EdExchange
ANNENBERG INSTITUTE AT BROWN

EdWorkingPapers Policy and Practice Series - September 2025

Neighborhood Effects on STEM Major Choice

Jeonghyeok Kim, Rohit Munshi, and Brian Murphy

Does the neighborhood where students grow up shape whether they choose STEM majors in college?

STEM degrees are among the strongest pathways to economic mobility, yet access to them remains deeply unequal across lines of race, gender, income, and geography. Students from wealthier families and suburban communities are far more likely to pursue STEM majors, while low-income students and students of color remain underrepresented in these fields.

This study adds new insight into why those disparities persist and what can be done about them. By following Texas students over time, the researchers show that neighborhood context itself matters: students who spend more of their middle and high school years in "STEM-rich" neighborhoods (places where peers frequently major in STEM and STEM professionals are visible in the community) are significantly more likely to choose STEM majors themselves.

This shows that students' academic and career decisions are influenced not only by interests or abilities, but also by the neighborhoods in which they grow up. This gives policymakers and educators a lever to increase STEM interest among underrepresented groups: expanding STEM-rich opportunities in their environments.

STUDY AND METHODS

The researchers wanted to know how much of the difference in STEM major choices across counties is actually caused by the neighborhoods themselves, not just by differences in the students or their families. Families who live in "STEM-rich" neighborhoods usually differ from those in other neighborhoods (e.g., in income, education, or motivation). So if their kids major in STEM at higher rates, it's hard to know whether that's because of the neighborhood or because of family characteristics.

This study overcomes that challenge by using Texas administrative data linking K–12 student records with postsecondary enrollment outcomes to measure neighborhood STEM exposure and STEM major choice. The authors track students who move between counties during their school years. By comparing students who moved at different ages, they can estimate how much extra time spent in a STEM-rich neighborhood increases the likelihood of majoring in STEM. Because both groups of movers share similar family backgrounds, the difference in outcomes can be attributed to when and how long they were exposed to different neighborhoods, not just who their families are.

STEM exposure is defined as the share of a student's non-moving peers from the same racial and economic background in a county who go on to major in STEM in college. This measure captures how "STEM-rich" a neighborhood is, based on the actual STEM outcomes of comparable peers.

KEY FINDINGS

1 **Students who spend more time living in "STEM-rich" neighborhoods are more likely to choose a STEM major themselves.**
- Each additional year spent in a county with a 1 percentage point higher STEM exposure increases the likelihood of selecting a STEM major by about 0.03 percentage points.
- This effect may seem small, but it accumulates over time. Since students typically spend about 13 years in school (K–12), the total impact adds up to 13 × 0.03 = 0.39 percentage points for every 1 percentage point difference in neighborhood STEM exposure.

> Imagine a student moved from a low-STEM county (where about 2% of peers go on to major in STEM) to a higher-STEM county (where about 6% of peers major in STEM). For each year that the student stays in the high-STEM county, they would have a 0.03x4=0.12 percentage point higher chance of majoring in STEM than if they had stayed in the low-STEM county.
>
> Imagine that same student moved to the county before 3rd grade and stayed there for 10 years until they graduated. That student would be 0.12x10=1.2 percentage points more likely to major in STEM than if they stayed in the low-STEM county.

2 **STEM exposure in high school matters most: the annual effect of STEM exposure is much larger in high school than in elementary or middle school.** Specifically:
- For students who moved before 8th grade, the annual exposure effect is about 0.016.
- For students who moved in 8th grade or later, the effect jumps to 0.066.
- This suggests that exposure in the later school years is more consequential for shaping whether a student chooses a STEM major. This difference makes sense since high school is when students make choices about advanced coursework, prepare for college applications,

and form clearer career aspirations. So while early exposure builds a foundation, exposure during high school is especially formative because it coincides with decision-making years.

3 Students growing up in communities with more STEM professionals are more likely to choose STEM majors in college.

- For each additional year spent in a neighborhood with a 1 percentage point higher STEM occupational share, the likelihood of choosing a STEM major increases by 0.017 percentage points.
- This highlights the importance of visible role models and networks: when young people see their community members in STEM fields, they are more likely to view STEM as a realistic and attainable career pathway.

4 Exposure to STEM-rich neighborhoods boosts STEM majoring for all groups.

- Race: Black students (0.051) have a higher exposure effect than Hispanic (0.024) and White (0.025) students.
- Income: Non-disadvantaged students experience a slightly larger annual exposure effect (0.031) compared to disadvantaged students (0.017).
- Gender: Male students see an average annual exposure effect of 0.040, while female students experience about 0.020.

5 Students are most influenced by seeing STEM professionals of their own gender in their communities.

- Female students are more likely to pursue STEM if they see female STEM professionals in their communities; male students respond similarly to male STEM role models.

6 About 15–40% of STEM participation gaps for minority and low-income students could be closed if they had equal access to high-STEM environments.

The authors ran a counterfactual simulation to see what would happen if Black, Hispanic, and low-income students grew up in neighborhoods as "STEM-rich" as those of their white and higher-income peers. They found the following:

- Race: White students currently experience 30–65% more STEM exposure than Black and Hispanic students. If exposure were equalized, 20–40% of the racial gap in STEM majors would disappear.
- Income: Students from higher-income families have more STEM exposure than economically disadvantaged students. Equalizing this gap would close about 20% of the income-based gap in STEM majors.
- Gender: Men and women generally live in similar neighborhoods, but women are less likely to see female STEM role models. If exposure to female STEM professionals were equalized, the gender gap in STEM major choice would shrink by about 10%.

7 Neighborhood effects operate mainly through behavioral changes

- Exposure to STEM-rich neighborhoods increases the probability of enrolling in advanced math and science courses; the authors find no detectable effect on test scores.

- Mediation analysis indicates that advanced course-taking accounts for about 30% of the neighborhood effect on choosing a STEM major.
- These patterns suggest that STEM exposure mainly shifts students' behavior by shaping their aspirations and access to information, rather than their academic performance.

IMPLICATIONS FOR POLICY AND PRACTICE

1. **Expand STEM exposure in places with lower concentrations of STEM professionals.** When STEM careers are visible in the community, students are more likely to see themselves in those roles**.** For places without natural concentrations of STEM professionals, schools and districts can replicate these conditions by bringing STEM professionals into schools, creating mentorship pipelines, and building partnerships between employers and community organizations.

2. **Prioritize early and sustained exposure to STEM courses and role models.** The study shows that exposure during high school years has the largest effects, but middle school and even late elementary exposure also matter. Districts should therefore:
   - Ensure equitable access to challenging math and science courses in elementary and middle schools.
   - Provide long-term mentoring opportunities so that exposure to STEM role models is consistent rather than one-off.

3. **States, districts, and employers should invest in programs that increase the visibility of female STEM professionals, especially in schools and communities serving large populations of girls and young women.** If young women see women working in STEM fields in their communities, they are more likely to major in STEM themselves. Making female STEM professionals more visible can help close the gender gap in STEM.

FULL WORKING PAPER

This report is based on the EdWorkingPaper "*Neighborhood Effects on STEM Major Choice*" published in August 2025. The full research paper can be found here: https://edworkingpapers.com/ai25-1263

The **EdWorkingPapers Policy & Practice Series** is designed to bridge the gap between academic research and real-world decision-making. Each installment summarizes a newly released EdWorkingPaper and highlights the most actionable insights for policymakers and education leaders. *This summary was written by Christina Claiborne.*