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The Relation of High-Achieving Adolescents' Social Perceptions and Motivation to Teachers' Nominations for Advanced Programs

Carolyn Barber
University of Missouri, Kansas City

Judith Torney-Purta
University of Maryland, College Park

In *National Excellence: A Case for Developing America's Talent,* a major report on the state of education for gifted and talented students, the U.S. Department of Education (1993) called for more challenging curriculum for students showing the highest levels of potential and performance. Almost a decade later, follow-up analyses of the 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

summary

The discrepancies between test-based and teacher-based criteria of high achievement are well-documented for students of all ages. This study seeks to determine whether certain high school students who score high on tests of academic achievement are more likely than others to be nominated for advanced academic programs by their teachers. Using Gagné's Differentiated Model of Giftedness and Talent as a guide, this study focused on three categories of correlates: social perceptions, individual motivation, and demographic background. Analysis of data from the Educational Longitudinal Study of 2002 revealed separate correlational patterns for nomination to advanced English programs and nomination to advanced math programs. High-achieving English students were more likely to be nominated by teachers for advanced work in the subject if they had high intrinsic motivation to read, if they were female, and if they were not Black. To contrast, high-achieving mathematics students were more likely to be nominated by teachers for advanced work in this subject if they had high math self-efficacy, if they were female, and if their friends did not place high importance on social relationships. Moreover, high-achieving male math students were more likely to be nominated if they had high levels of intrinsic motivation in math and if their friends valued academic goals. These results speak to the importance of considering the context of a particular subject area when deciding on who is eligible for enrollment in advanced programs. They also show a potential bias against poorly motivated male students in subjects that are traditionally male dominated.

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and eligible for such programs are of interest to policymakers and researchers alike. This is true both for identifying elementary school students for programs designed to nurture potential early on and for identifying adolescents who have already demonstrated high achievement in schoolwork and who warrant additional advanced programming in specific subject areas.

In considering how identification occurs, distinctions have been made between the use of objective criteria (e.g., achievement and aptitude test scores) and subjective criteria such as teacher, parent, or peer nominations (Plucker & Barab, 2005). Objective criteria such as tests of achievement have been questioned because of biases that might favor students from certain ethnic groups, or of certain home backgrounds (Baldwin, 2002); however, considerable questions also exist about the nature of subjective criteria such as teacher nominations. It has been well established that teachers and tests do not identify the same group of students as high achieving or high ability, but there is mixed opinion as to whether this discrepancy is something that warrants concern. On one hand, teachers may take into consideration other factors, such as motivation or interest, which would warrant the inclusion of comparatively less-achieving students (e.g., analysis using the Scales for Rating the Behaviors of Superior Students [Chan, 2000]). Some theorists have talked about teachers' individual considerations of the behaviors of their students as evidence of their implicit theories of giftedness (Sternberg & Zhang, 1995), meaning that teachers will focus on characteristics that they themselves think are indicative of potential for high performance, regardless of whether they fall under a formal definition. Certainly, exceptional motivation could be one characteristic that teachers find indicative of giftedness. As a result, there is also the possibility that teacher nominations might fail to identify certain students who meet psychometric criteria for high achievement, but who appear to be less motivated or serious about schooling (e.g., Siegle & Powell, 2004). This discrepancy raises two concerns among researchers: whether teacher nominations are diluting gifted education by nominating less-achieving but motivated students over the highest-achieving students, and

whether teacher decisions about lack of motivation constitute some type of bias on the part of teachers (i.e., as related to students of a certain gender or ethnic background).

In the current analysis, we focused on the students who performed well on objective tests of achievement, but who were overlooked by teachers. We examined two groups of high-achieving students, one of whom was nominated by teachers for advanced curricular programs or academic honors and one of whom was not nominated. In examining these two groups, we wished to determine whether teacher nominations for advanced work disproportionately go to students with certain characteristics, even among students who are above a certain threshold for achievement.

Theoretical Frame: Gagné's Differentiated Model of Giftedness and Talent

Who are the students identified as high-achieving based on achievement test scores, and are there differences between students with similarly high test performance who are and who are not recognized by teachers? This study explored these questions using components of Gagné's Differentiated Model of Giftedness and Talent (DMGT; Gagné, 2004, 2005; Gagné & Schader, 2006). Gagné's model distinguishes between giftedness, or students' potential to succeed, and talent, or the manifestation of high ability through accomplishment in one of many socially relevant areas, including academic achievement in various subjects. In this study, all students would be considered talented due to their high performance on achievement tests; however, not all are subsequently nominated for advanced work. This discrepancy is examined in light of three categories of catalysts identified by Gagné. In his model, high achievement (or, to use Gagné's term, talent) is ultimately recognized due to a combination of intrapersonal characteristics such as motivation and personality, contextual factors, and chance or luck. This consideration of contextual and motivational characteristics also made the DMGT

model especially useful for this current study, as it justifies studying both characteristics of students commonly associated with giftedness (e.g., motivation) and characteristics that may result in bias against students (e.g., socioeconomic status).

