	697	0.249	0.433
Teacher Nominations in English: High % of Students[3]	697	0.432	0.495
Teacher Nominations in Math: No Students[3]	723	0.319	0.466
Teacher Nominations in Math: High % of Students[3]	723	0.427	0.495
Control: Private[3]	752	0.18	0.386
Control: Catholic[3]	752	0.05	0.218
Locale: Urban[3]	752	0.217	0.412
Locale: Rural[3]	752	0.356	0.479
High Minority Enrollment[3]	752	0.501	0.500
100+ Students in Tenth Grade[3]	752	0.416	0.493

[1] Standardized across the complete ELS:2002 student sample, mean = 0, SD = 1
[2] Standardized across the complete ELS:2002 student sample, mean =50, SD = 10
[3] Dichotomous variable: mean indicates the proportion of students in a given category

Hierarchical Generalized Linear Models Related to Central Research Questions

In order to determine whether individual and school characteristics influenced the likelihood of belonging to one of the four achievement groups, a series of hierarchical generalized linear models (HGLMs) with a four-category multinomial outcome was conducted. Results are presented separately for achievement in English and in math.

Because logistic regression techniques analyze the likelihood of belonging to a certain group, the results of these analyses are discussed in terms of how variables increase or decrease the odds (or the likelihood) of meeting particular identification criteria by a certain factor. In these tables, odds ratios are the ratio of the probability of belonging to the group over the probability of belonging to the reference group (in this case, meeting both criteria) given a score of 1 on the variable of interest. Odds ratios are presented along with the log of the odds ratio and the log-odds standard error, as HLM uses the log-odds metric to calculate and report the results of logistic regression analyses.

Results for Achievement Criteria Met in English

Initial Analyses

In order to determine whether there was a sufficient amount of variance at the school level to analyze, a fully unconditional model was run with random effects in the intercepts for each of the three comparisons. There was a significant amount of between school variance in the likelihood of students meeting neither criterion ($\tau_{0(1)} = 1.331$, $\chi^2(696) = 1450.902$, $p < .001$) and the likelihood of students meeting only the teacher criterion ($\tau_{0(2)} = 0.545$, $\chi^2(696) = 828.472$, $p =.001$). However, there was not a significant amount of variability in the likelihood of students meeting the test criterion ($\tau_{0(3)} = 1.067$, $\chi^2(696) = 703.864$, $p = .410$). In other words, while the proportion of students in each school who met neither criteria or who only met the teacher criterion for high achievement differed in different schools, the proportion of students meeting the test-score criterion only was similar across schools. Therefore, differences between schools were only considered when looking at the two group comparisons with significant between-school variance components, and school-level effects were only considered for these comparisons.

Bear in mind, as illustrated in Chapter 3, there were significant differences among the four groups in the number of students who reported having been enrolled in Advanced Placement or International Baccalaureate programs, and in the number of students who received academic honors. In order to control for these differences, each of these three dichotomous correlates (capturing whether students did or did not participate in AP, IB, or academic honors) was added to the analysis prior to the inclusion of context, motivation, and individual background variables.

Finally, all significant correlates were originally tested with random effects, to see whether the magnitude of these effects on achievement group membership differed in different schools. In no case did the model with random effects for correlates result in a significant finding. In other words, there was no evidence to support the thought that motivation or context were associated with which achievement criteria were met differently in different schools (i.e., there is no variability to try to model with cross-level interactions). As a result, all correlates were included in the model with fixed effects and were centered on their grand mean.

Context Correlates

Table 8 reports results from the final model of English achievement criteria met with the above specifications. Information about intermediate models in which motivation, individual background, and interaction variables are added one block at a time are available in Appendix G. Variables assessing students' perceptions of teacher-student relationships, disruptions, friends' academic orientation, and friends' social orientation were not significant correlates of whether students were recognized as high achieving by teachers or by test scores. Therefore, in order to keep the model parsimonious, these context variables were not retained in the model.

Table 8. *Summary of Multilevel Multinomial Logistic Regression Analyses for Meeting Achievement Criteria in English*

	1. Teacher Criterion vs. Both			*2. Test Criterion vs. Both*			*3. Neither Criterion vs. Both*		
	LO	SE	OR	LO	SE	OR	LO	SE	OR
1. Constant	**1.51**	0.18	4.51	**0.71**	0.18	2.03	4.27	0.15	71.69
School									
2. School SES	**0.35**	0.28	1.42				**0.68****	0.23	1.97
3. Average Reading Ach.	**-0.19****	0.02	0.82				**-0.18****	0.02	0.83
4. No Teacher Nominations							**1.34****	0.21	3.80
5. High Teacher Nominations	**1.31****	0.13	3.70				**-0.28****	0.10	0.76
6. Large Tenth Grade	**-0.31***	0.14	0.74				**-0.25***	0.11	0.78
7. High Minority	**0.47****	0.13	1.60				**0.05**	0.11	1.05
Controls									
8. Previously in AP	**-0.50****	0.19	0.60	**-0.32***	0.19	0.73	**-1.07****	0.19	0.34
9. Previously in IB	**-0.36**	0.52	0.70	**0.03**	0.28	1.03	**0.00**	0.37	1.00
10. Previous Academic Honor	**-0.26**	0.18	0.77	**-1.19****	0.26	0.30	**-1.74****	0.20	0.17
Motivation									
11. English Self-Efficacy (IRT)	**-0.26***	0.12	0.77	**-0.05**	0.13	0.94	**-0.63****	0.11	0.53
12. Intrinsic Motivation in Reading (IRT)	**-0.66****	0.12	0.52	**-0.28***	0.14	0.76	**-0.86****	0.09	0.42
Background									
13. Ethnicity: Black	**2.10****	0.49	8.18	**1.68****	0.60	5.33	**2.90****	0.48	18.21
14. Ethnicity: Hispanic	**0.86****	0.31	2.36	**0.08**	0.40	1.08	**1.31****	0.28	3.71
15. Ethnicity: Asian	**0.24**	0.35	1.27	**-0.26**	0.35	0.77	**-0.17**	0.34	0.84
16. Ethnicity: Other	**0.38**	0.40	1.46	**1.10***	0.46	2.99	**0.79****	0.30	2.20
17. Socioeconomic Status	**-0.39***	0.15	0.68	**-0.23**	0.17	0.79	**-0.78****	0.12	0.46
18. Gender: Female	**0.34**	0.20	1.40	**-0.61***	0.22	0.54	**-0.07**	0.20	0.93
Interaction									
19. Black x Reading Intrinsic Motivation	**-1.09***	0.40	0.34	**-0.93**	0.63	0.33	**-1.12****	0.39	0.42

* p < .05, **p < .01

Note: LO= Log-odds, SE= Robust Standard Error, OR= Odds Ratio. Shaded numbers correspond to correlates that are significant at or below p<.05. Reference group meets both teacher and test-score criteria for high achievement in English. Variables in *italics* are uncentered; all other centered on grand mean.

Motivational Correlates

Although students' perceptions of school context were not significantly associated with the likelihood of achievement criteria met, both self-efficacy and intrinsic motivation were significantly associated with belonging to certain groups. Students who had higher self-efficacy in English were less likely to meet only the teacher criterion for high achievement (Table 8, Line 11, Column 1). More specifically, students who were one standard deviation above average in English self-efficacy were 77% as likely to meet the teacher criterion only compared to students with average efficacy. Another way to say this is that students who were more likely to be nominated by English teachers for advanced work despite being below the 90th percentile in English achievement had lower self-efficacy. To contrast, there was no significant difference in self-efficacy between students meeting the test-score criteria who were or were not nominated by teachers (Column 2). However, higher self-efficacy was also associated with having a lower likelihood of meeting neither criterion of high English achievement. Students one standard deviation above average in self-efficacy were approximately half as likely to meet neither criterion (e.g., not be identified at all) as were students with average efficacy (Column 3).

Students with more intrinsic motivation in reading were more likely to meet both criteria of high achievement. This can be said because higher intrinsic motivation was associated with a lower likelihood of meeting only the teacher criterion, a lower likelihood of meeting only the test criterion, and a lower likelihood of meeting neither criterion (Table 8, Line 12). Students who were one standard deviation above average in their intrinsic motivation in reading were 52% as likely to have met only the teacher criterion (Column 1) as average students, and were only 76% as likely to have only met only the test criterion (Column 2) as average students. As was the case with self-efficacy, however, intrinsic motivation had the greatest association with the likelihood of meeting neither criterion. Highly intrinsically-motivated students (i.e., those with motivation 1 SD above average) were 40% as likely to meet neither criterion as were students with average intrinsic motivation (column 3).

In summary, students' motivation in verbal areas (i.e., reading and English) was associated with students' likelihood of being identified as high-achieving in different ways. The students with the highest intrinsic motivation were most likely to meet both criteria for high achievement, while students who were relatively more likely to meet only one criterion or the other had somewhat less intrinsic motivation in the subject. At the same time, students with the highest self-efficacy in English were also those who were the most likely to perform the highest on tests of English achievement regardless of whether teachers nominated them. While higher self-efficacy was associated with a lower likelihood of meeting only the teacher criterion or of meeting neither criterion, it had no association with the likelihood of meeting the test score criterion only in this final model. Finally, it is the students with the lowest efficacy in English and the least amount of intrinsic motivation in reading who were the most likely to meet neither the teacher nor the test criterion of high achievement.

Individual Background Correlates

In the next step of analysis, individual background variables related to ethnicity, socioeconomic status, and gender were added to determine whether there were significant demographic differences among the achievement groups. As demonstrated in Lines 13 and 14 in Column 1 of Table 8, Black or Hispanic students were significantly more likely to meet only the teacher criterion compared to White students. Black students were 8 times as likely, and Hispanic students over twice as likely, to meet the teacher criterion only than were White students. To contrast, students of higher socioeconomic status were also *less* likely to meet only the teacher criterion in English; a one standard deviation increase in socioeconomic status was associated with a student having 68% of the chance of meeting the teacher criterion only.

In analyzing students who were more likely to meet only the test criterion of high achievement, ethnicity and gender appeared to be the most important variables. According to line 13 of Table 8, Black students were 5.3 times as likely to meet only the test criterion as were White students (column 1 for teacher criterion only, column 2 for test criterion only). At the same time, as reported in Line 18 of Table 8, females were 54% as likely as males to meet the test criterion only. Students who fell into the "other" category of ethnicity were also significantly more likely to meet test criterion only than were White students (Table 8, Line 16, Column 2). However, given the diversity of this group (which includes both multiracial and Native American students), this finding has limited interpretive value.

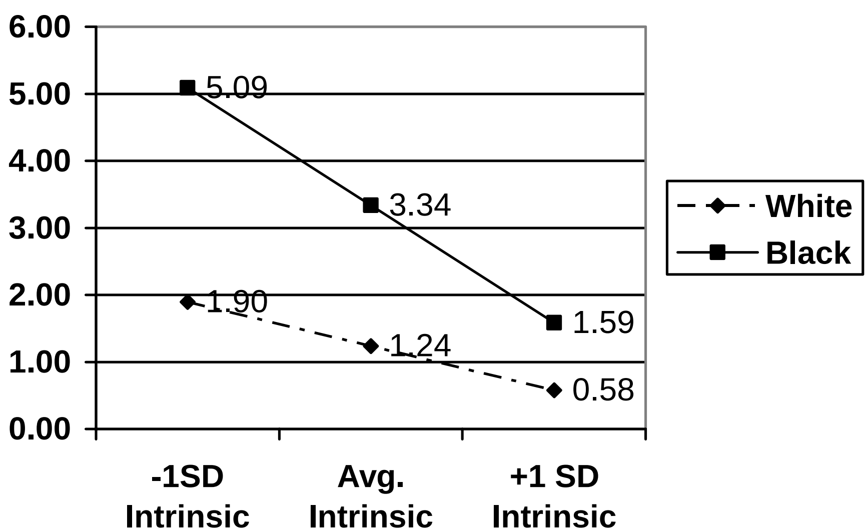
Finally, there were also significant differences in individual background among those students who did not meet either criterion (Column 3). Whereas students most likely to meet neither criterion were the most unmotivated both in terms of self-efficacy and intrinsic motivation, significant differences in terms of background were more mixed. Students meeting neither criterion were 18 times more likely to be Black, 3.7 times more likely to be Hispanic, and 2 times more likely to belong to the diverse "other" group as they were to be White. Moreover, a one standard deviation increase in socioeconomic status was associated with cutting the likelihood of meeting neither criterion in half. However, gender was not significantly associated with being likely to meet neither criterion; in other words, neither males nor females were more likely to meet neither criterion.

In summary, there appeared to be ethnic and socioeconomic differences among the groups of teacher-nominated students who were and were not in the top tenth percentile of students in English achievement. Black students, Hispanic students, and students of low socioeconomic status who were nominated by teachers for advanced work were less likely to meet test score for high achievement in English than were other groups. They were also the groups of students who were most likely to meet neither the test nor the teacher criterion for high achievement. To contrast, female students were less likely than were male students to have high test performance in English without a teacher nomination.

Significant Interactions with Individual Background

Only one significant ethnicity-by-motivation interaction was found and retained in the model. While students with lower intrinsic motivation in reading were more likely to be nominated by teachers regardless of ethnic background, this relationship of intrinsic motivation to achievement criteria met appeared to be especially strong in Black students (Table 8, Line 19, Column 1). Compared to White students, who were half as likely to meet only the teacher achievement criterion if their intrinsic motivation in English was one standard deviation above average, Black students were only 20% as likely to belong to this group. In other words, intrinsically-motivated Black students were especially likely (compared to less intrinsically-motivated Black students) to be considered high-achieving because of test performance in addition to teacher nomination. This interaction was similarly significant in analyzing which students were likely to have met neither criterion. However, it is also important to remember that Black students were more likely to be nominated by teachers without having high test performance regardless of their level of intrinsic motivation in English. Because of this, Black students with high intrinsic motivation in reading were still more likely to meet only the teacher criterion for high achievement than were White students. This interaction is illustrated in terms of the log-odds of meeting only the teacher criterion for high English achievement in Figure 2.

Figure 2. *Log-odds of Meeting only the Teacher Nomination Criterion of High Achievement in English , as a Function of Intrinsic Motivation in Reading for White and Black students.*



Note: Log-odds are considered with all other variables centered as indicated on Table 8.

School-Level Correlates

Finally, school-level correlates were added to the model to account for the differences in the proportions of students meeting only the teacher criterion for high English achievement and in the proportions of students who met neither criterion. Of the variables chosen to consider as school-level correlates, several were statistically significant and were retained in the model (see Table 8, Lines 2 through 7). Students had a greater likelihood of meeting only the teacher criterion of high achievement if they attended schools where average achievement scores were lower (Table 8, line 3, column 1), and, independently, where teachers nominated an above-average proportion of students for advanced programs (Table 8, Column 1, line 5). This suggests that schools in which large proportions of students were recommended for advanced programs were not necessarily the schools in which many students are high-achieving according to the test criterion. Instead, these schools may have relied on teacher nominations of students with less attention to their level of achievement. In addition, students were also more likely to be nominated by teachers without meeting the test criterion for high achievement if they attended a school with high minority enrollment and with under 100 tenth graders (Table 8, Column 1, lines 6 and 7, respectively). There were no significant differences between Catholic, private, and public schools; between schools located in urban, suburban, or rural areas; or between schools with higher or lower average socioeconomic status.

Several school-level variables were also significantly associated with the proportion of students in a school meeting neither criterion (Table 8, Rows 2-7, Column 3). Students were more likely to meet neither criterion if they attended a school where English achievement was lower on average, and where teachers did not recommend any student for advanced English work (Table 8, Rows 3 and 4 of Column 3, respectively). To contrast, students were less likely to meet neither criterion in schools where teachers nominated an above-average proportion of students for advanced work in this subject, as indicated in Row 5, Column 3 of Table 8. They were also more likely to meet neither criterion in schools with higher average socioeconomic status and with smaller tenth grades. Unlike the school-level analysis of meeting only the teacher criterion, having a high proportion of minority students in the school was not significantly associated with students' likelihood of meeting neither criterion.

In order for this model to converge, the random effect for meeting teacher criterion only was fixed after adding the school-level predictors. In other words, this model was set such that there was no additional variability between schools in the proportion of students meeting only the teacher criterion for high achievement in English not explained by the school-level predictors. Additionally, the random effect in this final model for the proportion of students meeting neither criterion was nonsignficant ($\tau_{0(1)}$ = 0.104, χ^2 (690) = 677.135, p >0.500). In other words, after considering these school-level variables there was not significant additional variability in the proportion of students meeting neither criterion for high achievement in English.

Summary: Recognition of High Achievement in English

Contextual variables relating to students' perceptions of teacher-student relationships and to their perceptions of their friends and peers did not significantly relate to the high-achievement criteria students met in English. However, characteristics of their motivation in the subject as well as their individual background were significantly associated with whether students were likely to be nominated as high-achieving by teachers, to score in the top tenth percentile of English achievement, or both. Overall, the students who were the most likely to meet both criteria were the most motivated, both in terms of their self-efficacy in English classes and the amount of intrinsic motivation that they have in reading. The relationship of intrinsic motivation to likelihood of achievement criteria met appeared to be the strongest among Black students, although overall they were more likely than were White students to meet only the teacher-nomination criterion. Hispanic students and students of low socioeconomic status were also more likely to meet only the teacher-nomination criterion, regardless of whether they scored in the top decile on the test of English achievement. However, male students were more likely to meet the test-score criterion only. Implications of these demographic differences will be discussed in greater depth in Chapter 5.

Results for Achievement Criteria Met in Math

Initial Analyses

Similar to the analysis of English achievement, a fully unconditional model for math achievement group membership was run with random effects in the intercepts for each of the three comparisons. A significant amount of between school variance existed in terms of the likelihood of students meeting both criterion ($\tau_{0(1)}$ = 1.162, χ^2 (722) = 1551.240, $p < .001$) and the likelihood of students meeting only the teacher criterion ($\tau_{0(2)}$ = 0.719, χ^2(722) = 881.990, $p < .001$). However, there was not a significant amount of variability in terms of the likelihood of students only meeting the test score criterion ($\tau_{0(3)}$ = 1.191, χ^2 (722) = 714.722, $p > .500$). In other words, while the proportion of students in each school who meet neither criteria or who only meet the teacher criteria for high achievement differed in different schools, the proportion of students meeting test-score criteria only was similar across schools. Therefore, differences between schools were only considered when looking at the comparisons with significant between-school variance components, and school-level effects are only considered for these comparisons.

Other similarities between the model of high math achievement identification and high English achievement identification were present as well. Once again, dichotomous variables capturing whether students had or had not participated in Advanced Placement programs, International Baccalaureate programs, and had or had not received academic honors were considered in order to control for previous recognition of high achievement. In addition, no significant random effects could be specified for correlates in the model. In other words, the relationships of high achievement criteria met to context perceptions, motivation, or individual background variables did not differ in different schools, meaning that there was no reason to test for cross-level interactions. Therefore, school-level variables were only considered when predicting the intercepts that have significant variance components.

Results from the final model run after taking these considerations into account are summarized in Table 9. Intermediary models in which blocks of predictors were added one at a time can be found in Appendix H.

Table 9. *Summary of Multilevel Multinomial Logistic Regression Analyses for Meeting Achievement Criteria in Math*

	1. Teacher Criterion vs. Both			*2. Test Criterion vs. Both*			*3. Neither Criterion vs. Both*		
	LO	SE	OR	LO	SE	OR	LO	SE	OR
1. Constant	**0.96**	0.19	2.62	**0.46**	0.18	1.58	**4.00**	0.15	54.49
School									
2. School SES	**0.59***	0.26	1.81				**1.14****	0.25	3.13
3. Average Math Achievement	**-0.24****	0.02	0.79				**-0.22****	0.02	0.81
4. No Students Nominated							**1.21****	0.17	3.34
5. High Students Nominated	**1.66****	0.07	5.28				**0.03**	0.12	1.03
Controls									
6. Previously in AP	**-0.52****	0.16	0.60	**-0.62***	0.22	0.53	**-1.00****	0.37	0.37
7. Previously in IB	**0.62**	0.48	1.85	**0.99***	0.48	2.69	**0.71**	0.38	2.04
8. Previous Academic Honor	**-0.34**	0.18	0.71	**-0.40**	0.22	0.67	**-1.55****	0.18	0.21
Context									
9. Teach.-Stud. Relation (IRT)	**-0.12**	0.10	0.89	**-0.12**	0.12	0.88	**-0.20**	0.11	0.82
10. Friends' Acad. Orient. (IRT)	**-0.18**	0.14	0.83	**-0.50****	0.13	0.60	**-0.04**	0.11	0.95
11. Friends' Soc. Orient. (IRT)	**0.27****	0.10	1.31	**0.20***	0.09	1.22	**0.31****	0.09	1.36
Motivation									
12. Math Self-Efficacy (IRT)	**-0.27****	0.11	0.76	**-0.33***	0.15	0.72	**-0.98****	0.10	0.37
13. Intrinsic Motivation in Math (IRT)	**-0.30***	0.14	0.74	**-0.43****	0.13	0.65	**-0.33****	0.12	0.72
Background									
14. Ethnicity: Black	**2.45****	0.50	11.67	**0.92**	0.55	2.51	**2.91****	0.49	18.29
15. Ethnicity: Hispanic	**0.61**	0.37	1.84	**0.21**	0.43	1.24	**0.85***	0.36	2.33
16. Ethnicity: Asian	**-0.46**	0.24	0.63	**-0.54***	0.22	0.58	**-1.17****	0.24	0.31
17. Ethnicity: Other	**0.23**	0.52	1.26	**-0.17**	0.54	0.84	**0.42**	0.37	1.53
18. Socioeconomic Status	**-0.49****	0.18	0.61	**-0.04**	0.13	0.96	**-0.91****	0.13	0.40
19. Gender: Female	**0.58**	0.25	1.79	**-0.92****	0.24	0.40	**0.19**	0.20	1.21
Interaction									
20. Female x Friend Academic	**0.63***	0.26	1.87	**0.96****	0.22	2.60	**0.03**	0.15	1.39
21. Female x Math Intrinsic Motivation	**0.14**	0.18	1.15	**0.44***	0.19	1.56	**0.39**	0.17	1.04

* p < .05, **p < .01

Note: LO= Log-odds, SE= Robust Standard Error, OR= Odds Ratio. Shaded numbers correspond to correlates that are significant at or below p<.05. Reference group meets both teacher and test-score criteria for high achievement in math. Variables in *italics* are uncentered; all others are grand-mean centered.

Context Correlates

Unlike the analysis of English achievement, there were significant relationships of context perceptions to the likelihood of meeting a particular set of math achievement criteria. In analyzing the how likely students were to be nominated by teachers despite lower achievement test performance, students who perceived their friends to be more socially-oriented were significantly more likely to meet the teacher criterion only (Table 9, Line 11, Column 1). In particular, the odds ratio indicates that students who perceived their friends to be highly socially-oriented were 33% more likely to meet the teacher criterion of high achievement only than students with more average perceptions. Students' perceptions of the social orientation of their friends had a similar relationship to the likelihood that students are not identified as high-achieving by either criterion. Students with high test performance but no teacher nomination also perceived their friends to be more socially oriented (Table 9, Line 11, Column 2). More specifically, students who perceived their friends to be highly socially oriented were 22% more likely to not have a nomination from teachers despite high test performance. Given that higher social orientation of friends was associated with higher likelihoods of meeting the teacher criterion only, the test criterion only, and neither criterion, it can be said that perceiving friends to have higher social orientation *decreased* the likelihood that a student met both criteria for high achievement in math simultaneously.

To contrast, students who had more academically-oriented friends were less likely to meet only the test criterion despite high achievement (Table 9, Line 10, Column 2). Students who had highly positive perceptions of their friends' academic orientations (i.e., that were one standard-deviation more positive than average) were only 60% as likely to meet the test criterion only as were students with average perceptions. Academic orientation of friends had no significant association with the likelihood of meeting only the teacher criterion or no achievement.

Finally, in this complete model, there were no significant relationships between perceptions of teacher-student relationships and the math achievement criteria that students were likely to meet (Table 9, line 7). However, as Appendix H illustrates, before considering students' motivational and background characteristics, there was a significant association between positive teacher-student relationships and the likelihood of only meeting the teacher criteria of high achievement. This is the only instance in which an independent variable was rendered nonsignficant with the addition of other blocks of variables.

In summary, students who met both criteria of high math achievement had overall the most positive perceptions of their school context. Compared to others, students who performed well on tests and who were nominated by teachers perceived their friends to give less importance to social activities. In addition, students with more academically-oriented friends were also less likely to have high test performance overlooked by teachers.

Motivational Correlates

As was the case in the English high-achievement analysis, motivation had a significant impact on the likelihood of belonging to a particular math achievement group. Students who had higher math self-efficacy were more likely to fall into the group of students who met both criteria (Table 9, Line 12). Students with high math self-efficacy (i.e., self-efficacy that was 1SD above the average) were 76% as likely to meet only the test-score criterion (Column 1), and were 72% as likely to meet only the teacher criterion (Column 2). The relationship between self-efficacy in math and the likelihood of meeting neither achievement criterion was even more dramatic; students who reported a higher level of self-efficacy in math were only 37% as likely to meet neither criterion (Column 3). In other words, while highly efficacious students were somewhat less likely to meet only one of two criteria for high achievement in math, they were very unlikely to be overlooked by both teachers and test score screening simultaneously.

Intrinsic motivation in math played an additional role in determining whether a student in the top tenth decile of math achievement was likely to be nominated by teachers as eligible for advanced programs (Table 9, Line 11). Students with the greatest intrinsic motivation in math were more likely to both perform exceptionally on achievement tests and to be nominated by teachers. More specifically, students with high intrinsic motivation in math (1SD above the average) were three-quarters as likely to meet only the test criterion of high achievement when compared to students of average intrinsic motivation. Students who were intrinsically motivated in math were also less likely to meet neither criterion; students with high intrinsic motivation were only 72% as likely to meet neither criterion as were students with average intrinsic motivation. Finally, students with higher math intrinsic motivation were 35% as likely to meet only the teacher criterion of high achievement.

In summary, as was the case looking at the relationship between motivation in English and membership in one of the four achievement groups in English, motivation in math had a significant relationship to who was more likely to meet certain achievement criteria. However, while intrinsic motivation in reading was associated in more ways with achievement group membership in English than was self-efficacy, intrinsic motivation and self-efficacy in math were equally important when looking at achievement group membership in math.

Individual Background Correlates

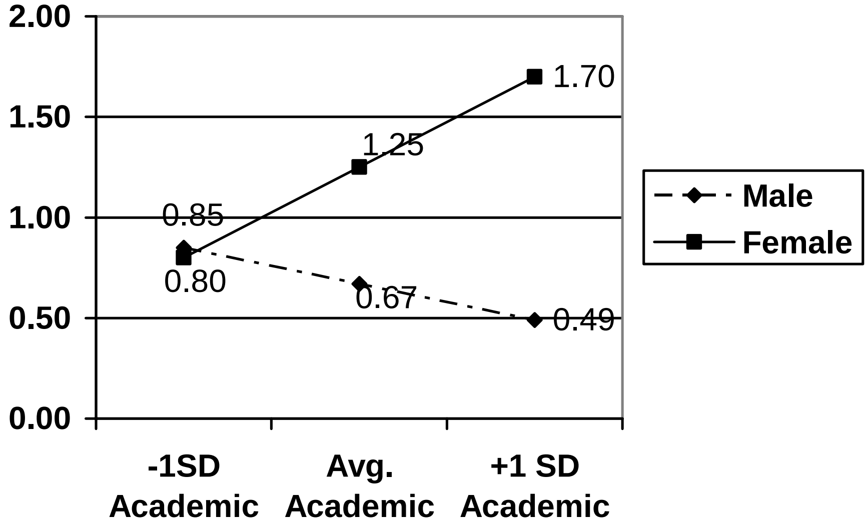
In the next step of analysis, individual background correlates related to ethnicity, gender, and socioeconomic status were entered into the model. Ethnicity and socioeconomic status were significant correlates of whether a student who was nominated by teachers for high math achievement had achievement test scores in the top tenth percentile. Black students were 11 times more likely to meet only the teacher criterion than were White students (Table 9, Line 14, Column 1). In addition, students nominated by teachers from higher socioeconomic statuses (1SD below average) were almost twice as likely to meet the teacher criterion only as were students of average socioeconomic status (Table 9, Line 18, Column 1). To contrast, Asian students were significant less likely to meet the teacher criterion of high achievement. An Asian student was only 58% as likely as was a White student to not have a teacher nomination despite high test performance.

Gender were also significantly associated with which high-achievement criteria in math are met Table 9, Line 15). However, whereas socioeconomic status and ethnicity were more associated with how likely a student was to meet the teacher criterion only, gender was more associated with how likely a student is to meet the test criterion only. Being female *decreased* the likelihood of meeting only the test-score criterion.

Significant Interactions with Individual Background

When considering whether motivation or context perceptions were more strongly associated with the achievement criteria met by certain groups, two significant sets of interactions by gender stood out. First, perceptions of friends' academic orientations had a different impact on identification criteria met for male and female students (Table 9, Line 20). Despite the lack of a significant main effect for friends' academic orientations on the likelihood of teacher nominations, the interaction between gender and friends' academic orientations was significant. As illustrated in Figure 3, females who reported having friends who were more academically-oriented were more likely to be nominated by teachers in the absence of high test scores (corresponding to Table 9, Line 20, Column 1). In other words, females who had highly academically-oriented friends were more likely to be given a chance in advanced programs despite lower test performance. In male students, this relationship is reversed (i.e., having more friends that are academically-oriented makes it slightly less likely that teachers will nominate male students with lower math test performance for advanced work).

