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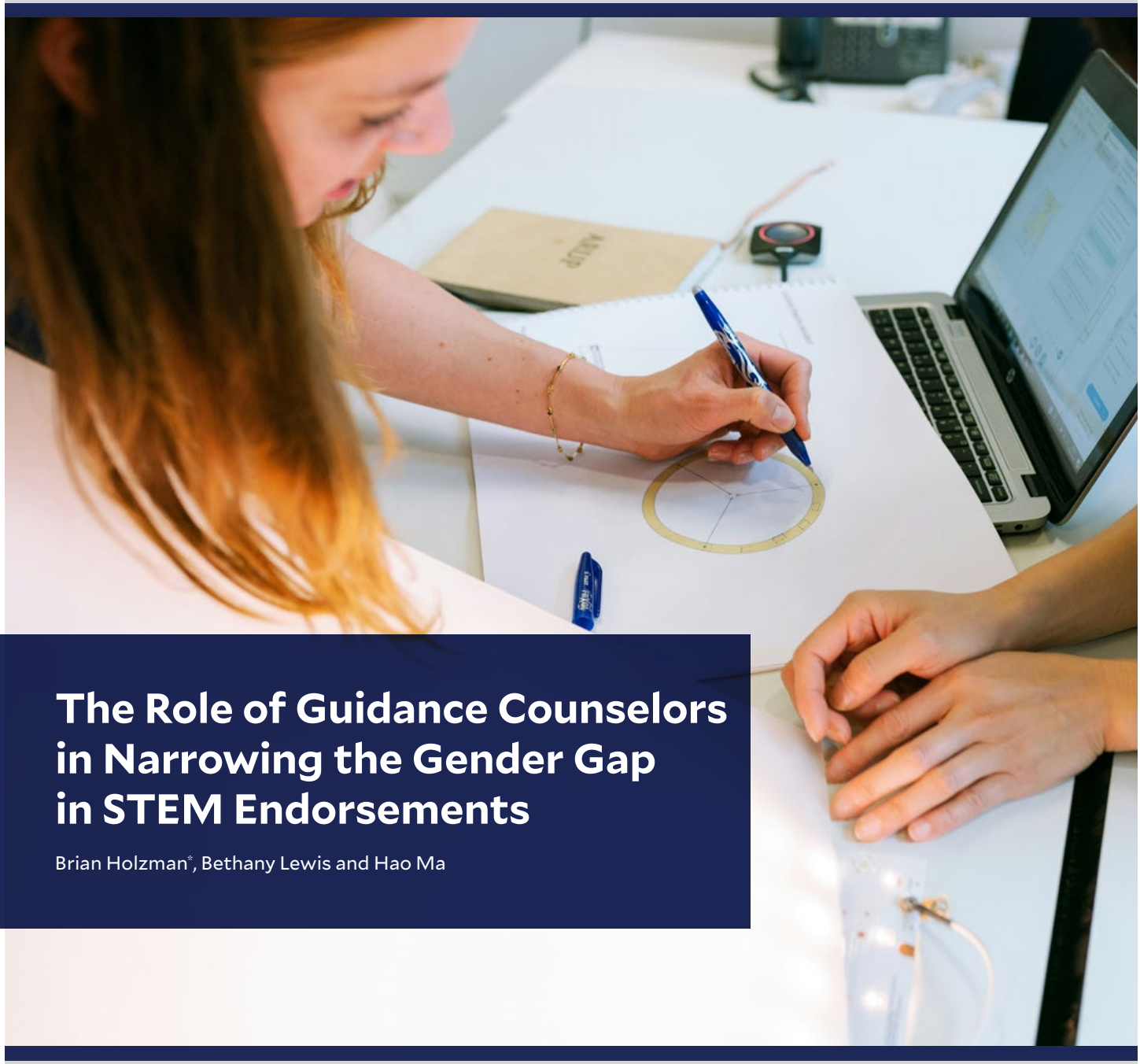

The Role of Guidance Counselors in Narrowing the Gender Gap in STEM Endorsements

Brian Holzman*, Bethany Lewis and Hao Ma

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Research Brief

* Corresponding author: bholzman@tamu.edu

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Note on the authors. Brian Holzman, Ph.D., is an assistant professor at Texas A&M University. Bethany Lewis, M.A., is an analyst at Ithaka S+R.

