THE IMPACT OF
student perception

ON EXPANDING YOUNG WOMEN'S
PARTICIPATION IN
COMPUTER SCIENCE & AI
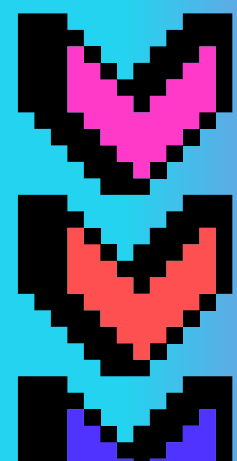
NEW INSIGHTS ON
HOW TO RECRUIT MORE GIRLS
INTO COMPUTER SCIENCE
COME AS AI IS SET
TO RESHAPE INDUSTRIES.

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abstract

New survey data on student perceptions of computer science (CS) highlight the importance of personal connection in shaping interest and enrollment decisions. When students see how CS aligns with their interests or feel a sense of belonging in the classroom, they are more likely to consider it an important subject and pursue coursework in the field.

These findings present an opportunity for policymakers and school leaders to reframe the approach to closing the gender gap in CS education. Rather than focusing on broad systemic trends, this data provides a more nuanced understanding of what drives engagement, reinforcing the importance of making CS feel relevant and inclusive to all students.

Computer science is foundational for many careers because it's used in nearly every industry and aspect of modern life — from manufacturing, finance, healthcare, and retail, to more creative sectors like fashion, beauty, food, and music. As AI continues to reshape industries, the need for diverse perspectives in computer science is more critical than ever. Yet, why do we rarely help young women see the myriad ways computer science is already embedded in their daily lives and how it can be used to make the things they're innately interested in even better?
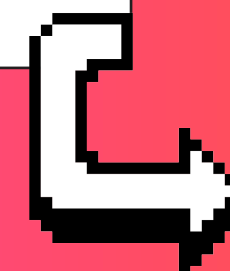
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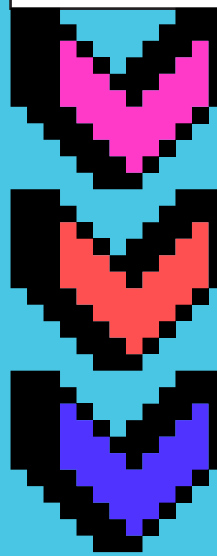
What if closing the gender gap in computer science came down to something as simple as spending more time explaining to students — and especially girls — that it doesn't confine you to a lifetime job writing code for a big tech firm, but is about using computational thinking to solve problems that occur every day? And while, yes, taking computer science classes and participating in extracurricular programs outside of school can position students for successful careers in computer programming, it can also prepare them to navigate a world increasingly shaped by AI and give them a leg up in careers they feel personally connected to, from nature conservation to music production.

Key Takeaways

From the survey of 12-17 year olds:

Students widely recognize computer science as one of the top four most important subjects, and its significance continues to grow. However, girls are less likely than boys to perceive computer science as important, consider it their favorite subject, or enroll in a computer science class — highlighting a gap in engagement and opportunity.
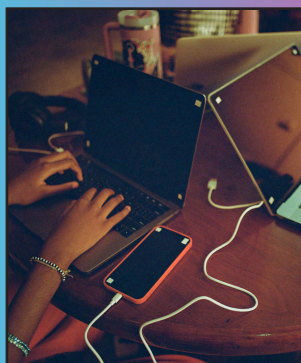
Feeling personally connected to computer science is by far the biggest driver of students feeling as though it's an important subject. And for girls (particularly middle school girls), the key opportunity is to understand how computer science is related to other things they're interested in, and to feel as though CS is for someone like them.