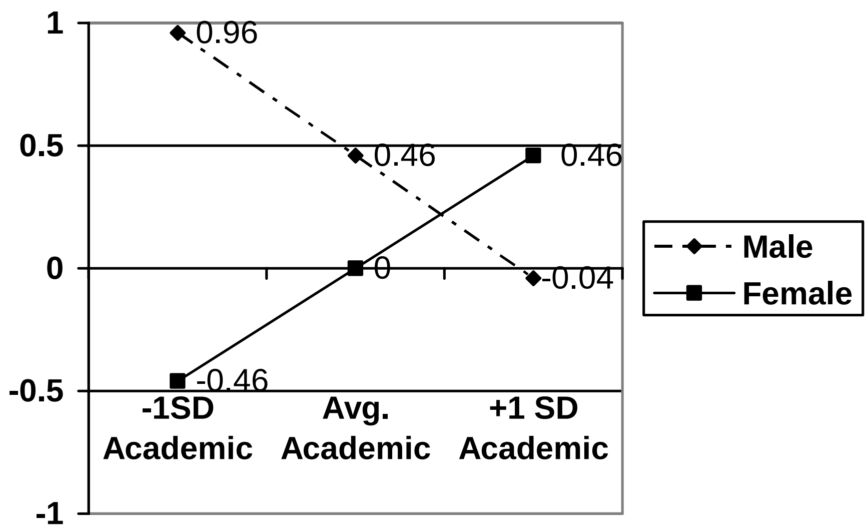
Figure 3. *Log-odds of Meeting Only the Teacher-Nomination Criterion of High Achievement in Math as a Function of Perception of Friends' Academic Orientations for Male and Female Students.*



Note: Log-odds are considered with all other variables centered as indicated on Table 9.

This interaction of friends' academic orientation and gender was also a significant correlate of the likelihood of a student meeting only the test criterion of high math achievement (Table 9, Line 20, Column 2). As illustrated in Figure 4, male students who perceived their friends to be more academically-oriented were less likely to have high test performance without being nominated by teachers. In other words, the male students with the most academically-oriented students were more likely, compared to males with less academically-oriented friends, to have their high performance also recognized by teachers. The opposite appeared to be true of female students. Females who perceived themselves having *more* academically-oriented friends were more likely to have high test performance without being nominated by teachers. As a result, male students with friends who are the least academically-oriented were the most likely to have high test performance without being nominated by teachers for advanced work in math.

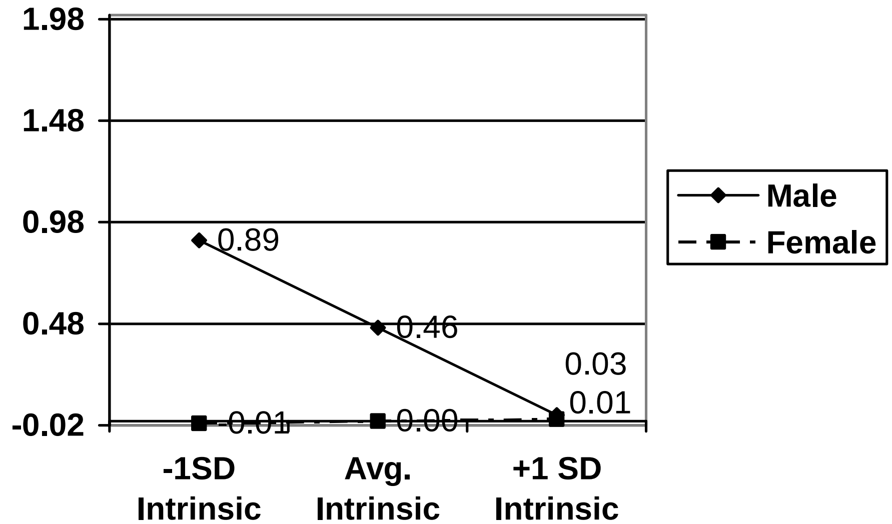
Figure 4. *Log-Odds of Meeting Only the Test-Score Criterion of High Achievement in Math as a Function of Friends' Academic Orientations for Male and Female Students.*



Note: Probabilities are considered with all other variables centered as indicated on Table 9.

In addition, there was also a significant gender-by-intrinsic motivation interaction in the likelihood of a student meeting only the test criterion for high achievement in math (Table 9, Line 21). As illustrated in Figure 5, male students who were less intrinsically motivated in math were more likely to have performed well on tests without being nominated by teachers. In other words, being intrinsically motivated lessened the chance that a male student who performs well on tests would have that achievement overlooked by teachers. To contrast, intrinsic motivation was not significantly related to the probability of having high test performance without teacher recommendations in females.

Figure 5. *Log-Odds of Meeting Only the Test-Score Criterion of High Achievement in Math as a Function of Intrinsic Motivation in Math for Male and Female Students.*



Note: Log-Odds are considered with all other variables centered as indicated on Table 9.

School-Level Correlates

Finally, school-level correlates were added to the model. Similar to the analysis of English achievement, students in schools that recommended above-average proportions of students for advanced work or honors by teachers were more likely to meet only the teacher criterion of high achievement (Table 9, Line 4, Column 1). At the same time, students in schools where teachers did not nominate any students for advanced work were more likely to meet neither criterion. In addition, students were more likely to meet only the teacher criterion of high achievement if they were in a school with higher average socioeconomic status (Table 9, Line 2). Once again, there were no significant differences between Catholic, private, and public schools; or between schools located in urban, suburban, or rural areas. Additionally, in the analysis of math achievement criteria met there were also no significant differences by minority enrollment or between schools with smaller and larger tenth grade classes.

As was the case in the analysis of English achievement, the random effect for meeting only teacher criterion of math achievement was fixed so that the model could converge. In other words, this model was set such that there was no additional variability between schools in the proportion of students meeting only the teacher criterion for high achievement in math not explained by the school-level predictors. Additionally, the random effect in this final model for the proportion of students meeting neither criterion for math achievement was nonsignificant ($\tau_{0(1)}$ = 0.049, χ^2 (718) = 715.927, p >0.500). In other words, after taking these school-level variables into account there was not significant additional variability in the proportion of students meeting neither criterion for high achievement in math.

Summary: Recognition of High Achievement in Mathematics

Overall, the most noticeable difference between the analysis of high achievement in English and in math was that individual perceptions of school context were significantly related to achievement criteria met in math only. In particular, students most likely to meet both criteria had the highest perception of their friends as academically-oriented and some of the lowest perceptions of friends as socially-oriented. Similarly, they were also the most self-efficacious and intrinsically motivated students when compared to students meeting only one criterion for high achievement or neither criterion.

There were also several significant results relating to students' individual background. However, it was the interactions between gender and other individual characteristics as they relate to achievement criteria met that stood out the most. In particular, having few academically-oriented friends and little intrinsic motivation in math was each associated with a lower likelihood that male students meeting the test-score criteria for high achievement would be nominated by teachers.

Considering Test Performance as a Statistical Control

Throughout the course of the preceding analyses of English and math achievement criteria, it became apparent that students meeting both criteria were more motivated (both in terms of intrinsic motivation and self-efficacy) than students in the other groups. In addition, students meeting both criteria for high achievement in math also had more positive perceptions of their school context. This finding raised two related questions. First, what is learned about the recognition of high achievement by teachers in directly comparing the two groups of students who are below the test performance cutoff for high achievement? The preceding analysis compared students meeting only the teacher criterion and students meeting neither criterion to the group meeting both criteria, but did not directly compare the teacher-only group to the group meeting neither. Because these two groups both consisted of students who were below the test-score cutoff for high achievement, a model was run looking at the differences in context, motivation, and individual background between these two groups while controlling for achievement level along with the controls in the previous analysis. Second, and stemming from the first question, to what extent was the likelihood of a student meeting the test criteria for high achievement and *also* meeting the teacher-nomination criteria influenced by the exact level of achievement in a subject? Or, more importantly for this study, did the observed influences of context, motivation, and individual background between students meeting just the test-score criterion and students meeting both criteria hold when achievement is controlled for?

In order to answer these questions, two sets of multilevel logistic regression analyses were conducted for each of the two subjects of interest. The first logistic regression focused only on students below the 90^{th} percentile on the test of subject achievement, modeling the likelihood with which students would be nominated as high-achieving by their teachers. The second multilevel logistic regression analyses focused on the likelihood with which students that scored above the 90^{th} percentile on the test of subject achievement would be nominated as high achieving by their teachers. The variables from each analysis matched the variables included in the final analysis of achievement group membership presented above, with test score added centered on its grand mean as a statistical control. The final multilevel logistic regression models for English achievement groupings appear in Table 10, and the final models for math achievement groupings appear in Table 11.

Results from Analysis of English Achievement Criteria Met Controlling for Reading Achievement Score

According to Table 10, which compared the two groups of students who did not meet the test criterion of high achievement, students who had greater self-efficacy in English and greater intrinsic motivation in reading were more likely to meet the teacher criterion. Those who had high self-efficacy (that is, one SD above average) were 32% more likely to be nominated by teachers than were students with average efficacy, while students with high intrinsic motivation in reading were 18% more likely to be nominated. In addition, Asian students were two times as likely to be selected by teachers as were

White students, and female students were 1.5 times more likely to be nominated as were male students. However, Black students in this group were less likely to be recommended by teachers for advanced work in English than were White students.

To contrast, Black students, students from "other" ethnic backgrounds, and males who met the test criterion were less likely to be nominated by their teachers than females and students from other ethnic backgrounds who also met the criterion. These findings mirrored the findings of the initial analysis, before including English achievement as a statistical control. However, the addition of the achievement control also resulted in a significant association with self-efficacy. Students who met the test criterion for high achievement in English and who had higher self-efficacy were more likely to be nominated by teachers than were students with lower self-efficacy. At the same time, this analysis demonstrated that students from higher socioeconomic statuses who met the test criterion were more likely than were other students meeting it to get a teacher nomination.

Table 10. *Results of Logistic Regression Analyses of Meeting Teacher Criteria Separately for Students Meeting or Not Meeting the Test-Score Criteria in English*

	Below 90th Percentile (Student N = 9463			Above 90th Percentile (Student N = 1229)		
	LO	SE	OR	LO	SE	OR
1. Constant	**-3.24**	0.16	0.04	**-2.69**	0.19	0.07
2. School SES	**-0.12**	0.23	0.88			
3. Average English Achievement	**-0.09****	0.02	0.92			
4. Large Class Size	**-0.01**	0.16	0.99			
5. High Minority Enrollment	**0.34**	0.20	1.43			
6. High Proportion Nominated	**2.11****	0.12	8.25			
Controls						
7. Previously in AP	**0.46****	0.14	1.77	**0.36***	0.07	1.43
8. Previously in IB	**-0.02**	0.33	0.97	**0.40**	0.24	1.49
9. Previous Academic Honor	**1.47****	0.12	4.24	**1.11****	0.07	3.02
Motivation						
10. English Self-Efficacy (IRT)	**0.27****	0.08	1.32	**0.09***	0.04	1.09
11. Intrinsic Motivation in Reading (IRT)	**0.14***	0.07	1.18	**0.18***	0.03	1.19
Background						
12. Ethnicity: Black	**-0.42***	0.23	0.91	**-2.00****	0.47	0.14
13. Ethnicity: Hispanic	**-0.23**	0.22	1.00	**-0.02**	0.22	0.98
14. Ethnicity: Asian	**0.66***	0.24	2.12	**0.35**	0.19	1.41
15. Ethnicity: Other	**-0.42**	0.24	0.72	**-1.22***	0.16	0.29
16. Socioeconomic Status	**0.23***	0.11	1.01	**0.19****	0.05	1.21
17. Gender: Female	**0.46****	0.12	1.49	**0.57****	0.07	1.77
Interaction						
18. Black x Reading Intrinsic Motivation	**-0.07**	0.20	0.90	**0.78***	0.35	2.19

* p < .05, **p < .01 *Note:* LO= Log-odds, SE= Robust Standard Error, OR= Odds Ratio. Shaded numbers correspond to correlates that are significant at or below p<.05. Tables report results from Unit-Specific Logistic regression models. Results for students meeting the test criteria were run without a random effect to match the multinomial analysis.

Results from Analysis of Math Achievement Criteria Met Controlling for Math Achievement Score

As illustrated in Table 11, there were also no differences in perceptions of context in whether students below the test criterion for high achievement were nominated by teachers for recognition of high achievement. However, students not meeting the test criterion who had higher self-efficacy in math were more likely to be nominated by teachers. Asian students, and females were also more likely than White students or male students from other ethnic backgrounds to be nominated by teachers.

When comparing the groups of students meeting the test criterion who did and did not meet the teacher criterion of high achievement, there was no longer a significant difference in the likelihood that Black students in top decile of math achievement were nominated by teachers after controlling for math achievement. However, students who were more likely to be nominated by teachers for advanced work in math were still more self-efficacious and intrinsically motivated in math, had more academically-oriented friends, and had more socially-oriented friends. They were also more often female.

Table 11. *Results of Logistic Regression Analyses of Meeting Teacher Criteria Separately for Students Meeting or Not Meeting the Test-Score Criteria in Mathematics*

	Below 90th Percentile (Student N = 9996)			Above 90th Percentile (Student N = 1366)		
	LO	SE	OR	LO	SE	OR
1. Constant	**-3.74**	0.14	0.02	**-1.96**	0.19	0.14
School						
2. School SES	**-0.25**	0.30	0.78			
3. Average Math Achievement	**-0.12****	0.03	0.88			
4. High Proportion of Students Recommended	**2.34****	0.17	1.38			
Controls						
5. Previously in AP	**0.28**	0.15	1.32	**0.60**	0.28	1.83
6. Previously in IB	**0.20**	0.40	1.22	**-0.73***	0.29	0.48
7. Previous Academic Honor	**0.97****	0.15	2.63	**0.46****	0.08	1.58
Context						
8. Teach.-Stud. Relation (IRT)	**0.09**	0.08	1.09	**0.07**	0.04	1.07
9. Friends' Acad. Orient. (IRT)	**-0.04**	0.11	0.96	**0.55****	0.06	1.74
10. Friends' Soc. Orient. (IRT)	**0.02**	0.08	1.02	**-0.19****	0.05	0.83
Motivation						
11. Math Self-Efficacy (IRT)	**0.54****	0.08	1.71	**0.24****	0.04	1.27
12. Intrinsic Motivation in Math (IRT)	**0.01**	0.11	1.01	**0.45****	0.06	1.56
Background						
13. Ethnicity: Black	**0.17**	0.22	1.18	**-0.69**	0.50	0.50
14. Ethnicity: Hispanic	**0.21**	0.20	1.24	**-0.17**	0.21	0.84
15. Ethnicity: Asian	**0.83****	0.18	2.29	**0.25**	0.16	1.29
16. Ethnicity: Other	**-0.11**	0.25	0.90	**0.01**	0.21	1.01
17. Socioeconomic Status	**0.21**	0.12	1.23	**-0.03**	0.05	0.97
18. Gender: Female	**0.60****	0.15	1.82	**0.89****	0.08	2.42
Interaction						
19. Female x Friend Academic	**0.17**	0.18	1.18	**-0.91****	0.09	0.40
20. Female x Math Intrinsic Motivation	**0.13**	0.12	1.01	**-0.41****	0.09	0.67

* p < .05, **p < .01 *Note:* LO= Log-odds, SE= Robust Standard Error, OR= Odds Ratio. Shaded numbers correspond to correlates that are significant at or below p<.05. Tables report results from Unit-Specific Logistic regression models. Results for students meeting the test criteria were run without a random effect to match the multinomial analysis.

Summary

In summary, there were many significant differences among students who were most likely to belong to each achievement identification group, in terms of context, motivation, and individual background. Because of the complexity of the analysis and the number of significant relationships found, summaries of the results for the analysis of high English and math achievement identification are provided in Tables 12 and 13, respectively.

Table 12. *Summary of English Identification Criteria Met*

	Neither Criterion	Teacher Criterion Only	Test-Score Criterion Only
Context Perceptions	No Significant Differences		
Motivation	More likely with lower efficacy and intrinsic motivation	More likely with lower efficacy and intrinsic motivation than students meeting both criteria	More likely with intrinsic motivation, more likely when lower efficacy after controlling for achievement
Individual Background	Less likely with Asian and female; more likely when Black or low-SES (comparing to students meeting teacher criterion only or both criteria), More likely Hispanic (comparing to students meeting both)	More likely with Female, Black, Hispanic, of low SES	More likely with Male Black, or of "other" background; more likely low SES after controlling for achievement
Schools Attended	More likely in high-SES schools, schools where no students are nominated; less likely in schools with higher average achievement, with smaller tenth grades, and where above-average proportions of students are nominated	More likely in schools with high minority enrollment and with above-average proportions of students nominated; less likely in schools with higher average achievement and with smaller tenth grades	n/a

Although no significant differences were found in the likelihood of belonging to each of the four groups in terms of individual context perceptions, there were several significant associations among the four groups in terms of students' motivation. Overall, students most likely meeting both criteria were the most motivated (i.e., had the highest self-efficacy in the subject and the most intrinsic motivation in it) and the students most likely meeting neither criteria were the least motivated. Students most likely to either meet one criterion or the other had mixed results, more likely to be intrinsically motivated than those meeting neither criterion but less likely to be intrinsically motivated than students meeting both criteria. In addition, students' likelihood of meeting the teacher criterion only was similarly associated with self-efficacy. However, a similar finding was found comparing students with high test performance who were more or less likely to be nominated by teachers after controlling for achievement; students likely to be nominated were also more efficacious.

In addition, students who were less likely to meet the test-score criterion were more likely to be Black or Hispanic rather than White, and were more likely of low socioeconomic status. They were also more likely to attend low-SES schools. The only gender differences were found when looking at students only meeting one criterion, with students meeting the teacher criterion only more likely to be female and students meeting the test criterion only more likely to be male.

To contrast, results from the analysis of math achievement identification met are as follows:

Table 13. *Text Summary of Results from Analysis of Math Achievement Criteria Met*

	Neither Criterion	Teacher Criterion Only	Test-Score Criterion Only
Context Perceptions	More likely when friends are socially-oriented	More likely when friends are socially Oriented; Academic orientation of friends depends on student's gender	More likely when friends are socially-oriented; less likely when friends are academically-oriented (esp. for male students)
Motivation	More likely with lower efficacy and intrinsic motivation (comparing to students meeting both criteria), more likely lower efficacy (comparing to students meeting teacher only)	More likely with lower efficacy and intrinsic motivation	More likely with lower efficacy than students meeting both criteria, more likely with lower intrinsic motivation than students meeting both criteria only for male students
Individual Background	Most likely when Black, Hispanic, lower SES (comparing to students meeting both criteria) less likely when Asian (comparing to students meeting both criteria or teacher criterion only) less likely when female (comparing to students meeting teacher criterion)	More likely when Black, lower SES	More likely male, Less likely Asian before controlling for achievement
Schools Attended	More likely in high-SES schools, schools in which no students is nominated by teachers; less likely in schools with high average achievement	More likely in higher-SES schools, schools in which above-average proportions of students are nominated by teachers; less likely in schools with high average achievement	n/a

There are several similarities between the findings here and the findings for English achievement identification criteria met. Students who were most likely to meet neither criterion were the least motivated, while students most likely to have met both criteria were the most motivated. Students who were most likely to meet one criterion or the other were somewhere in the middle, but in both cases were less motivated than were students likely to meet both criteria. Students unlikely to meet the test-score criterion were more likely Black and of lower SES, regardless of whether they were likely to meet the teacher criterion, and students from low-SES schools were also especially likely to meet the teacher criterion only. Analysis of gender finds that students who were likely to meet the teacher criterion only were more often female, and students who were likely to meet the test-score criterion were more often male.

However, there were also some differences that are of interest as well. Unlike the analysis of English identification criteria met, there were significant associations of context perceptions to the likelihood of which criteria were met. Overall, students most likely to meet both criteria perceived their friends to be less socially-oriented than did students in other groups, and perceived their friends to be more academically-oriented when compared to students meeting only the test criterion of high achievement. In addition, there were several significant gender interactions, and a male who lacked intrinsic motivation was especially likely to meet only the test-score criterion.

Additional discussion of these results is presented in the following chapter.

CHAPTER 5

Summary, Implications and Future Research

While there is extensive evidence that various methods of identifying high-achieving students result in different students being recognized, there is less research examining the nature of the differences between students nominated using these criteria. In particular, given the importance of teacher nominations and achievement tests in identifying high-achieving adolescents, it is especially useful to examine whether students identified using these sources of information differ in their characteristics. The goal of this study was to examine whether adolescent students who were identified by teachers or by test scores differed in terms of their social context, their motivation, or in terms of their individual background. Research in educational psychology and gifted education has identified several theories of teacher decision-making and of the development of gifted students that suggest which of these may be important. This study considered a general theory of giftedness as opposed to a theory of teachers' decision-making in order to examine more broadly the potential relationships between students' individual experiences and their identification as high achieving. Moreover, developmental psychologists find students' motivation and the social context of schools to be especially important when considering aspects of adolescents' in-school experiences.

This study found that many of these factors were indeed significantly associated with the recognition of high-achievement using different methods in both English and math. Although students most likely identified as high-achieving by any criterion were more motivated (and in the case of mathematics, had more positive perceptions of their peer context) than did students who were likely to not be identified by either teachers or tests, there were several significant and interesting differences among the three groups of students meeting at least one criterion. In particular, the very most motivated students were the most likely to meet both teacher and test-score criteria simultaneously, although the specific nature of this relationship depends on both the subject area and on whether comparisons were made to teacher nominations or to test-score criteria. Similarly, when looking at mathematics, students who were most likely to meet both criteria simultaneously had the most positive perceptions of school context, perceiving their friends to be the most academically oriented and perceiving the teacher-student relationships in their school as the most positive.

In addition, there were several demographic results that were interesting in this study, both in terms of students' individual background and characteristics of the schools that they attended. In both English and mathematics, male students were more likely than females to have met the test score criteria for high achievement without being nominated by teachers for advanced work. At the same time, students from several policy-relevant ethnic groups (i.e., those groups thought to be under-represented in advanced programs) were more likely to be nominated by teachers even if they did not meet the test-score criteria for high achievement. Overall, the highest proportions of students meeting only the teacher criterion of high achievement could be found in schools with the lowest average academic achievement.

This chapter will situate these findings in the context of previous research, in order to gain more insight into why certain relationships to high-achievement identification are seen. Through such an analysis, the results of this study can be used to inform educational policy and practice further, and to provide avenues for further theoretical developments and research on this topic. This chapter begins by separately addressing how the analyses of social context, motivation, and individual background each provide an important contribution to the understanding of the identification of high achievement. It then turns to acknowledging limitations inherent in this current study before identifying ways in which educational policy and practice may be informed by the findings here. Finally, sections on future directions for conceptual discussions of high achievement and specific avenues of research focus on potential ways in which further studies stemming from the current research can help to develop areas for further study.

Student Characteristics Associated with Recognition of High Achievement

Association of Social Context with the Recognition of High Achievement in Mathematics

Discussion of the role of individual perceptions of social context in the identification of high achievement is limited to its relationship in mathematics, because there were no significant differences among the four high-achievement groups in English in terms of students' perceptions of teacher-student relationships, perceptions of disruptions from their peers, or perceptions of their friends' academic or social orientations. In other words, there were no significant differences in individual perceptions of social context among students most likely to meet neither criterion, one criterion, or both criteria.

Explanation for Significant Findings in Mathematics Only

In light of previous research on the subject, this lack of significant findings in the field of English is surprising. Older research on the socio-emotional adjustment of academically talented students (e.g., Brody & Benbow, 1986) found that students who were academically talented in verbal areas felt less popular, and demonstrated more socio-emotional problems, compared to students who were academically talented in mathematics. The different findings from this study could result from several factors, all of which indicate that further research on the relationship of social relationship and high achievement identification is needed. First, this research was conducted 16 years prior to data collection for the ELS:2002 study, and attitudes toward verbally high-achieving students, both among individuals and among schools, may have changed in that time. Second, the outcomes of interest in Brody and Benbow’s study relate to popularity and social adjustment, while the variables of interest in this study relate more to the values that friends hold. Perhaps significant findings would have resulted from asking students how many friends students had, rather than asking them to comment on the values held by the friends that they have.

Finally, the sample of Brody and Benbow’s study was drawn from the Johns Hopkins University Talent Search, which uses a higher threshold for considering “academically talented” students than the threshold used here to define high achievement (see Gagné, 2004, for a discussion of differences in considering different thresholds for high achievement). At this high threshold, socioemotional differences between identified and non-identified students are more apparent than they are at lower thresholds (e.g., Kennedy, 1998, in a case study of the socioemotional characteristics of a highly gifted male student). Further research may indicate that the relationship between socio-emotional maladjustment and giftedness in verbal areas may only be applicable to the students at the very highest level of ability and achievement.

While research on giftedness specifically would lead one to believe that the association of social context to identification could be stronger in English, research that addresses more broadly on teachers' attitudes toward different subject areas can help to explain why significant results were found relating perceptions of social context to mathematics achievement. According to a survey of subject-area teachers conducted by Grossman and Stodolsky (1995), mathematics teachers, when compared to foreign language, English, science, and social studies teachers, most strongly agreed that instruction was effective when students were grouped by ability. Perhaps, then, the significant findings of context as related to mathematics achievement criteria met reflect whether the student in question has the social support necessary to fit into a group of students who will be challenged with more advanced work. Students with more socially-oriented friends would be less likely to have support, as would students with less academically-oriented friends. This consideration of "content as context," an idea set forth in several pieces of research conducted by the authors (Grossman & Stodolsky, 1995; Stodolsky & Grossman, 2000), should be considered further in understanding the differences between students identified as high-achieving in different subject areas.

Discussion of Specific Associations of Social Context to Identification

More specifically, there were several significant associations between perceptions of social context and likelihood of high achievement identification in mathematics. Overall, it is interesting that while perceptions of teachers and friends significantly related to the likelihood of achievement criteria met, perceptions of disruptions by peers did not. This mirrors findings throughout gifted education and developmental psychology that suggest that more proximal social relationships (such as friends and teachers) have more of an influence on individuals than more distal ones (such as peers in general).

Within these proximal relationships, there were several findings that help to inform how students come to be identified as high achieving using different criteria. Some of these findings do suggest that characteristics of students' social relationships could potentially be playing into teachers "implicit theories" of who is high-achieving. In particular, students who met the test score criterion but who have somewhat less-academically oriented friends were less likely to be nominated by teachers as high achieving. As will be discussed later in this chapter, this association was especially noticeable among males who perform well on achievement tests in math. The implications of such a relationship can be considered in light of the "stigma of giftedness" paradigm. If a high-achieving student is surrounded by friends who value school less, then that student may feel a conflict between the social and academic goals of school. Students may in turn become less motivated to do their school work well, and teachers may notice this lack of motivation and consider it when making judgments about whom to nominate for advanced work. Further research can examine teachers' opinions about these students, and help to determine whether the recommendation results from a conscious judgment of students' engagement in school. Teachers may find such unengaged students difficult to teach, and therefore may not want them in advanced classes in their school.

At the same time, students who were most likely to meet the teacher criterion of high achievement had less positive perceptions of their social context in other ways. Although students who were most likely to be nominated by teachers without meeting the test criterion for high achievement overall did not significantly differ in their perceptions of friends' academic orientation, they were less likely to perceive positive teacher-student relationships in their school than were students who met both criteria. However, this initially significant finding became nonsignificant after considering other characteristics of students. In particular, as shown in Appendix H, the relation of perceptions of teacher-student relationships to the likelihood of meeting the teacher criteria of high achievement was nonsigificant after considering motivation and individual background. This reflects how teachers may recognize students who do not fall into a traditional pattern of high achievement and engagement (notably, good feelings about relationships with teachers in the school) if they display other characteristics thought by teachers to reflect potential for high achievement. Motivation in particular may be an especially important factor to consider in this context (e.g., Hong & Aqui, 2004, and their discussion of "creatively gifted" students identified by teachers). To contrast, the relation of teacher-student relationship perceptions to meeting neither criterion remained significant until school-level characteristics were considered. This suggests that perceptions of teacher-student relationships in a school may be influenced by both individual characteristics of students as well as more contextual factors.

Finally, the significant relationships of perceptions of friends' social orientations to meeting specific achievement criteria in many ways mirror what is traditionally expected when examining the friendships of high achieving students. Students most likely to have both high test scores and to be nominated by teachers for advanced work in math perceived their friends to be significantly less socially-oriented than did students meeting neither criterion, or students meeting only one criterion (*either* test-scores *or* teachers alone). The most interesting part of this finding is that students who were most likely to have high test performance but no teacher nomination have more socially-oriented friends than students meeting both criteria. This relationship is especially notable in light of the discussion of the "stigma of giftedness" in relation to teachers' nominations of students who meet test criteria for high achievement. This finding suggests that students with high test performance, but with less academically oriented friends and more socially oriented friends are less likely to be nominated by teachers. This lends further credence to the argument that teachers' decisions to not nominate these students could be in reaction to a struggle on students' parts to balance their own high achievement with the more social goals of their friends. Even if teachers are not explicitly aware of students' struggles to respond to the social and academic goals of their friends, they may be reacting to the toll that this struggle takes on their ability to focus on schoolwork.

