**National High School Center**

at the American Institutes for Research

*Linking Research and Resources for Better High Schools*

# Using the Right Data to Determine if High School Interventions Are Working to Prepare Students for College and Careers

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## 1. THE CHALLENGE OF GETTING ALL HIGH SCHOOL STUDENTS TO COLLEGE AND CAREER READINESS

In recent years, policymakers have begun to emphasize the goal that all students graduate from high school college- and career-ready (National Governors Association Center for Best Practices, National Conference of State Legislatures, National Association of State Boards of Education, & Council of Chief State School Officers, 2008). Research has supported the idea that college-readiness and career-readiness are increasingly the same goal—the skills required to prepare for most well-paying careers are similar to those required for college readiness (ACT, 2006). Yet, evidence from college-readiness test scores indicates that the majority of students who finish high school do not graduate college ready.[2] This is especially true for African American and Hispanic students (ACT, 2008).[3]

The problem of inadequate student academic preparation usually does not begin in high school. Many students enter ninth grade with low levels of academic preparation, particularly in nonmagnet high schools in communities with many economically disadvantaged students. This places an "extreme degree of difficulty" on high schools to ensure that these students catch up (Neild & Balfanz, 2006). Many high schools struggle just to keep these students from dropping out (Balfanz & Herzog, 2006; Jerald, 2006; Allensworth & Easton, 2007; Kennelly & Monrad, 2007; Heppen & Therriault, 2008).

This report focuses on identifying students who have large academic preparation gaps entering high school and developing databases that can be used to identify promising interventions for those students. Section 2 discusses how to disaggregate poorly prepared students based on the size of their academic preparation gaps relative to college and career readiness targets on state and national tests. Section 3 reports on research at the National Center for Educational Achievement (NCEA) on the relationship between students' eighth-grade academic preparation gaps and their likelihood of meeting college and career readiness targets by the end of high school. Section 4 describes the datasets that states and school districts should create to be able to assess the benefits of interventions for students at different prior achievement levels. Finally, the conclusion in Section 5 summarizes the direction that high schools and school districts can take given this information.

In earlier years, when students entered high school with low levels of academic preparation, most educators did not attempt to make those students college ready. Instead, those students were assumed to be unsuitable for challenging academic work. They were tracked into undemanding courses, trained mainly to show up on time and complete easy assignments, and awarded a high school diploma at the end of the process. This approach was seen as providing adequate preparation for jobs with modest skill requirements. Students, parents, and communities were generally satisfied with this arrangement, and many teachers were satisfied as well, as long as the students behaved well in their classes (Powell, Farrar, & Cohen, 1985).

Continuing such a policy in today's world would put most of these students on a "road to nowhere" (Koelsch, 2006; Strong American Schools, 2008). As a consequence, this approach has been replaced in many states by policies encouraging or requiring all graduating students to complete a set of college-preparatory courses, including, at a minimum, those proposed in the landmark report *A Nation at Risk* (National Commission on Excellence in Education, 1983).[4] As of 2008, at least 19 states had met or exceeded the *Nation at Risk* requirements in their default or required graduation plans (Achieve, Inc., 2008).

Raising course completion requirements has not proven to be a sufficient solution to bring initially poorly prepared students up to the desired level of academic readiness. Without a coherent system of extra support and without measures to ensure that students receiving credit for "Algebra II" have been exposed to and have learned the needed algebra skills, many students completing a college preparatory curriculum on paper are still not graduating ready for college and other postsecondary learning opportunities leading to skilled careers (Dougherty, Mellor, & Jian, 2006; ACT, 2007). In the language of education policy, an emphasis on *access* to courses has not been accompanied by a suitable emphasis on course *rigor* and student academic *preparation* to succeed in the courses (Dougherty & Mellor, 2009).

The evidence in this paper indicates that only a small percentage of students who enter high school with large academic preparation gaps leave high school with the knowledge and skills they need to master college-level coursework. This fits with what educators and others have observed about the challenge of working with poorly prepared students (Balfanz, McPartland, & Shaw, 2002; Balfanz, Legters, & Jordan, 2004). Solutions for those students will need to be more comprehensive and intensive and rely on the best information that can be gathered from improved data and research.