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About HERC. Focusing on the most pressing challenges facing the region, the Houston Education Research Consortium (HERC) is a research-practice partnership between the Kinder Institute for Urban Research and 11 Houston-area school districts. HERC research is developed directly alongside district leaders with findings shared with decision-makers — culminating in long-term, equity-minded solutions, opportunities and growth for Houston and beyond.

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Research Brief

The Role of Guidance Counselors in Narrowing the Gender Gap in STEM Endorsements

This study examined whether there were gendered patterns in STEM endorsement choice in the Houston Independent School District (HISD) and how those patterns changed over time, in the wake of a policy change to guidance counseling. The first students required to choose high school endorsements were freshmen in 2014–2015 and graduated high school in spring 2018. The second cohort of students required to do so were freshmen in 2015–2016 and graduated in spring 2019. Students in this second cohort met with their guidance counselor during their senior year to check in on their endorsement progress; this meeting was called the Personal Graduation Plan (PGP) check-in. This was a new district policy implemented beginning in fall 2018, which means that the first cohort did not experience the PGP check-in, while the second cohort did.

This study reveals gender gaps in STEM endorsement choice among ninth-grade students. For the high school graduating class of 2018, which did not experience the PGP check-in, female students were less likely than male students to choose the STEM endorsement at any point during high school. However, for the high school graduating class of 2019, which did experience the PGP check-in, female students were less likely than male students to choose the STEM endorsement upon high school entry. Importantly, however, this gender gap in STEM endorsement choice nearly disappeared by high school graduation, suggesting that individualized counseling efforts might be a strategy to improve female retention in STEM.

Key Findings

- **Female students were less likely than male students to choose the STEM endorsement.**
- **The gender gap in STEM endorsement choice nearly closed for students in the class of 2019 after experiencing the PGP check-in.**
- **Among students in the class of 2019, who experienced the PGP check-in, females were more likely to stick with STEM than males.**

Background

In 2013, the Texas Legislature passed House Bill 5. This bill introduced a high school graduation framework called the Foundation High School Program, which aimed to increase students' college and career readiness by having them complete an *endorsement*. Endorsements are similar to college majors and are a way for students to specialize in an area aligned with their career goals. There are five endorsements students can choose from, and under each there are multiple course sequences, or paths, students can complete to earn their endorsement.

The Foundation High School Program went into effect starting with ninth-grade students in the 2014–2015 school year, meaning that to date, five cohorts of students have graduated under the new policy.

Personalized Graduation Plan (PGP)

Under the Foundation High School Program, students create a Personalized Graduation Plan (PGP) in eighth grade, or at the beginning of ninth grade if they did not attend a district middle school. The PGP is a form in which students write down the courses they plan to take during high school, as well as select their endorsement and the courses that will satisfy that endorsement. In HISD, a key change happened during the 2018–2019 year. To encourage more engagement between high school guidance counselors and students regarding students' PGPs, the district began requiring meetings during the senior year to discuss students' initial endorsement choices. This PGP check-in helped counselors determine whether students were on track to complete the endorsement they chose upon high school entry and, if not, what courses they might need to take to complete it. Counselors might also review students' course-taking patterns and suggest they drop, add, or switch endorsements. Because this policy change was first implemented in fall 2018, it affected students in the second and subsequent cohorts to graduate under the Foundation High School Program, but it did not affect students in the first cohort.

