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ABSTRACT

This report asserts that a student's assignment to a particular ability group affects the student's academic achievement. Empirical research finds that, on average, students assigned to higher ability groups attain higher test scores than those placed in lower groups, controlling for ability. Theoretical formulations indicate that these achievement differences are due to the greater learning opportunities provided to students at higher ability group levels. Based on this reasoning, the present study predicts that, regardless of ability, students will generally attain higher achievement in a higher level group. Predictions from empirical models from a longitudinal study of high school students demonstrate that with few exceptions, students would attain higher test scores if assigned to a higher ability group than the one to which they are actually assigned. Conversely, regardless of ability, students would perform more poorly if assigned to a lower ability group. The results raise serious questions about whether U.S. high schools sufficiently challenge students to attain optimal performance. (Contains 36 references.) (SM)

Ability Group Effects on High School Learning Outcomes

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ABSTRACT

A student's assignment to a particular ability group affects the student's academic achievement. Empirical research finds that, on average, students assigned to higher ability groups attain higher test scores than those placed in lower groups, controlling for ability. Theoretical formulations indicate that these achievement differences are due to the greater learning opportunities provided to students at higher ability group levels. Based on this reasoning, the present study predicts that, regardless of ability, students will generally attain higher achievement in a higher level group. Predictions from empirical models demonstrate that with few exceptions, students would attain higher test scores if assigned to a higher ability group than the one to which they are actually assigned. Conversely, regardless of ability, students would perform more poorly if assigned to a lower ability group. The results raise serious questions about whether American high schools sufficiently challenge students to attain optimal performance.

A commonly held belief about schooling is that a good fit between the curriculum and student ability promotes student learning. When students understand what they are being taught, they are more likely to be actively engaged in the learning process, and less likely to be distracted or disruptive of their classmates.

A belief in the effectiveness of a good match between student ability and curriculum level is reflected in the way most contemporary schools arrange students for instruction. At the elementary level, students frequently are organized into ability groups within the classroom for instruction in Reading and Mathematics. At the middle and secondary levels, students in most schools are assigned to ability grouped classes in English and Mathematics, and often in other subjects as well.

DETERMINANTS OF STUDENT LEARNING

A good fit between student ability and the curriculum is a necessary but not a sufficient condition for academic achievement. Three further conditions are needed to insure student learning: high quantity and quality of instruction; social psychological processes that encourage student motivation and effort; and a strong academic climate.

Quantity and Quality of Instruction: Several conceptual models explain why increasing the quantity and quality of instruction increases student learning. Carroll (1963) relates learning to student ability, curriculum level, quality of instruction, time spent on learning, and perseverance.

Newmann (1993) argues that increasing the competence and confidence of teachers improves the quality and quantity of instruction which, in turn, raises student achievement. Brown (1994) states that students learn best when they take an active role in the instructional process and when they are encouraged to use higher order thinking skills rather than being required to learn primarily through memorization. Sorensen and Hallinan (1986) depict learning as dependent on student ability, effort and opportunities to learn. In their model, learning is interactive, rather than additive, implying that even with an increase in ability or effort, a student will not learn more unless provided with opportunities to learn. In each of these models, the quantity and quality of instruction are seen as key determinants of academic achievement.

Empirical research provides considerable evidence that increasing the quantity and quality of instruction improves learning. Heyns (1978) looked at the effects of summer school on academic year achievement, and found that students who attended summer school had significantly higher achievement levels the following academic year than those who did not attend. Wiley (1976) showed that the longer the school year, the higher the students' achievement test scores, a result also seen in cross-national analyses of the TIMSS (1996) data. Barr and Dreeben (1983) demonstrated that increasing the pace of instruction without decreasing the length of a lesson had a positive effect on the reading scores of first grade students. Other studies show that higher achievement is related to teaching students higher order thinking skills, engaging students in the instructional process and providing a variety of tasks designed to engage student interest (Brown, 1994; Newmann, Marks and Gamoran, 1996).

Social Psychological Factors Associated with Learning: Most conceptual models of learning identify motivation as a major determinant of learning (Brown, 1994; Carroll, 1963; Sorensen and Hallinan, 1986). Students who are motivated to learn spend more time on task during school and devote more time to studying and homework outside of school. The more highly motivated a student, the greater the effort the student will expend, and the more the student will learn.

Students can be motivated in a number of ways. One powerful motivator is intrinsic and extrinsic rewards (Heckhausen, 1967). Teachers help students to appreciate and seek intrinsic rewards, such as the satisfaction of accomplishment and a sense of self mastery, through their own enthusiasm for knowledge and learning. They also provide extrinsic rewards for students, including academic honors, prizes and privileges. In addition, teachers can motivate students by building their self-confidence and by helping them develop an image of themselves as competent learners.

Students are also motivated by a desire for social status. A primary basis of status in high school is academic achievement. Schools bestow status on students by rewarding their academic success with social recognition and honors. Students who are average or below average are less likely to be motivated by academic honors, believing that they are unlikely to attain them. If schools recognize excellence in other activities, then all students have an opportunity to attain social status by excelling in some area. Social status is generally accompanied by positive attitudes toward school, which is generally related to higher motivation and achievement.

Students are also motivated by the effective use of pedagogical techniques. Research shows that cooperative learning methods increase student motivation and effort by allowing students to work together on common projects to attain a shared goal (Slavin, 1995; Slavin and Oickle, 1995). Competition, on the other hand, has been shown to dampen motivation for all but the most facile learners.

Academic Climate and Student Learning: A third condition that affects student learning is the academic climate of the instructional setting. The climate of an instructional group is influenced by teacher expectations and by peer norms and values (see Spady, 1973, for an review of early work in this area). Teachers' perceptions of student ability are, to a large extent, based on students' standardized test scores and grades. Their perceptions determine how much work they give students and at what level. If teachers hold high expectations for student performance, they will demand more work from students and challenge them to meet higher standards. Students typically respond to higher teacher expectations by improved academic performance (Rosenthal and Jacobson, 1968). In contrast, students respond to low teacher expectations for their performance by low achievement.

Academic climate is also created by students' values and norms, particularly regarding academic achievement. If most students in a group value learning and have high educational aspirations, the academic climate of the group is strong. In this situation, peers act as positive role models that support a student's motivation. Norms regarding study and performance encourage student effort. In an instructional group with a weak academic climate, students place less value on achievement. They often adopt negative attitudes toward school, lose motivation and expend less effort on learning, resulting in lower academic achievement.

DETERMINANTS OF LEARNING AND ABILITY GROUPING

Empirical studies provide evidence that the conditions that foster learning vary across instructional settings, and in particular, across group level in ability grouped schools. Most studies report that the higher the ability group level, the more conducive are the conditions to student learning. That is, high ability groups are more likely to be characterized by high quality and quantity of instruction, social psychological processes that support motivation and effort, and an academic climate that fosters learning.