Nearly half of students recognize the importance of computer science for future jobs, but at a key time to engage, middle school girls are less likely than middle school boys to be interested in it, see the connection between it and other things they are interested in, feel computer science is for someone like them, and see computer science as fun.
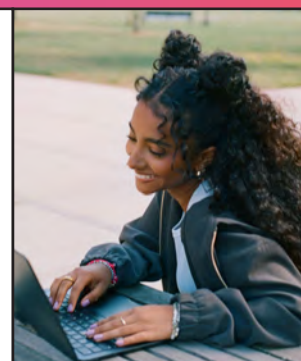
introduction

When Fifi Teklemedhin took her first computer science class in middle school, she was not familiar with CS, having chosen the elective at random to fill a gap in her schedule. But the Salt Lake City, Utah native, who was a flyer on her varsity high school cheerleading team, ended up maxing out on computer science classes by the time she graduated, taking AP Computer Science Principles, AP Computer Science A and IB Computer Science.

To say she accidentally fell in love with the subject is an understatement. Today, as a senior at Harvard University, the computer science and sociology major is putting her skill set to work on passion projects.

"I love building data-driven solutions that power policy, advocacy, and real-world change," she says.

Among other things, she's developed a cultural website for Louisiana's indigenous communities to understand adaptation strategies to natural and environmental disasters, and assisted in federal grant proposals and website development to fund hurricane-resilient housing for state-recognized but federally unsupported tribes. She's used software to scrape and analyze more than 40,000 GOP leadership bios to track political trends over 20 years, and co-authored policy reports for the U.S. State Department and the United Nations on social media repression and AI governance.

Despite her early success, Teklemedhin is bothered by something else related to computer science: the underrepresentation of girls due to seemingly intractable stereotypes that the subject somehow isn't suited for them or doesn't align with their interests.

"THE BIGGEST THING THAT'S STOPPING GIRLS FROM PURSUING COMPUTER SCIENCE, EVEN WHEN THEY HAVE THE OPPORTUNITIES, IS ATTACHING THIS SET OF IDENTITIES TO COMPUTER SCIENCE THAT IS NOT ALIGNED TO WHO THEY ARE," SHE SAYS.

"When they think of CS they think either you need to be nerdy or insurmountably smart in a way that they can't relate to. They see it as a talent you're born with when in reality, it's actually a skill that people develop over time with effort. Girls see it as a male-dominated field that's robotic and data-driven — in contrast to other fields that we see as more empathetic, like the humanities."

"In reality, we are just trying to solve problems. It's really important to reframe computer science for girls as a skill set — a skill set they can apply to whatever topic they want, whether that be software engineering or linguistics and literature. "Tech is created in service of our communities and it's designed to help users live better lives. Women, as half of that user base, deserve to thrive in the field."

The survey data reflects Teklemedhin's experience and angst about the status quo: Computer science is viewed among the top four most important subjects, and its importance is on the rise. Yet girls are significantly less likely than boys to say computer science is important, to say that it's their favorite subject, or to enroll in a computer science class.

Similarly, computer science is foundational to many fields and nearly half of all students recognize its importance for future jobs. As AI-driven tools become more embedded in daily life and the workforce, understanding computer science is becoming an essential skill — not just for programmers, but for anyone who wants to shape the future. But at a key time to explore potential workforce options, engagement among middle school girls plummets. At this crucial age, they are less likely than boys to say they're interested in.

WHY?!

Feeling personally connected to computer science was by far the biggest driver of students feeling as though it's an important subject, the survey found. And for girls in particular, the opportunities are to understand how computer science is related to other things they're interested in, and to feel as though it was for someone like them. **Put another way, the connection between computer science and personal identity is often less visible or emphasized for girls.**

HIGH SCHOOL GIRLS' LARGEST BARRIERS TO EXPLORING CS IS A PERCEPTION THAT CS "IS NOT INTERESTING" (24%) OR "HAS NOTHING TO DO WITH MY INTERESTS" (24%).

"THE NUMBERS DON'T LIE— GIRLS ARE JUST AS EXCITED ABOUT COMPUTER SCIENCE AS BOYS WHEN THEY'RE YOUNG," -SARAH MORRISON, SVP OF MARKETING AT CODE.ORG.

"But somewhere along the way, they stop seeing themselves in the field. That's not a talent gap, it's a culture gap.

If we want to change the face of tech, we need to make computer science feel relevant, welcoming, and undeniably for them. And in an era where AI is reshaping industries, the absence of women in computer science doesn't just impact them — it impacts the innovations that shape our world. That means showing young women how CS connects to their lives right now — not just as some distant career path, but as a powerful tool for their passions, creativity, and impact on the world today. It's time to double down and make sure every girl knows she belongs in CS."