Gender, STEM, and Counseling

This study of HISD students focuses on the STEM (science, technology, engineering, and math) endorsement.[1] Some studies show lower-income and female students are less likely to complete advanced math and science courses during high school than higher-income and male students, respectively (Long, Iatarola, & Conger, 2009; Morgan, Gelbgiser, & Weeden, 2013; Tyson et al., 2007). Female students are also less likely to hold STEM career aspirations than male students (Mau & Li, 2018; Morgan, Gelbgiser, & Weeden, 2013; Weeden, Gelbgiser, & Morgan, 2020). These gender gaps persist through postsecondary education, as female students, particularly those in the middle and lower end of the achievement distribution, are less likely than male students to major in STEM subjects (Cimpian, Kim, & McDermott, 2020; Morgan, Gelbgiser, & Weeden, 2013; Tyson et al., 2007; Weeden, Gelbgiser, & Morgan, 2020). Since the endorsement system was designed to tie to students' career aspirations and high school course-taking, the patterns found in prior research suggest there may be gender gaps in STEM endorsement choice.

1 For more information about the Foundation High School Program in HISD, see Holzman & Lewis (2020).

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However, counselors may ensure students are well-informed while making endorsement decisions. For example, Belasco (2013) finds that meeting with a high school guidance counselor impacts college enrollment and that the effects are strongest for students from lower socioeconomic backgrounds. It is possible that counseling can support female students and help reduce their underrepresentation in STEM. Counseling lessons can increase female students' attitudes and self-efficacy in mathematics (Falco, Summers, & Bauman, 2010) and their career decision-making and STEM self-efficacy (Falco & Summers, 2019). Exposing female students to women leaders at STEM companies is positively associated with female students' expectations of success in math and aspirations to pursue a STEM career (González-Pérez, Mateos de Cabo, & Sáinz, 2020).

Given the importance of counseling and prior research that shows it may help female students' STEM outcomes, it is important to study HISD's PGP check-in, its role in STEM endorsement choice, and how it may have affected the gender gap.

Research Questions

Using HISD administrative data, this study asked the following questions:

1. To what extent does gender predict STEM endorsement choice among ninth-grade students?
2. How may a districtwide counseling effort (PGP check-in) affect gender gaps in STEM endorsement completion?

To address these questions, this study focused on the first two cohorts of students required to choose an endorsement under the new high school graduation plan. These students were freshmen during the 2014–2015 and 2015–2016 school years and should have graduated high school by spring 2018 and spring 2019. The sample was further limited to students who attended HISD middle schools. The sample size for the analysis of ninth-grade STEM endorsement choice consisted of 14,772 students. For the analysis of the PGP check-in, the sample was smaller since it was restricted to high school graduates (N = 11,541).

