



## REL Appalachia Ask-A-REL Response

Educator Effectiveness, Math  
December 2017

### Question:

What is the impact of tracking in mathematics in grades 5–8 on students' mathematics achievement and future mathematics pathways?

### Response:

Thank you for your request to our REL Reference Desk regarding evidence-based information about tracking in mathematics. Ask-A-REL is a collaborative reference desk service provided by the 10 Regional Educational Laboratories (RELs) that, by design, functions much in the same way as a technical reference library. Ask-A-REL provides references, referrals, and brief responses in the form of citations in response to questions about available education research.

Following an established REL Appalachia research protocol, we searched for research reports and descriptive study articles on tracking in mathematics. We focused on identifying resources that specifically addressed the effects of tracking in mathematics on student achievement and future mathematics pathways. The sources included ERIC and other federally funded databases and organizations, research institutions, academic research databases, and general Internet search engines. For more details, please see the methods section at the end of this document.

The research team did not evaluate the quality of the resources provided in this response; we offer them only for your reference. Also, the search included the most commonly used research databases and search engines to produce the references presented here, but the references are not necessarily comprehensive, and other relevant references and resources may exist.

### References

Burris, C. C., Wiley, E., Welner, K. G., & Murphy, J. (2008). Accountability, rigor, and detracking: Achievement effects of embracing a challenging curriculum as a universal good for all students. *Teachers College Record*, 110(3), 571–607. Abstract retrieved from <https://eric.ed.gov/?id=EJ822225>; full text available at <https://pdfs.semanticscholar.org/cd11/84caf93d728f1931079cfb154e73b92f796f.pdf>

*From the abstract:* "This longitudinal study examines the long-term effects on the achievement of students at a diverse suburban high school after all students were given accelerated mathematics in a detracked middle school as well as ninth-grade "high-track"

curriculum in all subjects in heterogeneously grouped classes. Despite considerable research indicating the ineffectiveness and inequities of ability grouping, the practice is still found in most American high schools. Research indicates that high-track classes bring students an academic benefit while low-track classes are associated with lower subsequent achievement. Corresponding research demonstrates that tracks stratify students by race and class, with African American, Latino and students from low-socioeconomic households being dramatically over-represented in low-track classes and under-represented in high-track classes. In light of increasing pressure to hold all students to high learning standards, educators and researchers are examining policy decisions, such as tracking, in order to determine their relationship to student achievement. This study used a quasi-experimental cohort design to compare pre- and post-reform success in the earning of the New York State Regents diploma and the diploma of the International Baccalaureate. Using binary logistic regression analysis, the authors found that there was a statistically significant post-reform increase in the probability of students earning these standards-based diplomas. Being a member of a detracked cohort was associated with an increase of roughly 70% in the odds of IB diploma attainment and a much greater increase in the odds of Regents diploma attainment—ranging from a three-fold increase for White or Asian students, to a five-fold increase for African American or Latino students who were eligible to receive free or reduced-price lunch, to a 26-fold increase for African American or Latino students not eligible for free or reduced-price lunch. Further, even as the enrollment in International Baccalaureate classes increased, average scores remained high. The authors conclude that if a detracking reform includes high expectations for all students, sufficient resources and a commitment to the belief that students can achieve when they have access to enriched curriculum, it can be an effective strategy to help students reach high learning standards.”

Collins, C. A., & Gan, L. (2013). *Does sorting students improve scores? An analysis of class composition*. (NBER Working Paper 18848). Cambridge, MA: National Bureau of Economic Research. Retrieved from <https://www.nber.org/papers/w18848>

*From the abstract:* “This paper examines schools’ decisions to sort students into different classes and how those sorting processes impact student achievement. There are two potential effects that result from schools creating homogeneous classes—a “tracking effect,” which allows teachers to direct their focus to a more narrow range of students, and a peer effect, which causes a particular student’s achievement to be influenced by the quality of peers in his classroom. In schools with homogeneous sorting, both the tracking effect and the peer effect should benefit high performing students. However, the effects would work in opposite directions for a low achieving student; he would benefit from the tracking effect, but the peer effect should decrease his score. This paper seeks to determine the net effect for low performing students in order to understand the full implications of sorting on all students. We use a unique student-level data set from Dallas Independent School District that links students to their actual classes and reveals the entire distribution of students within a classroom. We find significant variation in sorting practices across schools and use this variation to identify the effect of sorting on student achievement. Implementing a unique instrumental variables approach, we find that sorting homogeneously by previous performance significantly improves students’ math and reading

scores. This effect is present for students across the score distribution, suggesting that the net effect of sorting is beneficial for both high and low performing students. We also explore the effects of sorting along other dimensions, such as gifted and talented status, special education status, and limited English proficiency.”