In summary, the analysis of the relationship of individual perceptions of social context to the identification of high-achieving students results in several interesting, and somewhat surprising, findings. First, individual perceptions of social context were only significantly related to which high-achievement criteria were met when examining achievement in math. They were not significantly associated with achievement criteria met in English. Within math, however, students most likely to meet only the test score criterion of high achievement had both fewer academically-oriented friends and more socially-oriented friends, which could suggest a struggle between social and academic goals commonly associated with the "stigma of giftedness," but more complex in its potential ramifications. Further research can help to determine whether teachers are seeing a lack of motivation on the part of the high-achieving student. It would also be useful to conduct additional research asking students to comment about these issues in a more open-ended way. Ethnographic research has done this on a small scale, but additional research could consider this in more varied contexts. Such research would help to provide more information on why such relationships were only seen as related to mathematics achievement by giving more information on the context of teachers' decisions and students' experiences in different subject areas.

To contrast, students who were nominated by teachers for advanced work in math despite lower test performance had less positive perceptions of student-teacher relationships (before controlling for individual background), and stronger perceptions of socially-oriented friends. Further research should be done on other characteristics of this group of students, in order to determine to which characteristics teachers are responding in nominating them for advanced work. This is especially important given the similarities in perceptions of social context between the two groups of students not nominated by teachers. Very social friends and low ratings of teacher-student relationships do not sound conducive to success in advanced programs; however, there are certain students who report both of these things who are nominated by teachers for advanced work. Levels of motivation specific to the subject, which were found to discriminate significantly between the students who were and were not nominated by teachers in this current study, could be important to consider and are discussed in the next section.

Association of Motivation with the Recognition of High Achievement

Some of the most dramatic results related to the association of motivation, both in terms of self-efficacy and intrinsic motivation, to meeting different criteria for high achievement. Overall, students who were the most likely to meet both criteria simultaneously were the most efficacious and the most intrinsically motivated in the subject; this held both when analyzing recognition of English achievement and mathematics achievement. At the same time, students who met only one criterion (either a high test performance or teacher nomination), while less motivated than students meeting both criteria, were still more motivated than students who met neither criterion for high achievement.

In particular, when looking at both subjects students who were below the top decile on achievement but nominated by teachers anyway had lower self-efficacy. This finding reflects Bandura's writings on self-efficacy (Bandura, 2001), in which he states that subject mastery is one of four sources of self-efficacy. From Bandura's perspective, it makes sense that the group who performs less well on tests of achievement in a subject would be somewhat less self-efficacious than students who perform better on such tests. However, the differences between students who were likely to garner teacher nominations with and without high test score performance were noticeable in two areas.

First, for both math and English, students with low self-efficacy were more likely to be nominated only by teachers than they were to have both teacher nominations and high test performance. However, students with lower self-efficacy were even more likely to meet neither criterion. Another way to think about this, as illustrated in the final analyses of Chapter 4, is to say that looking at the entire group of students who do not meet the test criterion of high achievement, students with lower self-efficacy are less likely to be nominated by teachers. This suggests that there is something unique about students identified as high-achieving regardless of which criteria are used. They are more motivated than students whose high achievement might be in question—those who meet certain criteria but not others.

Second, students who were most likely to be nominated by teachers despite not having high test performance may also differ in other ways as well. Most notably, students who scored below the top decile on the test of English achievement were more likely to be nominated by teachers if they were intrinsically motivated in the subject. This reinforces the importance of intrinsic motivation and enjoyment of topics to conceptions of giftedness (A. E. Gottfried & A. W. Gottfried, 1994; Chan, 2000; Miller, 2006). Even if students are not among the very highest achieving, teachers may be responding to what appears to be a higher level of intrinsic motivation in a subject relative to the majority of other students, which they believe will allow students to benefit more from advanced work. Such an explanation could also account for the relationship between intrinsic motivation and likelihood of gaining teacher nominations among students who do have high test performance in math.

Finally, when looking at mathematics achievement, students most likely to have had high test performance without recognition by teachers were less self-efficacious than students who have similarly high test performance and a teacher nomination. (In looking at English achievement, there was no significant difference). This relationship of self-efficacy to high-achievement identification in math mirrors the significant relation of self-efficacy to the achievement of gifted students found in previous research in math (e.g., Malpass et al., 1999; Pajares, 1996b) but not English (L. Chan, 1996). This relationship may stem from the fact that, overall, students express a low level of self-efficacy in math. As shown in the scaling analyses described in Chapter 3, the average student feels that they are rarely capable of doing good work in math class, whether on tests or on class assignments. As a result, teachers may feel especially obligated to encourage advanced work among the students who do feel efficacious. This difference between the association of efficacy to achievement identification in math and English once again speaks to the importance of considering subject area as part of the context of decision-making for high achievement identification. Since math is a well-structured task, students may have a clearer understanding of what is expected of them, and their belief that they are capable of completing these tasks becomes important in ensuring that this achievement is recognized.

One limitation in this analysis is that it only provided information on students' current levels of motivation. It is possible that students' reports both of self-efficacy levels and intrinsic motivation could be influenced greatly by the educational environment in which they are currently involved. Participation in an advanced class, or recognition of academic honors, could provide a more challenging environment that serves to stimulate students' interest in a subject. At the same time, the recognition of high achievement itself could bolster students' self-efficacy in the subject. By extension, then, if the association between motivation and achievement criteria met seen here is indicative of teachers' awareness of students' motivation, teachers are judging whether students should be placed in advanced programs based on their current motivation. They can only guess how students would be motivated if they were placed in a more difficult set of classes. As a result, students who may benefit from advanced work but who are unmotivated in their current context would be left out from the more "appropriately challenging curriculum" that advanced classes are designed to offer. Further work on the role of motivation in identifying students should focus both on the reasons for students' current levels of motivation (or lack thereof) as well as teachers' perceptions of how students could be motivated in the future if placed in a more challenging environment.

In summary, the findings about the relation of motivation to high achievement identification very much mirror the previous discussion of motivation as it is related both to achievement and to teachers' conception of high-achieving students. Efficacy is lower among students who do not perform well on tests of achievement. In addition, students with the highest self-efficacy in math, a subject in which even academically talented students have limited confidence, are the most likely to both do well on tests in the subject *and* to have that achievement recognized by teachers who nominate them for advanced work or academic honors. To contrast, the relation of intrinsic motivation in the subject to high achievement identification reflects the value that teachers place on intrinsic motivation in a subject when identifying students for advanced work. Even if students perform very well on tests in a subject, teachers appear less likely to nominate students for advanced work if they have a low level of intrinsic motivation in the subject. Finally, across both English and math, it is interesting to note that the students who meet one criterion of high achievement (either teachers or test scores) were still likely to be more motivated than were the three-quarters of students who meet neither criterion of high achievement. Specific differences in associations of motivation to achievement identification between math and English, particularly as related to self-efficacy, also speak to the importance of considering specific aspects of the subject as part of the context in which identification occurs.

Influence of Individual Background

In Chapter 2, the differences between who is nominated as high-achieving by teachers and by test scores is discussed in two ways: in terms of differences in teachers' "implicit theories" of what it means to be a high-achieving students, and in terms of biases that teachers may have toward (or against) students of different genders, or of certain ethnic background or socioeconomic statuses. So far, the findings relating to social context and motivation have most readily been analyzed in terms of teachers' implicit theories of what it means to be high-achieving (and to have further potential for high achievement), particular in relation to how teachers view interested and engaged students. The findings related to differences in the individual backgrounds of students who meet different high-achievement criteria, however, can more readily be discussed in terms of teachers' biases about who should be recognized as high achieving, and the role of schooling in providing appropriate pathways to later achievement. Not all of the differences, however, indicated that teachers are biased in a negative sense. In some cases, the bias (or particular pattern of thinking that systematically favors certain groups over others) may have come from the desire of teachers to have a greater number of diverse students recognized as high-achieving.

Ethnicity and Socioeconomic Status

The second interpretation of differences in achievement criteria associated with individual background holds especially when discussing differences among the four groups in terms of ethnic makeup and socioeconomic status. As discussed extensively in Chapter 2, there are mixed results in terms of how teachers react to students of different ethnic backgrounds, with some suggesting that teachers in general would be especially unlikely to identify minority students as high-achieving and others suggesting that teachers are more able than tests to identify high-achieving minority students who might benefit from challenging curricula. These findings provide more support for the second hypothesis about the relationships between minority background and the identification of high achievement. Black students (and students with low-socioeconomic status home backgrounds) are more likely in both math and English to be nominated by teachers despite having lower test performance than are White students. At the same time, students from Hispanic backgrounds (who may be thought to have more limitations in English proficiency compared to students of other ethnic backgrounds) are more likely to meet the teacher criterion of high English achievement without meeting the test criteria than are White students. In addition, when comparing the two groups of students not meeting the test criterion for high identification in math, students who are Black are significantly more likely to be nominated for advanced programs by teachers when compared to White students. At the same time, Hispanic students meeting the test score criteria were similarly more likely than were other students to meet the teacher criterion of high achievement in math compared to White students.

Such associations support the views of Baldwin (2002) and others, who argue that teacher nominations are useful if the aim is to include students from more diverse backgrounds into advanced programs. However, when looking at English achievement Black students are also more likely to meet the test-score criterion of achievement only than they are to meet both criteria simultaneously. In other words, Black students are more likely than were White students to meet only one criterion of English achievement or the other (i.e., they are more likely to *either* have high test performance *or* to be nominated by teachers, but not both simultaneously). Further research should focus on comparing the groups of Black students meeting who perform well on tests but who fail to impress teachers, to see whether other important differences exist between these two groups of students.

The relationship of Black ethnicity to achievement criteria met, however, is further complicated by an interaction between ethnicity and intrinsic motivation. As illustrated in Chapter 4 and discussed earlier in this chapter, Black students were considerably more likely than were White students to be nominated by teachers for advanced work despite low test performance when comparing among less intrinsically-motivated students. In other words, lower-performing but intrinsically-motivated Black and White students have more equal chances of being included by teachers, but teachers are more likely to select a lower-motivated, lower-performing Black student than they are a lower-performing and lower-motivated White student (presumably for reasons of social justice and encouraging access among ethnic minority students). This finding raises an important question: are these students primarily included for their ethnicity, despite having lower motivation to perform well in their subject? What does this mean for their eventual performance? Further research should focus on this group of lower-motivated and lower-performing Black students, to see how they subsequently achieve when included in advanced English programs.

To contrast, this analysis does not provide much additional information on Asian students' and their identification for advanced programs. In comparing students not meeting the test criterion of high achievement, Asian students were more likely than were White students to be nominated by teachers. Similarly, when comparing students in the top decile of math achievement, Asian students are more likely to be nominated by teachers after controlling for students' exact achievement scores. This finding supports the "model minority" bias of teachers toward Asian students presented by Plucker (1998) and Woliver and Woliver (1992).

In summary, the significant findings of this analysis suggest that teacher recommendations may be helpful in including students from diverse backgrounds into advanced programs. At the same time, more results relating to the nomination of Black students for English programs also suggest that, while teachers nominate diverse students who do not meet test-based criteria for high achievement, they also overlook some students who do meet test-based criteria. Further, the interaction of ethnicity and intrinsic motivation when identifying factors associated with high English achievement suggest that the consideration of ethnicity may be especially important when choosing among students who do not have other characteristics indicating suitability for advanced work. Future research should explore these complexities in greater depth.

Gender

Many of the most interesting and complex findings related to individual background and high achievement identification come from examining whether males or females are more likely to meet certain criteria for high achievement. As discussed in Chapter 2, there was some disagreement in the literature as to how gender is associated with high-achievement identification by teachers and test scores. From one perspective, some researchers argued that identification of high achievement, especially by teachers, would fall on largely gender-stereotypical lines, with females more likely to be nominated for verbal subjects like English and male students more likely to be nominated for quantitative subjects like mathematics. On the other hand, some argued that because females in general appear to be more engaged students, they would be more likely to be nominated by teachers in all subjects.

The findings of this analysis support the second argument. In both math and English, female students were more likely to be nominated by a teacher despite low test scores, while male students were more likely to have high test performance but no nomination from the teacher. Looking first at the higher likelihood of females to meet the teacher criterion of high achievement, the same interpretation used when discussing findings related to students' ethnicity and socioeconomic status can be used here in discussing gender patterns. Just as teachers may have nominated more minority students, regardless of test performance, in an attempt to diversify programs in their school and to redress past issues of gender inequality teachers might similarly nominate more females in an attempt to provide high-achieving girls with more advanced academic opportunities.

The discussion of males' likelihood of meeting the test-score criterion of high achievement is complicated by several significant gender interactions observed when analyzing math achievement. On one hand, the results of the analysis of gender and high English achievement, in which no significant gender interactions were found, were typically gender-stereotyped. While teachers in this subject were especially likely to nominate female students for advanced work, regardless of their test performance, teachers were less likely to nominate male students overall. On the other hand, the gender gaps between students with high test performance who were or were not nominated by teachers only appeared when comparing disengaged students. Male and female students with more academically-oriented friends and high test performance were similar in the chance that they were nominated by teachers; however, high-performing males without academically-oriented friends were more likely to be overlooked than similarly high-performing females without academic friends. Similarly, while highly-intrinsically motivated and high-performing males and females were equally as likely to be recognized by teachers, it was the high-performing but lower-intrinsically motivated male students who were most likely to be overlooked. This suggests that, in the absence of other behaviors that may indicate to a teacher that a student will thrive in advanced work, teachers rely on more gender-biased opinions of who is and is not likely to be a good candidate for special programs. Given, as indicated in Chapter 2, that male students are stereotypically seen as less well-behaved in the classroom than female students, this means that male students who are disengaged are more likely to be overlooked than are similarly disengaged female students. Another way to state this is to say that teachers appeared to be more sensitive to disengagement among high-performing male students than they were to the same behaviors among female students. Similar groups of disengaged males are the subject of other studies throughout the field of educational psychology, both in the area of gifted education (e.g., Hebert, 2001), and in more general areas of school participation and academic attainment (e.g., Barber, 2004; Greene & Homana, 2003), and warrant attention in future research.

However, the findings illustrated in the figures in Chapter 4 are also interesting to consider from the perspective of female students. Overall, female students with the least academically-oriented friends were the most likely to have both high math test performance and a teacher nomination. Female students who had more academically-oriented friends were more likely to meet either one or the other criterion for high achievement. This finding makes some sense in relation to the fact that this interaction is seen in math but not English. Older work by Eccles and Jacobs (1986) which was used in subsequent studies to inform research on stereotype threat among females in math, found that male students were more likely to be involved in math-based activities outside of the classroom, presumably with their peers who were also intrinsically motivated in math. Perhaps, then, female students' "academically oriented" friends may be oriented to achieve in areas other than mathematics, encouraging students to be motivated to succeed in those subject areas. Further research should look in greater depth at students' perceptions of their friends' academic goals, to determine whether those goals are focused on success in certain subject areas.

In summary, the results of the analysis of gender reveal complex ways in which males and females meet different criteria for high achievement. Female students are more likely to be nominated by teachers regardless of their test performance, while uninterested males with less academically-oriented friends are the least likely to be nominated by teachers even if they perform well on tests. These results reveal several areas for further research as to how teachers view males and females' behavior in relation to high achievement.

School Characteristics Associated with Recognition of High Achievement

In addition to the individual-level variables examined in their relation to high-achievement identification criteria, this analysis also allowed for the consideration of school level effects, in order to see whether students meeting certain identification criteria were concentrated in certain kinds of schools. The first interesting finding of the school-level analysis is that while there was not significant variability in the proportion of students in a school meeting only the test-score criterion for high achievement, there was significant variability in the proportion of students meeting neither criterion or the teacher criterion only. This was true looking at high achievement in English and in mathematics. In other words, while each school had a similar number of students who performed in the top decile on achievement tests but were not nominated by teachers for advanced work, schools had different proportions of students meeting the teacher identification criterion only (or meeting neither criterion).

Additionally, in examining a series of variables addressed by social organization of schooling researchers in relation to program placement, several interesting patterns emerge. Perhaps most surprising is that there are higher proportions of students meeting only the teacher criteria of high achievement in mathematics in schools with higher average socioeconomic status. Similarly, there are also higher proportions of students meeting neither criterion in schools with higher average socioeconomic statues in both math and English. In interpreting these findings, however, it is important to remember that this analysis also considered the average academic achievement in a school. This finding could be interpreted in one of two ways. On one hand, it is possibly an artifact of the regression analysis, as school socioeconomic status and average achievement in a school are highly correlated (see the correlations in Appendix G). Indeed, without average achievement in the model there is a negative relationship between socioeconomic status and the proportion of students nominated. On the other hand, this may reflect that teacher nominations are less often used in schools with higher socioeconomic status. Alternatively, it could also indicate that there is a closer match between students identified as high-achieving in high-socioeconomic schools. As a result, the students who are not considered high-achieving by test performance are also less nominated by teachers. This could be due to a higher selectivity in advanced programs in schools with higher socioeconomic statuses (i.e., there are more students who do not qualify by either criterion), or could indicate improved opportunities for professional development that encourage teachers to recognize high achievement in line with achievement tests.

However, students attending schools of higher socioeconomic status are also more likely to be nominated for advanced work in mathematics despite lower test performance. After controlling for average achievement, the positive relationship between socioeconomic status and teacher nominations in mathematics could reflect that more resourced schools are more willing to use alternatives to test scores in mathematics to identify other students even if they have many students who do well on tests. This alternative may be used especially to appease parents in these higher-resourced schools, who may be more likely to fight for their students to become included in prestigious honors programs in mathematics. Given that schools with higher average socioeconomic statuses have more resources to devote to special programs (see Hart et al., 1997), they could be more willing to devote resources toward developing these alternative criteria if they were demanded by parents.

To contrast, when looking at school-level predictors of English achievement criteria met, other variables commonly correlated with socioeconomic status are significantly related to which achievement criteria are met. Most interestingly, there is a greater proportion of students meeting only the teacher criteria for high achievement in schools with above-average proportions of Black, Hispanic, and “other” students. As was the case in examining the associations of ethnic background and achievement criteria met at the individual level, this supports the views of Baldwin (2002) and others who support teacher nominations for identifying high-achieving minority students. However, it is interesting that this finding is significant looking at English achievement criteria met, but not mathematics achievement criteria met. Perhaps this reflects how tests in more verbal subjects are thought to be even more culturally sensitive than other assessments (see Ablard & Mills, 1996, for a discussion of this general concept as related to the Ravens Progressive Matrices, a nonverbal test of intelligence).

Finally, students are more likely to either meet neither criterion for high English achievement or the teacher criterion only if they attend a school with a small tenth grade. This finding is somewhat surprising, particularly in relation to the likelihood of meeting the teacher criteria, because research on the social organization of schooling suggests that selecting students into certain curricular programs is especially important in order to help organize larger schools with more students per grade. It is further complicated by the fact that characteristics of schools correlated with size (e.g., urbanicity, control) are not similarly associated with achievement criteria met. Further research should take a special look at how students are selected for programs in schools with smaller enrollments per grade.

Limitations of the Study

Before elaborating on the suggested avenues for practice, policy, and further research, it is important to acknowledge the limitations associated with this study's design. This study used data from a cross-national survey of students, with some additional information about teachers and schools incorporated as appropriate. This presents several limitations. First, given the lack of information on ELS:2002 about how actual decisions for selection into advanced programs or for reception of academic honors are made, there is no way of knowing the relative contribution of test performance or teacher recommendations to these decisions. Although it is interesting to see whether students with certain characteristics may hypothetically be enrolled for advanced programs based on different criteria, knowing more concretely how such criteria are actually used in the sampled schools would be useful in situating the study in terms of actual practice. Such knowledge about what happens during actual selection is also helpful for understanding more about the students themselves. The achievement test administered as part of ELS:2002 was not a high-stakes test; however, the tests that identify students as high-achieving in actual situations are high-stakes. Because of this, students may perform differently on a test that they know has implications for their schooling than on a more unrelated assessment and survey.

Second, because the data are only from one time point, there is no way to determine how students' behavior has changed over time. In particular, the design only allows for the discussion of factors *associated* with meeting different achievement criteria, rather than factors that *predict* meeting different achievement criteria. While most of this analysis has focused on how context perceptions and motivation may influence how teachers come to think about students, it is possible that students' attitudes could have been formed because of their placement in certain academic programs based on their teachers' recommendations or their test scores. Combined with knowledge of whether different criteria are actually used in making decisions about advanced program enrollment, a longitudinal study could help to track changes in attitudes, motivation, and performance before and after the nomination.

A longitudinal study would also allow for the examination of another very important question: once in these programs, do students who meet different achievement criteria perform similarly? While it might be true to say that students who are nominated by teachers are more motivated than the majority of the students in the school, that motivation may not be useful to consider if it does not contribute to students' eventual academic success. As discussed in Chapters 1 and 2, some studies have looked at the differential experiences of students who are selected for programs using different set of criteria. Connecting such research to the current analysis of differences among students selected using different means, however, would help to provide a more complete picture of optimal programming for high-achieving students. In the context of high school, this connection to students' future success is especially important considering the criticism that Advanced Placement programs do not adequately prepare students for the material presented in college (Lichten, 2000).

Further, much of the discussion of findings presented in this chapter attempts to connect characteristics of students to teachers' judgments, without asking teachers whether they felt that such factors played into their decisions. On one hand, the focus on student characteristics rather than teacher attitudes is useful in examining exactly which students meet different criteria for high achievement, regardless of whether these characteristics played consciously into teachers' decision-making. However, in understanding which relationships are due to differences in teachers' beliefs about high achievement and which are due to unconscious biases on the part of teachers, research on the factors teachers took into account would contribute greatly.

Finally, as is the case with any secondary data analysis, the items and scales used in this analysis are limited to those available in the dataset. Further research, which will be discussed later in this chapter, should take the results from the analysis conducted using the ELS:2002 dataset and expand on it by considering more specific questions. In some cases, improvements could be made by developing and using more items to capture students' attitudes. The scales for perceptions of disruptions in the school and for intrinsic motivation in this study, for example, consisted of only two items each. Also, the ELS:2002 student survey does not ask students whether their friends think it is more important to succeed in one subject than it is in another. Such a report could help in analyzing the interaction between friends' academic orientation and students' gender as they relate to meeting different criteria for high-achievement in mathematics. Such avenues for further research will be discussed later in this chapter.

Educational Practice and Policy

Despite this study's limitations, its results have several provisional implications for educational practice and policy that could strengthen with further research. These implications surround the use of different criteria in selecting students for advanced work in high school. While test performance and teacher nominations may both be used in order to select students for such programs, understanding more about which students each criterion is likely to select is important to gain a more thorough understand of how such decisions are made, and what results those decisions are likely to have. Although state-level policies do give broad guidelines for identification, many states leave the specific procedures for identification of gifted and talented students up to the individual school systems (Brown, Avery, VanTassel-Baska, Worley, & Stambaugh, 2006). Therefore, the implications of this study are most salient to individuals making such decisions for individual schools and school districts.

While tests are explicitly designed to measure students' demonstrated performance in a given subject, teacher recommendations are likely to take into account other factors. On one hand, this may mean that teacher nominations are the most useful for schools in order to meet goals of having a diverse student body in advanced programs. Teachers are likely to nominate ethnic minority students and students of low-socioeconomic status into programs, with less concern for test performance. As Freeman (2004) states in her discussion of achievement criteria, it is this sensitivity to the context of the school and the expectations of a variety of publics that makes teacher nominations particularly important when schools are interested in meeting certain enrollment goals. One additional piece of information that could be helpful in learning more about this process is whether students of a particular ethnic background are minorities in their school (e.g., a White student in a predominantly Black school). This more detailed information about school context could help gain more insight into why students of certain ethnic backgrounds are identified.

However, in using teacher recommendations as a criterion for high achievement, it is important to consider how teachers' beliefs about how a high-achieving student behaves may influence their selection of who is picked. In particular, students who display less intrinsic motivation in a topic, or who have friends who are less engaged in a topic, may be less likely to be nominated by teachers even if they meet test-score criteria for high achievement. At this point, the school (or district) would benefit from making an explicit decision about what sorts of characteristics they want students in their program to have. If a program is going to encourage students who are capable of high achievement in a subject area to participate in these programs regardless of the motivation that they initially demonstrate, then it is important that achievement tests are considered along with teacher nominations. Such a strategy might be especially beneficial if once considers that students' motivation in a subject often improves when presented with appropriately challenging coursework in the context of peers with academic interests. To contrast, a school may decide to encourage students who perform somewhat lower on a test of achievement, but who are especially motivated in comparison with their peers. As suggested in the analysis in this study, this may be most common in schools with lower average test performance in a subject overall. In that sense, teachers may be the ones most qualified to nominate such students. This qualification could be strengthened by policy that encouraged training sessions for teachers responsible for making such decisions about enrollment into advanced programs (such as AP programs). This would encourage them to think more critically about their own biases and beliefs and to help teachers consider characteristics of students in line with school and district definitions of high achievement, as well as the resources available in a school in order to nurture such high achievement.

It is important to consider, however, that teachers may be making judgments about a students' motivation in school based on how students react to social pressures from their friends. In this sense, the implications for policy and practice are directed less at policymakers and more at teachers and counselors within a school. These individuals might help to provide students with a more appropriate, academically-oriented peer group. Involvement in extracurricular activities related to leadership or academics may help students to meet academically-oriented friends, and feel more of a support system to continue to do advanced work (see literature review by Barber, 2005). Adults in the school can encourage high-achieving students to become involved in such activities. This is especially important in preventing disengagement in male students, for whom motivation has an especially strong relationship to the recognition of high achievement by teachers. Even before making these suggestions to students, however, teachers should be provided with a better understanding of adolescent peer groups, in order to learn more about why such activities are beneficial.

Finally, in making all of these decisions, it is important to consider how students whose eligibility for advanced coursework is in doubt are being judged. In particular, different judgments about these students may result from comparing them to those who are definitely high-achieving as opposed to those who are clearly not high-achieving. In both English and math, results from analysis of the ELS:2002 data indicate that the most motivated and socially engaged students are those who are most likely to meet both criteria simultaneously. Regardless of whether achievement tests or teacher nominations are used to inform program enrollment decisions, these students will be included. Although students who are nominated by teachers without the corresponding high test performance are somewhat less motivated than students meeting both criteria, they are still significantly more motivated than are the three-quarters of students who meet neither criterion, even after controlling for academic achievement. Therefore, compared to these students, they show certain characteristics that warrant their selection for advanced work. However, if compared them to the group meeting both criteria, these students may appear less motivated. The appropriateness of each comparison may depend on the scarcity of places available in advanced programs. In schools where fewer students meet the test criterion of high achievement, it may be especially important to consider the use of teachers to identify students who could most benefit from advanced work. Research that currently exists in the field of social psychology related to decision-making could also be considered to gain further insight into these comparison processes.

Suggestions for Future Work

Considerations for Future Theoretical Frameworks

In addition to providing information relevant to policymakers, this study provides several suggestions for further insight into how theoretical frameworks can better account for the experiences of high-achieving teachers, regardless of whether they are identified by teachers or test performance. As a descriptive study, one of the major purposes of this analysis was to provide information that could further inform such theory. As discussed in Chapter 1, teachers' "implicit theories" of intelligence (Sternberg & Zhang 1995) can be used in order to explain why teachers may take factors other than demonstrated achievement into their decisions. However, this finding does not completely account for how individual background factors such as ethnicity and gender are associated with the recognition of high achievement. In order to identify more broadly factors that could be associated with how high achievement is recognized, Gagné's conceptual frame was used as the basis for selecting independent variables in this study. However, as indicated in Chapter 2, there are many questions raised by researchers about some of the tenets of Gagné's model.

This study has suggested several ways in which theoretical frameworks relating to the recognition of high achievement can be improved. First, it is important to combine models of teacher decision-making with models that define achievement as performance on a norm-referenced assessment. Although Gagné's model was important for identifying factors potentially related to the recognition of high achievement, it does not offer any guidance into how these factors may influence whether students meet certain criteria of high achievement (and not others). Gagné focuses only on identifying "talented" or high-achieving, students as those scoring in the top decile of some assessment of achievement. This analysis demonstrated that several characteristics of students' motivations and individual background might cause some students who perform well on tests to be overlooked by teachers, and vice versa. Such findings cannot be accounted for unless alternate methods for recognizing high achievement are incorporated into these more general models.

Second, theoretical frameworks of giftedness must consider in greater detail exactly which aspects of motivation are thought to relate to the recognition of high achievement. As indicated in Chapter 2, the general consideration of motivation in Gagné's model is a cause of concern among other gifted education researchers, who more specifically consider aspects of students' efficacy and intrinsic motivation as they relate to high achievement. This analysis suggests that concerns over specific aspects of motivation need to be taken a step further. Results here indicate that is not enough just to consider efficacy and motivation in a specific subject; rather, students' more general motivational goals must also be taken into consideration. Discussions of social and academic goals are considerably rarer in discussions of high-achieving students than are discussions of other aspects of motivation. However, this analysis indicated that students who perceived their friends to be less academically and socially oriented were less likely to have high achievement recognized. This demonstrates how these broader and less-often considered aspects of motivation are especially important to consider, especially in models that explicitly consider the social context of high achievement.

Third, subsequent theoretical frameworks of high achievement should provide a more explicit consideration of how aspects of individual background may influence how high achievement is recognized. This is something overlooked both by traditional models of teachers' "implicit theories" as well as by Gagné's broader model of how high achievement comes to be recognized. In framing the current analysis, ethnicity and gender were considered to be "chance" catalysts, over which students have no control. However, results from this analysis demonstrate several prominent associations between these demographic characteristics and achievement criteria met. This suggests that a more nuanced consideration of how these factors influence how achievement is recognized is needed.