Key Findings

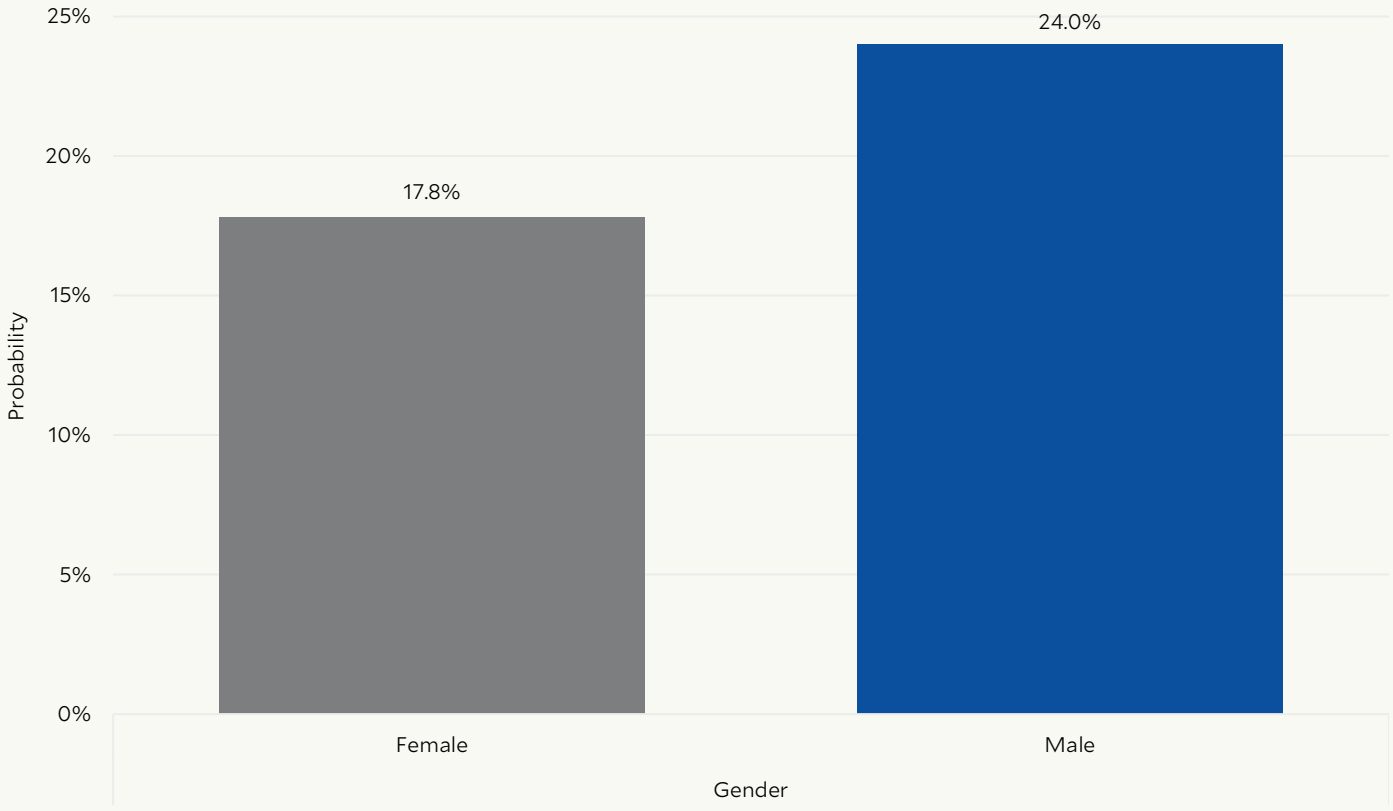
1 Female students were less likely than male students to choose the STEM endorsement on high school entry.

As shown in Figure 1, adjusted for background characteristics, 17.8% of female students and 24.0% of male students chose the STEM endorsement upon high school entry, constituting a 6.3-percentage-point gender gap.

This gender gap persisted and remained similar in size regardless of whether students were economically disadvantaged, non-economically disadvantaged, or resided in low, middle, or high socioeconomic-status neighborhoods.[2]

2 These results are available from the authors upon request.

FIGURE 1 **Predicted Probability of Initial STEM Endorsement Choice by Gender**



2 The gender gap in STEM endorsement choice nearly closed for students in the class of 2019 after experiencing the PGP check-in.

Table 1 shows the share of students from the graduating class of 2018 (cohort 1) and the graduating class of 2019 (cohort 2) who chose the STEM endorsement in grades nine and 12 by gender.

The class of 2018 was the first cohort of students required to complete an endorsement. This cohort did not experience HISD's PGP check-in. For the class of 2018, male students were more likely than female students to choose the STEM endorsement in grades nine and 12. At high school entry, there was a 5.5-percentage-point gender gap in STEM endorsement choice. At graduation, there was a 6.2-percentage-point gender gap in STEM endorsement choice.

After the class of 2018 graduated, HISD instituted the PGP check-in. Students in the class of 2019 were required to meet with a guidance counselor to discuss their endorsement during their senior year of high school. For this cohort, there was a gender gap in STEM endorsement choice upon high school entry: female students were 9.2 percentage points less likely to choose the STEM endorsement than male students. However, this pattern changed by high school graduation, after students would have experienced the senior-year PGP check-in. At graduation, the gender gap in STEM endorsement choice ***shrank*** to a mere 0.8 percentage points.