Barriers to taking CS	Students n=1,019	Middle School Girls n=181	High School Girls n=306	Middle School Boys n=213	High School Boys n=319
Any barrier (net)	74%	▲ 79%	▲ 79%	70%	68%
It's not a course requirement for me	20%	21%	21%	19%	18%
It's too hard to understand	19%	22%	22%	15%	16%
It's not interesting	18%	20% ▲	24% ▲	9%	16%
It has nothing to do with my interests	18%	21% ▲	24% ▲	11%	14%
I don't think I will need it for my future career/life path	17%	20% ▲	22% ▲	10%	14%
It isn't relevant for me	16%	19% ▲	20%	7%	17%
I don't have enough time	13%	14%	14%	12%	13%
My friends aren't going to be in the class	13%	16%	11%	10%	14%
It changes too quickly	12%	14%	11%	13%	13%
I feel like I don't belong in the class	10%	14%	11%	9%	8%
I don't have the right computer or device	9%	10%	9%	11%	7%
It's hard to know if I'm actually learning	9%	9%	8%	8%	9%
My parents don't think it is important	5%	7%	4%	5%	4%

Statistical significance calculated at the 95% C.L.
□ = higher compared to the other age group within gender
▲/▼ = higher/lower compared to boys in the same age group

MEANWHILE, THE LARGEST DRIVER FOR ENROLLING IN CS EDUCATION IS WHETHER IT CS "GETS THEM EXCITED TO LEARN" (20%).

The gender gap in computer science isn't new. While there has been tangible progress in expanding participation, disparities persist at a time when computer science is becoming increasingly essential across careers, especially with the growing presence of AI in society and the workplace.

We know from past research that around age 12, when both boys and girls still have a similar level of interest in computer science, something shifts and girls become half as likely to be encouraged to explore it. That's especially important considering that students who are told by a parent or a teacher that they'd be good at the subject are up to three times more likely to be interested in learning computer science in the future.

Our survey reveals at least one important silver lining: Black students are more likely to be engaged with computer science – a difference driven by the fact that Black girls are more engaged with the subject matter than girls of other ethnicities. While there is a clear gender divide when looking at all boys and girls, where girls are less likely to find computer science important and enroll in courses, this divide is nearly non-existent among Black students thanks to a concerted effort to increase participation in computer science and coding among Black girls.
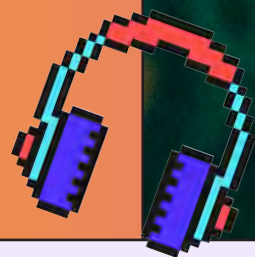
AMONG OTHER THINGS, our survey shows that Black girls are equally likely than boys to consider computer science extremely important, to have positive feelings about computer science, to consider computer science part of their identity and to participate in a computer science program or club outside of school.

Even still, the deleterious effects of our shortcomings in encouraging all girls to pursue computer science are staggering: Research shows that young women are less likely to have taken computer science in high school and less likely to enroll in it in the future – prompting a gender gap that extends into university and the workplace, potentially limiting their opportunities later in life, particularly in terms of financial well-being.

BOTTOM LINE:
It's essential to show girls that computer science is relevant to them, connects to the things they enjoy, and opens doors to a wide range of future careers.

At Code.org, we're on a mission to maximize the connection between computer science and the key interests of girls, as new data shows that playing upon related interests can be a powerful way to enhance the message that computer science is for girls like them.

Parents, educators, and school leaders can further impact girls' participation by showcasing examples of how computer science blends academic skills such as problem-solving with intrinsic social causes like nature conservation or medical care, or even in more niche fields like fashion design and music production. Once students come to understand that computer science can lead to jobs beyond sitting at a desk and coding for a tech company and is actually applicable to their own personal career interests, they're more likely to embrace CS.

And as it turns out, two of the most effective ways to flip the script might also be pretty easy lifts. The simple act of encouragement – telling a girl that she'd be great at computer science – and allowing them to see other girls and young women "like me" can be a powerful influence.