The ways in which ethnicity and gender are associated with the recognition of high achievement may be different in different situations. This leads to a fourth avenue for improvement suggested by research: a more holistic consideration of context. In Gagné's model, context is an isolated catalyst that has an association with high achievement independent of individual characteristics. Context may include individual relationships as well as more distal community and cultural factors. This analysis suggests that the consideration of context can be improved in several ways. On one hand, subject area is an important aspect of context not addressed in models of giftedness. As demonstrated by Grossman and Stodolsky (1995), teachers involved in different subjects have different ideas about what is important for achievement. In outlining ways in which several factors can influence the recognition of high achievement, then, it is necessary that the norms of a particular subject area are taken into account. The analysis presented in this study indicated several differences by subject, including differences in associations of ethnicity and perceptions of social context to recognition of high achievement. Models like Gagné's reflect the fact that achievement in a subject is subject-specific; a more comprehensive model of high achievement should recognize that the context in which that achievement develops is subject-specific as well.

On the other hand, the expansion of social context also suggests that it should not be considered separately from other factors of high achievement. Rather, individual characteristics such as motivation also take place in this context. Therefore, a more nested model of how context influences achievement (e.g., Bronfenbrenner, 1979) may best capture how the relationship of individual characteristics to achievement recognition is different in different contexts.

A fifth suggestion for further theoretical developments surrounds tailoring this model specifically to a particular age group. The effects that certain factors have (or do not have) on achievement recognition differ for different age groups. For example, the importance of friends' values, and their potential connection to individual students' social and academic goals, is particularly important for adolescent students, who are in the process of establishing identities separate from those of their parents (see Erikson, 1969). Rather than add to an already complex model by accounting for changes in relationships over time, theorists should consider how to build specific models for explaining achievement recognition appropriate for students of this age. This need for a framework specifically for adolescent students has begun to be addressed by Dixon and Moon (2006), but further work should be done.

Finally, there should be a more detailed consideration when considering the recognition of high achievement as it relates to giftedness. The conceptual frameworks and the empirical research guiding this study are largely based on the gifted education literature. Indeed, while Gagné contends that his Differentiated Model takes a step in separating “gifted” from “high-achieving” (or “talented”) students, it still assumes that the individuals who start with the most potential will be those to follow for eventual demonstrated performance. In truth, there are many students who may come to be recognized as high-achieving by teachers (through advanced programs or through academic honors) who would have likely not met Gagné’s definition for “gifted.” In addition, they most certainly would not have met his definition for high-achieving, since they fell out of the top decile on the subject test of achievement. Future theoretical work should consider how to account for these students. This may involve considering context, motivation, and individual background as factors in a separate model of teachers’ decision-making. Alternatively, it could be incorporated into more general models of “giftedness” in order to acknowledge that the identification process is more complex than administering tests of ability and achievement.

Considerations for Future Research

In order to inform policy and the practice of educators better, additional research on this general topic should be conducted even as more nuanced theoretical frames are considered. Several areas for further research have already been identified throughout the discussion of findings and limitations of the current study; this section will synthesize and expand on several ideas already presented.

In particular, additional research can focus on the connection between the characteristics of students most likely to be identified using each set of criteria and teachers' explicit decisions about whom to nominate for advanced work. Information about such connections could help to explain, for example, the relationship between perceptions of friendships and the likelihood of students meeting only the test criterion without meeting the teacher criterion of high achievement. It is unlikely that a teacher is explicitly taking into account characteristics of a student's friends when judging the student. By asking the teacher about their rationale for selecting (or not selecting) a student, more can be learned about the intentional implications of teacher recommendations (e.g., including more motivated and engaged students) as opposed to more unintentional implications of teacher recommendations (e.g., potentially including fewer male students or students with more negative peer groups). In other words, it can help to separate which differences are due to teachers' implicit theories of what high achievement entails

Just as it is important to gain additional information from teachers to take the current research further, additional information could also be gained from students in order to aid in the interpretation of current findings. When looking at math achievement identification in particular, there are several interesting relationships to students' perceptions of the academic and social orientation of their friends. The subject specificity of this finding raises questions about whether friends' academic orientations are more important for certain subjects or, in light of significant interactions with gender, more important for males than for females. Perhaps friends may see math as more “important” for a variety of reasons, or perhaps female students’ peers may see math as somewhat less important. Regardless, the current research suggests that general questions regarding students’ perceptions of their friends’ academic orientations are not nuanced enough to capture sufficiently the relationship of social context to achievement identification. Additionally, more information from students can be useful to understand how friends influence their own relation to school.

Information about schools could also help to provide more insight on the broader social context of which students come to be identified as high achieving. In particular, this analysis suggests that schools with lower average socioeconomic status may be especially reliant on teacher recommendations to identifying high-achieving students. Looking more in-depth at schools in this context can help to explore not only why teacher recommendations may be more useful in these schools, but also how they are used, and perhaps justified to publics outside of the school. Such research would have important implications for schools looking to tailor identification criteria to their particular social context.

Finally, further research should eventually plan to follow students meeting different identification criteria longitudinally, to see whether they ultimately succeed. A discussion of whether it makes sense to nominate students who are more or less motivated, or more or less engaged, may be moot if the students do not ultimately succeed once in these programs. While this study is important in exploring differences among students meeting different criteria, it is ultimately a student’s success, and not the criteria that they meet, that is the outcome of interest.

Conclusion

This study has shown the importance of looking at different criteria for high achievement, in order to examine how the use of these criteria may result in students with different characteristics being recognized as high achieving. The complexity of the results presented suggest that, unlike what is argued by some researchers, differences between nomination patterns of teachers and test scores are not simply a matter of "error" on the part of the teachers. Rather, they suggest systematically different ways of thinking about high achievement and its recognition. It may still be important to include certain groups of students who do not meet test criteria in programs in order to ensure that students diverse in gender, ethnicity, and socioeconomic status have opportunities to advanced programs. The students likely to be selected in this manner are also more motivated than the majority of their peers. To contrast, high achievement on a test may not be enough for some teachers to recommend a student; rather, teachers' judgments are associated with motivation in a subject and engagement in a school as well. In addition to gaining information about characteristics of students that may be important to teachers' beliefs about high achievement, this study also shows several biases that may be important for teachers and schools alike to recognize and consider. This is especially the case when considering the high-achieving but disengaged male student. Together, considering how characteristics of context, motivation, and individual background are associated with achievement criteria met by high-school students can help schools to recognize adequately how to support high-achieving students throughout the entirety of their school careers, despite the social and motivational complexities typically associated with the adolescent period.

APPENDICES

Appendix A

List of Items from the ELS: 2002 Database

A1: Achievement Identification Outcome Variables

Math Achievement Identification

TM19: Have you recommended this student for academic honors, advanced placement, or honors classes

Response options: 0 = No, 1 = Yes, Not Applicable

BY2XMSTD: Math test standardized score; mean = 50, SD = 10

(TE19 and BY2XMSTD Recoded into RECMATH.

Response options: 1 = TM19 = 0 and BY2XMSTD < 62.54;

2 = TM19 = 1 and BY2XMSTD < 62.54; 3 = TM19 = 0 and BY2XMSTD ≥ 62.54;

4 = TM19 = 1 and BY2XMSTD ≥ 62.54)

English Achievement Identification

TE19: Have you recommended this student for academic honors, advanced placement, or honors classes:

Response options: 0 = No, 1 = Yes, Not Applicable

BY2XRSTD: Reading test standardized score; mean = 50, SD = 10

(TE19 and BY2XRSTD recoded into RECENG.

Response options: 1 = TE19 = 0 and BY2XRSTD < 62.74;

2 = TE19 = 1 and BY2XRSTD < 62.74; 3 = TE19 = 0 and BY2XRSTD ≥ 62.74;

4 = TE19 = 1 and BY2XRSTD ≥ 62.54)

A2: Individual Background Items

BYSEX: Sex Composite

Response: 1 = male, 2 = female

(Recoded into FEMALE variable with 0 = male and 1 = female)

BYRACE: Race/Ethnicity Composite

Response: 1 = American Indian/Alaska Native, Non-Hispanic;

2 = Asian, Hawaii/Pacific Islander, Non-Hispanic;

3 = Black or African American, Non-Hispanic; 4 = Hispanic, no race specified;

5 = Hispanic, race specified; 6 = Multiracial, Non-Hispanic, 7 = White, Non-Hispanic

(Recoded into RACE variable, categories 1 & 6 and 4 & 5 combined)

(RACE recoded into 4 dummy-coded variables: ASIAN, BLACK, HISPANIC, and OTHER, with White, Non-Hispanic as reference category).

BYSES: Socioeconomic Status Composite, mean = 0, SD = 1.

A3: School-Level Items

TM19: Have you recommended this student for academic honors, advanced placement, or honors classes

Response options: 0 = No, 1 = Yes, Not Applicable

(TM19 was aggregated to the school level in order to calculate the proportion of students who are recommended for advanced work in each school. Aggregate recoded into categorical variable with two dummy codes. NORECMAT = 0% of students recommended for advanced programs; HIRECMAT = 15% or more students recommended for advanced programs)

TE19: Have you recommended this student for academic honors, advanced placement, or honors classes:

Response options: 0 = No, 1 = Yes, Not Applicable

(TE19 was aggregated to the school level in order to calculate the proportion of students who are recommended for advanced work in each school. Aggregate recoded into categorical variable with two dummy codes. NORECENG = 0% of students recommended for advanced programs; HIRECENG = 21% or more students recommended for advanced programs)

BY2XRSTD: Reading test standardized score; mean = 50, SD = 10

(Recoded into SCHREAD by aggregating the mean reading achievement test score of students in each school.)

BY2XMSTD: Math test standardized score; mean = 50, SD = 10

(Recoded into SCHMATH by aggregating the mean math achievement test score of students in each school.)

BYSES: Socioeconomic Status Composite, mean = 0, SD = 1.

(Recoded into AVESES by aggregating the mean socioeconomic status score of students in each school.)

BYSCNTRL: Public, private, or Catholic school as indicated in the Common Core of Data and the Private School Surveys

Response options: 1 = public, 2 = Catholic, 3 = other private

(Recoded into a series of two dummy-coded variables: PRIVATE and CATHOLIC. Public served as the reference category.)

BYSURBAN: Urbanicity of school locale as indicated in the Common Core of Data and the Private School Surveys

Response options: 1 = urban; 2 = suburban, 3 = rural

(Recoded into a series of two dummy-coded variables: URBAN and RURAL. Suburban served as the reference category.)

BYG10EP: Tenth grade enrollment in 2001/02 school year, from sampling roster

Response options: 1 = 1-99 students; 2 = 100-199 students; 3 = 200-299 students;

4 = 300-399 students, 5 = 400-549 students, 6 = 550-699 students;

7 = 700 or more students

(Recoded into dichotomous variable SIZEDIC: 0 = 1-99 students; 1 = 100-700+ students)

BYRACE: Race/Ethnicity Composite

Response: 1 = American Indian/Alaska Native, Non-Hispanic;

2 = Asian, Hawaii/Pacific Islander, Non-Hispanic;

3 = Black or African American, Non-Hispanic; 4 = Hispanic, no race specified;

5 = Hispanic, race specified; 6 = Multiracial, Non-Hispanic, 7 = White, Non-Hispanic

(Recoded into dichotomous MINORITY with 0 = categories 2 and 7, 1 = categories 1, 3, 4, 5, and 6. Aggregated to the school level. Recoded into HIMINOR; 0 = proportion of MINORITY is less than 15.6%; 1 = proportion of MINORITY students is greater than or equal to 15.6%)

A4: Negative Perception of Peer Context Items

S20D: Other students often disrupt class. (in DISRUPT factor of adapted model)

S20I: In class I often feel put down by other students. (removed from adapted model)

S20J: I do not feel safe at this school. (removed from adapted model)

S20K: Disruptions often get in the way of learning. (in DISRUPT factor of adapted model)

S20L: Misbehaving students in this school often get away with it. (In DISRUPT factor of adapted model)

S20M: There are gangs in this school. (in FIGHTING factor of adapted model)

S20N: Racial/ethnic groups often fight. (in FIGHTING factor of adapted model)

Response: 1 = strongly agree, 2 = agree, 3 = disagree, 4 = strongly disagree

A5: Perception of Student-Teacher Relationships Items (TEACHCON)

S20A: Students get along well with teachers. (removed from adapted model)

S20E: The teaching in this school is good.

S20F: Teachers are interested in their students.

S20G: Teachers praise students' effort.

Response: 1 = strongly agree, 2 = agree, 3 = disagree, 4 = strongly disagree

A6: Perception of Friends' Academic Orientation Items (ACADFR)

S90A: It is important to friends to attend classes regularly.

S90B: It is important to friends to study.

S90D: It is important to friends to get good grades.

S90F: It is important to friends to finish high school.

S90H: It is important to friends to go onto higher education.

Responses: 1 = not important, 2 = somewhat important; 3 = very important

A7: Perception of Friends' Social Orientation Items (SOCFR)

S90E: It is important to friends to be popular with students.

S90G: It is important to friends to have a steady boy/girlfriend.

S90L: It is important to friends to get together with friends.

S90M: It is important to friends to attend parties.

Responses: 1 = not important, 2 = somewhat important; 3 = very important

A8: Self-Efficacy Items

Math Self-Efficacy (MATHSEFF)

S89A: I can do an excellent job on math tests.

S89B: I can understand difficult math texts.

S89L: I can understand difficult math classes.

S89R: I can do an excellent job on math class assignments.

S89U: I can master math class skills.

English Self-Efficacy (ENGSEFF)

S89C: I can understand difficult English texts.

S89F: I can understand difficult English classes.

S89I: I can do an excellent job on English class assignments.

S89K: I can do an excellent job on English tests.

S89M: I can master English class skills.

Response: 1 = almost never, 2 = sometimes, 3 = often, 4 = almost always

A9: Intrinsic Motivation Items

Math Intrinsic Motivation (INTMATH)

S87A: I get totally absorbed in mathematics.

S87C: I think that mathematics is fun. (removed from adapted model)

S87F: I think mathematics is important.

Reading Intrinsic Motivation (INTREAD)

S87B: I think that reading is fun.

S87D: I get totally absorbed in reading.

S87E: I enjoy reading in my spare time. (removed from adapted model

Response: 1 = strongly agree, 2 = agree, 3 = disagree, 4 = strongly disagree

Appendix B

Scale Creation Details

Following the lead of several large-scale studies that included psychological and attitudinal scales (PISA 2002: Adams & Wu, 2002; or the IEA Civic Education Study: Husfeldt, Barber, & Torney-Purta, 2005; Schulz & Sibberns, 2004), scales of motivation and perceptions of context were created using a confirmatory factor analysis (CFA) to assess the hypothesized dimensionality of these constructs, and were followed by an item response theory (IRT) analysis to assess individual items and create scale scores. In order to avoid conducting similar analyses on the same students, the sample was divided in half, with half of the cases used in conducting the confirmatory factor analysis and half used in conducting item response theory item analysis. Then, all cases were scored using IRT scoring techniques.

Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) is an appropriate methodology to test the hypothesized dimensionality of survey items suggested by psychological theory. Two sets of CFA analyses will be tested here using on the first half of the sample: the first relating to students' self-efficacy and intrinsic motivation (four factors total) and the second relating to their perception of school context and peers (three factors total, as the items assessing students' perceptions of friends did not meet the assumptions for confirmatory factor analysis). The plausibility of these models was tested on the first half of the sample using EQS 6.1 for Windows (Bentler & Wu, 1995), using a maximum likelihood (ML) estimation procedure with corrections to the χ^2 fit statistic and standard errors for non-normal data (Satorra & Bentler, 1994). Design weights were used to adjust for the unequal probability of selection of respondents. A model will be considered tenable if it meets the joint fit criteria of a comparative fit index (CFI) above .96 and a root mean square error of approximation (RMSEA) below .06, as recommended by Hu and Bentler (1999).

It should be noted that the purpose of CFA in this study was to test the hypothesized dimensionality of certain student characteristics of interest, and *not* to provide a definitive measurement model of them. More in-depth analysis of the items used in these models, including consideration of missing data, followed in the IRT analysis.

Item Response Theory Analysis

IRT procedures (including an IRT-based analysis of differential item functioning) were preferred in international studies presented by IEA and PISA in order to ensure comparability of scale scores across countries and (in the case of IEA) across different age cohorts. In this current study, IRT analysis served several important functions. Compared to classical test theory procedures, it provided a more accurate estimate of individuals' attitudes or behaviors with fewer items. It also allowed for more flexible handling of missing data. In this sense, IRT scaling gave further information about the constructs identified in the CFA analysis.

Model. Items thought to be indicators of each of the four traits described above were analyzed using a series of generalized partial credit models (Muraki, 1992). One GCPM was fit to each construct (dimension) identified in the CFA. Models were also tested for the two perceptions of friends. Even though these items did not meet the CFA assumptions, they did meet the assumptions for IRT analysis. In each model, the probability of answering in a particular way to an item, given a particular location on latent trait θ can be expressed as

$$P_{jk}(\theta)\frac{\exp\left[\sum_{v=0}^{k} a_j(\theta - b_j + c_v)\right]}{\sum_{c=0}^{m_j}\exp\left[\sum_{v=0}^{c} a_j(\theta - b_j + c_v)\right]} \quad [1]$$

where *b* is a location (difficulty) parameter for item *j*, c is a category threshold parameter (or the "relative difficulty" of comparing category step *v* to other steps in item *j*), and *a* is a discrimination parameter for item *j*. In other words, the generalized partial credit IRT model allows for the analysis of how difficult items are overall, how difficult certain responses to the items are more specifically, and how effective the items are in discriminating between students with more positive and more negative attitudes. Although the CFA analysis was necessary in order to establish dimensionality, IRT analysis is more appropriate for the in-depth analysis of, likert-scale items.

Items were analyzed using PARSCALE 4.1. (duToit, 2003). PARSCALE allows the use of weights available as part of the ELS:2002 dataset when calculating item parameters in order to correct for the unequal probability of selection of students in the sample. In order to prevent conducting duplicate analyses on the same set of information, this test was conducted on the half of the sample that was *not* analyzed in the previous CFA test of dimensionality.

Model fit. A series of option characteristic curves (OCCs) were fit to the data using the MODFIT program (Levine & Drasgow, 2001), which is a macro available for Microsoft Excel to graphically assess model fit. Items were judged to *not* fit the data if the observed OCC fall outside of the confidence interval for the expected OCC. Items displaying poor model fit were removed, and the model re-specified using only those items displaying good fit. This resulted in optimal sets of items that could be used to create scales of students' attitudes on the entire sample (combining the CFA sample with the IRT sample). With the entire sample, scores were calculated in PARSCALE using an expected a priori estimation procedure (EAP). For ease in interpretation, the IRT scales created were standardized, such that each scale has a mean of 0 and a standard deviation of 1 across the entire weighted sample of tenth graders.

Appendix C

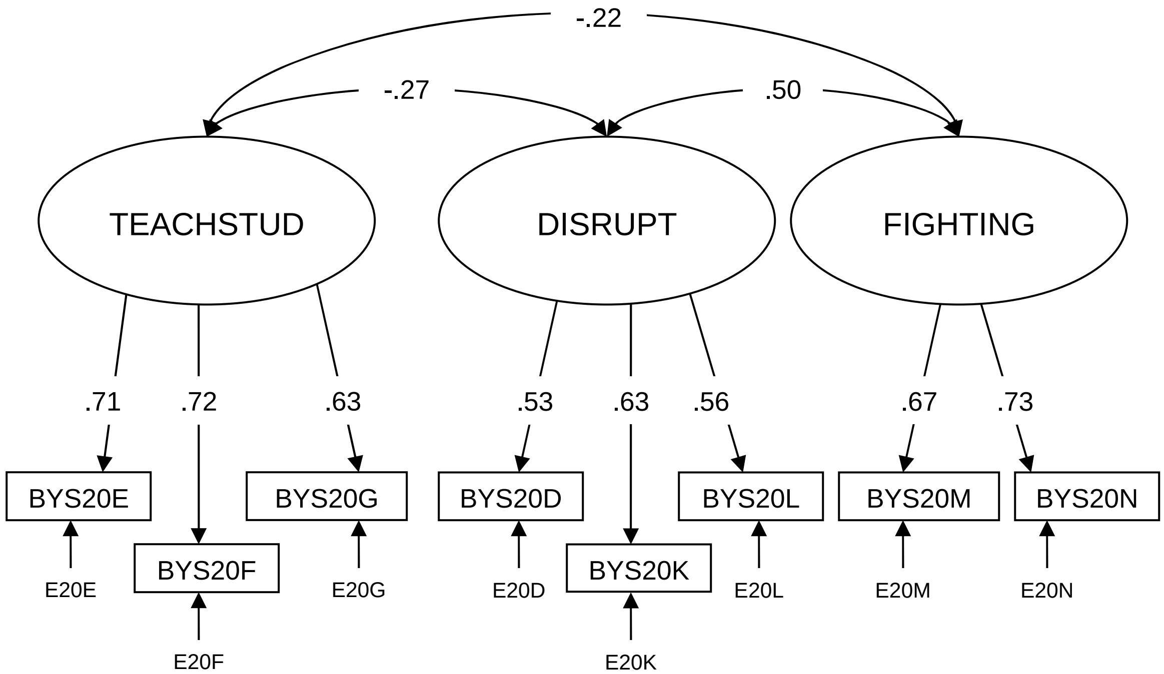
Information about School Context Item Analyses

Appendix C1: Frequencies of School Context Items

	1. Strongly Agree	2. Agree	3. Disagree	4. Strongly Disagree
Perception of Teacher-Student Relationships				
BYS20E	13.62%	67.00%	16.03%	3.36%
BYS20F	13.47%	60.75%	21.76%	4.02%
BYS20G	14.54%	49.47%	31.44%	4.56%
Perception of Disruptions by Peers				
BYS20D	19.90%	54.74%	22.93%	2.43%
BYS20K	11.63%	34.05%	43.78%	10.54%
BYS20L	12.61%	40.13%	39.56%	7.70%
Fighting In School				
BYS20M	9.13%	24.29%	41.20%	25.38%
BYS20N	6.60%	19.74%	46.77%	26.89%

	1. Not important	2. Somewhat important	3. Very important
Academic Orientation of Friends			
BYS90A	5.14%	43.37%	51.48%
BYS90B	11.52%	55.71%	32.77%
BYS90D	5.83%	44.73%	49.43%
BYS90F	4.01%	21.67%	74.32%
BYS90H	6.69%	37.14%	56.17%
Social Orientation of Friends			
BYS90E	21.25%	50.75%	28.00%
BYS90G	26.05%	53.32%	20.64%
BYS90L	4.78%	39.47%	55.75%
BYS90M	19.42%	47.79%	32.79%

Appendix C2: Confirmatory Factor Analysis to assess dimensionality of context factors



ChiSq=382.87, df=22; CFI=.952, RMSEA=.053 (90% CI = [.048, .058]).
Statistics are based on Yuan-Bentler correction with robust standard errors

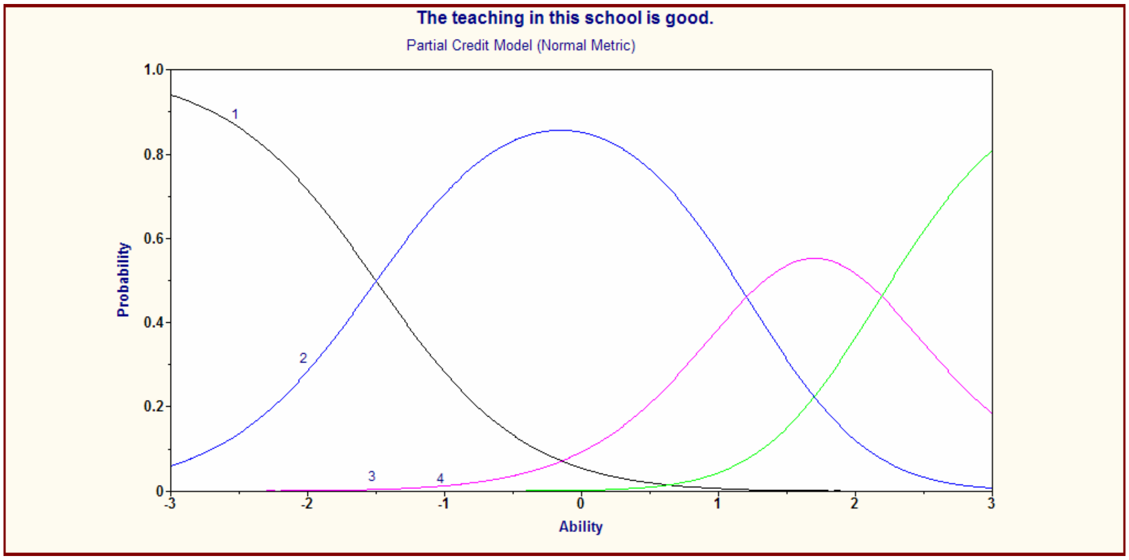
Appendix C3: Table of Item Parameters for revised context and friend scales

	Discrimination	Location	Threshold between Options 1 and 2	Threshold between Options 2 and 3	Threshold between items 3 and 4
Teacher-Student Relationships					
BYS20E	1.0350	0.6620	2.1650	-0.5620	-1.6030
BYS20F	1.6920	0.4740	1.7880	-0.2870	-1.5000
BYS20G	0.6830	0.4740	2.1240	-0.0580	-2.0660
Perception of Disruptions					
BYS20K	0.8180	0.0120	1.5510	0.2370	-1.7870
BYS2oL	0.6360	0.2130	1.8690	0.1440	-2.0130
Academic Orientation of Friends					
BYS90A	1.5140	-0.9040	0.9620	-0.9620	n/a
BYS90B	1.4940	-0.3660	1.0380	-1.0380	n/a
BYS90D	1.8370	-0.7760	0.9160	-0.9160	n/a
BYS90F	1.1300	-1.4690	0.6880	-0.6880	n/a
BYS90H	1.3540	-0.9330	0.8380	-0.8380	n/a
Social Orientation of Friends					
BYS90E	0.8340	-0.1470	0.9250	-0.9250	n/a
BYS90G	0.6900	0.1960	1.0770	-1.0770	n/a
BYS90L	0.6980	-1.4250	1.1980	-1.1980	n/a
BYS90M	1.0050	-0.2270	0.8400	-0.8400	n/a

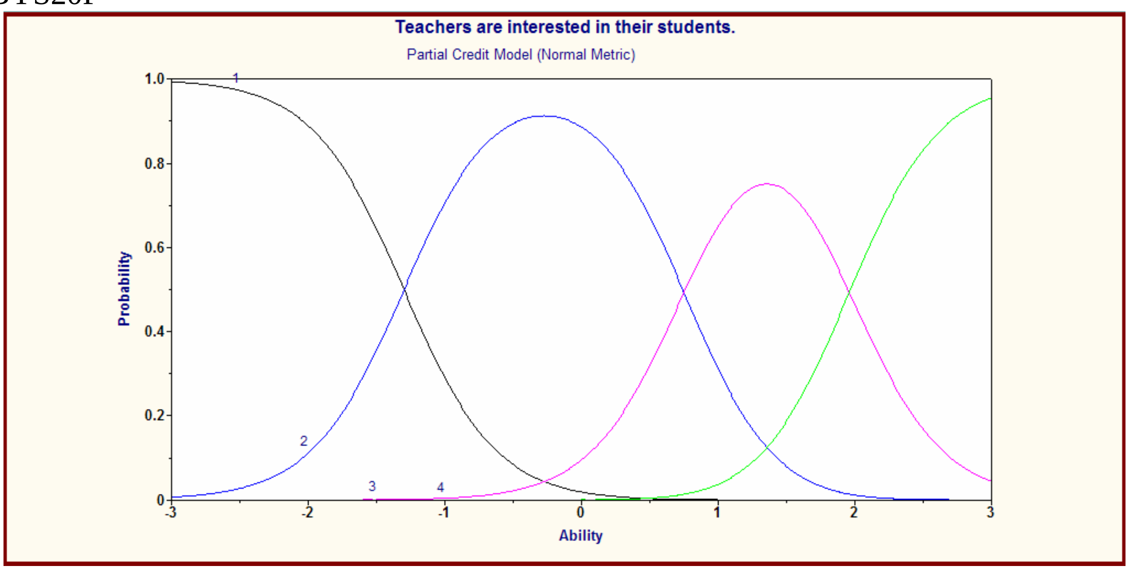
Appendix C4: Item Characteristic Curves

Teacher-student relationships items.