Several studies demonstrate the superiority of high ability groups in terms of the quantity and quality of instruction. In high ability groups, teachers devote more time to instruction and less time to management and discipline (1984); cover more of the curriculum at a faster pace (Barr and Dreeben, 1983); and are more experienced and skilled (Oakes, 1990). Furthermore, teachers have higher expectations for student performance in high ability groups (Fry,1982; Jussim and Eccles, 1992; Oakes, Gamoran and Page, 1992).

Empirical research also demonstrates that ability group level affects the social psychological dynamics that influence student motivation. Students in high ability groups have higher social status than pupils in lower ability groups (Oakes, 1985), receive more respect and recognition from their teachers, have higher self-confidence, and devote more time to studying, than students in lower ability groups (Patchen, 1982; Rosenbaum, 1976, 1980).

Research also reveals differences in academic climate across ability group levels. Brophy and Good (1974) found that teachers had higher expectations for the performance of students in high ability groups than for equally talented students assigned to lower ability groups or to heterogeneous groups. Similarly, teachers had lower expectations for the achievement of students in low ability groups than for those pupils of equal ability in higher ability groups (1984). Teachers minimized time spent dealing with disciplinary problems in higher groups and devoted more time to instruction. They praised minor accomplishments of students in lower ability groups, seemingly satisfied with minimal performance (Oakes, Gamoran and Page, 1992; 1981). In addition, studies show that students in high ability groups tend to be serious about learning and to share positive attitudes toward schooling with their classmates. Students in lower ability groups are more apt to subscribe to norms and standards of behavior that detract from learning. The stronger academic climate of higher ability groups acts as a positive influence on student achievement.

ABILITY GROUP ASSIGNMENTS

Identifying the ability group level that will best promote a student's learning is a major consideration in making ability group assignments. The theoretical and empirical research on ability grouping offers three reasons supporting a policy of assigning students to the highest ability group level at which they can perform successfully. First, higher ability groups provide a superior learning environment. This academic benefit is likely to counter the possible risk of student discouragement at the difficulty of the work. Further, the psychological benefits accruing to placement in a higher ability group may increase student motivation and effort and lead to greater academic success.

A second reason for assigning students to as high an ability group as possible is related to the way the assignment process occurs. Schools typically rely on several criteria in making ability group placements. These include grades, test scores, teacher and counselor recommendations, parental preference and student choice. While many of these criteria are designed to insure a good fit between the ability group and a student's ability level, some non-academic considerations may enter into consideration. For example, students may select a class because their friends are taking it, or because they like a particular teacher, or because it meets at a preferred hour. Moreover, scheduling constraints may necessitate a student's taking a class at a different level than the level for which they are most suited. Limitations on enrollment created by class size and the availability of teachers also affect placement decisions.

Each of these criteria introduces the likelihood that some students will be assigned to classes that are above or below their learning level. As a result, student ability is likely to overlap across groups. Some students at the higher end of the ability distribution in one group will have greater ability than some students at the lower end of the ability distribution in the next highest group. Theory and research indicate that the former group of students is likely to have the ability to succeed at the next highest level.

Another effect of heterogeneity within ability groups is that teachers must take into account a wider distribution of ability when presenting the curriculum. To instruct students with a broad range of abilities requires that some of the curriculum be taught at a level that is higher or lower than if the group were more homogeneous. This instructional accommodation has an unintended consequence. Students in any given ability group receive the same level of instruction, at least some of the time, as in the adjacent higher and lower ability groups.

A third reason for favoring higher ability group assignments is found in comparative research on Catholic and public schools. Studies show that on average, Catholic school students attain higher academic achievement than their public school counterparts (Bryk, Lee and Holland, 1993; Coleman and Hoffer, 1987; Greeley, 1982; Hoffer, 2000; Lee and Bryk, 1986). Researchers attribute the Catholic school advantage partly to characteristics of the academic program of these schools. Catholic schools tend to assign all their students to ability groups with a strong curriculum and high teacher expectations. The success of Catholic school students, especially low ability students, is evidence that taking solid, academic courses increases student achievement for all students.

STRATEGIES FOR STUDYING ABILITY GROUP EFFECTS

Previous studies of the effects of ability grouping on student achievement have taken one of two approaches. In the first approach, researchers have asked whether students in ability grouped schools perform differently from students in ungrouped schools (for a review, see Slavin, 1990). These studies typically find no mean difference in achievement between the homogeneous and heterogeneous groups. However, the variance in achievement tends to be greater in schools that ability group. This suggests that ability grouping has a differential effect on student achievement by level. Students in high ability groups attain higher achievement and /or students in low ability groups have lower achievement than similar peers in ungrouped schools.

In the second approach to studying ability group effects, researchers compare the effects of ability groups across group level (Hallinan and Kubitschek, 1999; Rosenbaum, 1976). When the data are cross-sectional, the studies generally show that the higher the ability group, the higher the mean achievement. With longitudinal data, they demonstrate that growth in achievement is higher in high ability groups than in low groups.

This paper takes a third approach to the study of ability group effects. The aim of the analysis is to examine whether a student would attain higher achievement if placed in a higher ability group than the one to which the student was actually assigned. Similarly, would a student have lower achievement if assigned to a lower ability group. This analytic strategy is similar to the one Coleman et al. (1966) used in comparing the achievement of Catholic and public school students. It permits an examination of the achievement of a student under different ability group contexts. The theoretical appeal of this approach is that it provides a better understanding of the results of the differential learning processes that occur in different ability groups. The practical appeal of this approach is its fit with some of the considerations that face educational personnel, parents and students when making decisions that affect ability group placement.

METHODOLOGY:

Sample: The analyses are based on survey data from a longitudinal study of the effects of ability grouping on students' growth in academic achievement. The schools in the study include five public high schools and one Catholic high school in a Midwestern city and a single public high school in an adjacent city. The data set contains information on over 4,000 students in two cohorts: the students in the seven high schools in the sample who entered high school in either the 1988-89 or 1989-90 school years.

In the present study, the analysis is conducted on a subset of the sample, consisting of students in the six public high schools. The single Catholic high school in the sample is excluded because its ability group structure differs from that of the public schools. The combined total population of Hispanics, Asians, Native Americans, and other non-white, non-black students is less than five percent of the sample. For purposes of these analyses, these students are treated as white. Students who took special education courses, English as a second language courses, and those not taking English or Mathematics in the particular grade being studied are excluded.

Variables: The dependent variables are student achievement in English and Mathematics in the spring of 9th, 10th and 11th grades. Achievement is measured by a student's percentile score in English and Mathematics on a statewide standardized test. This test was designed and scored by a national testing company that used a national sample as the reference group. Public school students took this test in the spring of their 8th, 9th and 10th grades, and the first of the two cohorts also took it in the 11th grade.