In addition, although Gagné's DMGT model does not explicitly address developmental differences in gifted students' experiences, it is well suited to the consideration of high-achieving adolescents in particular. As Moon and Dixon (2006) discussed, Gagné's stress on the importance of individual and contextual characteristics in transforming giftedness into talent makes it useful for research focusing on this developmental period, as achievement motivation and the competition of social and academic goals are thought to be especially salient issues for adolescents. Moreover, Gagné's model focuses on the development of achievement or talent in specific subject areas, just as achievement in adolescence is thought to become more domain-specific. This suggests that it is important to consider how the three sets of factors may uniquely relate to the recognition of high achievement in specific subject areas.

Contextual factors. According to Gagné (2004), schools themselves serve as an important and complex environmental catalyst. Models of contextual influences on development (e.g., Bronfenbrenner, 1979) capture this complexity that Gagné acknowledges by considering how a variety of psychological and sociological processes influence both individual students and their networks. For example, at the most proximal level to the student, students' interactions with friends and peers influence students' engagement in school (see Rubin, Bukowski, & Parker, 1998, for a discussion of the difference between peer groups generally and friends more particularly). In particular, Wentzel (Wentzel, Barry, & Caldwell, 2004; Wentzel & Caldwell, 1997) discussed the potential conflict between social and academic goals of peers in general, and how the values of a student's friends in particular, may influence a student's motivation to succeed in school. This attention to the potential conflict between academic achievement and social acceptance has been discussed extensively as

related to the *stigma of giftedness* paradigm (discussed in Cross, Coleman, & Stewart, 1993). In the context of this study, it is our hypothesis that students who experience conflict between the social goals set forth by their friends and the academic goals set forth by the school would be less likely to be nominated for advanced work.

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 influence the likelihood of student nomination by influencing motivation to achieve in school, which in turn influences the likelihood that teachers will see the student as a candidate for advanced schoolwork. Therefore, high-achieving students who perceive more positive student-teacher relationships overall are hypothesized to have a better chance of having their achievement recognized by their teachers in the form of nominations.

Motivational factors. Gagné's DMGT model also is considered unique compared to other conceptions of giftedness in its consideration of motivation as an intrapersonal background factor 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 facilitating the development of high achievement. It is hypothesized in this study that students who do not demonstrate motivation will be less likely to be nominated by their teachers, even though they perform well on achievement tests.

More specifically, we focused here on the roles of intrinsic motivation and self-efficacy as aspects of students' motivation. Each of these two constructs has grounding in several prominent theories of motivation in the educational psychology field, and has been researched extensively in the field of gifted education (see Dai, Moon, & Feldhusen, 1998, for a social-cognitive framework of the motivation of gifted students using these two constructs). Intrinsic motivation in particular has been considered by educational psychologists interested in talented students

in several ways. For example, Adele and Allan Gottfried have begun in recent years to develop a conceptualization of what gifted motivation means, noting a *rage to master* present among high-ability students (Gottfried & Gottfried, 2004). This leads the researchers to associate a high level of intrinsic motivation with high potential and achievement. In contrast, efficacy beliefs, or students' perceptions of their own abilities, have been of particular interest in the context of gifted underachievement (Malpass, O'Neil, & Hocevar, 1999; Pajares, 1996). Simply put, students who do not believe that they can be successful are ultimately not successful. Such beliefs are particularly important to consider in a study of high-achieving adolescents, because these beliefs have been shown to be lower among adolescents when compared to younger students (Wigfield, 1994; Wigfield & Eccles, 2000). Our hypothesis is that teachers more regularly consider students with higher self-efficacy for advanced programs.

Chance factors. Gagné's model does not provide much explicit guidance in considering how the recognition of high achievement may come about differently in specific populations of students. However, he has recently adapted his model in order to introduce the concept of chance (Gagné, 2004). Even given optimal conditions of aptitude, motivation, and context, not all talented students will come to be recognized as such. According to this theorist, it is possible to think of issues of being born a particular race, into a particular gender, or growing up in a particular socioeconomic status as chance. The stereotypes associated with gender and race, the cultural differences associated with ethnicity, and the risk factors associated with socioeconomic status all may have an influence on whether high achievement becomes recognized. Thus, each of these factors is important to consider separately.

When comparing two groups of students who score above a certain test score threshold for high achievement, it is our hypothesis that teachers' nominations will be more likely to go to certain groups of students than to others. Elhoweris, Mutua, Alsheikh, and Holloway (2005) have argued that teachers hold their own

preconceptions about students' talents, and they may assume that students from racial or ethnic minorities (i.e., Black or Hispanic students) are less likely to succeed in special programs aimed at gifted and talented students. Based on this logic, we could similarly expect teachers to hold lower expectations for students coming from low socioeconomic backgrounds, regardless of race or ethnicity. On the other hand, Asian students often are seen as model minorities by teachers, and we would therefore hypothesize that these students would be more likely to be nominated, especially in mathematics (Plucker, 1996; Woliver & Woliver, 1991). Finally, we expect nomination patterns by teachers to fall along gender-stereotypical lines, with teachers being more likely to nominate high-achieving females for work in English and more likely to nominate high-achieving males for work in math.