All figures, unless otherwise stated, are from a 15-minute online survey conducted by YouGov, Plc. for Code.org between September and November of 2024. 1. The sample consisted of 1,019 U.S. middle and high school students, aged 12-17, balanced on the following demographics: age, region, gender, ethnicity/race and socio-economic factors. Additionally, a minimum of n=150 Black/African American students, Hispanic students, and students receiving free/reduced-price lunch were surveyed.

FINDINGS

Computer science is viewed as important by nearly 3-in-4 students, and that importance is on the rise, with roughly two-thirds indicating that it will become more important in the coming years. It is within the top 4 subjects overall for importance and favorite subject. But regardless of age, girls are less likely to say it is important or a favorite, and middle school girls are less likely than middle school boys to think it will become much more important.

Students who have taken computer science course(s) are much more likely to say it is important (83% vs. 54%), rating it similarly to career and technical education and math. Students who have taken a course (71%) are also more likely to say computer science will become more important. Students who've taken more than one course are even more likely (79%) than those who've taken just one (66%).
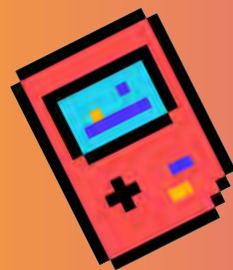
Black (84%) and Hispanic (78%) students think computer science is more important than white students (70%), with Hispanic boys (84%) more likely than girls (71%) to indicate this. There is less of a divide between genders among Black students. Additionally, Black students (78%) are more likely to say computer science will be more important than Hispanic (61%) or white (66%) students.

When looking at factors that lead students to consider computer science an important subject, feeling personally connected to it was the biggest driver, accounting for 60% of the importance attributed to CS.
> **The top driver for middle school girls was "being related to other things interested in,"** closely followed by "being for someone like me" and "making me think." For high school girls, the top item was "is for someone like me."

Personal connection was less of a driver for Black students overall (48%) compared to white students (57%) and Hispanic students (60%). **But for Black girls, having a personal connection was much more important** than for Black boys (60%, vs. 34%).

Black students were most likely to say computer science "is for someone like me" (29% of Black students compared to 19% of Hispanic students and 20% of white students).

While students ranked computer science in the top 4 for favorite subjects, there was a stark difference between boys and girls: **8% of girls said it was their favorite subject compared to 18% of boys.**

Black students are the most likely (78%) to have taken a course, with virtually no gender gap (81% Black boys compared to 76% of Black girls). Meanwhile, Hispanic and Black students are most likely to enroll (71% and 72%, respectively, say they are "very" or "somewhat" like to enroll compared to 61% of White students).