Domina, T., McEachin, A., Hanselman, P., Agarwal, P., Hwang, N., & Lewis, R. (2016). *Beyond tracking and detracking: The dimensions of organizational differentiation in schools*. (RAND Working Paper WR-1155). Santa Monica, CA: RAND Corporation. Retrieved from [https://www.rand.org/content/dam/rand/pubs/working\\_papers/WR1100/WR1155/RANDWR1155.pdf](https://www.rand.org/content/dam/rand/pubs/working_papers/WR1100/WR1155/RANDWR1155.pdf)

*From the abstract:* “Schools utilize an array of strategies to match curricula and instruction to students’ heterogeneous skills. While generations of scholars have debated “tracking” and its consequences, the literature fails to account for diversity of school-level sorting practices. In this paper we draw upon the work of Sørensen (1970) to articulate and develop empirical measures of five distinct dimensions of school cross-classroom tracking systems: (1) the degree of course differentiation, (2) the extent to which sorting practices generate skills-homogeneous classrooms, (3) the rate at which students enroll in advanced courses, (4) the extent to which students move between tracks over time, and (5) the relation between track assignments across subject areas. Analyses of longitudinal administrative data following 24,000 8th graders enrolled in 23 middle schools through the 10th grade indicate that these dimensions of tracking are empirically separable and have divergent effects on student achievement and the production of inequality.”

Dougherty, S. M., Goodman, J. S. Hill, D. V., Litke, E. G., & Page, L. C. (2015). Middle school math acceleration and equitable access to eighth-grade algebra: Evidence from the Wake County public school system. *Educational Evaluation and Policy Analysis*, 37(1), 80S–101S. Abstract retrieved from <https://eric.ed.gov/?id=EJ1058620>; full text available at <http://journals.sagepub.com/doi/pdf/10.3102/0162373715576076>

*From the abstract:* “Taking algebra by eighth grade is considered an important milestone on the pathway to college readiness. We highlight a collaboration to investigate one district’s effort to increase middle school algebra course-taking. In 2010, the Wake County Public Schools began assigning middle school students to accelerated math and eighth-grade algebra based on a defined prior achievement metric. This policy reduced the relationship between course assignment and student characteristics such as income and race/ethnicity, while increasing its relationship to academic skill. The policy increased the share of students on track for algebra by eighth grade. Students placed in accelerated math were exposed to higher-skilled peers but larger classes. Future work will assess impacts on subsequent achievement and course-taking outcomes.”

Gamoran, A. (2009). *Tracking and inequality: New directions for research and practice*. (WCER Working Paper No. 2009-6). Madison, WI: Wisconsin Center for Education Research. Retrieved from <https://eric.ed.gov/?id=ED506617>

*From the abstract:* “The practice of tracking and ability grouping—the division of students into separate tracks, classes, and groups for instruction based on their purported interests and abilities—has long been debated. Evidence from decades of research indicates that tracking magnifies inequality between high and low achievers without raising achievement overall, as high achievers perform better in tracked systems while low achievers perform worse, compared to similar students in mixed-ability contexts. These findings have been sustained in recent work, which has also advanced in three areas. First, international studies have yielded results that are generally consistent with those previously found for the U.S. and U.K. Second, new attempts to reduce or eliminate tracking have suggested ways in which some of the obstacles to reducing the practice may be overcome. Third, new work on classroom assignment and instruction has identified approaches that may capture the benefits of differentiation for meeting students’ varied needs without giving rise to the consequences for inequality that commonly accompany tracking and ability grouping. These findings in turn call for new research and experimentation in practice.”