Summary and Purpose

Many empirical studies in the education of students with high levels of performance and potential consider how motivation and school context influence how high achievement is recognized. Many others consider how students of different ethnic backgrounds, home resource backgrounds, and genders may differ in whether their achievement is recognized. The purpose of this study in particular was to provide descriptive analyses of the factors that work together to influence whether a student who is considered high-achieving based on achievement test scores is ultimately nominated for advanced work. It simultaneously considered aspects of students' motivation, context (specifically, students' perceptions of their relationships with others), and individual background to determine which factors are associated with meeting different criteria for being considered high-achieving. In line with Gagné's model, we considered these relations in two subject areas—mathematics and English—to determine whether certain factors are uniquely associated with the recognition of high achievement in a particular subject, or whether their influence is similar across subjects.

Methodology

Data for this analysis came from the Educational Longitudinal Study of 2002 (ELS:2002; see Ingels et al., 2004), which focused on the cohort of students who were in 10th grade in 2002. 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 for the study, 752 of which eventually participated. Once these schools were selected, clusters of approximately 26 tenth graders per school (excluding foreign exchange students) were selected for participation. In the context of this analysis, 10th graders were interesting to study because they were in the middle of their high school careers, meaning that while they were in a context in which subject-specific honors classes are common, they still had two additional years to be selected for advanced programs.

Variables

Variables considered in this analysis include individual items from ELS:2002, as well as several scales created from these items, designed to capture each dimension of Gagné's model. In addition, single, dichotomous (yes/no) items capturing students' previous involvement in Advanced Placement or International Baccalaureate programs and their previous academic honors were considered as controls in the statistical analysis.

Achievement identification. In the current analysis, we focused on those students who could be considered high-achieving according to their performance on standardized achievement tests. In particular, students who scored in the top decile of all participating students on the ELS:2002 test of reading achievement were considered to be high-achieving in English. Similarly, students who scored in the top decile of all participating students on the ELS:2002 test of mathematics achievement were considered high-achieving in mathematics. We chose to focus on the 90th percentile rank as our cutoff, inline with Gagné's

recommendations (Gagné, 2005). In other words, all students in the analytic subsample are high achievers, and references to high-achieving students refer to the entire group being analyzed. Further information about the structure and administration of these achievement tests is located in the ELS:2002 User's Manual (Ingels et al., 2004).

In each subject area, students who received a teacher nomination for participation in advanced curricular programs were compared to those who did not. As part of ELS:2002, reading and mathematics teachers were asked whether they have "ever recommended the student for AP/honors classes/academic honors" in their particular subject. Students were only included in this analysis if their teachers responded "yes" or "no" to this question; students whose teachers indicated that such a question was "not applicable" (presumably because such classes and opportunities were not offered) were removed from analysis. Overall, 1,110 students from 408 schools scored in the top decile of the ELS:2002 test of reading achievement, 57% of whom were nominated by their teachers for advanced work. On average, there were between two and three students per school who scored in the top decile of reading achievement (M = 2.72, SD = 2.72, min = 1, max = 20). Similarly, 1,224 students from 420 schools scored in the top decile of the ELS:2002 test of mathematics achievement, 54% of whom were nominated by their teachers for advanced work. On average, there were slightly fewer than three students per school who scored on the top decile of reading achievement (M = 2.91, SD = 2.38, min = 1, max = 19).

Social perceptions. We considered three scales capturing students' individual perceptions of their relationships with people in their school context, most notably their friends and their teachers. The first related to students' perceptions of teacher/student relationships in their school. The second and third measures focused on students' perceptions of their friends' academic goals, and their social goals. These scales of social perceptions were created using a combination of confirmatory factor analysis (CFA), to confirm the hypothesized dimensionality of social perceptions and polyto-

mous item response theory (IRT) techniques, to analyze the suitability of the individual, categorical items for inclusion in scales. We normalized these scales across the entire ELS:2002 sample (not just the subsample analyzed here) such that each scale has a mean of 0 and a standard deviation of 1. Barber (2007) provided full information on the scale development process, and the Appendix of this article contains a list of the items in each scale.

Motivation. We identified four scales of motivation in the ELS:2002 student survey. These scales originally appeared in the PISA study and were developed and analyzed by psychometricians in that context (Adams & Wu, 2002). Two of these scales measured intrinsic motivation, and two scales measured self-efficacy in completing class activities. For each type of motivation, the first scale pertained to students' motivation in reading or English, while the second pertained to students' motivation in math. These scales of individual motivation perceptions, like the social perception scales, were created using a combination of CFA and IRT techniques. Once again, we normalized the scales across the entire ELS:2002 sample for ease of interpretation.

Student background. Three sets of variables indicated students' gender, socioeconomic status, and racial/ethnic identification. Gender was indicated by the sex variable included in ELS:2002. A normalized socioeconomic status variable included in the ELS:2002 database was based on five components: father's/guardian's education, mother's/guardian's education, family income, father's/guardian's occupational prestige score, and mother's/guardian's occupational prestige score. Finally, we recoded the composite race variable existing in the ELS:2002 to consider five groups of students: Hispanic, Black, Asian, White, and "other" (i.e., multiracial and Native American).