## 2. QUANTIFYING THE ACADEMIC PREPARATION GAPS OF ENTERING NINTH-GRADE STUDENTS

Characterizing students as "poorly prepared" or "having academic preparation gaps" implies a comparison to a desired academic achievement level. That level could be the state's proficiency standard used for accountability; a normative standard for "on grade level" based on the achievement level of the median student from a national sample; or an achievement level that predicts that a student will be college and career ready by high school graduation. Since the goal should be to prepare all students for college and careers, this report focuses on the third option: measuring students' academic preparation relative to college- and career-readiness performance targets.

College- and career-readiness performance targets are test scores that indicate that a student is on track to be academically prepared for college by the time he or she finishes high school (Dougherty, 2008; National Center for Educational Achievement, in press-a). Setting these targets normally takes place in two steps. The first step is to establish those targets in an upper grade (typically Grade 11 or 12) by linking test scores in that grade to data on the same

students' college outcomes. The second step is to backward-map the upper-grade performance targets to lower grades. For lower grades in which no direct link exists to Grade 11 or 12, scores of comparable difficulty in different grades may be identified based on their location in the statistical distribution relative to the average score in their respective grades (National Center for Educational Achievement, in press-a).[5]

As an example of the first step, researchers at the Texas Higher Education Coordinating Board linked scores on the Grade 11 Texas Assessment of Knowledge and Skills (TAKS) to scores on a higher-education placement test used in college to identify whether students were in need of remediation (Dougherty, Mellor, & Smith, 2006). In a second example, researchers at ACT linked student scores on the Grade 12 ACT English, Mathematics, Science, and Reading tests, respectively, to student grades in introductory-level college courses in English composition, college algebra, biology, and social science subjects (ACT, 2006; Allen & Sconing, 2005).[6] College Readiness Benchmarks were identified as those ACT scores associated with approximately a 50% probability that a student will earn a grade of B or higher and 75% a C or higher in the corresponding introductory-level college course. In turn, NCEA researchers used the ACT benchmarks to set college and career readiness targets on the TAKS science test and validate earlier targets on the TAKS mathematics and English language arts tests (National Center for Educational Achievement, in press-a).

As examples of the second step, researchers at NCEA backward-mapped Grade 11 TAKS targets to the Grades 3–10 TAKS by identifying scores at comparable locations in the student score distribution for each grade (Dougherty, Mellor, & Smith, 2006), while ACT researchers identified Grade 8 EXPLORE and Grade 10 PLAN test scores[7] associated with a 50% probability of hitting the Grade 12 ACT benchmark. Using these methods, as of spring 2009 college- and career-readiness performance targets had been set in various subjects on Texas and Arkansas state tests and on the EXPLORE, PLAN, and ACT exams.[8] Given appropriate longitudinally linked data for at least one grade and statistical distribution information for all of the grades, these targets can be set on any state test (Dougherty, 2008). The availability of benchmarks on the EXPLORE, PLAN, and ACT tests makes it possible for any state to set college- and career-readiness performance targets by linking their state test results to one or more of these tests.

Once college and career readiness performance targets have been set, students in any grade can be divided into academic preparation groups based on their distance below the target, as illustrated in Tables 1 and 2. The key idea is to develop course placement and Response-to-Intervention (RTI) strategies based on the size of students' academic preparation gaps.[9] High schools can get a handle on the academic preparation of their entering students by using their eighth-grade test scores to identify how many of them fall into each of the five academic preparation groups.

| Table 1 Defining Academic Preparation Groups on the Grade 8 EXPLORE Mathematics Test | | | |
|---|---|---|---|
| Academic Preparation Group | EXPLORE Mathematics Test Scores | Standard Deviations Above (+) or Below (-) the College and Career Readiness Target | Size of Academic Preparation Gap |
| 0 | ≥ 17 | ≥ 0 | No gap: adequately prepared |
| 1 | 16 | -.5 to < 0 | Small to moderate |
| 2 | 14–15 | -1.0 to < -.5 | Moderate to large |
| 3 | 12–13 | -1.5 to < -1.0 | Large |
| 4 | ≤ 11 | below -1.5 | Very large |

| Table 2 Defining Academic Preparation Groups on the Grade 8 TAKS Mathematics Test | | | |
|---|---|---|---|
| Academic Preparation Group | TAKS Mathematics Test Scale Scores* | Standard Deviations Above (+) or Below (-) the College and Career Readiness Target | Size of Academic Preparation Gap |
| 0 | ≥ 777 | ≥ 0 | No gap: adequately prepared |
| 1 | 732–776 | -.5 to < 0 | Small to moderate |
| 2 | 686–731 | -1.0 to < -.5 | Moderate to large |
| 3 | 642–685 | -1.5 to < -1.0 | Large |
| 4 | ≤ 641 | below -1.5 | Very large |