TABLE 1 **STEM Endorsement Choice by Grade**

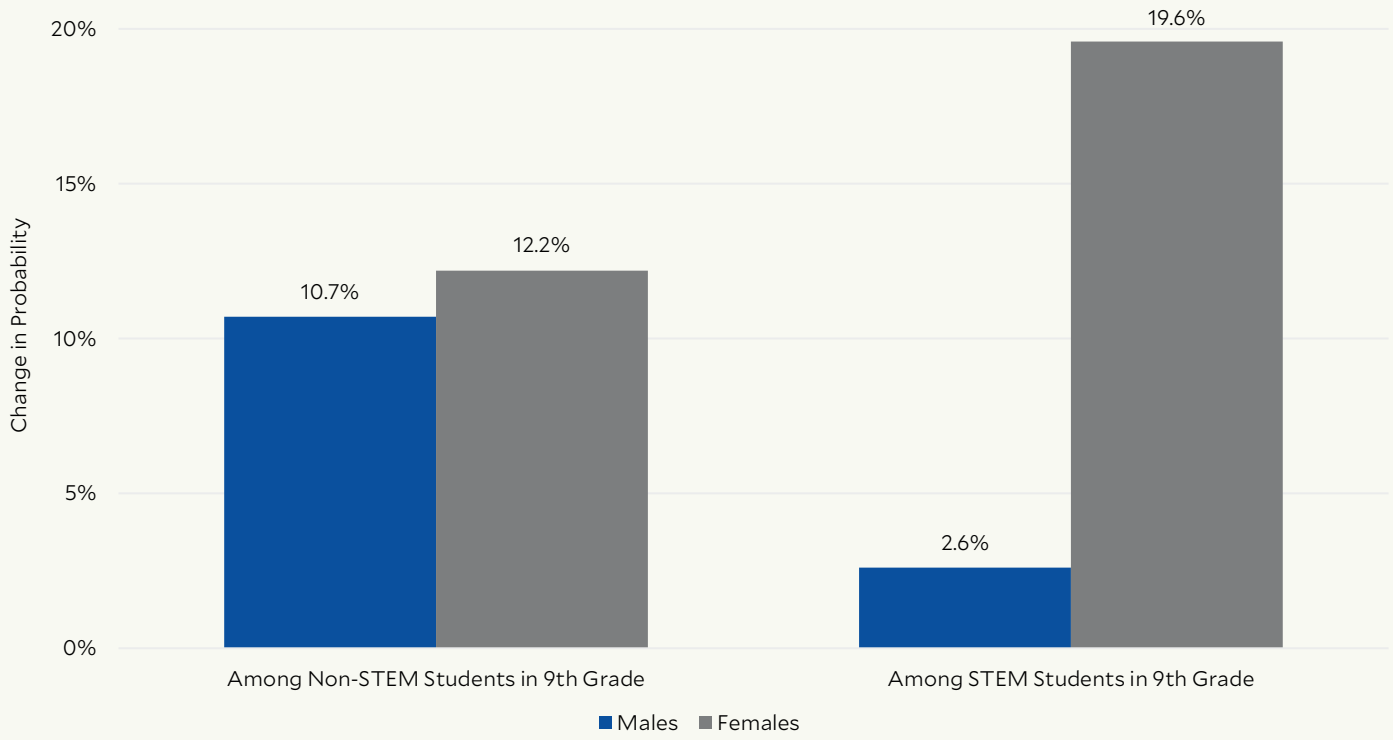
	Grade 9 (Initial Choice)	Grade 12 (Final Choice)
Class of 2018 (Cohort 1)		
Females	19.1%	21.8%
Males	24.6%	28.0%
Gender Gap (Males – Females)	5.5%	6.2%
Class of 2019 (Cohort 2)		
Females	19.2%	34.7%
Males	28.7%	35.5%
Gender Gap (Males – Females)	9.2%	0.8%

3 Among students in the class of 2019, who experienced the PGP check-in, females were more likely to stick with STEM than males.