Missing data. Missing data on items pertaining to students' background were imputed by the ELS:2002 researchers. Regarding the scales created here, one of the advantages of using IRT techniques in scale creation is that scale scores can be esti-

mated as long as the student has data on at least one of the items in the scale. However, some students were missing data on all items in a given scale (as many as 15% of the students given the particular scale). In these cases, a scale score was estimated using the EM single-imputation algorithm in SPSS 15.0 Missing Values Analysis (SPSS Incorporated, 2006). As a result, no cases were dropped due to missing data.

Statistical Analysis

These variables and scales were included in a logistic regression analysis, which simultaneously considered how all of the variables above related to the likelihood that a high-achieving student would be nominated for advanced work in a subject. We conducted a two-level logistic regression analysis, nesting students within schools, placing all variables of interest as independent variables at the student level. A multilevel framework was chosen, given the nature of the data as students were nested within schools.

After running descriptive statistics, we conducted significance tests to determine whether significant differences existed between the two groups in each subject area. We then used the Hierarchical Generalized Linear Model program in the HLM software package to conduct the multilevel logistic regression analyses using Restricted PQL Estimation procedures (Raudenbush, Bryk, Cheong, & Congdon, 2004)[1]. One set of analyses was conducted using variables associated with high achievement in English in order to predict nomination to advanced programs in that subject; a second used variables associated with high achievement in mathematics. In each case, the analyses were weighted in order to reflect the sampling design employed in the ELS:2002 study. At level 2, a school-level weight reflected the unequal probability of the sampling of schools, while a within-school weight was calculated and employed at level 1 in order to correct for the unequal probability of the sampling of certain students within schools.

We first tested fully unconditional models to consider whether there was a significant amount of variability in the pro-

portion of students meeting various high achievement identification criteria across schools. Using Snijders and Bosker's (1999) approximation, the ICC for English nomination among high-achieving students is .30 (τ = 1.52), and the ICC for mathematics nomination is .40 (τ = 2.19). Due to the small average within-school sample size, however, the estimated design effects were small (DEFF = 1.51 for English; DEFF = 1.76 for mathematics) according to Muthen and Satorra (1995). Therefore, although we decided to conduct analysis in HLM to appropriately apply weights to each level of analysis, we did not include a random effect in the intercept. As a result of this decision to focus on variability at the individual level, we did not include school-level predictor variables in the analysis[2].

Once we decided to include only level-1 predictors, we added student variables to the model in blocks. Individual-level social perceptions were added first, then motivation, then individual background variables such as ethnicity and gender. Then we tested potential interactions of individual background variables with social perceptions and motivation to determine whether the factors associated with motivation differed between students from various backgrounds. Finally, control variables (i.e., previous participation in AP or IB programs, or previous receipt of academic honors) were added to see whether the observed relationships among variables held after considering previous experiences. The effects of all of these predictor variables were fixed; exploratory analysis revealed no statistically significant random effects for any of the predictors (most likely due to the small average within-group sample size).

Results

Prior to conducting the multilevel logistic regression analysis, we computed the means and standard deviations for each of the two groups of students in each subject area, and conducted *t* tests (for continuous variables) and chi-square tests (for dichotomous variables) to test for the significance of observed differences. These

are reported in Table 1. Across both subject areas, high-achieving students who were nominated by their teachers for advanced programs had more positive perceptions of student-teacher relationships compared to their high-achieving peers who were not nominated; additionally, they perceived their friends to be more academically oriented. They also had higher levels of motivation, both in terms of intrinsic motivation and self-efficacy. Although the nominated groups in each subject were of higher socioeconomic status, differences in racial/ethnic composition between the two groups were not statistically significant. Statistically significant differences in gender composition only existed in English, where the nominated group had a higher proportion of female students. Finally, the nominated groups in each subject had higher proportions of students who had already participated in AP classes and who have received academic honors; however, there was no statistically significant difference in the small proportion of students who have participated in IB programs.

Correlates of Teacher Nominations for Advanced English Programs

We then looked at how these factors were associated with the nomination of high-achieving English students to advanced programs. This analysis is summarized in Table 2, where we report both log-odds coefficients and odds ratios associated with each correlate. We present the model in two ways: first without the addition of controls for previous participation in AP/IB and other honors and second with this addition.

Although variables related to individual students' social perceptions were considered for this analysis, they were not associated with the likelihood of nomination for English programs upon their initial introduction to the model, and were therefore left out of the final model presented here. However, statistically significant relationships did exist among variables in other categories. Most especially, high-achieving students who were intrinsically motivated to read were more likely to receive teacher nominations for advanced work in the subject than were

Table 1

Descriptive Statistics

	High English achievement				High math achievement			
	No teacher nomination (n = 480)		Teacher nomination (n = 630)		No teacher nomination (n = 568)		Teacher nomination (n = 656)	
Teacher-student relationships (IRT)	0.11	(0.89)	0.29*	(0.89)	0.15	(0.90)	0.31*	(0.93)
Friends' academic orientation (IRT)	0.13	(0.82)	0.30*	(0.82)	0.05	(0.88)	0.25*	(0.83)
Friends' social orientation (IRT)	-0.12	(0.86)	-0.09	(0.85)	-0.08	(0.84)	-0.14	(0.83)
Subject self-efficacy (IRT)	0.46	(0.90)	0.65*	(0.89)	0.54	(0.94)	0.86*	(0.84)
Subject intrinsic motivation (IRT)	0.42	(0.99)	0.69*	(0.89)	0.15	(0.96)	0.53*	(0.97)
Race/ethnicity: Black[a]	3%		2%		2%		1%	
Race/ethnicity Hispanic[a]	3%		6%		6%		4%	
Race/ethnicity: Asian[a]	4%		4%		6%		9%	
Race/ethnicity: other[a]	5%		3%		3%		3%	
Socioeconomic status	0.42	(0.70)	0.63*	(0.68)	0.33	(0.47)	0.43*	(0.50)
Gender: female[2]	39%		61%*		51%		62%	
Participated in AP program	28%		41%*		25%		41%*	
Participated in IB program	3%		4%		4%		3%	
Received academic honor	45%		76%*		55%		76%*	