Students who have participated in a club are significantly more likely (88%) than those who haven't (57%) to say they're likely to take a computer science course at their next opportunity. The same goes for those who've taken a course (76%) compared to those who haven't (40%).
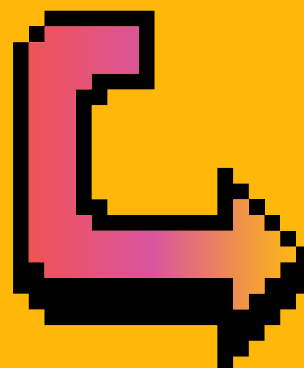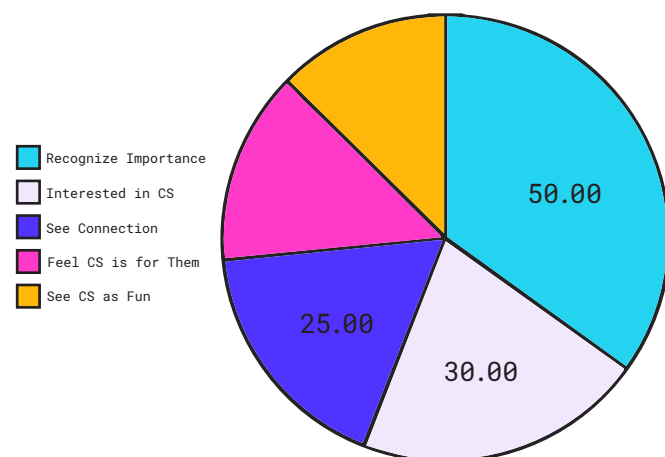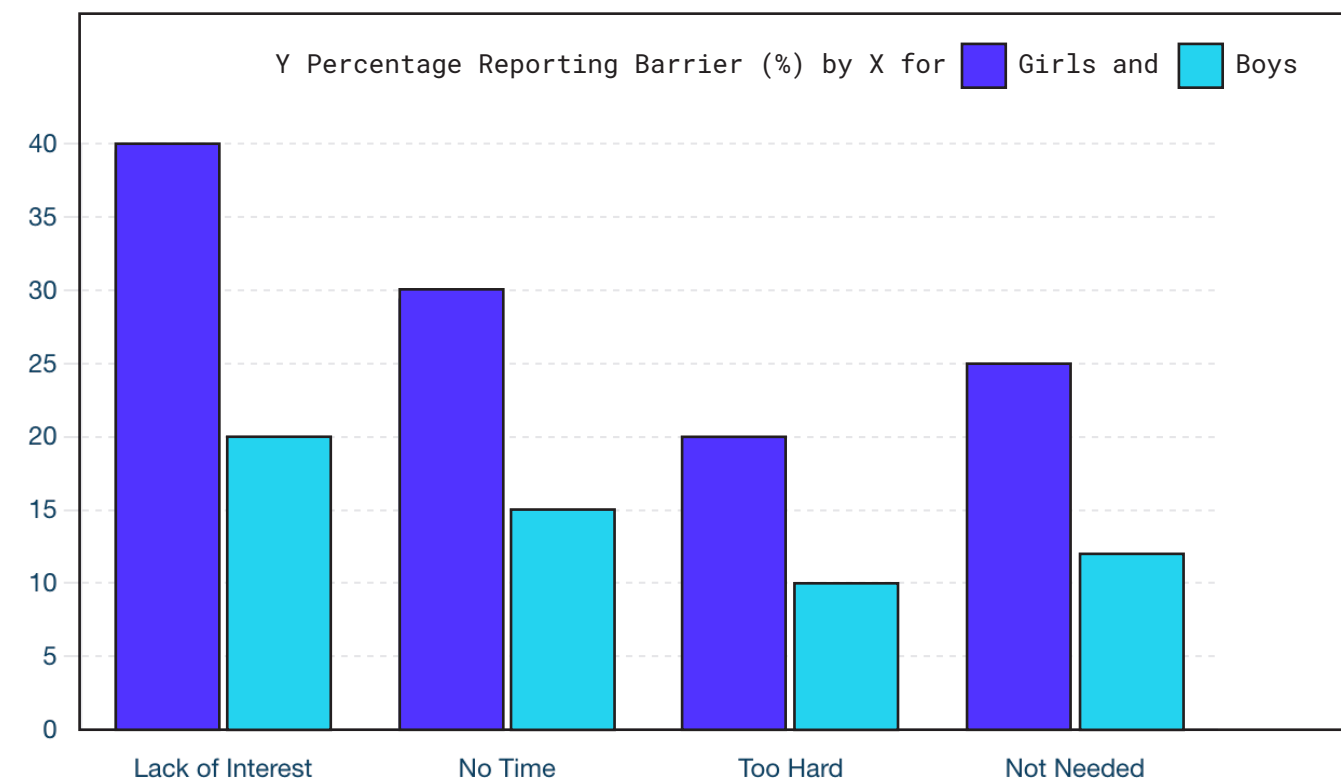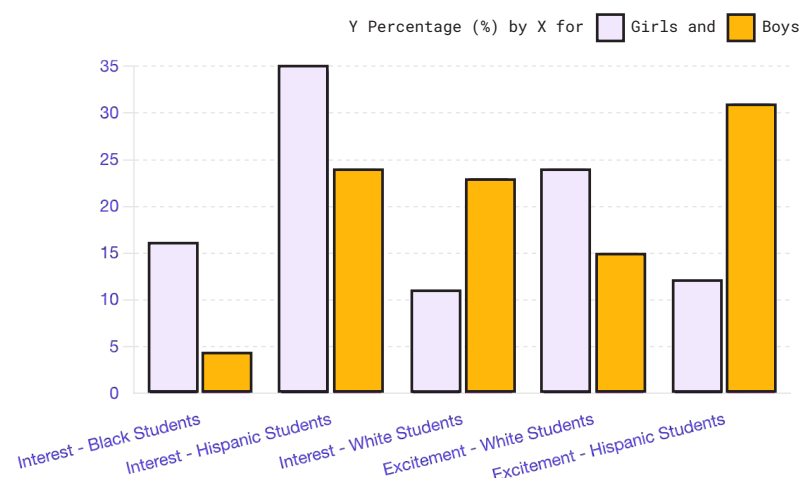
FINDINGS