* From 2003 to 2008, Texas used a different, nonvertical scale for the TAKS test. The bottom scores for each academic preparation group were 2271 for Group 0, 2170 for Group 1, 2069 for Group 2, and 1968 for Group 3. Scores below 1968 would identify a student as being in Group 4. The earlier and later scales can be matched to each other using a concordance table provided by the Texas Education Agency.

To have a metric that may be compared across different tests, the academic preparation groups in Tables 1 and 2 are defined based on the number of standard deviations (a standard statistical unit) the students are below the college- and career-readiness performance target. That way, if the college- and career-readiness targets themselves are set at roughly comparable difficulty levels, the academic preparation groups defined in Tables 1 and 2 also will be roughly comparable.[10] This, in turn, increases the odds that a conclusion that "Group 4 students need Interventions X, Y, and Z to succeed in Algebra I" will be portable across states and tests.[11]

A one-standard-deviation difference in scores is quite large: in reading and mathematics, it is roughly the difference between scoring at the Basic and Proficient levels on the National Assessment of Educational Progress (NAEP), or between the 50th and the 84th percentiles on a norm-referenced standardized test. Thus, students in the lowest two preparation groups in Tables 1 and 2, who are more than one full standard deviation below the target, have large academic preparation gaps and are likely to be poorly prepared for rigorous high school courses.

It also must be noted that college readiness benchmarks on the ACT Reading, Mathematics, and Science exams are above national median scores and thus are "above grade level" based on national norms. Thus, when college- and career-readiness targets on state exams are based on the ACT benchmarks, they are also likely to be above grade level. Similarly, college- and career-readiness targets are above state proficiency standards in Arkansas, Illinois, and Texas (Allensworth, Correa, & Ponisciak, 2008; National Center for Educational Achievement, in press-a, in press-b), and may well be above proficiency standards in the vast majority of states. Thus, many of the students in the groups in Tables 1 and 2 with academic preparation gaps measured relative to college readiness may meet state standards and score at or above grade level on norm-referenced tests.

## 3. RESULTS FROM AN NCEA LONGITUDINAL ANALYSIS ON COLLEGE AND CAREER READINESS IN MATHEMATICS

To examine the end-of-high-school success on college- and career-readiness performance targets of students who enter high school with academic preparation gaps, NCEA researchers analyzed longitudinal student-level data for two

states, Texas and Arkansas. The Texas data came from the Texas Education Agency and contained information on state test scores, while the Arkansas data were supplied by ACT and included information on student EXPLORE and ACT scores. Both data sets contained information on Grades 8 and Grade 11 or 12 test scores and student course-taking patterns in high school.[12] In addition, ACT supplied separate data on Arkansas students' Grade 8 EXPLORE scores in 2007 and 2008.[13] The analysis focused on mathematics, as limitations in the Texas data prevented the linking of Grades 8 and 11 reading and science.[14]

Major findings from this analysis include the following:

a.  Most students—especially low-income and minority students—were not meeting college and career readiness targets in Grade 8, meaning that there were gaps in their academic preparation on entering high school. A high percentage of students fell into Groups 3 and 4 in Tables 1 and 2, indicating that they had large preparation gaps on entering high school. For example, among African American eighth-grade students in 2007, 39% in Texas and 54% in Arkansas fell into Group 3 or 4. The corresponding percentages for Hispanic students were 32% in Texas and 31% in Arkansas. The overall percentage of Hispanic and African American eighth-graders not meeting college- and career-readiness performance targets in 2007 was 77% and 82%, respectively, in Texas; and 71% and 90% in Arkansas. The Texas percentages were similar for students eligible for the free and reduced-price lunch program, a common measure of low-income status.[15] If the goal is college and career readiness for all students, high schools with minority and disadvantaged students are likely to be playing catch-up with the vast majority of their students.