The independent variables include several exogenous and control variables. Ability group level for each student was obtained from school records at four points over each school year. In this study, ability group assignment at mid-year is used. The schools in the sample had four ability group levels in English: Advanced, Honors, Regular and Basic. They had five levels in Mathematics: Advanced, Honors, Regular, Basic and Very Basic. (The terms "Basic" and "Very Basic" were not used by the school, but examination of the curriculum indicated that these names are appropriate.)

Other independent variables in the analysis are students' previous percentile test scores in English and Mathematics, students' final grade in their previous English and Mathematics classes, and absenteeism. Previous grades follow the usual four point scale, from A = 4.0 to F = 0.0. Absenteeism is measured by the total number of days the student missed school during the first semester of that year. Background variables for the analysis include gender, race, SES, and age (measured in years minus an appropriate integer for that year). Cohort is added as a control variable, as are dummy variables for school attended.

Statistical Model: The dependent variable, student percentile test score in English and Mathematics, is censored at both ends of the distribution: no student can obtain a test score lower than one nor higher than 99. Since this censoring violates the assumptions of the ordinary least squares regression model, OLS coefficient estimates would be biased toward zero by the resulting "floor" and "ceiling" effects. Therefore, a two-limit tobit model is employed which provides consistent coefficient estimates for censored dependent variables with this type of distribution (See for example, Maddala, 1983). The tobit model estimates the underlying, and unobservable, uncensored error distribution, and computes coefficients based on that distribution.

Tobit coefficient estimates can be and usually are interpreted as if they were ordinary regression coefficients. This is essentially accurate for those cases that fall in the middle of the distribution, though less accurate if one is discussing the ends of the distribution. The statistical program used for these analyses (LIMDEP) also provides an estimate of the standard deviation (not the standard error) of the estimated uncensored error distribution, identified as σ in the appropriate tables.

RESULTS

Descriptive Analysis: Table 1 presents the means and standard deviations of the dependent and independent variables in the analysis for 9th grade students. Descriptive statistics are similar for 10th and 11th grades. The data show that the students in the sample are slightly above the statistical mean for the test score distribution in both English and Mathematics. Their previous English and Mathematics grades were about a C. Students were absent five and a half days during the first semester, on average, and were evenly divided by gender. Twenty-two percent of the sample was black and 20% participated in the free lunch program. Students were fairly evenly distributed across the six public high schools in the sample. More than half the students had been assigned to the Regular English and Mathematics ability groups in eighth grade, with Honors being the next largest previous ability group placement.

TABLE 1 here

Figures 1a and 1b present the distribution of eighth grade standardized test scores in English and Mathematics for the ninth grade students in the sample by their ninth grade ability group placement. To create a more readable graph, that is, one without a large number of spikes, a moving average was calculated over a range of seven percentile points. For example, if two students had test scores from 1 to 7, the point (4, 0.27) was plotted:"4" is the midpoint of the range from 1 to 7, and 2/7 = .27. If seven students had test scores from 2 to 8, the point (5,1) was plotted. A consequence of using this method is that the scores of the lowest and highest scoring students do not appear per se in the figure, but they are included in the first and last average, respectively. For example, while several Advanced English students achieved test scores at the 99th percentile, their frequency is averaged with those of students who scored between 93 and 99.

Figures 1a and 1b here

Figures 1a and 1b reveal considerable overlap in test scores between adjacent ability groups and a surprising amount of overlap between groups two or more levels apart. The high degree of overlap reveals striking features in these schools. For example, if a student were to receive an English test score of, say, 60%, the student could feasibly be placed at any one of the four ability group levels, and would not be the lowest or highest scoring student in any of the groups. As another example, students who scored at the 90th percentile in Mathematics can be found in Basic, Regular, Honors and Advanced Mathematics ability groups. Again, the distribution of English scores in the Basic group is almost completely contained within the Regular group distribution. Similar extensive overlap in standardized test scores across English and Mathematics groups is found in the 10th and 11th grades.

These data show that high school ability groups are less homogeneous than generally believed. Nearly every student in the ninth grade, regardless of ability level, could have been assigned to the next higher ability group in English or Mathematics, without being at the bottom of the ability distribution of that higher group. Similarly, nearly every student could have been assigned to the next lower ability group without being at the top of that lower distribution. Greater heterogeneity in ability groups weakens the effectiveness of ability grouping by making it more difficult for a teacher to tailor the curriculum and instruction to the student's abilities.

The heterogeneity within ability groups suggests that not all assignment criteria are designed to maximize academic homogeneity within groups. Apparently, some assignment decisions are based on non-academic preferences. The amount of variability within ability groups also suggests that one could easily assign a student to the next highest ability group level without jeopardizing the student's likelihood of academic success.

Inferential Analysis: Tables 2a and 2b present tobit models predicting students' English and Mathematics test scores at the end of ninth grade by ninth grade ability group. The predictors are previous test score, previous grades, absenteeism, background information, school, and previous ability group level. Table 2a shows that previous test scores have a positive effect on English achievement in all ability groups. Older students, that is, those who are more likely to have been retained a year at some previous point in school, obtain lower test scores than younger students, although this effect is only statistically significant in the Basic and Regular ability groups. Being black has a negative effect on English achievement in most groups, though only significantly so in the Advanced group. Previous ability group has the expected effect that students previously in lower groups have lower achievement and students previously in higher groups have higher achievement, compared to the Regular ability group. Students from schools that did not ability group in eighth grade do considerably better than other students.

TABLES 2a and 2b here

Table 2b reveals that previous test scores have a positive effect on Mathematics achievement in all ability groups. Previous Mathematics grade also has a positive and significant effect on achievement in all five ability groups, although this effect is somewhat countered by the negative effect of English grades, which are positively correlated with Mathematics grades. Few background effects are found. As with English, previous assignment to a low ability group has a negative effect on achievement while previous assignment to a high ability group has a positive effect.

The estimates from these models allow the prediction of the test score of any student in the sample, had the student been placed in any track. These estimates must be interpreted with caution for two reasons. First, they are based on the particular distribution of students in each ability group in the sample. The ability and motivation of the individual students in each group, and the quantity and quality of instruction, social psychological factors, and academic climate that characterize the group, all affect the coefficients of the prediction equations. If a student is moved into or out of an ability group, the derived estimates are no longer the best estimates for the new situation. Second, hypothetically moving students from one group to another assumes that the unmeasured characteristics of the students moved have the same distribution, most notably the same mean, as the students already in the ability group. Students in different ability groups have mean differences in certain characteristics, such as motivation to learn and educational aspirations, which were not measured, and which affect achievement.