Loveless, T. (2016). *The 2016 Brown Center report on American education: How well are American students learning? With sections on reading and math in the Common Core era, tracking and Advanced Placement (AP), and principals as instructional leaders*. Washington, D.C.: The Brown Center on Education Policy at The Brookings Institution. Retrieved from <https://eric.ed.gov/?id=ED569108>

*From the abstract:* “The 2016 edition of the Brown Center Report (BCR) is number five in the third volume and the 15th issue overall. As is customary, this year’s BCR contains three studies. ... The second section investigates whether tracking, the practice of grouping students into different classes based on ability or prior achievement, in eighth grade is related to Advanced Placement (AP) outcomes in high school. In eighth grade, the tracking question currently boils down to whether high achieving students who are ready for a formal algebra course will get one—or whether all students will take the same general math course. No relationship was found between tracking and AP participation.”

Nomi, T., & Allensworth, E. M. (2013). Sorting and supporting: Why double-dose algebra led to better test scores but more course failures. *American Educational Research Journal*, 50(4), 756–788. Abstract retrieved from <https://eric.ed.gov/?id=EJ1014932>; full text available at [https://www.researchgate.net/publication/269459778\\_Sorting\\_and\\_Supporting\\_Why\\_Double-Dose\\_Algebra\\_Led\\_to\\_Better\\_Test\\_Scores\\_but\\_More\\_Course\\_Failures](https://www.researchgate.net/publication/269459778_Sorting_and_Supporting_Why_Double-Dose_Algebra_Led_to_Better_Test_Scores_but_More_Course_Failures)

*From the abstract:* “In 2003, Chicago schools required students entering ninth grade with below-average math scores to take two periods of algebra. This led to higher test scores for students with both above- and below-average skills, yet failure rates increased for above-average students. We examine the mechanisms behind these surprising results. Sorting by incoming skills benefitted the test scores of high-skill students partially through higher demands and fewer disruptive peers. But more students failed because their skills were low relative to classroom peers. For below-average students, improvements in pedagogy and more time for learning offset problems associated with low-skill classrooms. In some cases,

classrooms were not sorted, but below-average students took an extra support class simultaneously. Test scores also improved in such classes.”

Nomi, T., & Allensworth, E. (2014). *Research brief. Skill-based sorting in the era of college prep for all: Costs and benefits*. Chicago, IL: The University of Chicago Consortium on Chicago School Research. Retrieved from <https://eric.ed.gov/?id=ED553171>

*From the abstract:* “Whether or not to sort students by incoming skills has been a contentious issue. This brief shows that there are potential costs and benefits to both approaches. Even with the same curriculum, the consequences of sorting depend on students' incoming skills and the outcomes being considered. This brief highlights a critical role skill-based sorting plays in shaping students' academic achievement, given a common curriculum for all students. It summarizes findings from a number of prior studies to show what happened after Chicago Public Schools (CPS) introduced two curricular reforms that drastically changed how schools sorted students into classrooms while aiming to teach the same curricular content (Algebra I) to everyone. One policy reduced skill-based sorting and the other increased skill-based sorting. Both policies showed that how schools sort students into classrooms is as important as the content students are exposed to in those classrooms—for students' learning gains, for the grades they receive, and for their pass rates.”

Tyson, W., & Roksa, J. (2017). Importance of grades and placement for math attainment. *Educational Researcher*, 46(3), 140–142. Abstract retrieved from <https://eric.ed.gov/?id=EJ1139284>; full text available at <http://journals.sagepub.com/doi/pdf/10.3102/0013189X17706079>

*From the abstract:* “Research on high school math course taking documents the advantages of starting high school at or beyond Algebra 1. Fewer studies examine differentiation into remedial, general, and honors Algebra 1 course types by course rigor. This study examines how course grades and course rigor are associated with math attainment among students with similar eighth-grade standardized math test scores. Students who earned an A in remedial courses had lower attainment than students with a D in general Algebra 1. Students with an A in general Algebra 1 had lower attainment than students with median grades in honors Algebra 1.”