b.  Given current high school practices, students with large academic preparation gaps in Grade 8 have a low probability of meeting college- and career-readiness performance targets in high school. Students in Groups 1, 2, 3, and 4, respectively, had a 30%, 10%, 3%, and 1% probability of reaching college- and career-readiness targets by the end of Grade 11 in Texas and a 37%, 15%, 4%, and 1% probability of meeting those targets by Grade 12 in Arkansas. This indicates that current high school interventions are not intensive or comprehensive enough to prepare most of those students for college and careers by the end of high school.

c.  Students in the lowest academic preparation group were less likely to complete or be taking mathematics courses beyond Algebra II by their senior year. In Texas, only 1% of Group 4 students had completed mathematics courses beyond Algebra II by the end of their junior year, versus 58% for the Group 0 students. In Arkansas, where the data addressed whether students had taken or were taking the course by their senior year, those statistics were 33% for Group 4 students and 80% for Group 0 students. On the other hand, the majority of students in all five preparation groups in the two states completed or were taking mathematics courses at least through Algebra II: in Texas 54% of Group 4 students and 95% of Group 0 students completed Algebra II by the end of their junior year, while in Arkansas 76% of Group 4 students and 98% of Group 0 students completed or were taking Algebra II by their senior year. Thus, lack of course-taking is unlikely to be the main explanation for the difficulties that poorly prepared students encounter in striving toward college- and career-readiness targets.

d.  Students in the lower academic preparation groups are unlikely to meet college-readiness targets even when they have completed or are taking an extra mathematics course beyond Algebra II. For students in Texas who had completed such a course by the end of 11th grade, college- and career-readiness targets were reached

by 87%, 49%, 22%, 10%, and 2% of students in Groups 0, 1, 2, 3, and 4, respectively. For Arkansas students who had completed or were taking such a course by their senior year, college- and career-readiness targets were reached by 77%, 43%, 19%, 6%, and 3% of students in Groups 0 through 4.

To summarize, when students enter high school with large academic preparation gaps, high schools have great difficulty getting those students to college- and career-readiness targets. The following sections discuss the implications of this finding.

## 4. THE DATA WE NEED

In 2004, Balfanz, Legters, and Jordan wrote that

> Several whole school reform models for high schools are developing catch-up courses, and several school districts have developed special prep courses for poorly prepared students that are given during the school day in addition to the standard grade courses (Balfanz, McPartland, & Shaw). To date, however, in large part because of their infancy, the impact of these efforts has not been evaluated beyond small, formative studies typically involving a single school and one or two teachers. As a result, *very little is known about the feasibility and rapidity with which the academic learning of students who enter high school multiple years behind grade level can be accelerated* (p. 1, emphasis added).

School systems need the right data to look for patterns of student growth associated with various interventions and to predict what combination of those interventions might be required to produce a desired amount of acceleration in student learning. For example, students in Academic Preparation Groups 1 or 2 as described above might need certain types of interventions to succeed in an Algebra I class, while the interventions needed by students in Groups 3 or 4 might be much more intensive. Because this kind of specific information is often not available, many high schools and school systems are flying blind when it comes to designing programs of extra help for students.

The data needed to do the required analysis may not exist within a single school or even a single school district.[16] For example, if the question is whether 12-week interventions are more effective than 6-week interventions, information from a district that operates three different 6-week interventions will probably not be sufficient. It is difficult for a single district to operate all of the different combinations of programs and features that need to be investigated.

Therefore, school districts should work with state education agencies to incorporate information on the interventions that students receive into the longitudinal student databases that states are already building.[17] The outcome of such an effort should be a statewide longitudinal database with the following types of information on each high school student:

- The student's achievement level in each core academic subject on entry into high school, measured relative to college and career readiness as well as relative to state standards. As of the summer of 2009, nearly all states had students' eighth-grade achievement data in their longitudinal databases (Data Quality Campaign, 2009b), but performance targets for college and career readiness had been set in only a relatively small number of states.

- Courses taken by the student and the grade earned in each course. As of 2009, 24 states collected student-level course completion data, but not all of these collected information on grades earned in each course (Data Quality Campaign, 2009b).

- The student's performance on end-of-course (EOC) exams in each core high school course. As of 2009, 21 states gave EOC exams in at least one subject, and an additional 14 states had plans to introduce one or more of these exams in the near future.[19]

- Student scores on college entrance exams such as the SAT or ACT, where available, as well as scores on Advanced Placement (AP) or International Baccalaureate (IB) exams.[20] As of 2009, 37 states collected student-level data from at least one of these types of tests, but not all of these states assigned a statewide student identifier to the college entrance exam data to facilitate linking the records to the rest of their longitudinal student database (Data Quality Campaign, 2009b).