Students in the class of 2019, who experienced the PGP check-in, were more likely to complete the STEM endorsement by the end of high school than students in the class of 2018, who did not experience the check-in. However, gains in STEM endorsement completion differed by gender. Figure 2 shows that, relative to the class of 2018, male and female students in the class of 2019 who initially did not choose the STEM endorsement in ninth grade were 10.7 and 12.2 percentage points, respectively, more likely to complete the STEM endorsement by high school graduation. Basically, male and female students were adding the STEM endorsement at similar rates.

Turning to students who initially chose the STEM endorsement in ninth grade, relative to the class of 2018, female students were much more likely than male students to complete the STEM endorsement. In other words, female students in the cohort exposed to the PGP check-in saw greater gains in sticking with STEM than male students.

FIGURE 2 **The Role of the PGP Check-In in STEM Endorsement Completion by Gender & Initial STEM Endorsement Choice**



4 Among students in the class of 2019, who experienced the PGP check-in, female students from less-privileged backgrounds (i.e., economically disadvantaged, low and middle socioeconomic-status [SES] neighborhoods) were more likely to stick with STEM, and even add it, than female students from more-privileged backgrounds (i.e., non-economically disadvantaged, high SES neighborhoods).

As shown earlier, there is suggestive evidence that female students who experienced the PGP check-in were more likely to stick with STEM than male students. Figure 3 below shows how this relationship may vary by economic disadvantage. Focusing on the bars labeled "Among STEM Students in 9th Grade," it becomes clear that, relative to the class of 2018, economically disadvantaged female students in the class of 2019 were more likely to retain the STEM endorsement (a 21.5-percentage-point change) than non-economically disadvantaged female students (a smaller 13.7-percentage-point change).

Figure 4 shows similar patterns by neighborhood socioeconomic status (SES). Focusing on the bars labeled "Among STEM Students in 9th Grade," relative to the class of 2018, female students in the class of 2019 who lived in low- and middle-SES neighborhoods were more likely to retain the STEM endorsement (23.6- and 20.0-percentage-point changes, respectively) than female students from high SES neighborhoods (a much smaller 5.1-percentage-point change). There is some evidence that relative to the class of 2018, female students in the class of 2019 who lived in low-SES neighborhoods and who initially did not choose the STEM endorsement in ninth grade were more likely to add or switch to the STEM endorsement by high school graduation (leftmost gray bar in the figure; a 10.5-percentage-point change).

Overall, these findings suggest that the PGP check-in is more strongly associated with sticking with STEM for less-privileged female students than it is for more-privileged female students. It may also be associated with some less-advantaged female students adding STEM.

FIGURE 3

The Role of the PGP Check-In in STEM Endorsement Completion by Gender, Economic Disadvantage, & Initial STEM Endorsement Choice