Despite these difficulties, making predictions of one student's achievement in a variety of ability group settings is a useful and important exercise. Given the size of the sample, moving one student would have no more than a trivial effect on the parameter estimates. Moreover, the omitted variable problem can be conceptualized in terms of sample selection into the various ability groups. Gamoran and Mare (198) demonstrate that, given sufficient controls for previous achievement, the effects of sample selection are small in such situations. In these models, English and Mathematics test scores and grades are controlled in both equations. Estimation of sample selection models on these data (results not shown) indicate that while some sample selection effects are present, the coefficient estimates are barely affected. This lack of selection effect is likely because motivations and aspirations are partially measured by previous grades. In addition, the overlap in ability seen across ability groups suggests overlap in other characteristics as well. Although there are clear mean differences, the ability groups do not have precise boundaries in terms of measurable student characteristics.

More generally, although based on a specific set of students, the coefficient estimates are intended to represent a more general process of teaching and learning, and are consistent estimates of this process. In this theoretical sense, students can be substituted across ability groups. In terms of practice, students are actually substituted during the school year. Approximately five percent of the students in the sample schools leave during the school year and are replaced with an almost equal number of students. Because these replacements were not in the school for the whole year, they are not in the sample for the analyses. But these students affected the academic climate of their ability groups; thus, their leaving and arriving will have influenced the parameter estimates. That is, some substitution of students is already inherent in the parameter estimates.

Table 3 presents the predicted test scores for ninth grade students in English and Mathematics, given their assignment to any ability group. The predictions are of the unobserved, uncensored variable as estimated by the tobit model. Thus, individual predicted scores greater than 99 and less than 1 are possible. The mean and standard deviation of these predictions were computed by ability group.

TABLE 3 here

The means of the predictions can be interpreted as the test score the typical student in the specified ability group would receive, had that student been in a different ability group. The typical student in 9th grade Regular ability group in English achieves a test score of 47.3. Had that student been in the Basic group, the student would be expected to achieve only a 40.1, while in the Honors group, the student could have expected a score of 49.5, and in the Advanced group a score of 50.1.

Given the discussion of the lack of sample selection bias, the overlap in the distributions of student characteristics across ability groups, and the on-going substitutability of students in the schools, these predictions are believed to be quite accurate. However, some error is certainly present. As is well known, models predict most accurately for cases near the center of the observed variable distributions and less accurate for cases nearer the ends of the distributions. The typical student assigned to the Basic group is well within the Regular group distribution, but towards the end of the Honors and Advanced distributions. Thus, prediction of that student's achievement is more accurate for the Regular group than for the Honors group, and least accurate for the Advanced group. Both of these sources of error in the predictions indicate that, when examining Table 3, the further one moves a student from one ability group to another, the less accurate the predictions.

Table 3 demonstrates a pattern of improved English test scores with higher ability group placement for students at all group levels except the Basic group. For example, if students assigned to the Regular English ability group were placed in the Honors group instead, their standardized test score would increase from 47.3 to 49.5 and would increase again to 50.1 if they were assigned to the Advanced group. This same pattern holds for Honors and Advanced students.

Consistent with this relationship, placing students in a lower English group than the one to which they were actually assigned would lower their test scores. Students in the Regular group would lose an average of 7.2 percentile points by placement in the Basic group, Honors students would lose 3.1 points by assignment to the Regular group and the scores of Advanced students would drop by 2.1 percentile points if they were assigned to the Honors group. The biggest decrease in test scores would occur if students were moved to the Basic group from any other ability group. This suggests that learning is more problematic in the Basic English group.

The Basic English students form a slight exception to the pattern of higher predicted test scores on assignment to a higher ability group. If a Basic student were assigned to the Regular group, the model predicts that the student's score would drop slightly, less than a percentile. If a Basic student were assigned to the Honors group, the student's score would drop a little more than two percentile points. While these differences are not large, any loss in achievement associated with organizational factors is reason for concern. At the same time, the small differences in the predicted means for Basic students assigned to higher ability groups might simply be due to random error.

The predictions in Table 3 for Mathematics provide further evidence that assigning students to higher ability groups increases their achievement. In every case, except Advanced students assigned to the Regular group, moving a student to a higher ability group increases the student's Mathematics standardized test scores. For example, students assigned to the Very Basic Mathematics group would gain over a percentile by assignment to the Basic group, over 4 percentile points by assignment to the Regular group, 13 points by assignment to Honors and almost 25 percentile points by assignment to the Advanced group.

Of course, we need to be cautious about the large predicted gains for ability groups two or more levels above Very Basic. Not only will there be error, but also, these models do not incorporate effects of student discouragement. Proponents of ability grouping argue that students presented with material beyond their capabilities get discouraged, lose their motivation, and learn less as a result. The models do not incorporate such effects of a curriculum that is obviously too challenging for a student.

The one minor exception to the observed pattern of improved test scores with higher ability group placement is found for students assigned to the Advanced Mathematics group. If these students were placed in the Regular group instead of the Advanced group, their test scores would increase about one percentile. This deviation from the pattern is likely due to unwarranted weight being given to the effect of being in the Advanced Mathematics group in the 8th grade for students in the 9th grade Regular group. As shown in Table 2, this coefficient is extremely large (b=17.60) but is based on only those two students who moved from Advanced in 8^{th} grade to Regular in 9^{th} grade. Almost all (94.4%) of the students in 9th grade Advanced Mathematics were in 8th grade Advanced Mathematics, and thus receive the full weight of this effect in their predicted Regular scores. If the true effect of previously being in Advanced versus Regular for students in the Regular group is "merely" as large as the estimated effect for students in the Honors group (b=11.61, well within one standard error of the Regular estimate), the pattern of improved test scores by group for Mathematics is without exception.

In general, even with discounting the magnitude of gains two or more group levels above an actual group assignment, and acknowledging minor exceptions in the data, the pattern of higher predicted test scores in higher ability groups is clear for both English and Mathematics. The findings provide strong evidence that greater learning opportunities are available in higher ability groups, resulting in a direct positive impact of ability grouping on student achievement. They also indicate that these learning opportunities could be taken advantage of by a far larger group of students than are encouraged to do so at the present.

CONCLUSIONS

This study is based on theoretical arguments about the determinants of student achievement. Theoretical research suggests that learning is facilitated by a good fit between student ability and the curriculum and that three conditions support learning: high quantity and quality of instruction, strong social psychological support and an academic climate. Empirical findings, including the results presented here, show that students assigned to high ability groups attain higher achievement than those assigned to lower groups. It is reasonable to conclude that the determinants of learning are present to a greater extent in higher level ability groups.

The findings from this analysis provide fairly dramatic evidence that assigning a student to a high ability group has a positive effect on achievement, regardless of the student's learning ability. Apparently, all students would benefit from placement in a group one and possibly even two levels higher than school criteria indicate. Conversely, assignment of a student to a lower ability group tends to have a negative effect on student achievement. These findings suggest that students respond well to intellectual challenge, and through greater intellectual engagement, become more successful in their academic efforts. The results raise serious questions about whether schools underestimate student ability and fail to challenge students adequately, or have sufficiently high expectations for their performance.