Note. (IRT) indicates scales constructed using item response theory techniques. [a] Reference category: White students. * significantly higher than other group in subject, $p < .01$.

Table 2

Likelihood of Teacher Nomination for Advanced English Programs

	Without controls			With controls		
	Log odds	Standard error	Odds ratio	Log odds	Standard error	Odds ratio
Constant	-0.27	0.17	0.77	-0.64	0.18	0.52
Social perceptions						
Teacher-student relations (IRT)	0.03	0.13	1.03	0.00	0.14	1.00
Friends' academic orientation (IRT)	-0.07	0.12	0.93	-0.10	0.11	0.90
Friends' social orientation (IRT)	0.11	0.13	1.12	0.09	0.13	1.09
Motivation						
English self-efficacy (IRT)	0.15	0.14	1.16	0.10	0.13	1.10
Intrinsic motivation in reading (IRT)	0.25*	0.13	1.29	0.27*	0.13	1.31
Background						
Race/ethnicity: Black[a]	-0.93*	0.40	0.39	-1.15*	0.45	0.32
Race/ethnicity: Hispanic[a]	0.09	0.48	1.09	-0.03	0.42	0.97
Race/ethnicity: Asian[a]	0.28	0.38	1.33	0.43	0.47	1.53
Race/ethnicity: other[a]	-1.05*	0.46	0.35	-1.05*	0.45	0.34
Socioeconomic status	0.33*	0.16	1.39	0.25	0.16	1.29
Gender: female	0.60**	0.21	1.82	0.50*	0.20	1.65
Previous experience controls						
Previous AP participation				0.40*	0.20	1.49
Previous IB participation				0.25	0.32	1.29
Previous receipt of academic honor				1.18**	0.14	3.26

Note. Robust standard errors are reported. All effects (intercept and coefficients) are fixed. (IRT) indicates scales constructed using item response theory techniques. [a] Reference category: White students. *$p < .05$, **$p < .01$.

their less-motivated counterparts. As indicated in Table 2, a one-unit change in intrinsic motivation increases the odds of being nominated by a factor of 1.31, taking all other variables (including previous AP/IB participation) into account. In other words, a high-achieving student with intrinsic motivation to read who is one standard deviation above that of an average 10th grader is almost one and one-third times as likely to be nominated for advanced work in English as is a student with average motivation. Self-efficacy in English, however, was not significantly associated with nomination.

In addition, three group differences existed in the likelihood of nomination. Looking at racial and ethnic differences, high-achieving Black students were less likely than White students to be nominated by teachers. The associated odds ratio of .32 indicates that Black students are only 32% as likely to be nominated as are White students. Said differently, they were more than three times less likely to be nominated than their White counterparts were. Similarly, other students (i.e., multiracial students or Native American students) were less likely than White students to be nominated by teachers. Students in this group are only 34% as likely to be nominated as are White students. Given the diversity in this group of "other" students, however, this finding has limited interpretive value. There were no significant differences among the likelihood of nomination for Hispanic or Asian students. Further, there was a significant gender gap, indicating that high-achieving female students were more likely to be nominated than were male students (associated with an odds ratio of 1.65).

Correlates of Teacher Nominations for Advanced Mathematics Programs

The analysis of factors associated with the nomination of high-achieving mathematics students to advanced programs is summarized in Table 3. Again, these models are presented with and without the addition of statistical controls for previous participation in advanced programs.

Table 3

Likelihood of Teacher Nomination for Advanced Mathematics Programs

	Without controls			With controls		
	Log odds	Standard error	Odds ratio	Log odds	Standard error	Odds ratio
Constant	-0.19	0.17	0.82	-0.41	0.20	0.66
Social perceptions						
Teacher-student relations (IRT)	0.09	0.10	1.09	0.08	0.12	1.09
Friends' academic orientation (IRT)	0.58**	0.16	1.78	0.54**	0.15	1.72
Friends' social orientation (IRT)	-0.23*	0.11	0.80	-0.21*	0.10	0.81
Motivation						
Math self-efficacy (IRT)	0.33**	0.12	1.40	0.30*	0.12	1.35
Intrinsic motivation in math (IRT)	0.41**	0.12	1.51	0.43**	0.13	1.53
Background						
Race/ethnicity: Black[a]	-0.63	0.53	0.53	-0.64	0.50	0.53
Race/ethnicity: Hispanic[a]	-0.38	0.47	0.68	-0.21	0.49	0.81
Race/ethnicity: Asian[a]	0.31	0.22	1.36	0.47	0.26	1.59
Race/ethnicity: other[a]	-0.08	0.65	0.92	-0.04	0.67	1.96
Socioeconomic status	0.07	0.14	1.07	0.04	0.14	1.04
Gender: female	0.89**	0.25	2.43	0.80**	0.24	2.22
Interaction terms						
Female x friend academic	-0.96**	0.25	0.38	-0.89**	0.23	0.41
Female x math intrinsic motivation	-0.42*	0.20	0.66	-0.40*	0.20	0.67
Previous experience controls						
Previous AP participation				0.62**	0.08	1.86
Previous IB participation				-0.78**	0.28	0.46
Previous receipt of academic honor				0.51*	0.08	1.66