- A set of codes to describe the extra help that the student received related to each core high school course. For example, a set of codes might describe the following:

  – a code for each general type of extra help received (one-to-one tutoring, differentiated instruction within the classroom, a parallel catch-up class, etc.);

  – for each type of extra help, the number of hours per week and the number of weeks for which the help was received;

  – for each type of extra help, the student's rate of attendance at the extra help sessions (if applicable); and

  – the date when the extra help began, and a code for whether the extra help occurred over a continuous period of time or was interrupted.

  To the author's knowledge, as of 2009 no state collected this kind of information for its longitudinal database. In general, new data collections such as this should first be piloted in a set of interested and willing school districts to prove the utility of the database and iron out the inevitable unexpected difficulties and complications.[21]

By building databases with information on prior achievement, student program participation, course grades, EOC exams, college entrance exam results, and the features of the interventions that students receive, states would have the basic information they need to assess the progress of students subject to specific interventions.[22] Alternatively, consortia of school districts or the federal government could build such a database using common data definitions and standards. Because of the relative absence of such databases today, we are still in the early stages of learning "the feasibility and rapidity with which the academic learning of students who enter high school multiple years behind grade level can be accelerated" (Balfanz, Legters, & Jordan, 2004, p. 1).

## 5. NEXT STEPS FOR HIGH SCHOOLS AND SCHOOL SYSTEMS

Given the challenges posed by students who enter high school with large preparation gaps and the current lack of the necessary data to guide efforts to address these challenges, leaders in research and school-system improvement should take the following actions:

a. Develop collaboration between the state education agency, local school districts, and research universities to build a statewide longitudinal database with the information described in Section 4. Use multiple statistical analyses of the data to search for the best strategies for accelerating the performance of academically

underprepared high school students. Look for combinations of interventions that provide the greatest boost to students, rather than expecting to find a single silver bullet.

b.  Include in the assessment of all high school programs an analysis of student growth and performance levels *disaggregated by students' level of prior academic preparation*. For example, few discussions of accelerated programs such as AP courses, Early College High Schools, dual-credit, or IB programs include any analysis of student performance in those programs as a function of their level of prior academic achievement (Dougherty & Mellor, in press). Is AP truly for everyone, or mainly for students who are already college ready or have only modest academic preparation gaps? For RTI programs, to what extent do students in specific academic preparation groups—identified by their number of standard deviations below college- and career-readiness performance targets—require different sets of interventions?

c.  Look for consistency between the grades students receive in their courses and their level of achievement as measured by state tests and college entrance exams. If these are inconsistent, conduct professional development and facilitate conversations among educators on how to use grades to provide better feedback to students on their level of college and career readiness.

d.  Identify the high schools most consistently successful at accelerating the learning of students with significant academic preparation gaps. Study how the practices of these relatively higher-performing high schools differ from those in average-performing schools (Dougherty & Rutherford, 2009). For example, one recent study compared the practices of higher and average performing middle and high schools in mathematics and science in five states (National Center for Educational Achievement, 2009).

e.  Treat the problem of poorly prepared ninth-graders as a P-12 problem, not just a high school problem (Dougherty & Rutherford, 2010). Develop content and performance criteria in the elementary and middle school grades to identify the extent to which each student is on track to readiness for high school, college, and careers. Emphasize the importance of accelerating students onto the "ramp to college and career readiness" in elementary and middle school.

These steps should help school systems reduce students' academic preparation gaps prior to high school entry, as well as provide better instruction, assessment, and intervention for high school students with preparation gaps and those who are already meeting college- and career-readiness performance targets.

# END NOTES

[1] The author is a senior research scientist at the National Center for Educational Achievement, a subsidiary of ACT. See www.nc4ea.org.

[2] Although test scores provide a readily available statistical indicator of students' academic college readiness, states and school districts also might develop other indicators to capture skills not measured by tests, such as the ability to write a good research paper. Psychosocial and other nonacademic variables are also important; ACT and the College Board collect information on students' career goals, and ACT has developed a survey instrument that captures student behavioral indicators. Additional aspects of college readiness are discussed in Conley (2005).