The study points to an equity issue related to differences in learning opportunities across ability groups. The finding that higher ability groups are more conducive to learning than lower groups implies that low ability students are doubly disadvantaged. Not only do they find learning difficult, but they are further disadvantaged by the weak learning environment found in most low ability groups. If a low ability student were placed in a higher group, the strong learning environment might compensate for the student's ability, and lead to higher achievement.

This study also raises questions about when students are is challenged beyond their ability. Numerous social psychological studies point to negative effects of failure on student self-confidence and self-esteem. Students may become discouraged in a demanding academic environment, and a loss of self-confidence or fear of failure may lead them to disengage from learning. Moreover, the threshold of tolerance for challenge may differ by student characteristics and ability, implying that some students may become discouraged more easily than others. For example, students at the lower end of the ability distribution may be more vulnerable to discouragement than students who are more accustomed to academic success.

While the research in this paper does not directly address the issue of student discouragement in the face of challenge, it does show that educators are far more likely to err on the side of not challenging students sufficiently than of discouraging them by assigning work that is too difficult. Moreover, educators always have the option of reassigning a student to a lower ability group if the student reacts poorly to more difficult work. Hence, the long-term risks of placing students in a higher ability group seem unlikely while the advantages of higher group placement appear compelling.

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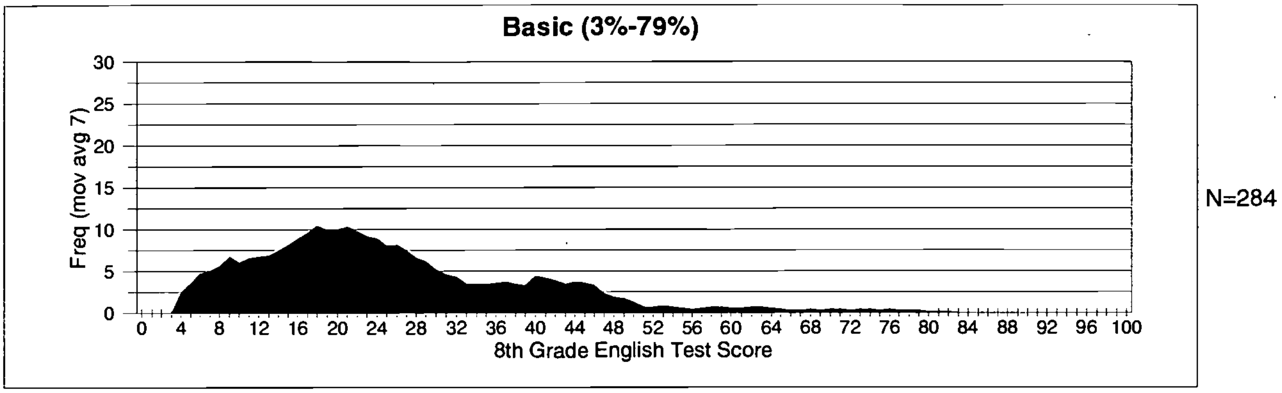
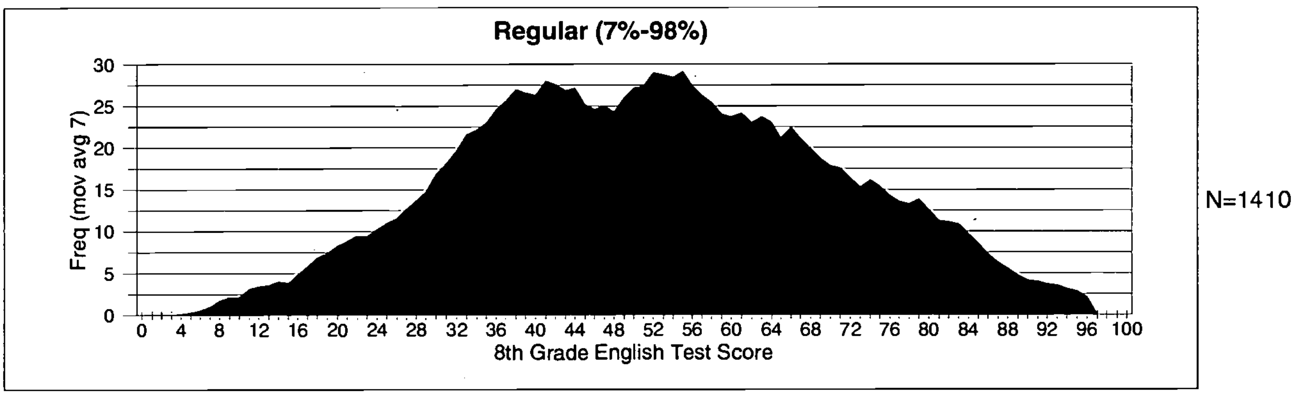
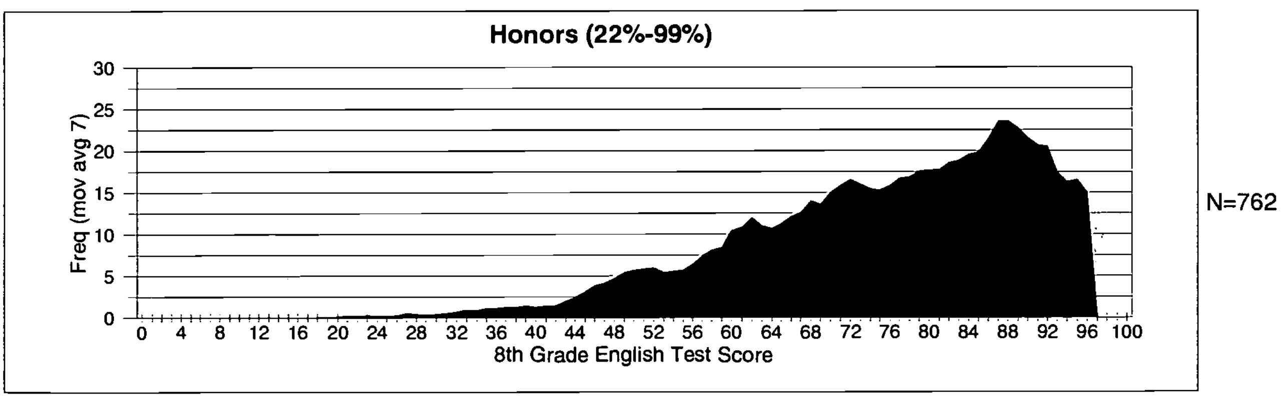
Table 1: Descriptive Statistics