Note. Robust standard errors are reported. All effects (intercept and coefficients) are fixed. (IRT) indicates scales constructed using item response theory techniques. [a] Reference category: White students. *$p < .05$, **$p < .01$.

Unlike the analysis of advanced English achievement, there were several significant relationships between characteristics of students' social perceptions and their likelihood of being nominated for advanced programs. Overall, high-achieving students who perceived their friends to value academics more were more likely to be nominated by their teachers for advanced work (odds ratio = 1.72), while students who perceived their friends to value social goals such as dating more were less likely to be nominated by their teachers (odds ratio = 0.81).

Also unlike the analysis of advanced English achievement, self-efficacy was statistically significantly associated with the likelihood of nomination. Students who had higher levels of self-efficacy related to math were more likely to be nominated by teachers for advanced work (odds ratio = 1.35). However, the two analyses were similar in that intrinsic motivation was associated with teacher nomination in each subject. As was the case in the analysis of high English achievement, students who were more intrinsically motivated to succeed in mathematics were more likely to be nominated for advanced work by teachers (odds ratio = 1.53).

There were statistically significant group differences in the likelihood of teacher nomination for advanced mathematic programs related to gender. Overall, high-achieving math students were more than twice as likely to be nominated by their teachers for advanced work if they were female (odds ratio = 2.22). In addition, gender also moderated relationships among the social perceptions and motivational correlates to nomination. A significant and negative interaction between gender and friends' academic orientation revealed that the gender gap in nomination to advanced programs was nonexistent among students who perceived that their friends cared about school. In other words, gender gaps in the likelihood of nomination were only observed among students who perceived limited academic support from their friends. This relationship is illustrated graphically in Figure 1.

A statistically significant interaction also existed between gender and intrinsic motivation in mathematics. The magnitude of the interaction term is nearly equal in size, yet opposite in direction, to the coefficient associated with intrinsic motivation

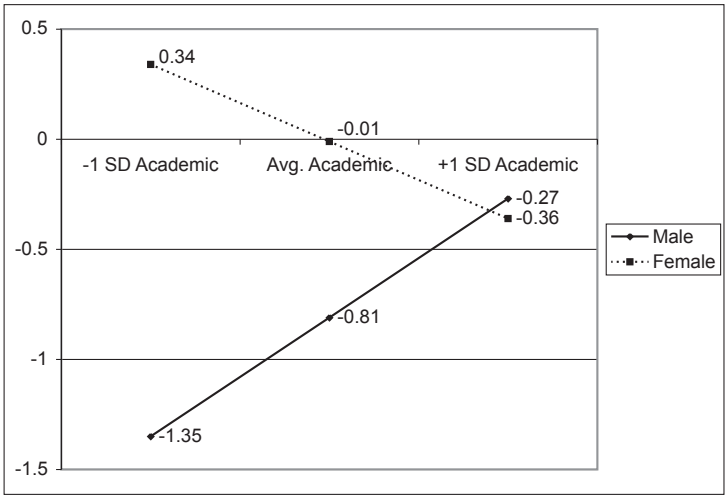

Figure 1. **Log-likelihood of teacher nomination to advanced programs by perception of friends' academic orientation for male and female students.**

in math. This indicates that being intrinsically motivated to do well in mathematics was associated with a higher likelihood of teacher nomination for male students, but not for female students. In fact, the average male student with high intrinsic motivation in the subject was nearly as likely as the average female to be nominated by teachers. This interaction is illustrated graphically in Figure 2.

Discussion

The purpose of this analysis was to identify factors associated with the nomination of high-achieving adolescent students for advanced curricular programs by their teachers. Separate analyses were conducted for high achievement in math and in English to determine whether different patterns existed in different subjects. We drew upon Gagné's DMGT model to identify possible correlates of nomination and hypothesized that students with more pro-academic social perceptions, higher motivation, and who were White and at least middle class would be nominated.