Werblow, J., Urick, A., & Duesbery, L. (2013). On the wrong track: How tracking is associated with dropping out of high school. *Equity & Excellence in Education*, 46(2), 270–284. Abstract retrieved from <https://eric.ed.gov/?id=EJ1010695>; full text available at [https://www.researchgate.net/profile/Jacob\\_Werblow/publication/263443002\\_On\\_the\\_Wrong\\_Track\\_How\\_Tracking\\_is\\_Associated\\_with\\_Dropping\\_Out\\_of\\_High\\_School/links/553a878b0cf2c415bb08e5c6/On-the-Wrong-Track-How-Tracking-is-Associated-with-Dropping-Out-of-High-School.pdf](https://www.researchgate.net/profile/Jacob_Werblow/publication/263443002_On_the_Wrong_Track_How_Tracking_is_Associated_with_Dropping_Out_of_High_School/links/553a878b0cf2c415bb08e5c6/On-the-Wrong-Track-How-Tracking-is-Associated-with-Dropping-Out-of-High-School.pdf)

*From the abstract:* “Academic tracking has been shown to limit the quality of student instructional opportunities, decrease students' perceptions of their abilities, and negatively influence student achievement. These factors associated with academic tracking also may

influence students in lower tracks to learn less and ultimately to drop out of high school. Few studies, however, have investigated academic tracking as a collective school-level phenomenon and an individual student-level predictor of school dropout. To date, no study has examined this issue using a nationally representative sample. In this study, multilevel analytic models of the first two waves of the Educational Longitudinal Study (ELS) of 2002 indicate that, while controlling for student- and school-level differences, students in the lower academic tracks are roughly 60% more likely to drop out of high school. Academic tracking appears to disadvantage students who are Latinos, have Individualized Education Plans (IEPs), or have lower socioeconomic backgrounds. Schools with a more positive academic climate, high morale, and a focus on learning, however, show a slight decrease in the likelihood of students dropping out.”

## **Methods**

### **Keywords and Search Strings**

The following keywords and search strings were used to search the reference databases and other sources:

- Math\* AND (track\* OR “ability group\*” OR sort\* OR detrack\*)
- Math\* AND "middle school" AND (pathway\* OR course-taking OR course enrollment)

### **Databases and Resources**

We searched ERIC, a free online library of more than 1.6 million citations of education research sponsored by the Institute of Education Sciences (IES), for relevant resources. Additionally, we searched the academic database ProQuest, Google Scholar, and the commercial search engine Google.

### **Reference Search and Selection Criteria**

In reviewing resources, Reference Desk researchers consider—among other things—these four factors:

- **Date of the publication:** Searches cover the most current information (i.e., within the last ten years), except in the case of nationally known seminal resources.
- **Search priorities of reference sources:** Search priorities include IES, nationally funded, and certain other vetted sources known for strict attention to research protocols. Applicable resources must be publicly available online and in English.
- **Methodology:** The following methodological priorities/considerations guide the review and selection of the references: (a) study types—randomized controlled trials, quasi experiments, surveys, descriptive data analyses, literature reviews, policy briefs, etc., generally in this order; (b) target population, samples (representativeness of the target population, sample size, volunteered or randomly selected), study duration, etc.; (c) limitations, generalizability of the findings and conclusions, etc.

- Existing knowledge base: Vetted resources (e.g., peer-reviewed research journals) are the primary focus, but the research base is occasionally slim or nonexistent. In those cases, the best resources available may include, for example, reports, white papers, guides, reviews in non-peer-reviewed journals, newspaper articles, interviews with content specialists, and organization websites.

Resources included in this document were last accessed on November 18, 2017. URLs, descriptions, and content included here were current at that time.

This memorandum is one in a series of quick-turnaround responses to specific questions posed by education stakeholders in the Appalachia region (Kentucky, Tennessee, Virginia, and West Virginia), which is served by the Regional Educational Laboratory Appalachia (REL AP) at SRI International. This Ask-A-REL response was developed by REL AP under Contract ED-IES-17-C-0004 from the U.S. Department of Education, Institute of Education Sciences, administered by SRI International. The content does not necessarily reflect the views or policies of IES or the U.S. Department of Education, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. government.