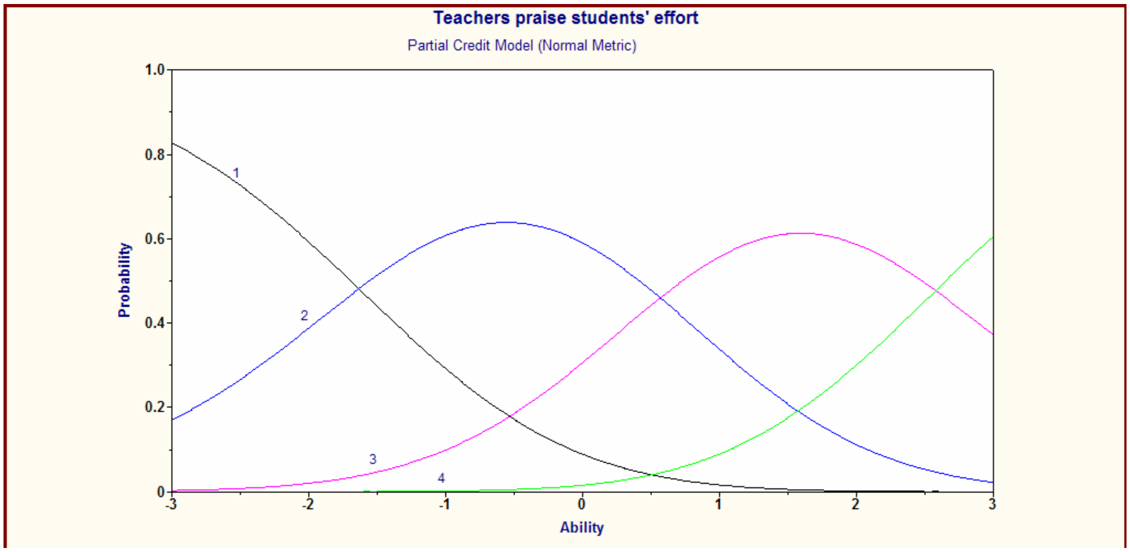
BYS20E



BYS20F



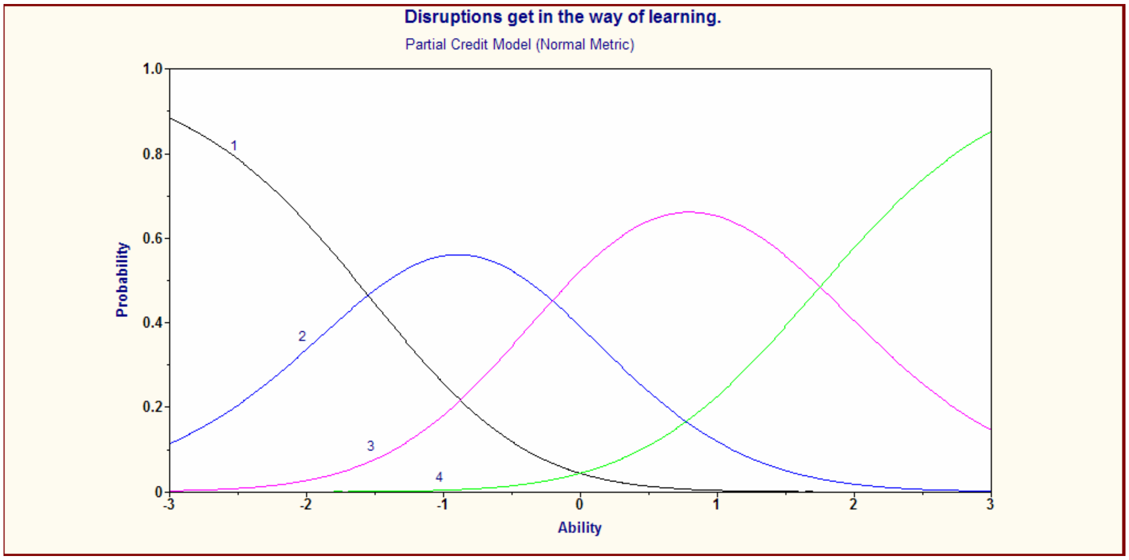
BYS20G



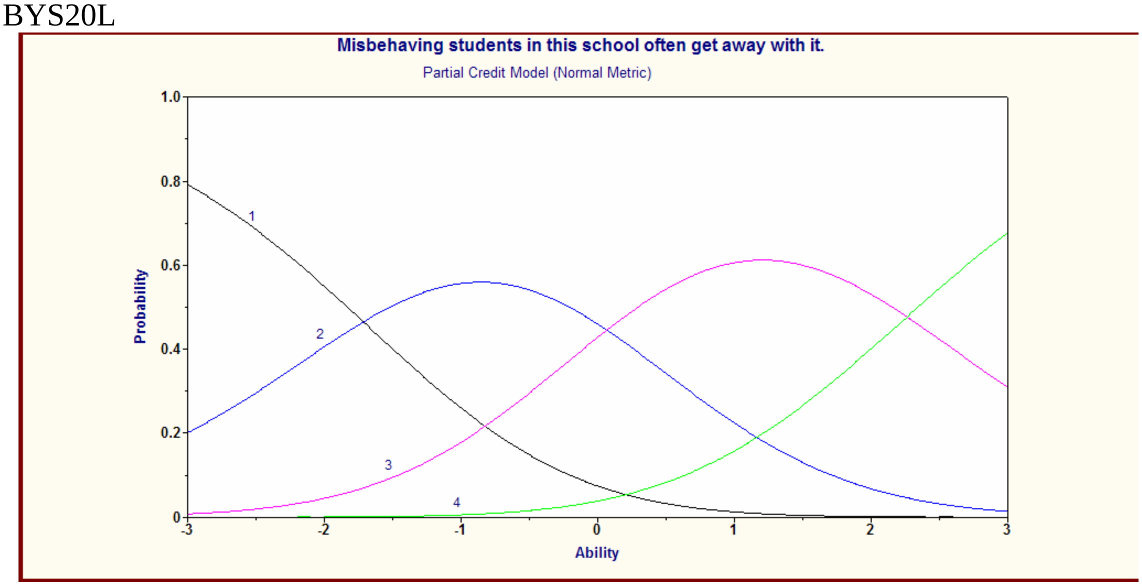
Teachers praise students' effort
Partial Credit Model (Normal Metric)
Probability
Ability
1.0
0.8
0.6
0.4
0.2
0
-3
-2
-1
0
1
2
3
1
2
3
4

Perceptions of disruptions items.

BYS20K

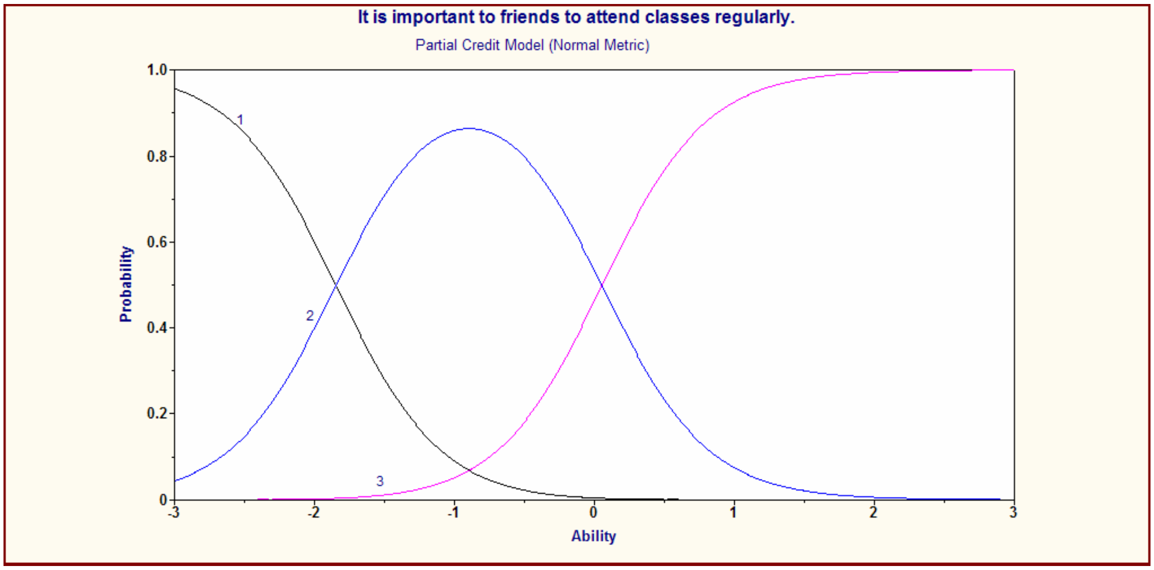


BYS20L

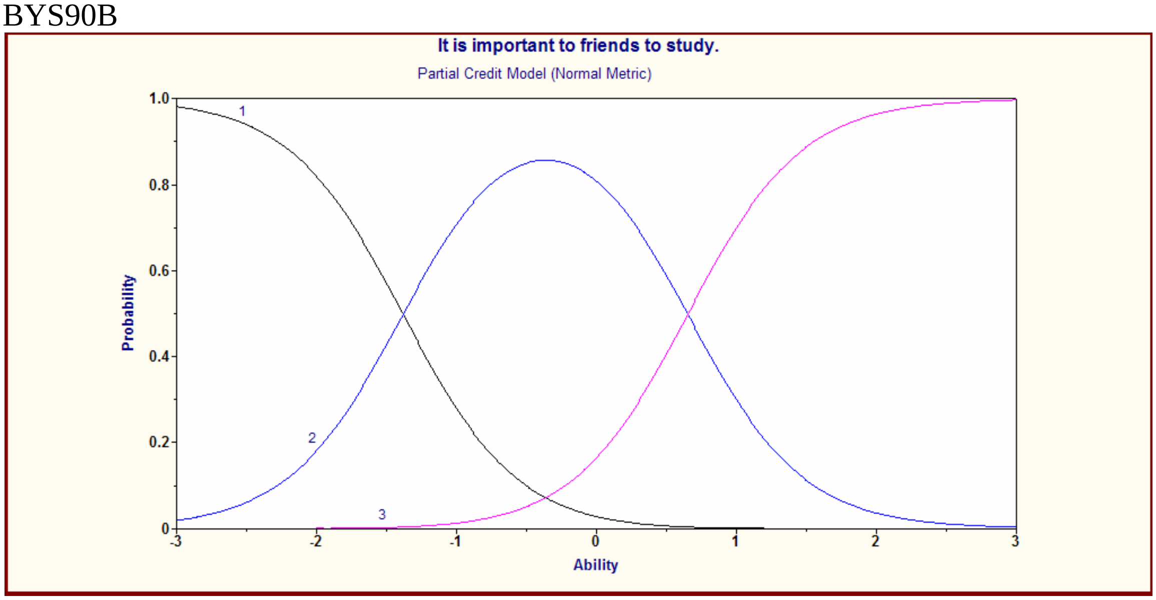


Perceptions of friends' academic orientation.

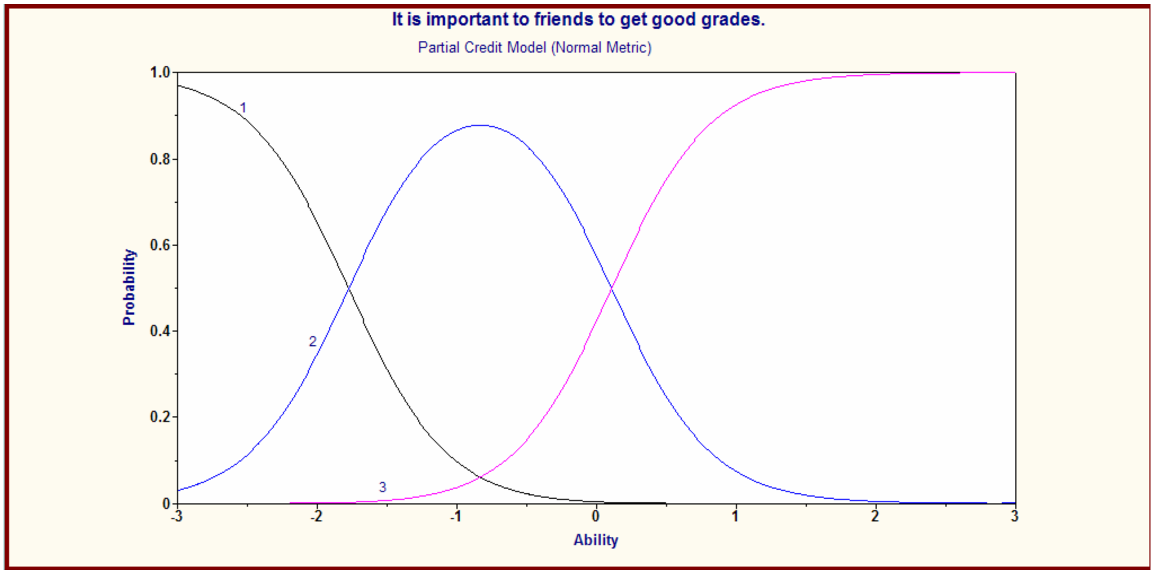
BYS90A



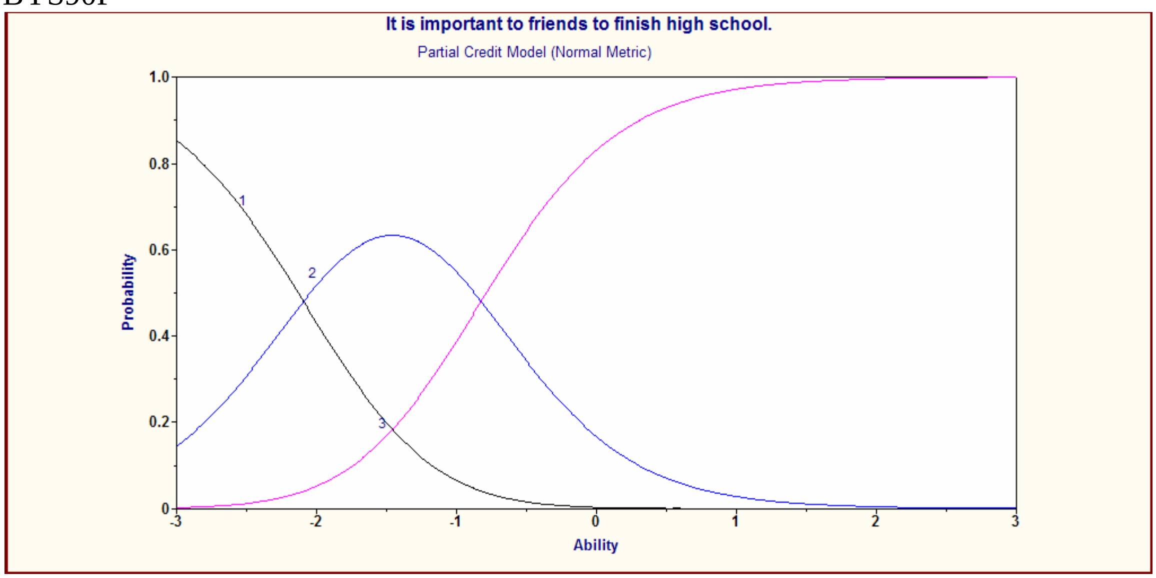
BYS90B



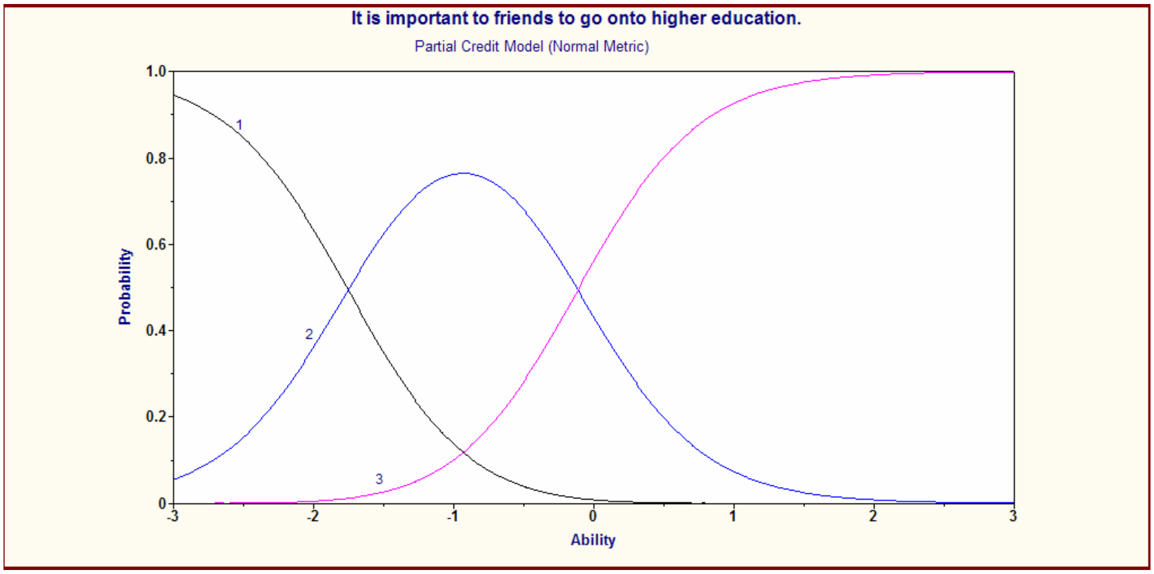
BYS90D



BYS90F



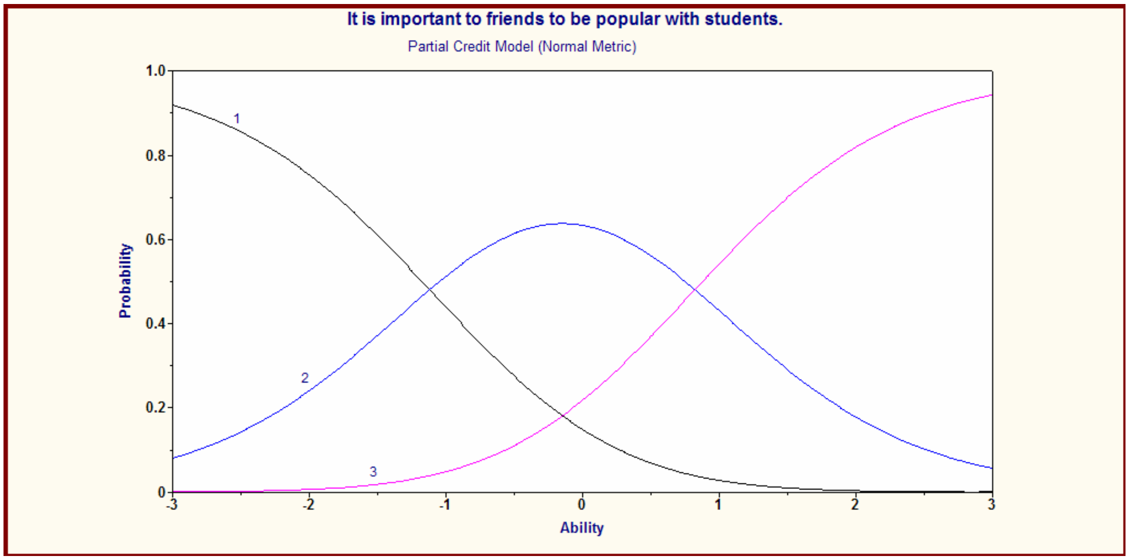
BYS90H



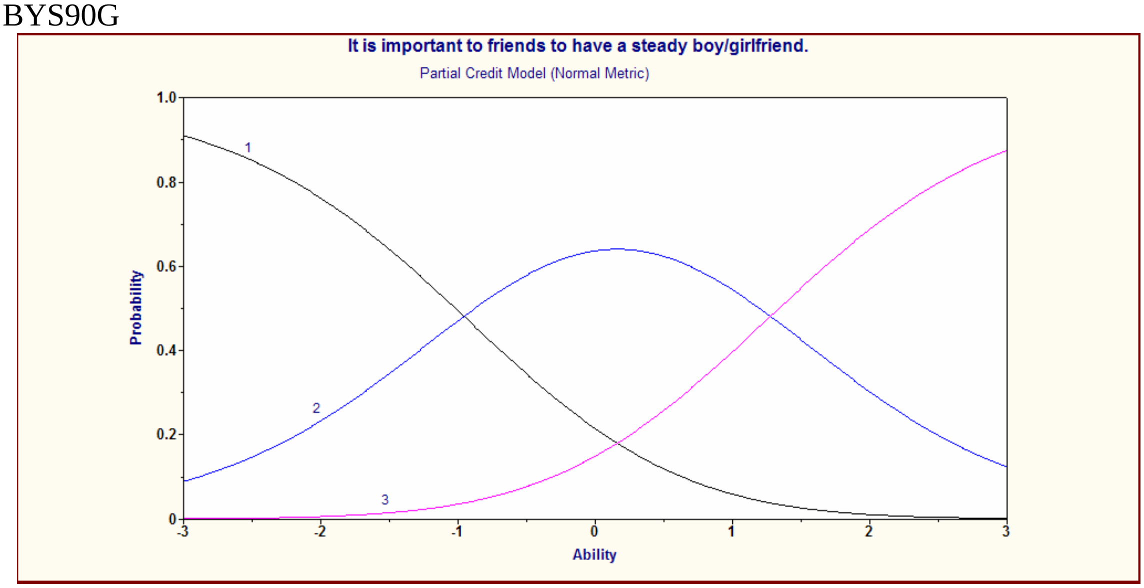
It is important to friends to go onto higher education.
Partial Credit Model (Normal Metric)
Probability
Ability
1.0
0.8
0.6
0.4
0.2
0
-3
-2
-1
0
1
2
3
1
2
3

Perception of friends' social orientation

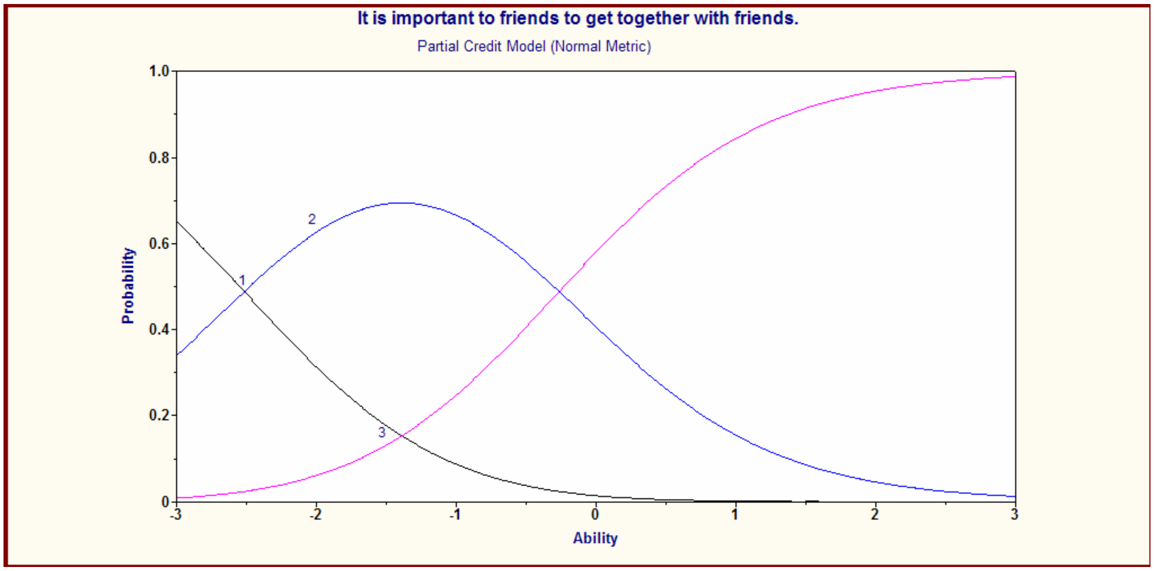
BYS90D



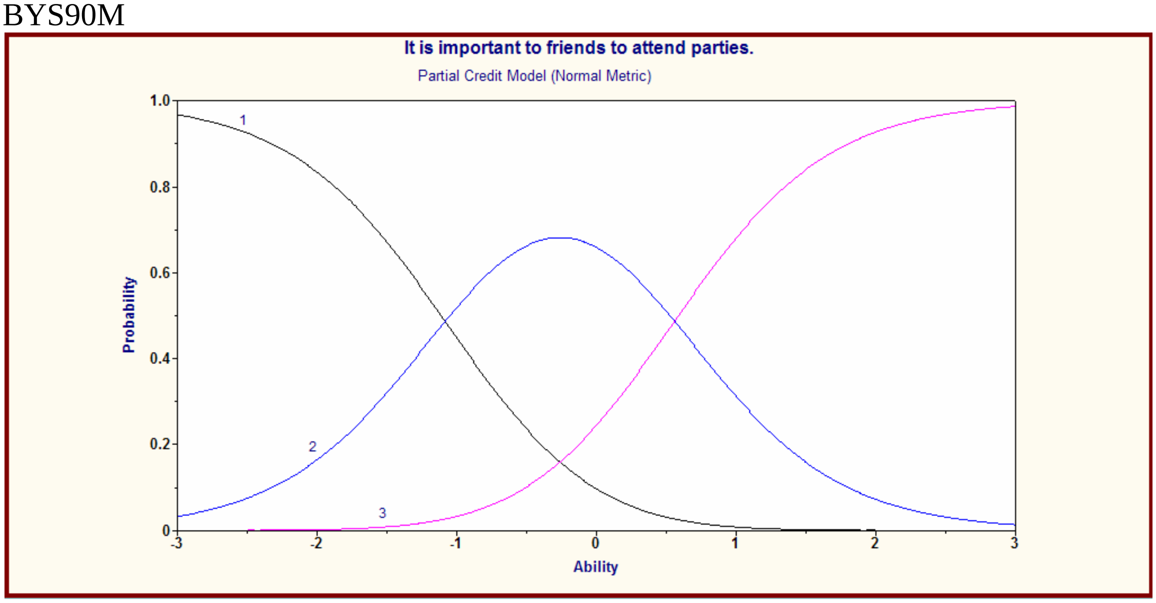
BYS90G



BYS90L



BYS90M



Appendix D

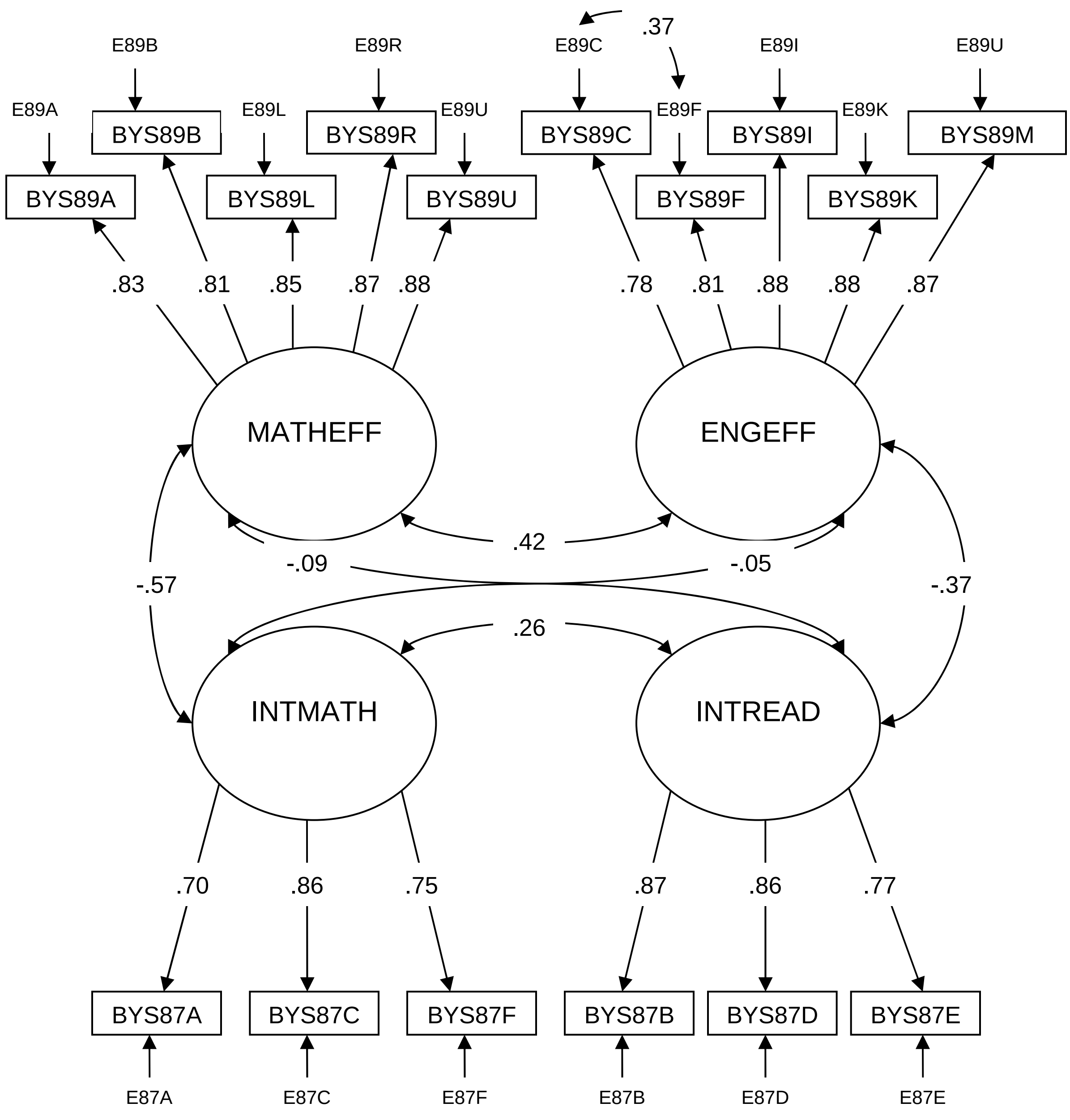
Information about Motivation Item Analyses

Appendix D1: Item Frequencies

	1. Strongly Agree	2. Agree	3. Disagree	4. Strongly Disagree
Reading Intrinsic Motivation				
BYS87A	14.20%	35.20%	36.37%	14.24%
BYS87C	13.64%	37.08%	33.10%	16.19%
BYS87F	20.19%	42.08%	26.27%	11.45%
Math Intrinsic Motivation				
BYS87B	9.29%	41.85%	37.96%	10.89%
BYS87D	6.73%	26.30%	46.11%	20.86%
BYS87E	11.72%	38.33%	34.27%	15.67%

	1. Almost never	2. Sometimes	3. Often	4. Almost Always
English Efficacy				
BYS89C	8.71%	40.03%	32.40%	18.86%
BYS89F	9.41%	38.68%	30.67%	21.24%
BYS89I	5.28%	32.28%	35.74%	26.71%
BYS89K	5.85%	35.08%	33.62%	25.45%
BYS89M	6.32%	36.49%	33.56%	23.63%
Math Efficacy				
BYS89A	10.59%	46.15%	23.26%	20.00%
BYS89B	18.39%	42.95%	24.71%	13.95%
BYS89L	16.12%	40.21%	26.48%	17.19%
BYS89R	10.94%	38.64%	29.27%	21.15%
BYS89U	10.28%	37.25%	30.39%	22.08%