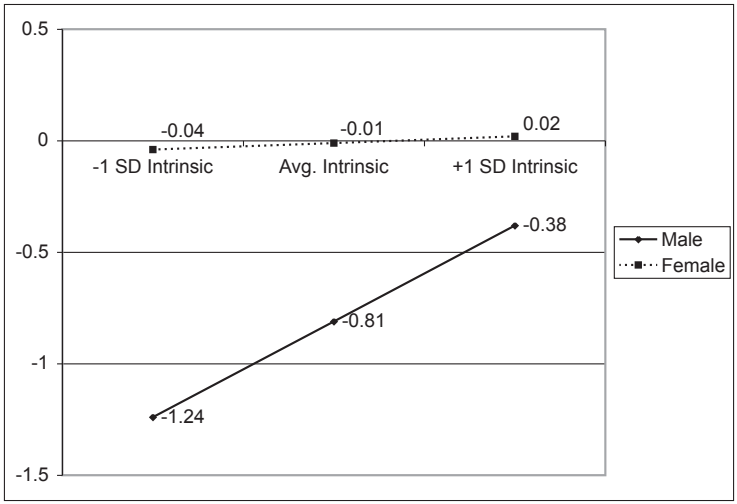

***Figure 2*. Log-likelihood of teacher nomination to advanced programs by intrinsic motivation in math for male and female students.**

This analysis only partially supports our hypotheses. Starting first with social perceptions, we did find in certain instances that students who perceived more supportive peer contexts were more likely to have their high achievement recognized by teachers. In particular, high-achieving male students were more likely to be nominated by teachers as high-achieving if their friends valued academics, while high-achieving students of both genders were more likely to be nominated if their friends were less socially oriented. The implications of such a relationship can be considered in light of the *stigma of giftedness* paradigm (Cross et al., 1993). If a high-achieving student is surrounded by friends who value school less, then that student may feel a conflict between social and academic goals in the school setting. Students may in turn become less motivated to do their school work well, and teachers may pick up on this lack of motivation and consider it when making judgments about whom to nominate for advanced work. Further research should attempt to determine the extent to which conscious judgments about students' engagement in school enter into teachers' recommendations for advanced work.

Why is such a pattern found in relation to mathematics, but not English? Research that broadly addresses teachers' attitudes toward different subject areas may help to explain why such a difference exists. 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 the significant findings that social perceptions are related to mathematics nominations reflect that the students in question may not have the social support necessary to fit into groups challenged with more advanced work. This consideration of *content as context*, an idea set forth in several pieces of research conducted by Grossman and Stodolsky (Grossman & Stodolsky, 1995; Stodolsky & Grossman, 2000), should be examined to understand how students come to be identified as high achieving in different subject areas. Connecting back to Gagné's frame, it would expand the consideration of subject area as a characteristic of the context in which a specific talent develops.

Turning to our second category of correlates, while it does appear generally that students who are nominated by teachers are more motivated than high-achieving students who are not identified, the exact nature of this association varies again across subject areas. In line with our hypothesis, intrinsic motivation was related to nomination in both subject areas (although, as will be discussed later, there are gender differences in its relation to mathematics nomination). It was only when looking at mathematics achievement, however, that high-achieving students were more likely to be nominated by teachers if they had high self-efficacy in the subject. This relationship of self-efficacy to high achievement identification only 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, 1996) but not English (Chan, 1996). This relationship may stem from the fact that the majority of students express a low level of self-efficacy in math (Barber, 2007). As a result, students who do feel efficacious may be especially encouraged

to pursue advanced work. Moreover, this difference between the association of self-efficacy to nomination 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.

Combined with the significant relationship of friends' values to teachers' nominations, this analysis also suggests several ways in which the consideration of motivation can be improved in future research and theoretical frames. Results here indicate that it is not enough just to consider self-efficacy and intrinsic motivation in a specific subject; rather, more general goals that students have also must be taken into consideration. Comprehensive consideration of social and academic goals as they relate to academic achievement are considerably rarer in discussions of high-achieving students than are discussions of other aspects of motivation, although some qualitative case studies have identified this as an important theme in the life experiences of underachievers (e.g., Hébert, 2001). However, this analysis indicated that students who perceived their friends to be less academically oriented and more socially oriented were less likely to have their 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.

Finally, in examining group differences, the limited racial/ethnic and socioeconomic differences between high-achieving students who are and are not nominated by teachers for advanced work is somewhat surprising. The only notable finding was that Black students were less likely to be nominated for advanced English programs. This lends partial support to findings by Elhoweris et al. (2005) that the use of nominations may result in talented students of color being underrepresented in advanced programs. In interpreting the paucity of significant differences, however, it is necessary to note the small number of students of color in these samples. Overall, only 15 Black students were in the top decile of math, and only 24 were in the top decile of English. Similarly, only 54 Hispanic students were

in the top decile of English, and only 50 were in the top decile of math. This suggests that this analysis may not have had the power to detect additional group differences and interactions. In order to learn more about racial and ethnic dynamics influencing the nomination of high-achieving students, a more purposive sampling technique that balances the number of minority and nonminority students may be useful.

It also is important to remember, when interpreting these differences, that biases in achievement tests may have eliminated many minority and low-SES students with high potential from this analysis (Baldwin, 2002). Additional analysis conducted by Barber (2007) suggests that racial/ethnic group membership and socioeconomic status are larger predictors of a student being identified by teachers despite scoring below the 90th percentile on achievement tests. This is an important finding, especially given the sizeable group of students from all racial and ethnic backgrounds who fall into this category (1,650 students in English; 1,106 students in math), and further research will explore it in greater depth.

