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ANNENBERG INSTITUTE AT BROWN

EdWorkingPapers Policy and Practice Series - August 2025

Introducing a High-School Exit Exam in Science: Consequences in Massachusetts

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How does a high-stakes science test shape opportunities for students from different backgrounds?

There have been growing concerns about stagnant or declining science achievement among U.S. students, evidenced by poor performance on international and national assessments. As a result, some states have responded by introducing science exit exams as a graduation requirement, aiming to raise standards and accountability.

In 2010, Massachusetts implemented a requirement for students to pass a science exam as a condition for high school graduation. Although this requirement was repealed in 2024, research on its implementation offers important insights for states and districts considering similar policies or seeking to improve science instruction and outcomes.

This study examines the impacts of the science exit exam on student achievement, high school graduation, and college enrollment. While overall science scores and graduation rates improved from 2010 to 2020, English learners, students with disabilities, and low-income students were significantly more likely to fail the exam. The results highlight the need for graduation policies that are paired with targeted supports and equitable access to instruction, retesting, and academic support to ensure all students have a fair chance to succeed.

ABOUT THE TEST

From 2010 to 2024, all MA students were required to pass a science exam in one of four subjects,, to receive a high school diploma, in addition to English and math exams. Students could take the exam in 9th or 10th grade, and it was aligned to the specific course they were taking. Students who failed the science exit exam could retake it in the same subject or choose a different one. They could also pursue

an appeals process based on course grades. If they never passed but met all other local graduation requirements, they received a Certificate of Attainment instead of a diploma.

STUDY AND METHODS

To evaluate the effects of Massachusetts' science exit exam policy, the researchers used a combination of descriptive and causal methods. Their dataset included students in the high school graduating classes of 2010–2020.

The study explored three main questions:

1. How did the initial cohorts of test-takers fare on the science exit exam?
2. For the subset of students who scored near the passing threshold in the early years of the test, how did barely passing (as opposed to barely failing) affect students' high school graduation and college outcomes?
3. How have students' testing outcomes and schools' responses to the exit exam changed over time?

Methods

Descriptive Analysis: The researchers examined overall trends in science test performance, retesting, and graduation rates, with a special focus on patterns by income, gender, and English learner (EL) status.

Regression Discontinuity Design (RDD): To estimate the causal impact of passing the exam, the researchers compared students who scored just above the passing cutoff (and therefore passed the exam) with those who scored just below it (and therefore failed), under the assumption that these two groups are otherwise nearly identical in background, ability, and motivation. Because these students are so similar, except for the fact that one group passed and the other didn't, any difference in graduation rates between them can be interpreted as a causal effect of passing the exam.

KEY FINDINGS AND POLICY IMPLICATIONS

Descriptive Findings

1 **Science test scores increased for all student groups after the policy's rollout, and first-attempt pass rates rose from 82% (2010 cohort) to 92% (2019–2020 cohorts).** These gains could suggest that the policy motivated schools and students to prioritize science learning. However, they might also result from test preparation, familiarity with the exam, focusing instruction on tested content, or other concurrent changes.

2 **English learners (ELs), students with disabilities, and low-income students were significantly more likely to fail the exam.**
- **English learners:** By 2018, over 50% of students who never passed the science test were ELs, even though they represented only 8% of the tested population**.** ELs were far less likely to succeed on retests as well, raising concerns about the use of a test with complex English language demands to measure science proficiency.
- **Students with disabilities** also had higher initial failure rates (20%) than the general student population (where the failure rate dropped to about 8%).

3 **Low-income students were more likely to fail the science exam than their higher-income peers, even among students with similar 8th-grade test scores** This suggests that the exam may be reflecting differences in high school experiences, such as access to experienced science teachers, rigorous coursework, and academic supports.

Causal Findings

4 **Barely passing the exam increased the likelihood of on-time high school graduation by 4 percentage points overall.** High-stakes thresholds can shape students' mindsets and decisions. For example, barely passing the exam may act as a positive signal to students, reinforcing the belief that they are capable of succeeding academically. In contrast, barely failing the test may discourage students, even if their academic abilities are nearly identical to those who passed.

5 **The largest high school graduation impacts were for female students, especially those who had previously failed the 8th-grade science test.** For this group, barely passing the high school science exam increased the probability of on-time graduation by 12 percentage points and five-year graduation by 9 percentage points. This suggests an "encouragement effect:" girls who had struggled in middle school science may have expected to fail again, and passing the exam likely boosted their confidence and motivation to persist.

6 **Among higher-income students, those who barely passed were more likely to enroll in and complete college than those who barely fell below the passing threshold, but no similar effect was found among low-income students.** This suggests that meeting a high-stakes requirement may open doors to further educational opportunities, but only when students also have access to the resources needed to take advantage of those opportunities.

POLICY AND PRACTICE IMPLICATIONS

1 **Ensure students have ample opportunities to demonstrate their competency via retests and appeals.** Monitoring how schools implement these supports can help ensure that all students have a consistent and fair chance to meet graduation requirements.

2 **Graduation requirements should be accompanied by equitable access to quality instruction, or they risk widening outcome gaps.** Students from low-income backgrounds,

English learners, and students with disabilities often attend schools with fewer resources, less experienced teachers, or limited access to advanced coursework. When these students are held to the same high-stakes standards without equal support, they are more likely to fall short, not because of ability, but because of opportunity.

3 **Make science lessons easier to understand for English learners by using language they can follow while still helping them learn the science content.** This may include more active scaffolding of scientific vocabulary, dual-language resources, and sheltered instruction strategies.

4 **Review test design for linguistic accessibility, ensuring that science assessments are not overly reliant on complex vocabulary or long reading passages that disadvantage ELs. Providing translated versions of the test in multiple languages could also reduce reliance on English proficiency.**

5 **Prioritize strategies that increase girls' confidence in science starting in elementary and middle school, well before they encounter high-stakes assessments.** The finding that barely passing the high school science exam significantly increased graduation rates for girls who had failed the 8th-grade science test points to the importance of boosting students' confidence in their ability to succeed. Schools can help by providing positive reinforcement and creating inclusive science classrooms to help girls stay engaged and motivated, especially those who may doubt their potential due to earlier challenges or gender-based stereotypes.

FULL WORKING PAPER

This report is based on the EdWorkingPaper "*Introducing a High-School Exit Exam in Science: Consequences in Massachusetts*," published in July 2025. The full research paper can be found here: https://edworkingpapers.com/ai22-645

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