Appendix D2: Confirmatory Factor Analysis to Assess Dimensionality of Motivation Factors



ChiSq=2329.718, df=109; CFI=.960, RMSEA=.057 (90% CI = [.055, .059]).
Statistics are based on Yuan-Bentler correction with robust standard errors

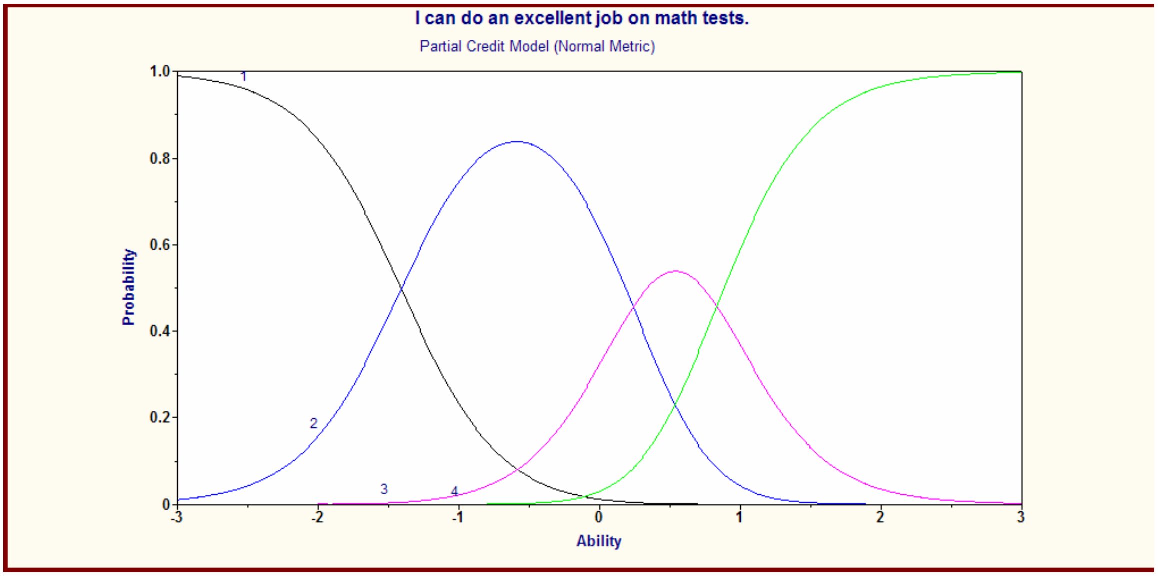
Appendix D3: Item Parameters for Revised Motivation Scales

	Discrimination	Location	Threshold between Options 1 and 2	Threshold between Options 2 and 3	Threshold between items 3 and 4
Math Efficacy					
BYS89A	1.7480	-0.1080	1.2750	-0.3470	-0.9280
BYS89B	1.8860	0.1490	1.1480	-0.1540	-0.9950
BYS89L	2.3250	0.0350	1.0630	-0.1250	-0.9370
BYS89R	2.3920	-0.1740	1.1540	-0.1690	-0.9850
BYS89U	2.3590	-0.2000	1.1430	-0.1560	-0.9870
Math Intrinsic Motivation					
BYS87C	1.6000	-0.4210	1.2790	0.0960	-1.3750
BYS87F	1.7900	-0.0520	1.2770	-0.0770	-1.1990
English Efficacy					
BYS89C	1.3880	-0.2050	1.4190	-0.1770	-1.2410
BYS89F	1.8330	-0.1920	1.2600	-0.1600	-1.1000
BYS89I	2.2450	-0.4660	1.3000	-0.1280	-1.1710
BYS89K	2.4550	-0.3940	1.2760	-0.1530	-1.1230
BYS89M	2.1410	-0.3550	1.3220	-0.1780	-1.1440
Reading Intrinsic Motivation					
BYS87B	2.2380	-0.0090	1.1740	0.0110	-1.1860
BYS87D	2.2830	-0.0400	1.1750	-0.0630	-1.1120

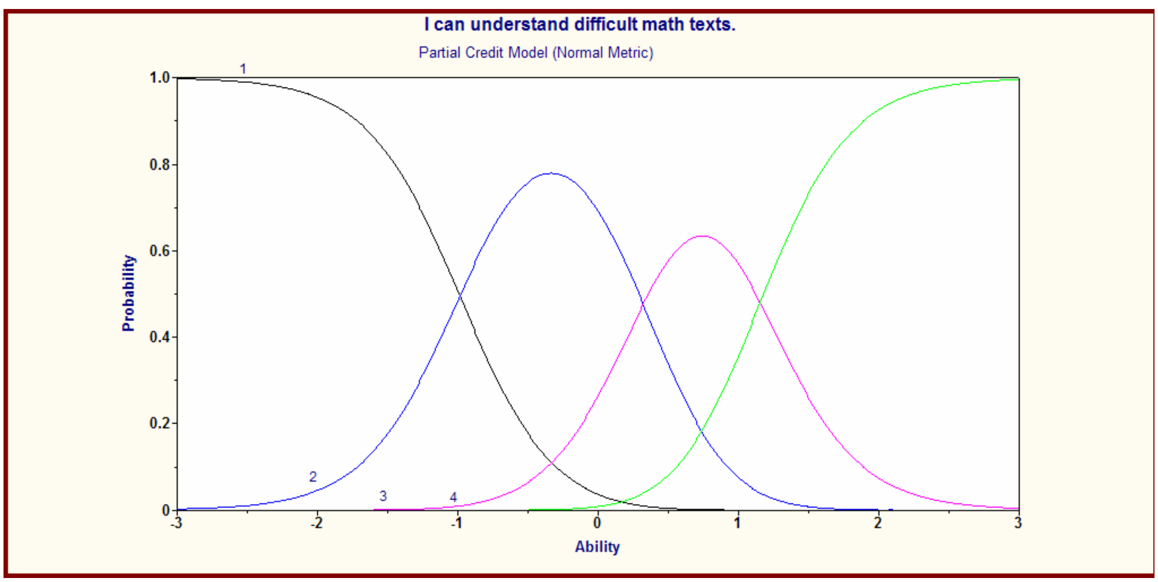
Appendix D4: Item Characteristic Curves

Math efficacy

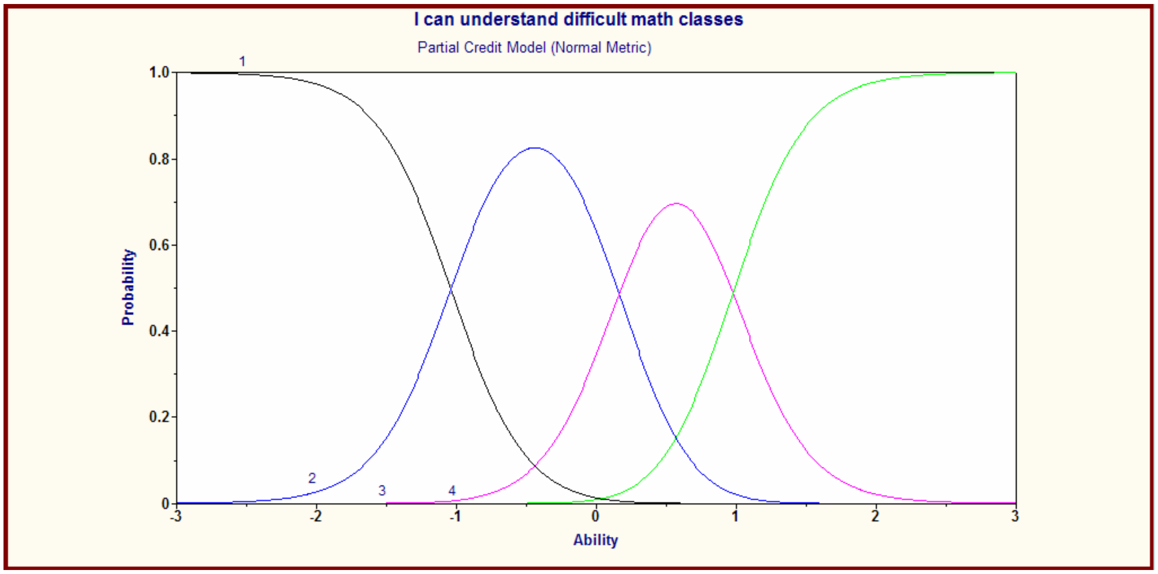
BYS89A



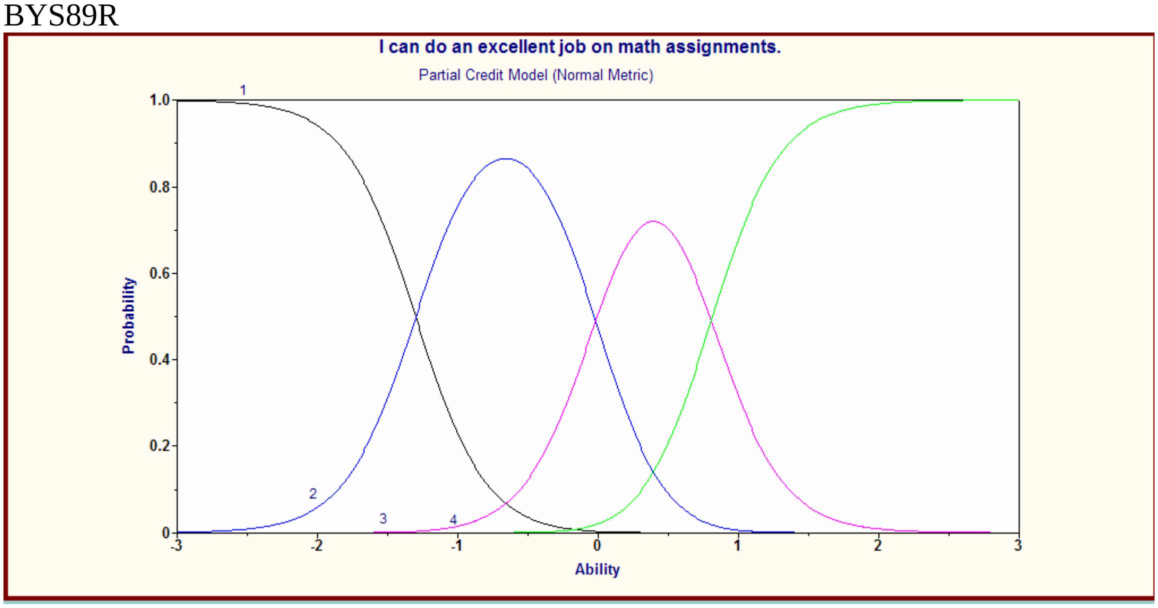
BYS89B



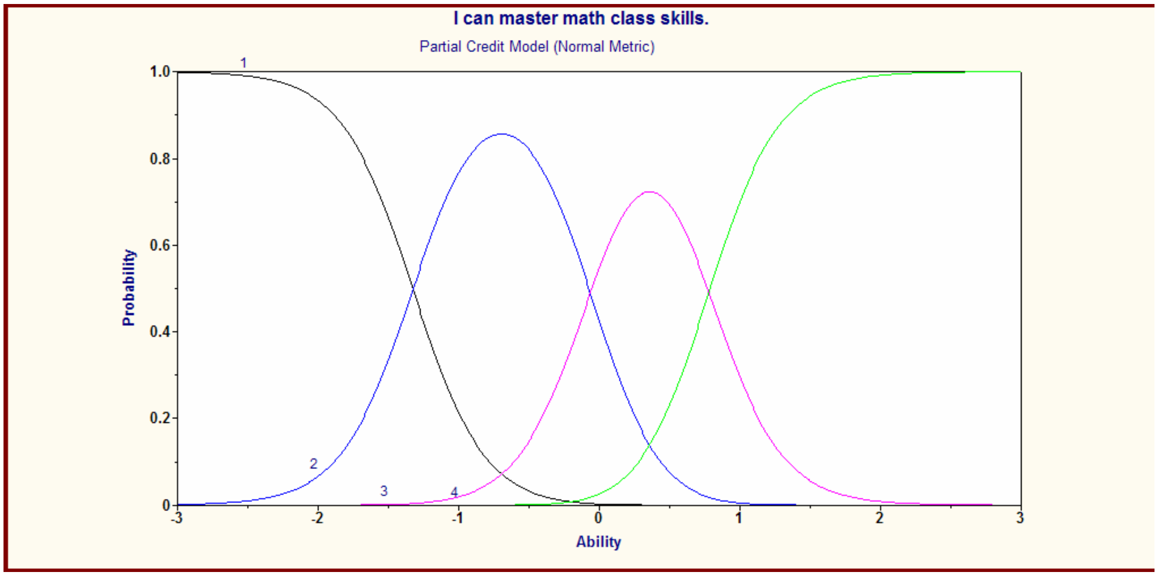
BYS89L



BYS89R



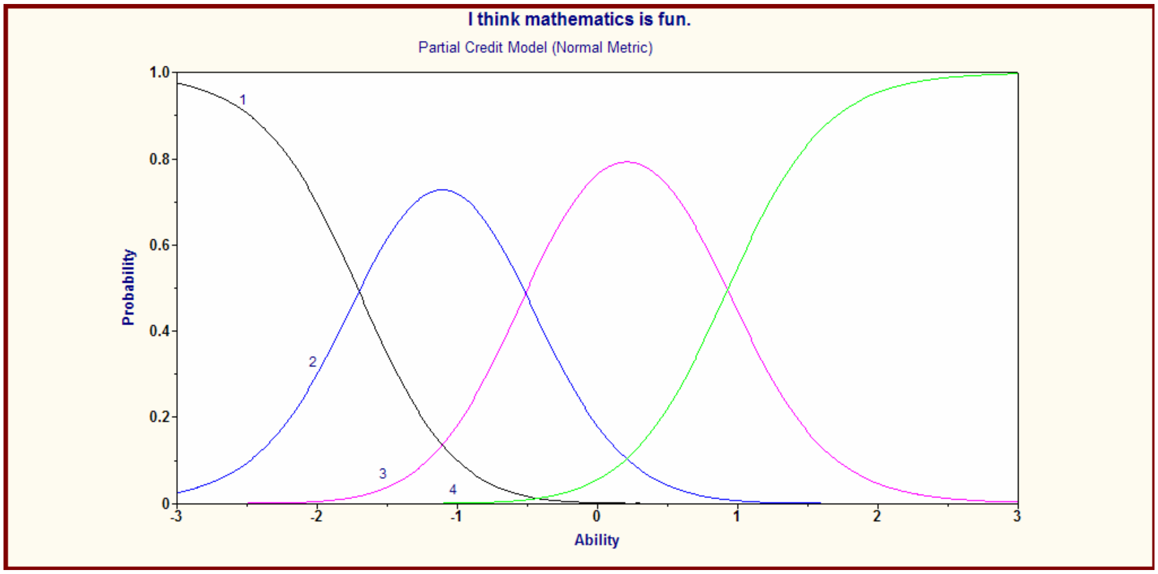
BYS89U



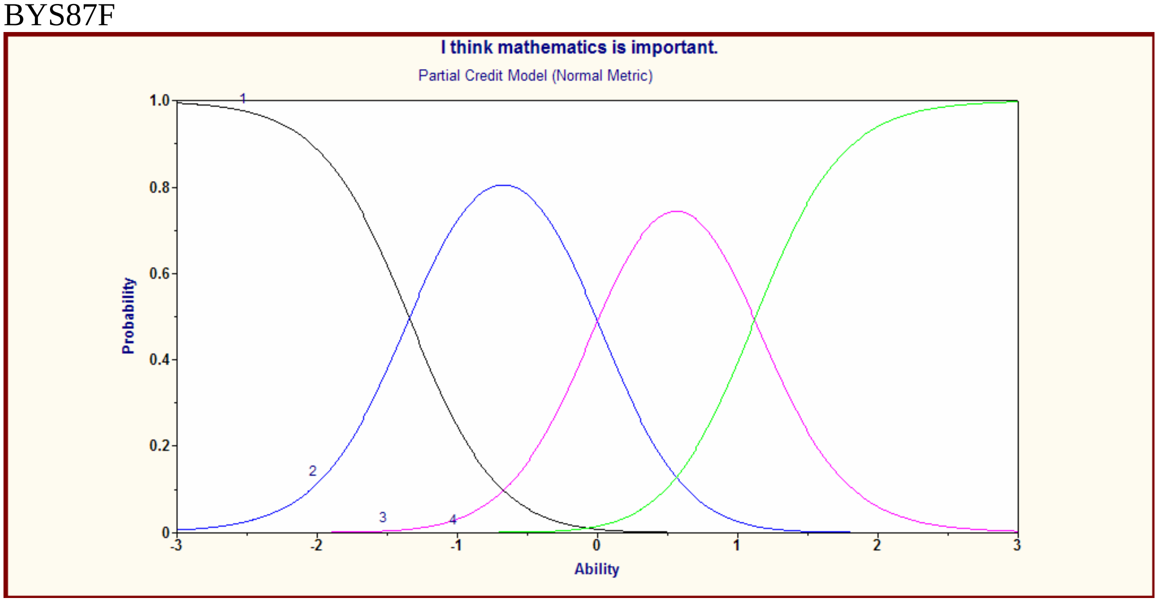
I can master math class skills.
Partial Credit Model (Normal Metric)
Probability
Ability
1.0
0.8
0.6
0.4
0.2
0
-3
-2
-1
0
1
2
3
1
2
3
4

Math intrinsic motivation items.

BYS87C

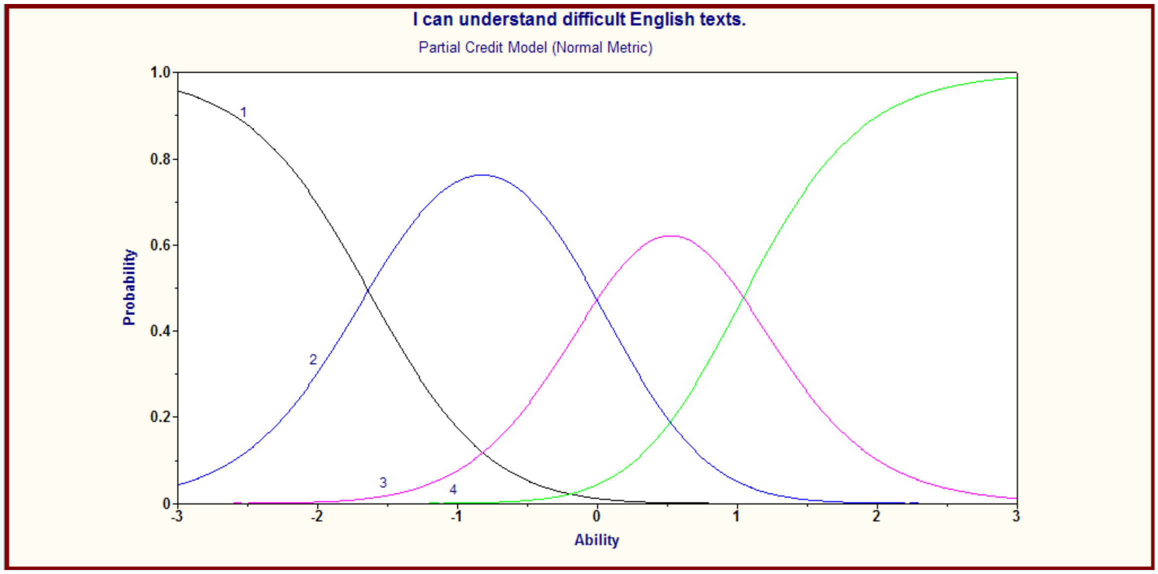


BYS87F

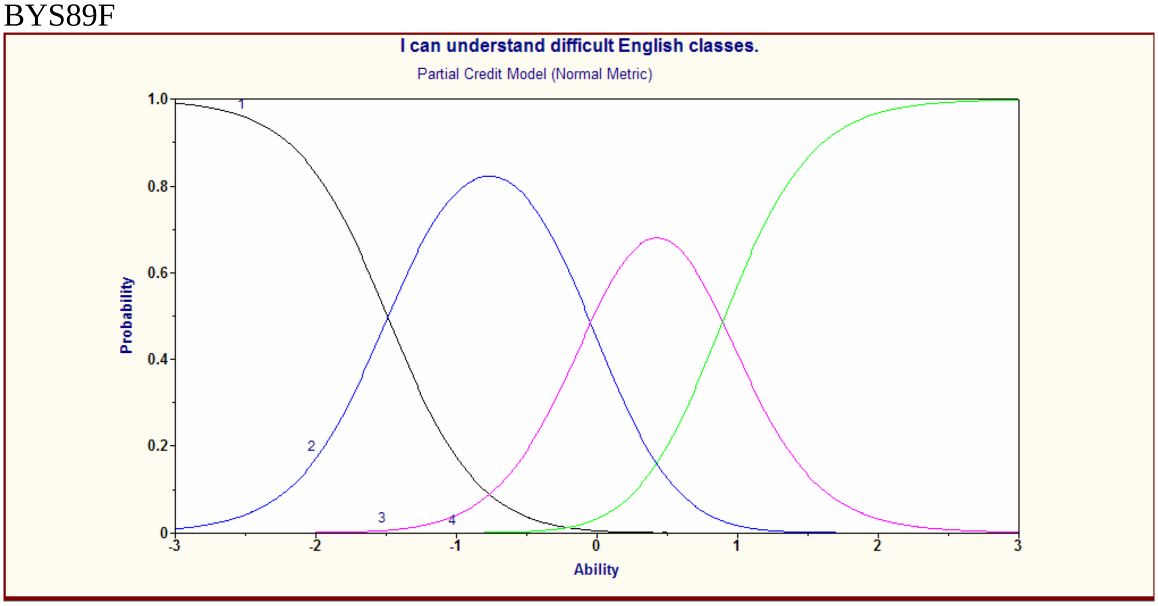


English self-efficacy items.

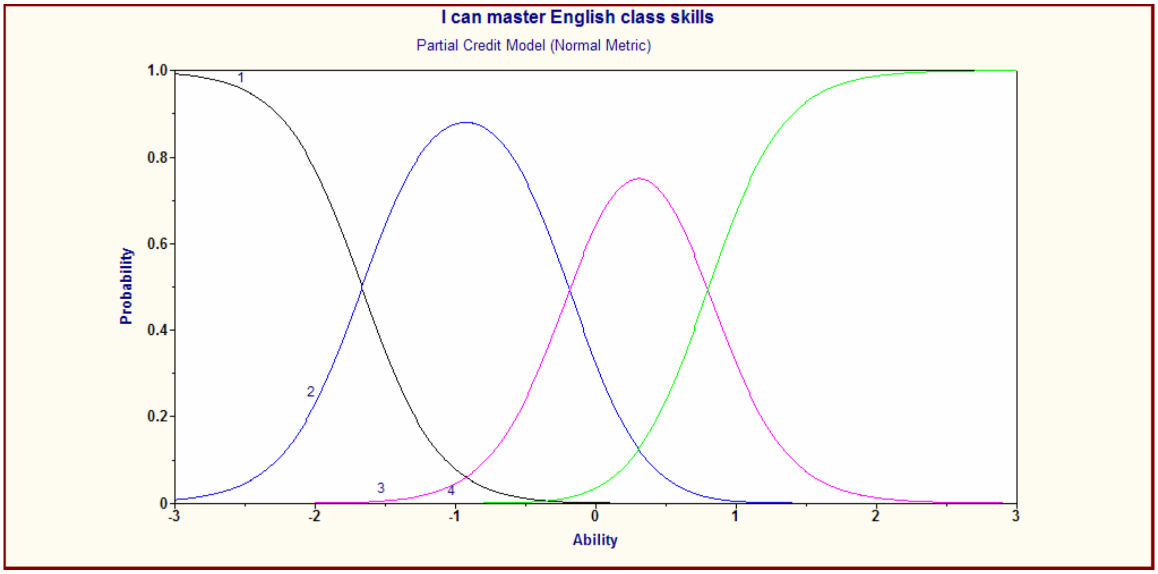
BYS89C



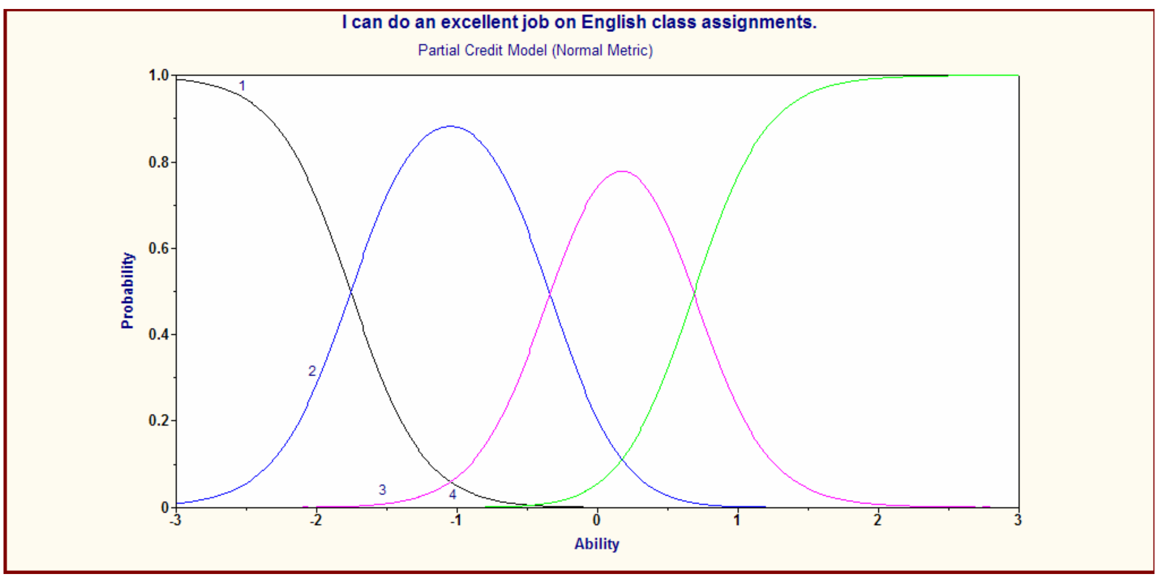
BYS89F



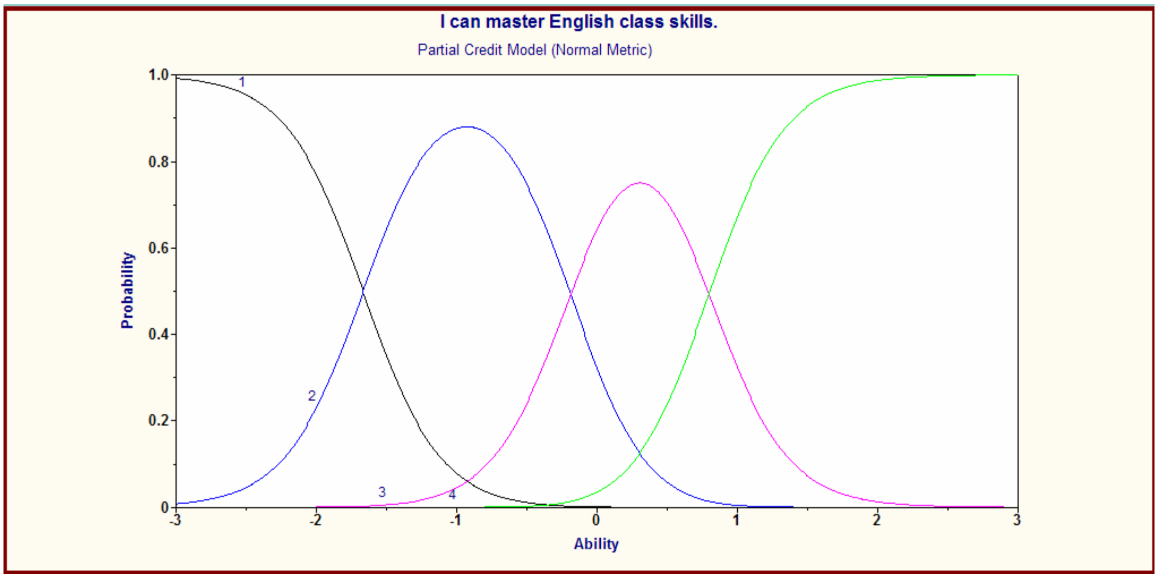
BYS89I



BYS89K

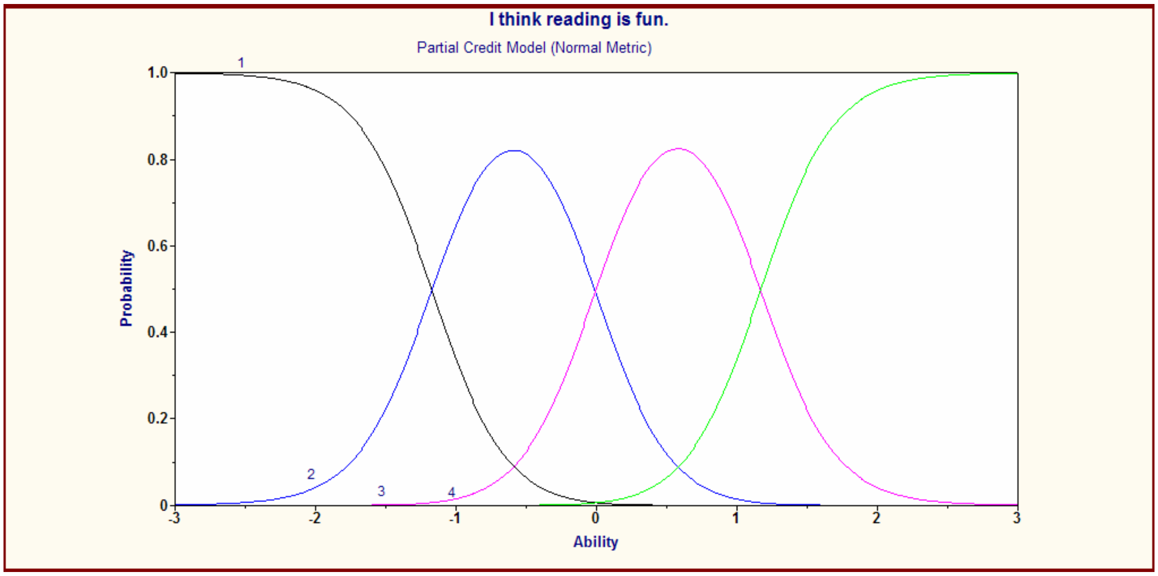


BYS89M

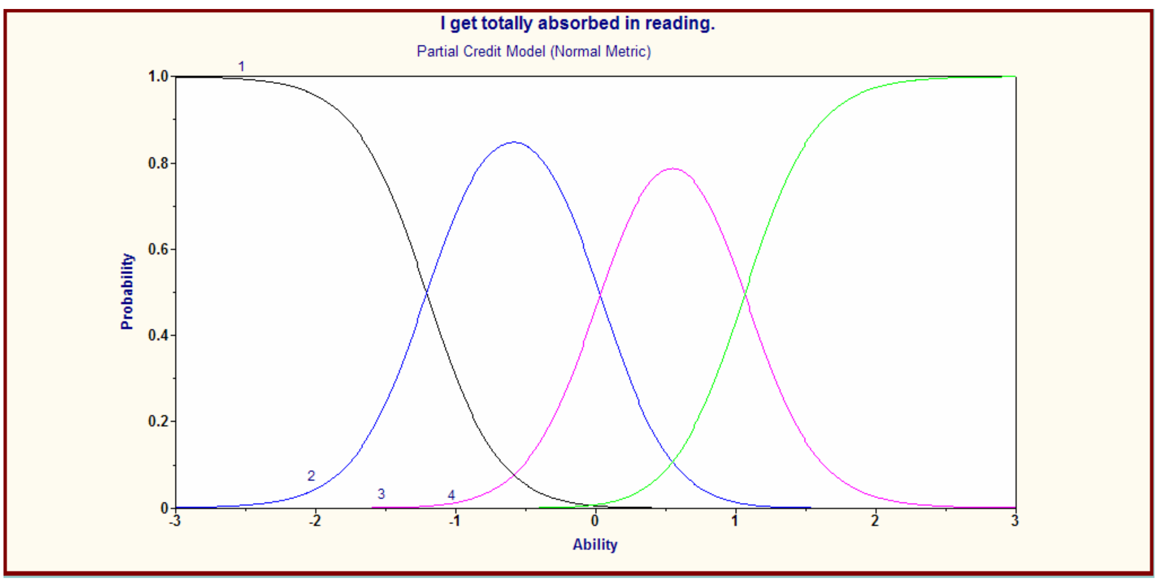

I can master English class skills.
Partial Credit Model (Normal Metric)
Probability
1.0
0.8
0.6
0.4
0.2
0
-3
-2
-1
0
1
2
3
Ability
1
2
3
4

Reading intrinsic motivation items.