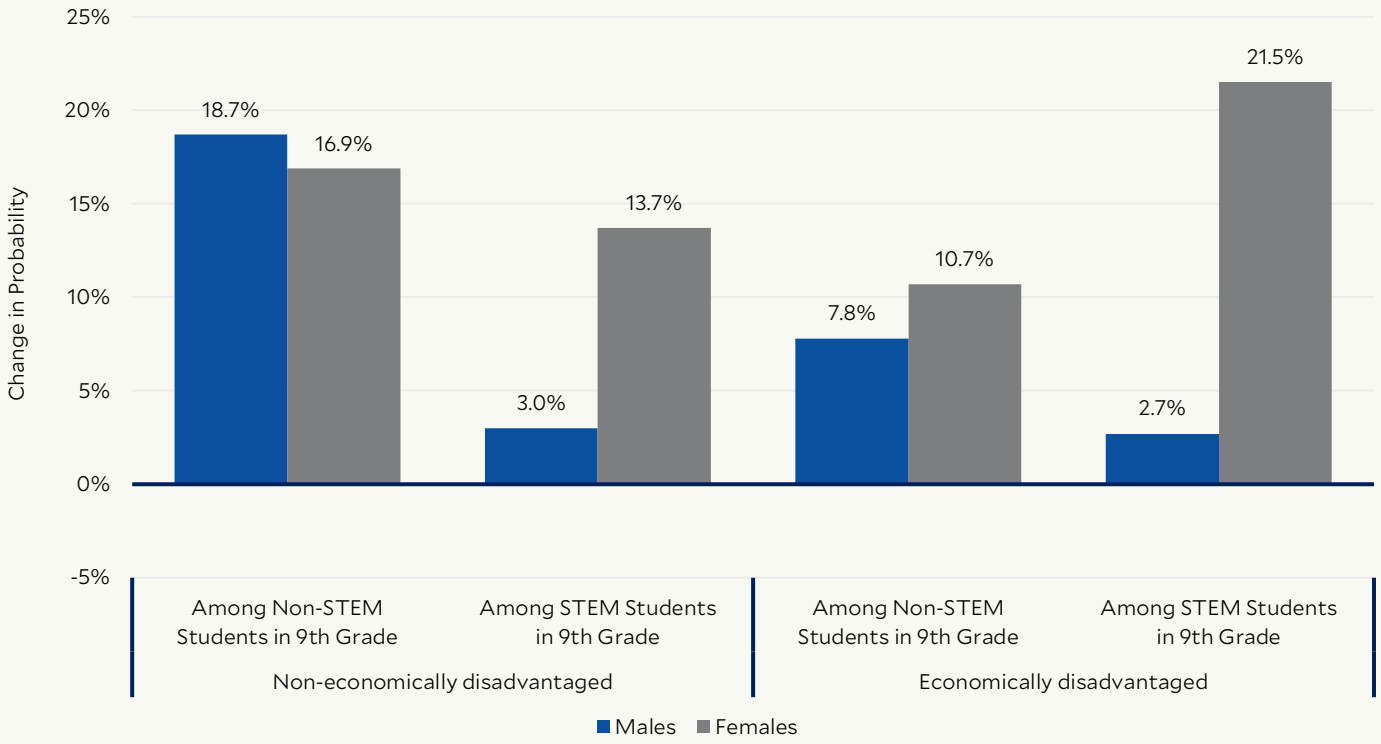
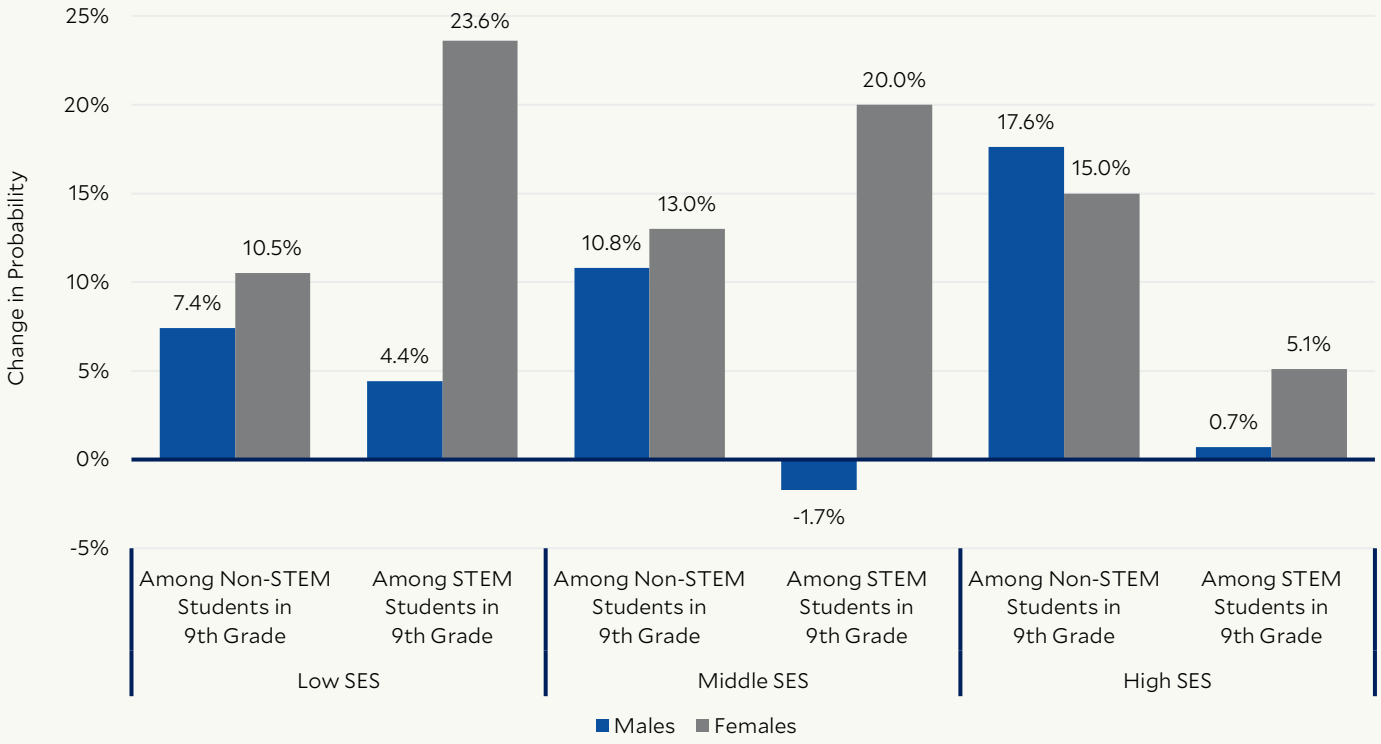