> When looking at factors that drive enrollment in computer science, feeling personally connected to it was the biggest driver.
> • Overall, enrollment among girls was driven more by feelings that computer science "is for someone like me." The top enrollment driver for middle school girls was "something I am interested in."
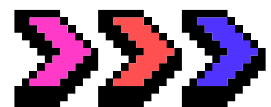
Both Black girls (16% vs. 4%) and Hispanic girls (35% vs. 24%) are more likely than their male counterparts to enroll due to interest in the subject, while the reverse is true for white students (11% vs. 23%). Excitement to learn is a larger driver of enrollment for white girls (24% vs. 15% boys). Excitement is also a larger driver for Hispanic boys (31% vs. 12% girls).

Y Percentage (%) by X for Girls and Boys

- Interest - Black Students
- Interest - Hispanic Students
- Interest - White Students
- Excitement - White Students
- Excitement - Hispanic Students

Y Percentage Reporting Barrier (%) by X for Girls and Boys

| | Lack of Interest | No Time | Too Hard | Not Needed |

Legend:
- Recognize Importance
- Interested in CS
- See Connection
- Feel CS is for Them
- See CS as Fun

Pie chart values: 50.00, 30.00, 25.00

Nearly half of students (47%) recognize the importance of computer science for future jobs, but at a key time to engage, middle school girls are less likely than middle school boys to be interested in it, see the connection between it and other things they are interested in, feel computer science is for someone like them, and see computer science as fun. **The interest gap continues into high school for girls, even if the gap in relatability narrows.**

Computer science access isn't a barrier, at a nearly universal level (90%+), but it is more commonly offered in high schools and more often required in private schools.

> Boys report fewer barriers than girls to accessing computer science (68% vs. 79%). Girls most commonly report barriers related to a lack of interest/relevance (including for career), or that it's too hard to understand.

Just over one-quarter of students 12-17 have participated in computer science outside of school, similar among age and gender groups. Top providers are The Coding School and Code Next, though this differs by gender and age.

Across races, Black students are more likely than white students to have positive feelings towards computer science (78% compared to 62%), more willing to give up other things to code (56% compared to 43%) and believe more strongly that computer science is part of their identity (57% compared to 40%).

BLACK GIRLS & COMPUTER SCIENCE

While there is a clear gender divide when looking at total boys and girls, where girls are less likely to find computer science important and enroll in courses, this divide is nearly non-existent among Black Students:

> **Subject Importance** (Extremely): 60% Girls, 58% Boys
> **CS Descriptors:** Girls and Boys describe CS similarly (no significant differences)
> **Taken CS course:** 76% Girls, 81% Boys
> **Likely to enroll:** 72% Girls, 73% Boys
> **CS Club/out of school participation:** 27% Girls, 21% Boys
> **CS Is part of my identity:** 58% Girls, 56% Boys
> **Would be willing to give up other things to have time to code:** 61% Girls, 49% Boys
> **Feelings towards CS are positive:** 79% Girls, 78% Boys
> **I'd be upset if my school stopped offering CS:** 63% Girls, 69% Boys *(non-significant gap)

Black students are more likely to be engaged with CS, but more importantly, that difference is driven by the fact that **Black girls are more engaged with computer science.**

There has been a movement to get Black girls involved in computer science and coding and the results are apparent.

Moving the needle:
Examine the outreach efforts and implement similar strategies for all female students.