BYS87B



BYS87D



Appendix E

Student-Level Correlation Tables

Appendix E1: English Achievement

	1	2	3	4	5	6	7	8	9	10
1. TEACHSTUD	1.00									
2. DISRUPT	0.14**	1.00								
3. ACADFR	0.27**	0.03**	1.00							
4. SOCFR	-0.02	-0.01	0.16**	1.00						
5. ENGSEFF	0.22**	0.00	0.25**	0.04**	1.00					
6. INTREAD	0.19**	-0.02	0.19**	-0.13**	0.34**	1.00				
7. BLACK	-0.03**	-0.02	0.04**	0.00	0.02*	0.02*	1.00			
8 HISPANIC	0.03**	-0.03**	-0.01	-0.02	-0.01	0.02	-0.17**	1.00		
9. ASIAN	0.02	-0.02	0.03**	-0.02	-0.01	0.01	-0.08**	-0.08**	1.00	
10. OTHER	-0.04	-0.01	-0.04**	-0.01	-0.02*	0.01	-0.09**	-0.10**	-0.04**	1.00
11. SES	0.04**	0.06**	0.12**	0.04**	0.14**	0.08**	-0.13**	-0.26**	0.00	-0.01
12. FEMALE	0.03**	-0.02	0.14**	-0.05**	0.04**	0.14**	0.00	0.02*	-0.01	-0.02

	11	12
1. TEACHSTUD		
2. DISRUPT		
3. ACADFR		
4. SOCFR		
5. ENGSEFF		
6. INTREAD		
7. BLACK		
8 HISPANIC		
9. ASIAN		
10. OTHER		
11. SES	1.00	
12. FEMALE	-0.03**	1.00

Appendix E2: Math Achievement

	1	2	3	4	5	6	7	8	9	10
1. TEACHSTUD	1.00									
2. DISRUPT	0.15**	1.00								
3. ACADFR	0.27**	0.04**	1.00							
4. SOCFR	-0.03**	0.01	0.15**	1.00						
5. ENGSEFF	0.22**	0.05**	0.19**	0.01	1.00					
6. INTREAD	0.24**	-0.03**	0.19**	-0.04**	0.51**	1.00				
7. BLACK	-0.03**	-0.02**	0.04**	-0.02	0.00	0.06**	1.00			
8 HISPANIC	0.02*	-0.04**	-0.01	-0.02*	-0.02*	0.05**	-0.16**	1.00		
9. ASIAN	0.01	-0.03**	0.03**	-0.02	0.04**	0.05**	-0.08**	-0.08**	1.00	
10. OTHER	-0.03**	-0.02*	-0.03**	0.00	-0.01	-0.01	-0.09**	-0.10**	-0.05**	1.00
11. SES	0.04**	0.06**	0.11**	0.04**	0.13**	0.01	-0.13**	-0.25**	0.00	-0.01
12. FEMALE	0.04**	-0.01	0.15**	-0.05**	-0.12**	-0.05**	0.00	0.01	0.00	0.00

	11	12
1. TEACHSTUD		
2. DISRUPT		
3. ACADFR		
4. SOCFR		
5. ENGSEFF		
6. INTREAD		
7. BLACK		
8 HISPANIC		
9. ASIAN		
10. OTHER		
11. SES	1.00	
12. FEMALE	-0.02*	1.00

Appendix F

School-Level Correlation Tables

	1	2	3	4	5	6	7	8	9	10
1. SCHSES	1.00									
2. SCHREAD	0.60**	1.00								
3. SCHMATH	0.66**	0.86**	1.00							
4. MNOREC	-0.14**	-0.23**	-0.24**	1.00						
5. MHIREC	0.19**	0.26**	0.21**	-0.59**	1.00					
6. ENOREC	-0.18**	-0.30**	-0.34**	0.27**	-0.17**	1.00				
7. EHIRED	0.23**	0.37**	0.30**	-0.23**	0.33**	-0.50**	1.00			
8. MINORDIC	-0.25**	-0.37**	-0.41**	-0.06	0.03	0.08*	-0.05	1.00		
9. SIZEDIC	0.07	0.00	0.07*	-0.13**	-0.03	-0.10**	-0.01	0.19**	1.00	
10. CATHOLIC	0.27**	0.21**	0.18**	-0.11**	0.15**	-0.08*	0.04	-0.06	0.04	1.00
11. PRIVATE	0.30**	0.16**	0.05	0.09*	0.06	0.20**	-0.01	-0.13**	-0.41**	-0.12**
12. URBAN	0.14**	-0.09*	-0.11**	-0.10**	0.09*	-0.02	0.02	0.20**	0.08*	0.17**
13. RURAL	-0.22**	0.06	0.06	0.15**	-0.15	-0.06	0.04	-0.24**	-0.29**	-0.16**

	11	12	13
1. SCHSES			
2. SCHREAD			
3. SCHMATH			
4. MNOREC			
5. MHIREC			
6. ENOREC			
7. EHIRED			
`8. MINORDIC			
9. SIZEDIC			
10. CATHOLIC			
11. PRIVATE	1.00		
12. URBAN	0.18**	1.00	
13. RURAL	-0.18**	-0.39**	1.00

Appendix G

Intermediary Tables for English Achievement Criteria Met

G1. Motivation

	Meet Teacher Criteria Only			*Meet Test Score Criteria Only*			*Meet Neither Criterion*		
	LO	SE	OR	LO	SE	OR	LO	SE	OR
Constant	**1.57**	0.13	5.06	**0.46**	0.16	1.59	**3.45**	0.14	31.61
Controls									
INAP	**-0.42***	0.19	0.66	**-0.38***	0.18	0.68	**-1.19****	0.18	0.30
INIB	**-0.26**	0.58	0.77	**0.05**	0.28	1.05	**0.20**	0.51	1.22
INHONOR	**-0.28**	0.19	0.75	**-1.21****	0.25	0.30	**-1.89****	0.20	0.15
Motivation									
ENGEFF	**-0.28***	0.12	0.76	**-0.08**	0.13	0.92	**-0.66****	0.12	0.52
READINT	**-0.63****	0.10	0.52	**-0.32****	0.12	0.72	**-0.89****	0.08	0.41
Background									
BLACK									
HISPANIC									
ASIAN									
OTHER									
SES									
GENDER									
Interaction									
BLACK X INTEREST									

G2. Background

	Meet Teacher Criteria Only			*Meet Test Score Criteria Only*			*Meet Neither Criterion*		
	LO	SE	OR	LO	SE	OR	LO	SE	OR
Constant	**1.91**	0.14	6.78	**0.59**	0.17	1.81	**3.83**	0.14	46.14
Controls									
INAP	**-0.36**	0.19	0.70	**-0.33**	0.19	0.72	**-1.08****	0.19	0.34
INIB	**-0.18**	0.45	0.84	**-0.01**	0.27	0.99	**0.18**	0.38	1.19
INHONOR	**-0.19**	0.20	0.83	**-1.19****	0.26	0.31	**-1.76****	0.21	0.17
Motivation									
ENGEFF	**-0.25***	0.13	0.78	**-0.05**	0.13	0.95	**-0.63****	0.12	0.53
READINT	**-0.65****	0.11	0.52	**-0.29***	0.13	0.75	**-0.88****	0.09	0.42
Background									
BLACK	**1.50****	0.35	4.49	**0.73**	0.44	2.08	**2.37****	0.33	10.65
HISPANIC	**1.09****	0.32	3.00	**0.05**	0.40	1.05	**1.47****	0.27	4.35
ASIAN	**0.33**	0.37	1.39	**-0.27**	0.35	0.76	**-0.13**	0.35	0.88
OTHER	**0.48**	0.39	1.61	**1.05***	0.45	2.86	**0.86****	0.31	2.36
SES	**-0.56****	0.13	0.57	**-0.23**	0.16	0.79	**-0.92****	0.10	0.40
GENDER	**0.36**	0.20	1.44	**-0.56***	0.22	0.57	**-0.08**	0.20	0.93
Interaction									
BLACK X INTEREST									

G3. Interaction Terms

	Meet Teacher Criteria Only			*Meet Test Score Criteria Only*			*Meet Neither Criterion*		
	LO	SE	OR	LO	SE	OR	LO	SE	OR
Constant	**2.04**	0.14	7.71	**0.71**	0.18	2.04	**3.96**	0.15	52.42
Controls									
INAP	**-0.35**	0.19	0.70	**-0.33**	0.19	0.72	**-1.08****	0.19	0.34
INIB	**-0.19**	0.46	0.83	**-0.01**	0.27	0.99	**0.16**	0.38	1.18
INHONOR	**-0.19**	0.20	0.83	**-1.19****	0.26	0.31	**-1.76****	0.21	0.17
Motivation									
ENGEFF	**-0.25***	0.13	0.78	**-0.05**	0.13	0.95	**-0.63****	0.12	0.53
READINT	**-0.64****	0.11	0.53	**-0.29***	0.13	0.75	**-0.86****	0.09	0.42
Background									
BLACK	**2.60****	0.52	13.41	**1.76****	0.62	5.82	**3.46****	0.51	31.74
HISPANIC	**1.09****	0.32	2.98	**0.04**	0.40	1.05	**1.47****	0.27	4.33
ASIAN	**0.33**	0.37	1.39	**-0.27**	0.35	0.76	**-0.13**	0.35	0.88
OTHER	**0.48**	0.39	1.61	**1.04***	0.46	2.85	**0.86**	0.31	2.36
SES	**-0.56****	0.12	0.57	**-0.23**	0.16	0.79	**-0.92****	0.10	0.40
GENDER	**0.36**	0.20	1.44	**-0.56***	0.22	0.57	**-0.08**	0.20	0.92
Interaction									
BLACK X INTEREST	**-1.15***	0.44	0.32	**-0.97**	0.63	0.38	**-1.16****	0.43	0.31

Appendix H

Intermediary Models for High Mathematics Achievement Criteria Met

H1. Context

	Meet Teacher Criteria Only			*Meet Test Score Criteria Only*			*Meet Both Criterion*		
	LO	SE	OR	LO	SE	OR	LO	SE	OR
Constant	**1.01**	0.12	2.44	**0.20**	0.14	1.21	**3.31**	0.13	27.48
Controls									
INAP	**-0.59****	0.18	0.59	**-0.65****	0.25	0.52	**-1.27**	0.19	0.28
INIB	**-0.72**	0.50	1.96	**0.99**	0.51	2.20	**0.83***	0.18	2.28
INHONOR	**-0.39***	0.20	0.68	**-0.52***	0.20	0.62	**-1.89**	0.36	0.15
Context									
TEACHSTUD	**-0.24***	0.10	0.76	**-0.19**	0.12	0.79	**-0.39****	0.10	0.68
ACADFR	**0.12**	0.12	1.10	**-0.31***	0.13	0.70	**-0.08**	0.09	0.92
SOCFR	**0.18**	0.09	1.20	**0.14**	0.10	1.19	**0.24***	0.09	1.27
Motivation									
MATHEFF									
MATHINT									
Background									
BLACK									
HISPANIC									
ASIAN									
OTHER									
SES									
GENDER									
Interaction									
GENDER X ACADFR									
GENDER X INTEREST									

H2. Motivation

	Meet Teacher Criteria Only			*Meet Test Score Criteria Only*			*Meet Neither Criterion*		
	LO	SE	OR	LO	SE	OR	LO	SE	OR
	1.23	0.14	3.44	**0.40**	0.15	1.49	**3.56**	0.14	35.23
Constant									
Controls									
INAP	**-0.53****	0.18	0.59	**-0.62****	0.24	0.54	**-1.13****	0.19	0.32
INIB	**0.79**	0.53	2.21	**1.04***	0.59	2.84	**0.96***	0.42	2.62
INHONOR	**-0.35**	0.20	0.71	**-0.46****	0.24	0.63	**-1.73****	0.18	0.18
Context									
TEACHSTUD	**-0.20***	0.10	0.82	**-0.12**	0.12	0.86	**-0.24***	0.10	0.79
ACADFR	**0.18**	0.12	1.20	**-0.24***	0.12	0.76	**0.08**	0.09	1.08
SOCFR	**0.20***	0.10	1.23	**0.15**	0.10	1.21	**0.27****	0.09	1.32
Motivation									
MATHEFF	**-0.40****	0.10	0.67	**-0.28**	0.10	0.76	**-1.07****	0.10	0.34
MATHINT	**-0.10**	0.08	0.90	**-0.28****	0.10	0.76	**-0.19***	0.08	0.82
Background									
BLACK									
HISPANIC									
ASIAN									
OTHER									
SES									
GENDER									

H3. Background

	Meet Teacher Criteria Only			*Meet Test Score Criteria Only*			*Meet Neither Criterion*		
	LO	SE	OR	LO	SE	OR	LO	SE	OR
Constant	**1.69**	0.18	5.41	**0.46**	0.18	1.59	**4.01**	0.16	54.90
Controls									
INAP	**-0.47***	0.17	0.62	**-0.61***	0.23	0.54	**-1.03****	0.19	0.36
INIB	**0.79**	0.50	2.22	**1.02**	0.49	2.77	**0.95***	0.40	2.58
INHONOR	**-0.28**	0.21	0.76	**-0.41**	0.22	0.66	**-1.57****	0.19	0.21
Context									
TEACHSTUD	**-0.21**	0.11	0.81	**-0.14**	0.13	0.87	**-0.25***	0.11	0.78
ACADFR	**0.14**	0.14	1.15	**-0.17**	0.13	0.84	**0.10**	0.10	1.11
SOCFR	**0.24***	0.09	1.27	**0.14**	0.10	1.15	**0.30****	0.09	1.34
Motivation									
MATHEFF	**-0.30****	0.11	0.74	**-0.30***	0.15	0.74	**-0.98****	0.10	0.37
MATHINT	**-0.18***	0.09	0.83	**-0.30****	0.10	0.74	**-0.31****	0.08	0.73
Background									
BLACK	**3.13****	0.49	22.96	**0.97**	0.57	2.64	**3.48****	0.50	32.67
HISPANIC	**0.93***	0.53	2.54	**0.19**	0.43	1.21	**1.17****	0.36	3.23
ASIAN	**-0.25**	0.25	0.78	**-0.51***	0.22	0.60	**-1.05**	0.24	0.35
OTHER	**0.52**	0.44	1.68	**-0.17**	0.55	0.84	**0.72***	0.36	2.05
SES	**-0.59****	0.16	0.55	**-0.04**	0.13	0.96	**-0.95****	0.11	0.39
GENDER	**0.69****	0.25	2.00	**-0.64***	0.23	0.53	**0.23**	0.20	1.26
Interaction									
GENDER X ACADFR									
GENDER X MATHINT									

H4. Interactions

	Meet Teacher Criteria Only			*Meet Test Score Criteria Only*			*Meet Neither Criterion*		
	LO	SE	OR	LO	SE	OR	LO	SE	OR
Constant	**1.68**	0.17	5.40	**0.40**	0.18	1.49	**4.00**	0.16	54.85
Controls									
INAP	**-0.47***	0.17	0.62	**-0.62***	0.22	0.54	**-1.04****	0.18	0.35
INIB	**0.77**	0.48	2.16	**0.99**	0.47	2.70	**0.92***	0.38	2.50
INHONOR	**-0.26**	0.21	0.77	**-0.39**	0.22	0.67	**-1.56****	0.19	0.21
Context									
TEACHSTUD	**-0.20**	0.11	0.82	**-0.12**	0.12	0.88	**-0.24***	0.11	0.79
ACADFR	**-0.17**	0.13	0.84	**-0.50****	0.13	0.61	**-0.07**	0.12	0.94
SOCFR	**0.28****	0.09	1.31	**0.19***	0.09	1.21	**0.31****	0.09	1.37
Motivation									
MATHEFF	**-0.30****	0.11	0.74	**-0.32***	0.14	0.72	**-0.98****	0.10	0.37
MATHINT	**-0.20**	0.13	0.82	**-0.42****	0.13	0.66	**-0.31***	0.12	0.73
Background									
BLACK	**3.14****	0.49	23.05	**0.95**	0.55	2.60	**3.49****	0.49	32.64
HISPANIC	**0.95***	0.43	2.57	**0.22**	0.43	1.24	**1.19****	0.36	3.27
ASIAN	**-0.26**	0.25	0.77	**-0.53***	0.22	0.59	**-1.06****	0.24	0.34
OTHER	**0.55**	0.43	1.73	**-0.12**	0.54	0.89	**0.74***	0.36	2.10
SES	**-0.59****	0.16	0.55	**-0.04**	0.13	0.97	**-0.95**	0.11	0.39
GENDER	**0.55***	0.26	1.74	**-0.91****	0.24	0.40	**0.12****	0.20	1.12
Interaction									
GENDER X ACADFR	**0.59***	0.26	1.81	**0.93****	0.21	2.54	**0.35***	0.17	1.43
GENDER X MATHINT	**0.26**	0.16	1.07	**0.44***	0.19	1.56	**0.02**	0.14	1.02

GLOSSARY OF TERMS

Terms defined elsewhere in this glossary are indicated in **bold**

Ability: The set of cognitive skills that individuals have that make them capable of a certain level of achievement. High ability is often referred to as **giftedness.**

Achievement: Demonstrated competence in a given area. Used here in contrast to **ability**.

Achievement Identification Criteria: Refers to the methods being used to identify **high-achieving** students. This study focuses on two achievement identification criteria: The **teacher nomination criterion** and the **test-score criterion**.

Adolescence: A period of development between childhood and adulthood. Typically referred to as occurring between the ages of 13-19, this study focuses on what can be referred to as the "middle adolescent" period around ages 15-16.

Giftedness: A general term referring to potential for exceptional achievement in the future. This potential often stems from **ability,** although other factors (e.g., **motivation**) may also be taken into account. Giftedness is often considered interchangeably with **talent**, although some theorists have attempted to distinguish between these two concepts. Current demonstrations of **high achievement** are often taken as evidence of giftedness. Note that the term "giftedness" (and the related term "talent") is used in this study when describing other research studies or when commenting on the field of study in general. For this study, the term "high achievement" more precisely relates to the outcome being studied.

High Achievement: The recognition or identification of exceptional performance in a given area. This is an important component of **giftedness.** This recognition may occur by many means, but this current study focuses on the role of **test scores** and **teacher nominations** in determining what high achievement is.

Individual Background: A general term referring to students' racial or ethnic background, home socioeconomic status, and gender.

Individual Context Perceptions: Students' self-reports of their attitudes toward their relationships with other people in the school. This study primarily focuses on students' individual perceptions of friendship contexts. To a lesser extent, it also focuses on students' individual perceptions of peer contexts and the context of teacher-student relationships.

Intrinsic Motivation: The reasons that students have to be **motivated** to achieve in their own, without motivation from outside sources. This study considers intrinsic motivation as a general term covering their interest in these subjects and the importance that they place on them. Other conceptualizations of intrinsic motivation include a discussion of psychological states of intrinsic motivation (e.g., flow); this is beyond the scope of this study.

Motivation: Students' attitudes toward whether they care to perform successfully, whether they think that they will perform successfully, and why their performance will (or will not) be successful (Eccles et al., 1998). This study focuses on the constructs of **intrinsic motivation** and **self-efficacy.**

School Context: Social characteristics of a student's educational environment. In this study, school context is considered at two levels, **individual context perceptions,** and school-level characteristics of structure, location, and composition

Self-Efficacy: Students' perceptions of their capability for performance within specific settings (see Bandura, 1997). Considered in this study as a type of **motivation**.

Talent: Often used interchangeably with **giftedness.** When certain theorists (notably Gagné) distinguish between giftedness and talent, talent is more closely associated with demonstrated **high achievement** than it is with **ability**.

Teacher Criterion: The use of **teacher nominations** in this study as one **high achievement identification criterion.** Compared and contrasted to the students identified as high-achieving using a **test-score criterion.**

Teacher Nominations: The use of judgments by teachers in order to identify students as **gifted,** or more specific to the current study, as **high-achieving**. In this study, teachers report on whether they have nominated students for advanced curricular programs (such as AP or IB) or for academic honors, both of which are thought to indicate that teachers view these students as high-achieving.

Test Scores: Student's performance on a written assessment of **achievement.** In this study, this is sometimes also referred to as test performance.

Test-Score Criterion: Using students' **test scores** as an indication of whether they are **high-achieving** in a given area. In this study, the test-score criterion for high achievement is performance in top decile on the ELS:2002 test of achievement in a given subject.

REFERENCES

Ablard, K. E., & Mills, C. J. (1996). Evaluating abridged versions of the Raven's Advanced Progressive Matrices for identifying students with academic talent. *Journal of Psychoeducational Assessment, 14*(1), 54-64.

Adams, R., & Wu, M. (2002). *PISA 2000 technical report.* Paris: Organisation for Economic Co-operation and Development.

Ambrose, D. (2002). Socioeconomic stratification and its influences on talent development: Some interdisciplinary perspectives. *Gifted Child Quarterly, 46*(3), 170-180.

American Institutes for Research (2006). *AM statistical software user's manual.* Washington, DC: Author.

Assouline, S. G., & Colangelo, N. (2006). Social-emotional development of gifted adolescents. In F. A. Dixon & S. M. Moon (Eds.), *The handbook of secondary gifted education.* (pp. 65-85). Waco, TX: Prufrock Press.

Baer, J., & Kaufman, J. C. (2004). Considering the DMGT: Something old, something new. *High Ability Studies, 15*(2), 149-150.

Baker, B. D. (2001). Gifted children in the current policy and fiscal context of public education: A national snapshot and state-level equity analysis of Texas. *Educational Evaluation and Policy Analysis, 23*(3), 229-250.

Baldwin, A. Y. (2002). Culturally diverse students who are gifted. *Exceptionality*, *10*(2), 139-147.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Prentice-Hall, Inc.

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology, 52*, 1-26.

Barab, S. A., & Plucker, J. A. (2002). Smart people or smart contexts? Cognition, ability, and talent development in an age of situated approaches to knowing and learning. *Educational Psychologist, 37*(3), 165-182.

Barber, C. (2004a). A cross-national analysis of the relation of educational trust to expected educational attainment. In: C. Papanastasiou (Series Ed.), *Proceedings of the IRC-2004: Vol. 4. CivEd-SITES* (pp. 87-104). Nicosia, Cyprus: University of Cyprus Press.

Barber, C. (2005). Gifted adolescents' peer relationships in the school context: a review of the literature. Unpublished manuscript.

Barber, C. (2006, April). *An analysis of high-ability high-school students not recommended for advanced programs*. Paper presented at the American Education Research Association annual conference, San Francisco, CA.

Beckley, D. (1998). Gifted and learning disabled: twice exceptional students. *The National Center for Research on Giftedness and Talent Newsletter*, (Spring), 6-10.

Bentler, P. M., & Wu, E. J. C. (1995). *EQS for Windows user's guide*. Encino, CA: EQS

Bleske-Rechek, A., Lubinski, D., & Benbow, C. P. (2004). Meeting the educational needs of special populations: Advanced placement's role in developing exceptional human capital. *Psychological Science*, *15*(4), 217-224.

Borland, J. H. (2005). Gifted education without gifted children: The case for no conception of giftedness. In R. J. Sternberg & J. E. Davidson (Eds.), *Conceptions of giftedness (2nd ed.).* (pp. 1-19). New York: Cambridge University Press.

Borland, J. H., & Wright, L. (2004). Identifying young, potentially gifted, economically disadvantaged students. In J. S. Renzulli (Ed.), *Identification of students for gifted and talented programs.* (pp. 25-41). New York: Corwin Press.

Bourdieu, P., Passeron, J.-C., & Nice, R. (1990). *Reproduction in education, society and culture* (2nd ed.). Thousand Oaks, CA: Sage Publications, Inc.

Brody, L. E., & Benbow, C. P. (1986), Social and emotional adjustment of adolescents extremely talented in verbal or mathematical reasoning. *Journal of Youth and Adolescence, 15,* 1-18.

Bronfenbrenner, U. (1979). *The ecology of human development*. Cambridge: Harvard University Press.

Brown, B. B., Mory, M. S., & Kinney, D. (1994). Casting adolescent crowds in a relational perspective: Caricature, channel, and context. In R. Montemayor, G. R. Adams & T. P. Gullotta (Eds.), *Personal relationships during adolescence.* (pp. 123-167). Thousand Oaks, CA: Sage Publications, Inc.

Brown, E., Avery, L., VanTassel-Baska, J., Worley, B., & Stambaugh, T. (2006). A five-state analysis of gifted education policies. Ohio policy study results. *Roeper Review, 29*(1), 11-23.

Brown, S. W., Renzulli, J. S., Gubbins, E. J., Siegle, D., Zhang, W., & Chen, C.-H. (2005). Assumptions underlying the identification of gifted and talented students. *Gifted Child Quarterly, 49*(1), 68-79.

Bryk, A. S., Lee, V. E., & Holland, P. B. (1993). *Catholic schools and the common good*. Cambridge, MA: Harvard University Press.

Burkam, D. T., & Lee, V. E. (2003). *Mathematics, foreign language, and science coursetaking and the NELS:88 transcript data.* (NCES Working Paper 2003-01). Washington, DC: National Center for Education Statistics.

Chan, D. W. (2000). Exploring identification procedures of gifted students by teacher ratings: Parent ratings and student self-reports in Hong Kong. *High Ability Studies, 11*(1), 69-82.

Chan, L. K. S. (1996). Motivational orientations and metacognitive abilities of intellectually gifted students. *Gifted Child Quarterly, 40*(4), 184-193.

Clinkenbeard, P. R. (1996). Research on motivation and the gifted: Implications for identification, programming and evaluation. *Gifted Child Quarterly, 40*(4), 220-221.

Coleman, L. J., & Cross, T. L. (1988). Is being gifted a social handicap? *Journal for the Education of the Gifted, 11*(4), 41-56.

Corno, L., & Randi, J. (1999). A design theory for classroom instruction in self-regulated learning? In C. M. Reigeluth (Ed.), *Instructional-design theories and models: A new paradigm of instructional theory, Vol. II.* (pp. 293-318). Mahwah, NJ: Lawrence Erlbaum Associates Publishers.

Crocker, L. & Algina, J. (1986). Introduction to classical and modern test theory. Fort Worth: Holt, Rinehart and Winston.