[3] These results are evident in states such as Colorado and Illinois, where all 11th graders take the ACT.

[4] The authors of *A Nation at Risk* proposed that all students take at least 4 years of English, 3 years of mathematics, 3 years of science, and 3 years of social studies by high school graduation. By 2005, 65% of high school graduates took at least this set of courses, up from 14% in 1983 (Snyder, Dillow, & Hoffman, 2007).

[5] This approach, commonly referred to as "statistical moderation," has been used in studies comparing results from state tests with those from the National Assessment of Educational Progress (NAEP), and NAEP results with those from the Third International Mathematics and Science Study (TIMSS) (National Center for Education Statistics, 2007; Phillips, 2007).

[6] The social science courses linked to the ACT Reading results included introductory courses in history, psychology, sociology, political science, and economics (Allen & Sconing, 2005).

[7] EXPLORE and PLAN are two tests designed by ACT to measure college readiness in English, reading, mathematics, and science. EXPLORE is typically taken in 8th or 9th grade, and PLAN is taken in 10th grade.

[8] ACT's College Readiness Benchmarks consist of the following scores on ACT exams: 18 in English, 21 in Reading, 22 in Mathematics, and 24 in Science. The Grade EXPLORE and PLAN benchmarks, based on scores that predict attainment of the ACT benchmarks, are, respectively, 13 and 15 in English, 15 and 17 in Reading, 17 and 19 in Mathematics, and 20 and 21 in Science (ACT, 2007).

[9] For a brief discussion of Response to Intervention, see National Association of State Directors of Special Education (NASDSE) and Council of Administrators of Special Education (CASE), 2006.

[10] The comparability of these groups also depends on the extent to which the EXPLORE and TAKS mathematics tests measure similar content.

[11] The portability of such a conclusion also will increase to the extent that states and school systems develop common definitions of "success in Algebra I."

[12] The Texas dataset matched students' 2004 Grade 8 TAKS mathematics scores with their 2007 Grade 11 TAKS scores. State-supplied course completion data were used to identify the highest-level mathematics course each student

took in Grades 9–11. The Arkansas data set matched 2003 Grade 8 mathematics EXPLORE scores with the highest ACT score earned by the student by Grade 12 in 2007. Students fill out a survey when they register for the ACT to identify which courses they have completed or are taking.

[13] The 2007 and 2008 data covered all Arkansas eighth graders taking EXPLORE in each year and were not longitudinally linked, as those students are still early in their progress through high school. The purpose of obtaining these "snapshot" datasets was to have information on a broader and more representative group of eighth graders than was found in the matched 2003 EXPLORE and 2007 ACT data.

[14] The Grade 8 Texas science test was first administered in 2006, so no matching Grade 11 science results from spring 2009 were available at the time of the analysis. In reading, Texas gives a test in Grade 8 but combines reading and writing into a single English language arts test for Grade 11.

[15] Information on student participation in the free and reduced-price lunch program was not available in the Arkansas dataset.

[16] A handful of the nation's largest school districts, with hundreds of schools in a single district, may have enough variation in programs to be able to conduct the desired analysis without pooling data with other districts.

[17] See www.dataqualitycampaign.org for information on states' progress in building longitudinal student databases and in using these databases to improve student outcomes.

[18] Specifically, as of summer 2009 these targets had been set on state tests in Texas and Arkansas. In addition, Colorado, Illinois, Michigan, and Kentucky give all students the ACT, on which College and Career Readiness Benchmarks have been established as described previously.

[19] The source is state education agency Web sites and telephone conversations between NCEA staff and state education agency personnel.

[20] Some states, districts, and high schools encourage all students to take college entrance exams to encourage students to enroll in higher education.

[21] For example, depending on how local intervention programs work, new variables and/or data codes may need to be specified to capture the details and nuances of these programs. The governing body of the state data system needs to develop these specifications, and local school district employees responsible for data submission need to learn how to code the data correctly (Data Quality Campaign, 2009a).

[22] Caution must still be exercised in interpreting these results in cases where students are not randomly assigned to programs, especially if participation in specific intervention programs is related to student motivation.  In general, analysis of the information in such a database can be used to create hypotheses about program effects that can be tested systematically by randomly assigning students to alternative promising intervention programs (Myers & Dynarsky, 2003).

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