	English 9th Grade		Mathematics 9th Grade	
	N = 2581		N = 2574	
Variable	mean	s.d.	mean	s.d.
9th Grade English Test Score	54.70	24.44	---	---
9th Grade Mathematics Test Score	---	---	56.78	26.19
8th Grade EnglishTest Score	57.92	23.87	58.02	23.87
8th Grade Mathematics Test Score	61.26	25.75	61.34	25.70
8th Grade English Grade	2.18	1.10	2.19	1.10
8th Grade Mathematics Grade	2.00	1.12	2.00	1.12
Days Absent 1st Semester	5.43	6.70	5.43	6.65
Cohort 2 = 1	0.50	0.50	0.50	0.50
Age in Years	-0.03	0.52	-0.03	0.52
Female = 1	0.50	0.50	0.50	0.50
Black = 1	0.22	0.41	0.22	0.41
Free Lunch = 1	0.20	0.40	0.20	0.40
School 1.1 = 1	0.15	0.36	0.15	0.35
School 1.2 = 1	0.15	0.36	0.15	0.36
School 1.3 = 1	0.19	0.39	0.19	0.39
School 1.4 = 1	0.13	0.33	0.13	0.34
School 1.5 = 1	0.18	0.38	0.17	0.38
School 2.1 = 1	0.21	0.41	0.21	0.41
8th Grade Ability Group Very Basic = 1	---	---	---	---
8th Grade Ability Group Basic = 1	0.09	0.28	0.10	0.30
8th Grade Ability Group Regular = 1	0.57	0.50	0.57	0.49
8th Grade Ability Group Honors = 1	0.28	0.45	0.20	0.40
8th Grade Ability Group Advanced = 1	---	---	0.10	0.30
8th Grade Ability Group Spec Prog = 1	0.01	0.11	0.01	0.08
8th Grade Not Ability Grouped = 1	0.01	0.12	0.02	0.13
8th Grade Ability Group Missing = 1	0.04	0.20	0.01	0.10

Figure 1a
Frequency of Standardized Test Scores By Ability Group Level
9th Grade English







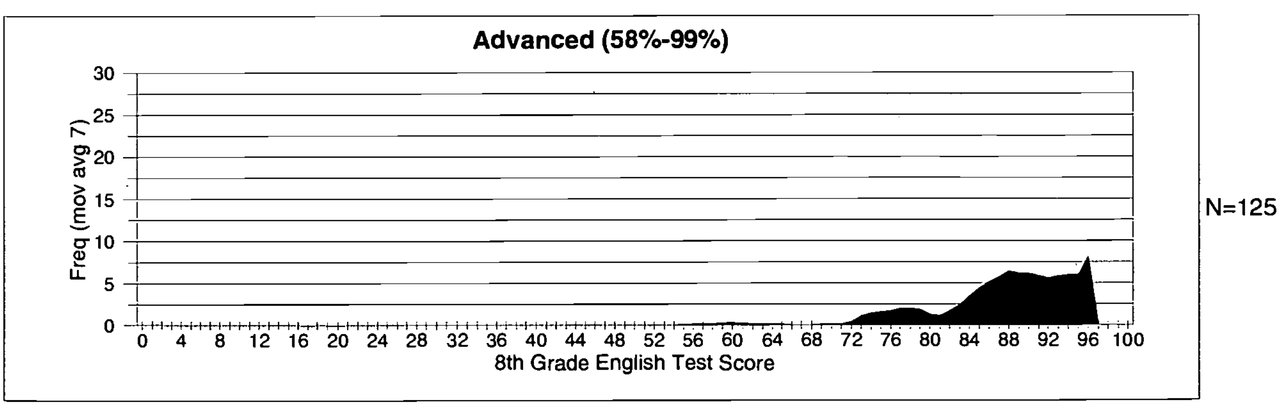
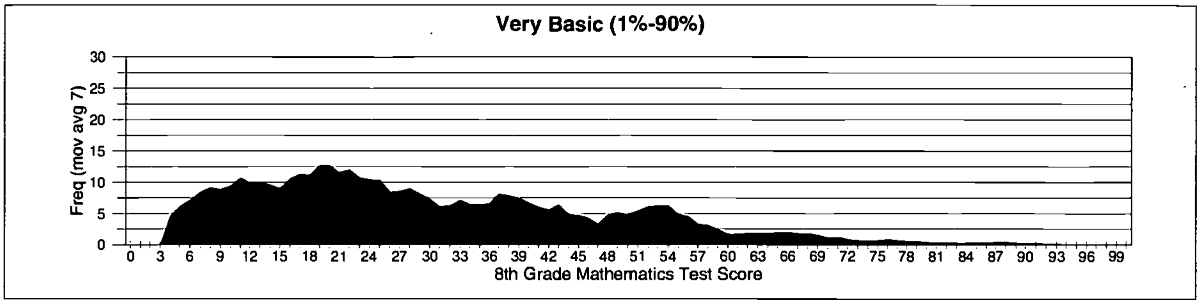


Figure 1b
Frequency of Test Scores By Ability Group Level
9th Grade Mathematics



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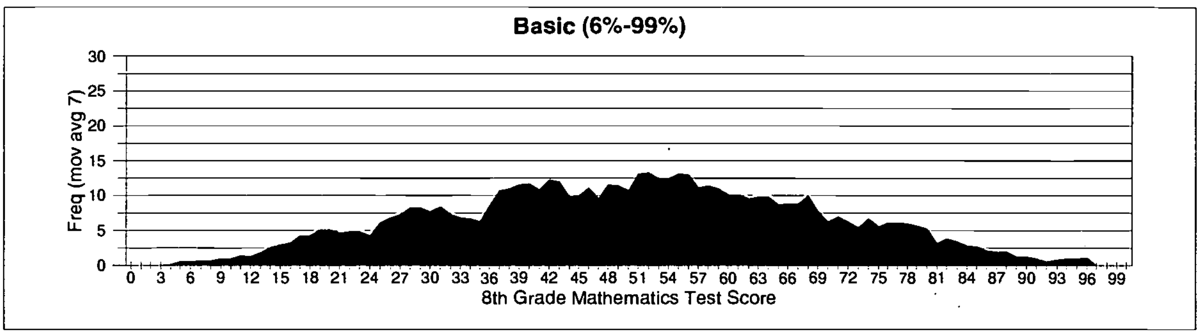

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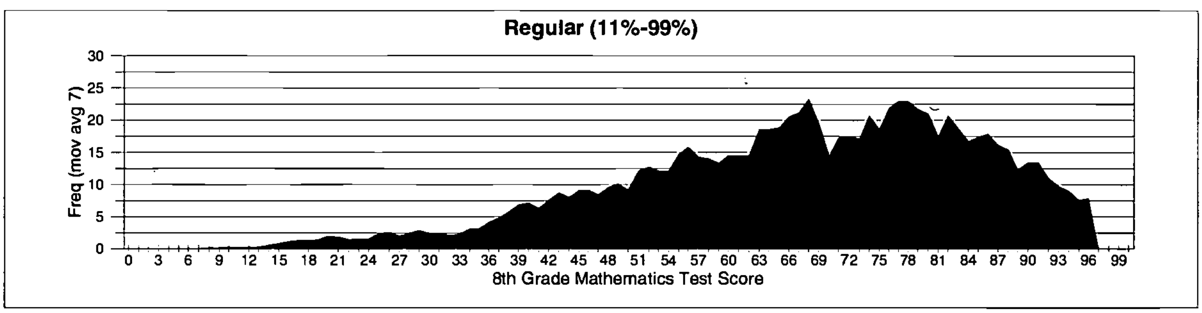