FIGURE 4

The Role of the PGP Check-In in STEM Endorsement Completion by Gender, Neighborhood Socioeconomic Status, & Initial STEM Endorsement Choice



Conclusion

Summary

Female students in the class of 2019, which experienced the PGP check-in, were more likely to stick with the STEM endorsement during high school, relative to male students. This finding suggests that guidance counseling may be a potential solution to the gender gap in STEM endorsement choice and completion. In addition, class of 2019 female students from less-privileged backgrounds (i.e., economically disadvantaged, low- and middle-SES neighborhoods) were more likely to stick with the STEM endorsement, or even add it, than female students from more-privileged backgrounds (i.e., non-economically disadvantaged, high-SES neighborhoods). This suggests that counseling may be an especially helpful strategy for less-privileged female students and their access to and retention in STEM.

Study Limitations

The findings of this study cannot fully explain the gender gap in STEM endorsement choice or completion. The analyses accounted for a number of academic variables, yet a consistent gender gap remained. This suggests other factors, such as those tied to gender socialization, may contribute to the gender gap in STEM endorsement choice, but this falls outside the scope of this study. Furthermore, this study cannot establish a causal link between the PGP check-in and STEM endorsement completion. Although it seems plausible the district policy change played a role in the sizeable difference in STEM endorsement completion between the two cohorts, our analyses cannot say for certain that the check-in definitively produced those changes.

Recommendations

- **Communicate with female and male students and their families to learn why they do or do not choose the STEM endorsement:** Speaking to people, or administering a survey, may help school and district leaders, as well as guidance counselors, build on existing strategies, or develop new ones, that can address the gender gap in STEM endorsement choice.
- **Continue and expand information and counseling efforts on the endorsement system for students and families:** Reminders and materials delivered by text, Naviance, and mail may help students and families learn more about the STEM endorsement and help them make decisions in line with students' long-term aspirations. Targeted advising during high school may aid students at risk of dropping the STEM endorsement (i.e., female students, economically disadvantaged students, students from low- and middle-SES neighborhoods). These information and counseling efforts can even begin during eighth grade, which is when Houston ISD students and their families first choose their endorsement.

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The Houston Education Research Consortium (HERC) is a research-practice partnership between the Kinder Institute for Urban Research and 11 Houston-area school districts. HERC aims to improve the connection between education research and decision making for the purpose of equalizing outcomes by race, ethnicity, economic status, and other factors associated with inequitable educational opportunities.

RICE UNIVERSITY
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6100 Main Street MS-208 • Houston, TX 77005
713-348-4132 • kinder@rice.edu
kinder.rice.edu