Turning to gender, the discussion of males' likelihood of being nominated by teachers for advanced work is complicated by several significant gender interactions observed in one subject, but not the other. 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, with teachers especially likely to nominate females for advanced work. On the other hand, the gender gaps between students with high test performance in math who were or were not nominated by teachers only appeared when comparing disengaged students (i.e., those without academically oriented friends or intrinsic motivation). 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. Rather than relying on gender stereotypes of who is more likely to excel in a subject (which would favor male students), teachers appear to be drawing on stereotypes of who is a better

behaved student. This means that male students who are disengaged are more likely to be overlooked than 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., Hébert, 2001), and in more general areas of school participation and academic attainment (e.g., Barber, 2004) and warrant attention in future research.

Implications for Educators

Although the results of this analysis suggest many avenues for further research, there are some preliminary suggestions for educators that can be taken from this analysis. For example, before relying on nominations as a criterion for enrollment in advanced work, it is important to consider the systematic differences between high-achieving students whom teachers are likely (or unlikely) to nominate for advanced work. In particular, students who display less intrinsic motivation in a topic, or who have friends who are less academically engaged, may be less likely to be nominated by teachers. 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 possess. 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 one considers that students' motivation in a subject often improves when presented with appropriately challenging coursework in the context of peers with academic interests.

It is important to consider, however, that social pressures from friends may relate to students' likelihood of being nomi-

nated. In this sense, the implications for policy and practice are directed less at school 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 & Mueller, 2008). Adults in the school can encourage high-achieving students to become involved in such activities. This is especially important in preventing disengagement among male students, for whom motivation has an especially strong relationship to nomination by teachers. Generally speaking, teachers need a better understanding of adolescent peer groups in order to learn more about why such activities can help to support academic success.

This analysis, and its limitations, also suggests several avenues for further research that can be used to develop recommendations. First, and most importantly, this analysis did not ask whether teachers themselves took students' individual motivation (and the motivation of their friends) into account when deciding whether to nominate these students. Although this analysis has revealed that important differences and patterns are evident, further work should explore the extent to which these characteristics are actually considered by teachers. Work by Siegle and Powell (2004) has begun to look at teachers' beliefs; however, this analysis suggests a need for further research on the recommendation of actual students from a variety of backgrounds (rather than vignettes) and for the consideration of students' social perceptions and goals in addition to their achievement motivation. In addition, this work can address whether characteristics of the teachers themselves, rather than the students, are related to their nomination decisions.

Second, further research can serve to disentangle the relation of individual characteristics to previous participation in advanced programs from their relation to nominations for future programs. Although previous participation was included in this

analysis as a statistical control, a more nuanced and complete analysis of how previous participation has influenced individuals' motivation and social perceptions is warranted. This can be accomplished with more in-depth consideration of advanced classes previously taken (perhaps with the use of transcript data) and/or a longitudinal design that tracks students' social perceptions and motivation as they move in and out of advanced academic programming. In short, decisions made earlier in students' academic career will shape their development in ways that may determine their eligibility for future advanced work.

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. High achievement on a test may not be enough to secure a recommendation; rather, nominations 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 social perceptions, motivation, and individual background are associated with achievement criteria met by high school students can help schools to adequately recognize 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.

References

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

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

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,* 229–250.

Barber, C. (2004). 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* (pp. 87–104). Nicosia: University of Cyprus Press.

Barber, C. (2007). *Recognizing high achievement in context: A multilevel analysis of the relationships of friends' values and individuals' motivation and background to the identification of tenth-grade students.* Unpublished doctoral dissertation, University of Maryland, College Park.

Barber, C., & Mueller, C. (2008, March). *Gifted adolescents' peer relationships and friendships in the school context*. Paper presented at the American Educational Research Association annual conference, New York.

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

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,* 69–82.

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

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,* 37–40.

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.

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,* 25–31.

Gagné, F. (2004). Transforming gifts into talents: The DMGT as a developmental theory. *High Ability Studies, 15,* 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: Cambridge University Press.

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

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

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.

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,* 174–194.

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

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,* 281–288.

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.

Muthen, B. O., & Satorra, A. (1995). Complex sample data in structural equation methodology. *Sociological Methodology, 25,* 267–316.

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

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

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

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: Cambridge University Press.

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.

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

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

Snijders, T. A. B., & Bosker, R. J. (1999). *Multilevel analysis: An introduction to basic and advanced multilevel modeling.* Thousand Oaks, CA: Sage.

SPSS Incorporated. (2006). *SPSS 15.0 user's manual*. Chicago: SPSS.

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

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

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

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,* 195–203.

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

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

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

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End Notes

[1] The original version of this analysis (reported in Barber, 2007) considered a comparison of these two groups as part of a larger, multinomial multilevel logistic regression comparing four categories of students total. In that analysis, students below the top decile who were and who were not nominated for advanced

programs also were considered. For ease in discussion, we reran the comparison of these two groups (in each of two subjects) as a binomial multilevel logistic regression; however, the original analysis was considered in making decisions about the inclusion of the random effect of the intercept.

[2] In addition to the small design effects, results from the original, multinomial version of this analysis (reported in Barber, 2007) were useful in deciding to drop the random effect of the intercept from the analysis. In the original analysis, the chi-square tests assessing the random effect of the intercept associated with comparing the two groups above the top decile on achievement were statistically nonsignificant in both subjects.