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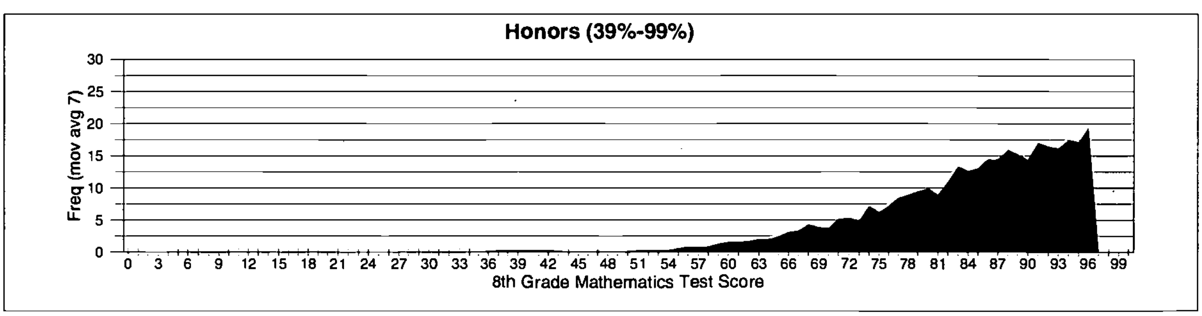

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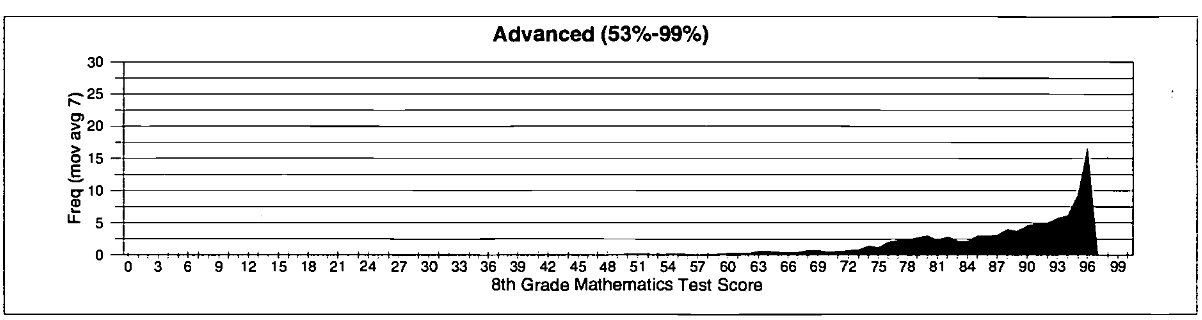

N=178

Table 2a: Tobit Models Predicting 9th Grade English Achievement

	Students in Basic N=284	Students in Regular N=1410	Students in Honors N=762	Students in Advanced N=125
	b	b	b	b
8th Grade English Test Score	0.59 ***	0.78 ***	0.80 ***	0.79 ***
8th Grade Mathematics Test Score	0.02	0.06 ***	0.12 ***	0.15 *
8th Grade English Grade	-0.62	0.92 **	0.64	0.84
8th Grade Mathematics Grade	0.10	0.33	-0.32	-0.09
Days Absent 1st Semester	0.03	-0.02	0.03	0.29
Cohort 2 = 1	1.00	1.45 **	1.03	1.37
Age in years	-2.54 ***	-2.10 ***	-0.37	-2.22
Female = 1	1.03	0.55	0.21	1.10
Black = 1	-1.43	-0.61	0.04	-5.81 **
Free Lunch = 1	0.68	0.10	-1.42	-0.15
School 1.2 = 1	-2.00	2.67 **	-0.87	-3.73
School 1.3 = 1	-1.29	1.83 *	-1.30	1.04
School 1.4 = 1	-0.40	0.16	-2.22	-4.96 **
School 1.5 = 1	-2.39	2.32 **	-0.19	—
School 2.1 = 1	-3.54	4.02 ***	1.19	1.08
8th Grade Ability Group Basic = 1	-0.05	-2.85 *	-11.97	—
8th Grade Ability Group Honors = 1	—	1.80	1.94 *	2.15
8th Grade Ability Group Advanced = 1	—	—	—	—
8th Grade Ability Group Spec Program = 1	-0.44	-1.34	-0.90	3.45
8th Grade Not Ability Grouped = 1	—	5.39	3.92 *	5.39
8th Grade Ability Group Info Missing = 1	-0.86	-2.87 *	-1.83	1.30
Constant	10.46 ***	-1.09	1.81	-1.37
σ	7.53 ***	9.34 ***	8.28 ***	5.33 ***
Log-likelihood	-976.33	-515.30	-2678.98	-372.14

* = p < .05   ** = p < .01   *** = p < .001

Table 2b: Tobit Models Predicting 9th Grade Mathematics Achievement

	Students in Very Basic N=463	Students in Basic N=605	Students in Regular N=921	Students in Honors N=407	Students in Advanced N=178
	b	b	b	b	b
8th Grade Mathematics Test Score	0.56 ***	0.51 ***	0.56 ***	0.51 ***	0.60 ***
8th Grade English Test Score	0.06	0.19 ***	0.14 ***	0.07	0.03
8th Grade Mathematics Grade	2.39 **	2.13 **	2.69 ***	2.80 ***	2.11 **
8th Grade English Grade	-0.35	-1.54 *	-1.18 *	-0.54	0.13
Days Absent 1st Semester	-0.19 **	-0.15	0.03	0.09	0.23
Cohort 2 = 1	3.01 **	0.24	2.91 ***	-0.02	-1.92
Age in years	-1.90 *	-1.40	-1.83 *	-0.14	1.91
Female = 1	0.97	-1.87	-1.28	-1.46	-1.97
Black = 1	-0.98	-1.11	-2.71 *	-1.69	-3.22
Free Lunch = 1	0.36	1.03	-0.20	-0.51	0.65
School 1.2 = 1	1.51	2.19	-0.49	-0.94	-1.43
School 1.3 = 1	0.82	6.93 ***	1.73	3.55 *	-2.98
School 1.4 = 1	-3.95 *	-0.94	-1.01	-8.22 ***	-4.02 *
School 1.5 = 1	-0.35	2.15	-4.94 ***	-5.56 **	-2.46
School 2.1 = 1	-10.48 ***	5.38 **	1.83	-2.42	-5.43 *
8th Grade Ability Group Basic = 1	-3.40 **	-0.68	4.96	—	—
8th Grade Ability Group Honors = 1	-0.36	6.60	7.08 ***	6.57 **	—
8th Grade Ability Group Advanced = 1	—	—	17.60 *	11.61 ***	0.33
8th Grade Ability Group Spec Program = 1	-4.42	4.54	8.23	-9.86	—
8th Grade Not Ability Grouped = 1	-0.16	0.96	4.86	10.22 **	—
8th Grade Ability Group Info Missing = 1	-0.19	-5.65	-0.15	-13.73	4.94
Constant	10.91 ***	6.88 *	8.83 ***	24.32 ***	33.23 ***
σ	10.45 ***	12.49 ***	11.44 ***	8.70 ***	5.79 ***
Log-likelihood	-1738.13	-2386.07	-3540.28	-1403.42	-462.92