Cross, T. L., & Burney, V. H. (2005). High ability, rural, and poor: Lessons from Project Aspire and implications for school counselors. *Journal of Secondary Gifted Education, 16*(4), 148-156.

Cross, T. L., Coleman, L. J., & Stewart, R. A. (1993). The social cognition of gifted adolescents: An exploration of the stigma of giftedness paradigm. *Roeper Review, 16*(1), 37-40.

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience.* New York: Harper and Row.

Curry, W., MacDonald, W., & Morgan, R. (1999). The Advanced Placement Program: Access to excellence. *Journal of Secondary Gifted Education, 11*(1), 17-23.

Dahme, G. (1996, September). *Teachers' conceptions of gifted students in Indonesia (Java), Germany, and the USA.* Paper presented at the 5th conference of the European Council for High Ability, Vienna, Austria.

Dai, D. Y. (2000). To be or not to be (challenged), that is the question: Task and ego orientations among high-ability, high-achieving adolescents. *Journal of Experimental Education, 68*(4), 311-330.

Dai, D. Y. (2001).A comparison of gender differences in academic self-concept and motivation between high-ability and average Chinese adolescents. *Journal of Secondary Gifted Education*, *13*(1), 22-33.

Dai, D. Y. (2002). Are gifted girls motivationally disadvantaged? Review, reflection, and redirection. *Journal for the Education of the Gifted, 25*(4), 315-358.

Dai, D. Y. (2004). Why the transformation metaphor doesn't work well: A comment on Gagné's DMGT model. *High Ability Studies*, *15*(2), 159-161.

Dai, D. Y., Moon, S. M., & Feldhusen, J. F. (1998). Achievement motivation and gifted students: A social cognitive perspective. *Educational Psychologist, 33*(2-3), 45-63.

Department of Education and Training, Government of Western Australia (2006). The education of gifted and talented students in Western Australia: Characteristics of gifted and talented students. Retrieved 31 October 2006 from http://www.det.wa.edu.au/education/gifttal/identification/idenchar.htm.

Dixon, F. A., & Moon, S. M. (2006). *The handbook of secondary gifted education*. Waco, TX: Prufrock Press.

Donato, R., Menchacha, M., & Valencia, R. R. (1991). Segregation, desegregation, and integration of Chicano students: Problems and prospects. In R. R. Valencia (Ed.), *Chicano school failure, and success: Research and policy agendas for the 1990s*. (The Stanford Series on Education and Public Policy pp. 27-63.) Basingstoke, England: Falmer Press.

Dornbusch, S. M., Glasgow, K. L., & Lin, I. C. (1996). The social structure of schooling. *Annual Review of Psychology, 47*, 401-429.

duToit, M. (2003). *IRT from SSI: BILOG-MG, MULTILOG, PARSCALE, TESTFACT.* Lincolnwood, IL: Scientific Software International.

Dweck, C. S., Chin, C.-Y., & Hong, Y.-Y. (1995). Implicit theories and their role in judgments and reactions: a world from two perspectives. *Psychological Inquiry, 6,* 267-285.

Eccles, J. S., & Harold, R. D. (1993). Parents' school involvement during the early adolescent years. *Teachers College Record*, *94*(3), 568-587.

Eccles, J. S., & Roeser, R. W. (2005). School and community influences on human development. In M. H. Bornstein & M. E. Lamb (Eds.), *Developmental science:*

An advanced textbook (5th ed.) (pp. 513-555). Mahwah, NJ: Lawrence Erlbaum Associates Publishers.

Eccles, J. S., Wigfield, A., & Schiefele, U. (1998). Motivation to succeed. In W. Damon (Series Ed.) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology* (5th ed., Vol. 3). New York: Wiley.

Elhoweris, H., Mutua, K., Alsheikh, N., & Holloway, P. (2005). Effect of children's ethnicity on teachers' referral and recommendation decisions in gifted and talented programs. *Remedial and Special Education, 26*(1), 25-31.

Erikson, E. H. (1968). *Identity: youth and crisis.* London: Faber and Faber.

Feldhusen, J. F. (2004). Transforming gifts into talent: The DMGT theoretical model--A response. *High Ability Studies, 15*(2), 151-152.

Feldhusen, J. F. (2005). Giftedness, talent, expertise, and creative achievement. In R. J. Sternberg & J. E. Davidson (Eds.), *Conceptions of giftedness (2nd ed.).* (pp. 64-79). New York: Cambridge University Press.

Feldhusen, J. F., & Dai, D. Y. (1997). Gifted students' attitudes and perceptions of the gifted label, special programs, and peer relations. *Journal of Secondary Gifted Education, 9*(1), 15-20.

Feldhusen, J. F., & Jarwan, F. A. (2000). Identification of gifted and talented youth for educational programs. In K. A. Heller, F. J. Monks, R. J. Sternberg, & R. F. Subotnik (Eds.), *The international handbook of giftedness and talent* (2nd Edition, pp. 271-280). Oxford: Pergamon.

Fernandez, A. T., Gay, L. R., Lucky, L. F., & Gavilan, M. R. (1998). Teacher perceptions of gifted Hispanic limited English proficient students. *Journal for the Education of the Gifted*, *21*(3), 335-351.

Fox, L. H., Engle, J. L., & Paek, P. (2001). An exploratory study of social factors and mathematics achievement among high-scoring students: cross-cultural perspectives from TIMSS. *Gifted and Talented International, 16,* 7-15.

Freeman, J. (2004). Cultural influences on gifted gender achievement. *High Ability Studies, 15*(1), 7-23.

Freeman, J. (2005). Permission to be gifted: how conceptions of giftedness can change lives. In R. J. Sternberg & J. E. Davidson (Eds.), *Conceptions of giftedness (2nd ed.).* (pp. 80-97): Cambridge: University Press.

Friedkin, N. E., & Thomas, S. L. (1997). Social positions in schooling. *Sociology of Education, 70*(4), 239-255.

Gagné, F. (1995). From giftedness to talent: A developmental model and its impact on the language of the field. *Roeper Review, 18*(2), 103-111.

Gagné, F. (1998). A proposal for subcategories within gifted or talented populations. *Gifted Child Quarterly, 42*(2), 87-95.

Gagné, F. (2004). Transforming gifts into talents: The DMGT as a developmental theory. *High Ability Studies, 15*(2), 119-147.

Gagné, F. (2005). From gifts to talents: The DMGT as a developmental model. In R. J. Sternberg & J. E. Davidson (Eds.), *Conceptions of giftedness* (2nd ed., pp. 98-119). New York, NY: Cambridge University Press.

Gagné, F., & Schader, R. M. (2006). Chance and talent development. *Roeper Review, 28*(2), 88-90.

Gagné, F., & St. Pere, F. (2002). When IQ is controlled, does motivation still predict achievement? *Intelligence, 30*(1), 71-100.

Greene, J., & Homana, G. (2003, November). Student government and voluntary organization participation: a cross-national study in Australia, Hong Kong, and the United States. Paper presented at the Conference on Civic Education Research, New Orleans, Louisiana.

Goffman, E. (1963). *Stigma: notes on the management of spoiled identity*. Englewood Cliffs, NJ: Prentice-Hall.

Gottfried, A. E., Fleming, J. S., & Gottfried, A. W. (2001). Continuity of academic intrinsic motivation from childhood through late adolescence: A longitudinal study. *Journal of Educational Psychology, 93*(1), 3-13.

Gottfried, A. E., & Gottfried, A. W. (1996). A longitudinal study of academic intrinsic motivation in intellectually gifted children: Childhood through early adolescence. *Gifted Child Quarterly, 40*(4), 179-183.

Gottfried, A. E., & Gottfried, A. W. (2004). Toward the development of a conceptualization of gifted Motivation. *Gifted Child Quarterly, 48*(2), 121-132.

Grantham, T. C. (2004). Rocky Jones: Case study of a high-achieving Black male's motivation to participate in gifted classes. *Roeper Review, 26*(4), 208-215.

Grantham, T. C., & Ford, D. Y. (1998). A case study of the social needs of Danisha: An underachieving gifted African-American female. *Roeper Review, 21*(2), 96-101.

Grantham, T. C., & Ford, D. Y. (2003). Beyond self-concept and self-esteem: racial identity and gifted African American students. *High School Journal*, 18-29.

Grossman, P. L., & Stodolsky, S. S. (1995). Content as context: the role of school subjects in secondary school teaching. *Educational Researcher*, *24*(8), 5-23.

Guenther, Z. C. (2004). Transforming gifts into talents: The DMGT as a developmental theory--A response. *High Ability Studies*, *15*(2), 165-166.

Hallinan, M. T. (1994). School differences in tracking effects on achievement. *Social Forces*, *72*(3), 799-820.

Hart, D., Atkins, R., & Ford, D. (1998). Urban America as a context for the development of moral identity in adolescence. *Journal of Social Issues, 54*(3), 513-530.

Hartup, W. W., & Stevens, N. (1999). Friendships and adaptation across the life span. *Current Directions in Psychological Science, 8*(3), 76-79.

Hébert, T. P. (1998). Gifted black males in an urban high school: factors that influence achievement and underachievement. *Journal for the Education of the Gifted, 21*(4), 385-414.

Hébert, T. P. (2001). "If I had a new notebook, I know things would change:" bright underachieving young men in urban classrooms. *Gifted Child Quarterly, 45*(3), 174-194.

Hébert, T. P., & Reis, S. M. (1999). Culturally diverse high-achieving students in an urban high school. *Urban Education*, *34*(4), 428-457.

Heck, R. H., Price, C. L., & Thomas, S. L. (2004). Tracks as emergent structures: A network analysis of student differentiation in a high school. *American Journal of Education, 110*(4), 331-353.

Heller, K. A. (2004). Identification of gifted and talented students. *Psychology Science, 46*(3), 302-323.

Hertzog, N. B. (2003). Impact of gifted programs from the students' perspectives. *Gifted Child Quarterly, 47*(2), 131-143.

Heymans, P., & Mönks, F. (2004). Identifying promising individuals: A commentary. *Psychology Science, 46*(3), 398-403.

Hoekman, K., McCormick, J., & Gross, M. U. M. (1999). The optimal context for gifted students: A preliminary exploration of motivational and affective considerations. *Gifted Child Quarterly, 43*(3), 170-193.

Hoffer, T., Greeley, A. M., & Coleman, J. S. (1985). Achievement growth in public and Catholic schools. *Sociology of Education, 58*(2), 74-97.

Hogan, D. P., & Astone, N. M. (1986). The transition to adulthood. *Annual Review of Sociology, 12*, 109-130.

Hong, E., & Aqui, Y. (2004). Cognitive and motivational characteristics of adolescents gifted in mathematics: Comparisons among students with different types of giftedness. *Gifted Child Quarterly, 48*(3), 191-201.

Hoogeveen, L., van Hell, J. G., & Verhoeven, L. (2005). Teacher attitudes toward academic acceleration and accelerated students in the Netherlands. *Journal for the Education of the Gifted, 29*(1), 30-59.

Howley, A., Pendarvis, E., & Gholson, M. (2005). How talented students in a rural school district experience school mathematics. *Journal for the Education of the Gifted, 29*(2), 123-160.

Hu, L.-T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*(1), 1-55.

Hughes, J. N., Gleason, K. A., & Zhang, D. (2005). Relationship influences on teachers' perceptions of academic competence in academically at-risk minority and majority first grade students. *Journal of School Psychology, 43*(4), 303-320.

Hunsaker, S. L., Finley, V. S., & Frank, E. L. (1997). An analysis of teacher nominations and student performance in gifted programs. *Gifted Child Quarterly, 41*(2), 19-24.

Husfeldt, V., Barber, C., & Torney-Purta, J. (2005). *Students' social attitudes and expected political participation: New scales in the enhanced database of the IEA Civic Education Study.* College Park, MD: Civic Education Data and Researcher Services.

Ingels, S. J., Burns, L. J., Charleston, S., Chen, X., & Cataldi, E. F. (2005). *A profile of the American high school sophomore in 2002: Initial results from the base year of the Educational Longitudinal Study of 2002.* (NCES 2005-538). Washington, DC: National Center for Education Statistics.

Ingels, S. J., Pratt, D. J., Rogers, J. E., Siegel, P. H., & Stutts, E. S. (2004). *Educational Longitudinal Study of 2002: Base-year data file user's manual.* (NCES 2004-405). Washington, DC: National Center for Education Statistics.

Jacobs, J. E., Lanza, S., Osgood, D. W., Eccles, J. S., & Wigfield, A. (2002). Changes in children's self-competence and values: Gender and domain differences across grades one though twelve. *Child Development, 73*(2), 509-527.

Kao, G., & Thompson, J. S. (2003). Racial and ethnic stratification in educational achievement and attainment. *Annual Review of Sociology, 29,* 417-442.

Kelly, S. (2004). Do increased levels of parental involvement account for social class differences in track placement? *Social Science Research, 33*(4), 626-659.

Kennedy, D. M. (1998). Glimpses of a highly gifted child in a heterogeneous classroom. *Roeper review, 24*(3), 120-124.

Kerr, B. K., & Cohn, S. J. (2001). *Smart boys: Talent, manhood, and the search for meaning.* Scottsdale, AZ: Great Potential Press.

Kerr, B., & Kurpius, S. E. R. (2004). Encouraging talented girls in math and science: Effects of a guidance intervention. *High Ability Studies, 15*(1), 85-102.

Kitano, M. K., & Lewis, R. B. (2005). Resilience and coping: Implications for gifted children and youth at risk. *Roeper Review, 27*(4), 200-205.

Kubitschek, W. N., & Hallinan, M. T. (1998). Tracking and students' friendships. *Social Psychology Quarterly, 61*(1), 1-15.

Kuhl, J., & Beckmann, J. (1985). *Action control: from cognition to behavior*. New York: Springer-Verlag.

Landrum, M. S., Katsiyannis, A., & DeWaard, J. (1998). A national survey of current legislative and policy trends in gifted education: Life after the National Excellence report. *Journal for the Education of the Gifted, 21*(3), 352-371.

Leder, G. (2004). Gender differences among gifted students: Contemporary views. *High Ability Studies, 15*(1), 103-108.

Levine, M. V., & Drasgow, F. (2001). *Program ModFIT web demo.* [Available: http://io.psych.uiuc.edu/irt/mdf_modfit.asp]

Lichten, W. (2000). Wither Advanced Placement? *Education Policy Analysis Archives, 8*(29). Retrieved 15 March 2007 from http://epaa.asu.edu/epaa/v8n29.html.

Lohman, D. F. (2005). An aptitude perspective on talent: Implications for identification of academically gifted minority students. *Journal for the Education of the Gifted, 28*(3-4), 333-360.

Long, J. S. (1997). *Regression models for categorical and limited dependent variables.* Thousand Oaks, CA: Sage.

Lubinski, D., & Benbow, C. P. (2000). States of excellence. *American Psychologist, 55*(1), 137-150.

Lucas, S. R., & Berends, M. (2002). Sociodemographic diversity, correlated achievement, and de facto tracking. *Sociology of Education, 75*(4), 328-348.

Luke, D. A. (2004). *Multilevel modeling.* (Quantitative Applications in the Social Sciences paper 07-143). Thousand Oaks, CA: Sage.

Lundy, G. F., & Firebaugh, G. (2005). Peer relations and school resistance: Does oppositional culture apply to race or to gender? *Journal of Negro Education, 74*(3), 233-245.

Maitra, K. (2000). Identification of the gifted—some methodological issues. *Gifted Education International, 14,* 296-301.

Malpass, J. R., O'Neil, H. F., Jr., & Hocevar, D. (1999). Self-regulation, goal orientation, self-efficacy, worry and high-stakes math achievement for mathematically gifted high school students. *Roeper Review, 21*(4), 281-288.

Manor-Bullock, R., Look, C., & Dixon, D. N. (1995). Is giftedness socially stigmatizing? The impact of high achievement on social interactions. *Journal for the Education of the Gifted*, *18*(3), 319-338.

McBee, M. T. (2006). A descriptive analysis of referral sources for gifted identification screening by race and socioeconomic status. *Journal of Secondary Gifted Education, 17*(2), 103-111.

McCoach, D. B., & Siegle, D. (2003). Factors that differentiate underachieving gifted students from high-achieving gifted students. *Gifted Child Quarterly, 47*(2), 144-154.

Miller, E. M. (2006) *I think, therefore I am: understanding teacher cognition.* Paper presented at the National Association for Gifted Children Annual Conference, Charlotte, NC.

Moon, S. M., & Dixon, F. A. (2006). Conceptions of giftedness in adolescence. In F. A. Dixon & S. M. Moon (Eds.), *The handbook of secondary gifted education.* (pp. 7-33). Waco, TX: Prufrock Press.

Moulton, P., Moulton, M., Housewright, M., & Bailey, K. (1998). Gifted and talented: Exploring the positive and negative aspects of labeling. *Roeper Review, 21*(2), 153-154.

Muraki, E. (1992). A generalized partial credit model: Application of an EM algorithm. *Applied Psychological Measurement, 16*, 159–176.

National Research Council (2002). *Learning and understanding: Improving advanced study of mathematics and science in U.S. high schools.* Washington, DC: National Academies Press.

Neber, H. (2004). Teacher identification of students for gifted programs: Nominations to a summer school for highly-gifted students. *Psychology Science*, *46*(3), 348-362.

Ngoi, M., & Vondracek, M. (2004). Working with gifted science students in a public high school environment: One school's approach. *Journal of Secondary Gifted Education, 15*(4), 141-147.

Niederer, K., Irwin, R. J., Irwin, K. C., & Reilly, I. L. (2003). Identification of mathematically gifted children in New Zealand. *High Ability Studies, 14*(1), 71-84.

Oakes, J. (2005). *Keeping track: How schools structure inequality* (2nd edition). New Haven, CT: Yale University Press.

Ogbu, J. (1982). Socialization: A cultural ecological approach. In K. M. Borman (Ed.), *The social life of children in changing society*. Hillsdale, NJ: Erlbaum.

Olsewski-Kubilius, P. (2003). Do we change gifted children to fit gifted programs, or do we change gifted programs to fit gifted children? *Journal for the Education of the Gifted, 26*(4), 304-313.

Olszewski-Kubilius, P., & Lee, S.-Y. (2005). How schools use talent search scores for gifted adolescents. *Roeper Review, 27*(4), 233-240.

Olszewski-Kubilius, P., & Limburg-Weber, L. (1999). Options for middle school and secondary level gifted students. *Journal of Secondary Gifted Education, 11*(1), 4-10.

Ortiz, V. Z., and Gonzalez, A. (1991). Gifted Hispanic adolescents. In M. Bireley & J. Genshaft (Eds.), *Understanding the gifted adolescent* (pp. 240-247). New York: Teachers College Press.

Pajares, F. (1996a). Self-efficacy beliefs in academic settings. *Review of Educational Research*, *66*(4), 543-578.

Pajares, F. (1996b). Self-efficacy beliefs and mathematical problem-solving of gifted students. *Contemporary Educational Psychology*, *21*(4), 325-344.

Patrick, H., Gentry, M., & Owen, S. V. (2006). Motivation and gifted adolescents. In F. A. Dixon & S. M. Moon (Eds.), *The handbook of secondary gifted education.* (pp. 165-195). Waco, TX: Prufrock Press.

Pedhazur, E. J. (1997). *Multiple regression methods in behavioral research.* (3rd Edition). New York: Holt.

Pegnato, C. V., & Birch, J. W. (1959). Locating gifted children in junior high schools: A comparison of methods. *Exceptional Children*, *25,* 300-304.

Peine, M. (1998). Practical matters. *Journal for the Education of the Gifted, 22*(1), 37-55.

Peterson, J. S. (1999). Gifted—through whose cultural lens? An application of the postpositivistic mode of inquiry. *Journal for the Education of the Gifted, 22,* 354-383.

Peterson, J. S., & Margolin, L. (1997). Naming gifted children: an example of unintended “reproduction.” *Journal for the Education of the Gifted, 21,* 82-101.

Plucker, J. A. (1996). Gifted Asian-American students: Identification, curricular, and counseling concerns. *Journal for the Education of the Gifted, 19*(3), 315-343.

Plucker, J. A., & Barab, S. A. (2005). The importance of contexts in theories of giftedness: learning to embrace the messy joys of subjectivity. In R. J. Sternberg & J. E. Davidson (Eds.), *Conceptions of giftedness* (2nd ed., pp. 201-216). New York, NY: Cambridge University Press.

Poelzer, G. H., & Feldhusen, J. F. (1997). The International Baccalaureate: A program for gifted secondary students. *Roeper Review*, *19*(3), 168-171.

Porath, M. (2004). Transforming gifts into talents: The DMGT as a developmental theory--A response. *High Ability Studies, 15*(2), 153-155.

Pyryt, M. C. (2004). Pegnato revisited: Using discriminant analysis to identify gifted children. *Psychology Science, 46*(3), 342-347.

Pyryt, M. C. (2006).*Conceptions of Giftedness revisited: Déjà vu all over again?* Paper presented at the National Association for Gifted Children Annual Conference, Charlotte, NC.

Raudenbush, S. W., & Bryk, A. S. (2002). Hierarchical linear models: applications and data analysis methods. (2nd Ed.). Thousand Oaks, CA: Sage Publications.

Raudenbush, S. W., Bryk, A. S., Cheong, Y. F., & Congdon, R. (2004). *HLM 6: Hierarchical Linear and Nonlinear Modeling.* Lincolnwood, IL: Scientific Software International.

Rea, D. W. (2000). Optimal motivation for talent development. *Journal for the Education of the Gifted, 23*(2), 187-216.

Reis, S. M. (2006). Gender, adolescence, and giftedness. In F. A. Dixon & S. M. Moon (Eds.), *The handbook of secondary gifted education.* (pp. 87-111). Waco, TX: Prufrock Press.

Reis, S. M., Colbert, R. D., & Hébert, T. P. (2005). Understanding resilience in diverse, talented students in an urban high school. *Roeper Review, 27*(2), 110-120.

Reis, S. M., & Dìaz, E. (1999). Economically disadvantaged urban female students who achieve in schools. *Urban Review, 31*(1), 31-54.

Reis, S. M., & Park, S. (2001). Gender differences in high-achieving students in math and science. *Journal for the Education of the Gifted, 25*(1), 52-73.

Renzulli, J. S. (2005). The three-ring conception of giftedness: A developmental model for promoting creative productivity. In R. J. Sternberg & J. E. Davidson (Eds.), *Conceptions of giftedness* (2nd ed., pp. 246-279). New York, NY: Cambridge University Press.

Renzulli, J. S., & Delcourt, M. A. (1986). The legacy and logic of research on the identification of gifted persons. *Gifted Child Quarterly, 30*(1), 20-23.

Rubin, K. H., Bukowski, W., & Parker, J. G. (1998). Peer interactions, relationships, and groups. In W. Damon (Series Ed.) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (5th ed., pp. 619-700). New York: John Wiley and Sons.

Satorra, A., Bentler, P. M., von Eye, A., & Clogg, C. C. (1994). Corrections to test statistics and standard errors in covariance structure analysis. In *Latent variables analysis: Applications for developmental research.* (pp. 399-419): Sage Publications, Inc.

Schober, B., Reimann, R., & Wagner, P. (2004). Is research on gender-specific underachievement in gifted girls an obsolete topic? New findings on an often discussed issue. *High Ability Studies, 15*(1), 43-62.

Schofield, N. J., & Hotulainen, R. (2004). Does all cream rise? The plight of unsupported gifted children. *Psychology Science, 46*(3), 379-386.

Schulz, W., & Sibberns, H. (Eds.) (2004). *IEA Civic Education Study Technical Report.* Amsterdam: IEA.

Siegle, D., & Powell, T. (2004). Exploring teacher biases when nominating students for gifted programs. *Gifted Child Quarterly, 48*(1), 21-29.

Siegle, D., & Reis, S. M. (1998). Gender differences in teacher and student perceptions of gifted students' ability and effort. *Gifted Child Quarterly, 42*(1), 39-47.

Solorzano, D. G., & Ornelas, A. (2002). A critical race analysis of Advanced Placement classes: A case of educational inequality. *Journal of Latinos and Education, 1*(4), 215-229.

Soloranzo, D. G., & Ornelas, A. (2004). A critical race analysis of Latina/o and African American Advanced Placement enrollment in public high schools. *High School Journal, 87*(3), 15-26.

SPSS Incorporated. (2006). *SPSS 15.0 User's Manual.* Chicago: SPSS

Staiger, A. (2004). Whiteness as giftedness: Racial formation at an urban high school. *Social Problems, 51*(2), 161-181.

Stanley, J. C. (1996). In the beginning: The Study of Mathematically Precocious Youth. In C. P. Benbow & D. J. Lubinski (Eds.), *Intellectual talent: Psychometric and social issues.* (pp. 225-235). Baltimore, MD: Johns Hopkins University Press.

Sternberg, R. J., & Davidson, J. E. (2005). *Conceptions of giftedness (2nd ed.).* New York: Cambridge University Press.

Sternberg, R. J., & Zhang, L-F. (1995). What do we mean by giftedness? A pentagonal implicit theory. *Gifted Child Quarterly, 39,* 88-94.

Stodolsky, S. S., & Grossman, P. L. (2000). Changing students, changing teaching. *Teachers College Record, 102*(1), 125-172.

Tannenbaum, A. J. (1983). *Gifted children.* New York: MacMillan.

Terman, L. M., & Oden, M. H. (1959). *Genetic studies of genius. Vol. V. The gifted group at mid-life*. Oxford: Stanford University Press.

Tookey, M. E. (1999). The International Baccalaureate: A program conducive to the continued growth of the gifted adolescent. *Journal of Secondary Gifted Education, 11*(2), 52-66.

Torney-Purta, J., & Barber, C. (2006, July). Gender differences in the IEA Civic Education Study. In C. Frederico (Chair), *Gender differences in political knowledge and attitudes in Europe.* Paper symposium presented at the International Society for Political Psychology Annual Meeting, Barcelona, Spain.

Torney-Purta, J., Lehmann, R., Oswald, H., & Schulz, W. (2001). *Citizenship and education in twenty-eight countries: civic knowledge and engagement at age fourteen.* Amsterdam: IEA.

U. S. Department of Education (1991). *National educational longitudinal study 88. Final report: Gifted and talented education programs for eighth grade public school students.* Washington, DC: United States Department of Education, Office of Planning, Budget, and Evaluation

U. S. Department of Education (1993). *National excellence: a case for developing America's talent.* Washington, DC: United States Department of Education, Office of Educational Research and Improvement.

Valaez, J. R. (2002). The influence of social capital on mathematics course selection by Latino high school students. *Hispanic Journal of Behavioral Sciences, 24*(3), 319-339.

VanTassel-Baska, J. (1996). Contributions of the Talent-Search concept to gifted education. In C. P. Benbow & D. J. Lubinski (Eds.), *Intellectual talent: Psychometric and social issues.* (pp. 236-245). Baltimore, MD: Johns Hopkins University Press.

VanTassel-Baska, J., Johnson, D., & Avery, L. D. (2002). Using performance tasks in the identification of economically disadvantaged and minority gifted learners: Findings from Project STAR. *Gifted Child Quarterly*, *46*(2), 110-123.

VanTassel-Baska, J., Olszewski-Kubilius, P., & Kulieke, M. (1994). A study of self-concept and social support in advantaged and disadvantaged seventh and eighth grade gifted students. *Roeper Review, 16*(3), 186-191.

Volker, M. A., Guaranaccia, V., & Scardapane, J. R. (1999). Short forms of the Stanford-Binet Intelligence Scale: Fourth Edition for screening potentially gifted preschoolers. *Journal of Psychoeducational Assessment, 17,* 226-235.

Watkins, M. W., Greenawalt, C. G., & Marcell, C. M. (2002). Factor structure of the Wechsler Intelligence Scale for Children—Third Edition among gifted students. *Educational and Psychological Measurement*, *62*(1), 164-172.

Wentzel, K. R. (1997). Student motivation in middle school: The role of perceived pedagogical caring. *Journal of Educational Psychology*, *89*(3), 411-419.

Wentzel, K. R. (1998). Social relationships and motivation in middle school: The role of parents, teachers, and peers. *Journal of Educational Psychology*, *90*(2), 202-209.

Wentzel, K. R., Barry, C. M., & Caldwell, K. A. (2004). Friendships in Middle School: Influences on Motivation and School Adjustment. *Journal of Educational Psychology*, *96*(2), 195-203.

Wentzel, K. R., & Caldwell, K. (1997). Friendships, peer acceptance, and group membership: Relations to academic achievement in middle school. *Child Development, 68*(6), 1198-1209.

Wigfield, A. (1994). Expectancy-value theory of achievement motivation: A developmental perspective. *Educational Psychology Review, 6*(1), 49-78.

Wigfield, A., & Eccles, J. S. (2000). Expectancy-value theory of achievement motivation. *Contemporary Educational Psychology, 25*(1), 68-81.

Woliver, R., & Woliver, G. M. (1991). Gifted adolescents in the emerging minorities: Asians and Pacific Islanders. In M. Bireley & J. Genshaft (Eds.), *Understanding the gifted adolescent* (pp. 248-258). New York: Teacher's College Press.

Wright, P. B., & Leroux, J. A. (1997). The self-concept of gifted adolescents in a congregated program. *Gifted Child Quarterly, 41*(3), 83-94.

Ziegler, A., & Raul, T. (2000). Myth and reality: a review of empirical studies on giftedness. *High Ability Studies, 11*(2), 113-136.

Ziegler, A., & Stoeger, H. (2004). Evaluation of an attributional retraining (modeling technique) to reduce gender differences in chemistry instruction. *High Ability Studies, 15*(1), 63-83.

Notes:

---

[i] A glossary of terms accompanies Chapter 1; it is found in Appendix A.