* = $p < .05$ ** = $p < .01$ *** = $p < .001$

Table 3: 9th Grade English and Mathematics Achievement by Ability Group

English

Ability Group		Actual Test Score	Predicted Test Score if Students with these Characteristics were Assigned to: Basic	Regular	Honors	Advanced
Basic	Mean	22.9	22.9	21.5	18.8	23.1
N= 284	Std. Dev.	11.9	9.1	12.5	14.7	14.8
Regular	Mean	47.3	40.1	47.3	49.5	50.1
N= 1410	Std. Dev.	18.6	11.6	16.0	17.5	18.4
Honors	Mean	74.6	55.0	71.5	74.6	76.2
N= 762	Std. Dev.	15.9	9.2	12.9	13.6	14.7
Advanced	Mean	88.8	63.4	82.7	86.5	88.6
N= 125	Std. Dev.	10.1	5.0	7.0	7.3	8.9

Mathematics

Ability Group		Actual Test Score	Predicted Test Score if Students with these Characteristics were Assigned to: Very Basic	Basic	Regular	Honors	Advanced
Very Basic	Mean	27.2	27.2	28.4	31.9	40.4	51.0
N= 463	Std. Dev.	16.0	12.1	12.6	13.2	12.0	12.4
Basic	Mean	43.6	42.3	43.6	46.4	54.0	64.1
N= 605	Std. Dev.	18.6	12.4	13.7	14.1	12.7	12.6
Regular	Mean	61.3	55.6	57.5	61.4	67.6	76.1
N= 921	Std. Dev.	18.3	11.9	13.7	14.4	13.0	12.1
Honors	Mean	84.2	67.1	73.2	81.7	84.5	88.5
N= 407	Std. Dev.	12.1	8.9	8.9	10.2	9.0	7.5
Advanced	Mean	92.2	73.4	73.5	94.5	91.9	93.4
N= 178	Std. Dev.	8.2	8.5	7.9	8.9	9.7	7.4

Note: The mean of the observed test scores for students in an ability group does not exactly equal the predicted mean for students with those characteristics if they were in that ability group because of the non-linearities of the tobit model.

Table A1: 10th Grade English and Mathematics Achievement by Ability Group

English

Ability Group		Actual Test Score	Predicted Test Score if Students with these Characteristics were Assigned to: Basic	Regular	Honors	Advanced
Basic	Mean	26.0	26.0	26.1	18.7	54.4
N= 175	Std. Dev.	15.5	12.9	12.5	14.3	8.8
Regular	Mean	50.3	49.2	50.3	52.5	68.5
N= 1315	Std. Dev.	18.7	17.2	16.4	16.5	11.0
Honors	Mean	77.0	74.4	75.1	77.0	82.5
N= 831	Std. Dev.	14.6	14.1	13.1	12.4	8.9
Advanced	Mean	91.4	88.0	83.9	89.9	91.7
N= 158	Std. Dev.	6.3	8.2	7.7	7.4	5.3

Mathematics

Ability Group		Actual Test Score	Predicted Test Score if Students with these Characteristics were Assigned to: Very Basic	Basic	Regular	Honors	Advanced
Very Basic	Mean	30.3	30.3	34.4	35.7	43.5	46.3
N= 274	Std. Dev.	18.1	12.8	14.5	13.9	12.3	12.4
Basic	Mean	48.0	45.1	48.0	49.1	56.1	58.9
N= 465	Std. Dev.	19.4	12.1	15.3	15.0	13.2	12.7
Regular	Mean	64.3	58.7	66.8	64.3	70.1	72.3
N= 842	Std. Dev.	18.0	12.9	15.8	15.0	13.2	12.5
Honors	Mean	86.3	78.4	88.9	83.0	86.5	87.5
N= 400	Std. Dev.	11.6	10.1	11.3	11.4	9.6	9.4
Advanced	Mean	92.9	77.2	90.7	86.2	93.7	93.9
N= 176	Std. Dev.	7.2	7.0	7.8	7.7	6.9	6.8

Note: The mean of the observed test scores for students in an ability group does not exactly equal the predicted mean for students with those characteristics if they were in that ability group because of the non-linearities of the tobit model.

Table A2: 11th Grade English and Mathematics Achievement by Ability Group

English

Ability Group		Actual Test Score	Predicted Test Score if Students with these Characteristics were Assigned to: Basic	Regular	Honors	Advanced
Basic	Mean	25.9	25.8	24.4	27.5	41.7
N= 60	Std. Dev.	13.9	11.6	11.6	12.0	14.1
Regular	Mean	45.9	42.8	45.8	47.2	60.9
N= 602	Std. Dev.	19.7	16.0	16.3	16.5	17.0
Honors	Mean	73.3	64.4	72.4	73.3	81.4
N= 466	Std. Dev.	16.3	12.4	12.9	12.8	13.5
Advanced	Mean	89.6	75.4	82.6	86.8	90.1
N= 83	Std. Dev.	8.8	8.0	6.8	8.1	7.7

Mathematics

Ability Group		Actual Test Score	Predicted Test Score if Students with these Characteristics were Assigned to: Very Basic	Basic	Regular	Honors	Advanced
Basic	Mean	45.2	—	45.2	48.8	40.3	45.1
N= 132	Std. Dev.	19.9		14.6	14.1	18.1	18.9
Regular	Mean	69.6	—	55.5	69.6	66.0	66.3
N= 327	Std. Dev.	16.6		12.7	12.9	16.3	17.1
Honors	Mean	81.9	—	67.1	83.7	82.7	87.8
N= 230	Std. Dev.	17.2		11.7	11.7	15.0	16.4
Advanced	Mean	92.2	—	72.2	89.9	99.1	94.2
N= 88	Std. Dev.	9.6		8.9	7.6	9.7	9.4

Note: The mean of the observed test scores for students in an ability group does not exactly equal the predicted mean for students with those characteristics if they were in that ability group because of the non-linearities of the tobit model.

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