Increasing Middle School Girls' Self-Efficacy in Computer Science

What is the Issue?

Girls participate in computer science (CS) at a much lower rate than boys. The lack of representation of girls in CS begins before high school, continuing beyond formal education into the community and workforce. One way to broaden participation is to focus on girls' self-efficacy in computer science. Self-efficacy is a person's belief in their ability to perform a task. Research suggests that girls' lack of participation and engagement in computing during middle school and beyond can be a result of low self-efficacy. Teachers can help support girls in their CS classroom through instructional practices and relationship building.

Why It Matters

- Exposing girls to CS in middle school provides a foundation for them to continue in the field. The computing profession is projected to have nearly 4 million job openings by 2029. It provides one of the highest starting and median salaries of any STEM field, ensuring that women can provide for themselves and their families.
- Bringing girls' perspectives into the learning process enriches it for everyone. Self-efficacy plays a role in student achievement and interest, helping students to believe they can do whatever they want to do. Bringing greater gender diversity into computing helps prepare even more students for this lucrative field.
- Whether or not they pursue CS as a career, girls with technical skills can help their communities thrive.

By Angela Prater, Sonnya Preston, Wendy DuBow | June 2021

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Things to Consider

- Social encouragement, academic exposure (including courses and out-of-school activities), self-perception, and career perceptions are factors influencing girls' participation in CS.
- Offering any encouragement and exposure is better than none, since these factors are the most Many studies show that negative stereotypes about computing (including "nerd," "boring," "hard," and "geeky") inhibit girls' interest in the field.
- Exposing girls to CS at a younger age can create a foundation for positive attitudes toward computing. The earlier they are introduced to CS, the more familiar with it they will become.
- Teachers need professional development on how to present CS (e.g., why CS is important, what computer scientists do, how it can connect other subject areas).
- Many students and parents do not realize that CS is a profession that can positively impact the world. Research suggests we need to teach parents, particularly fathers, that computing is a good career for their daughters.
- Role models can make a difference in girls' career aspirations. Seeing women who work in the industry and in CS education can inspire girls.
- Girls can get a sense of belonging in computing by increased interactions with teachers. Check-ins with teachers in and out of the classroom can help build stronger relationships.

Recommended Actions

- Emphasize to students that computing is a field where they can be creative, help others, and incorporate their other interests, including sports, fashion, and art. Focus on the impact of computing, and demonstrate a path forward into a career for girls.
- Interact with the girls in your computing classes and provide encouragement. Interact not just in the classroom, but outside as well, to increase their feelings of self-efficacy and belonging.
- Provide role models of women in technical fields. Feature women of various intersecting identities, including race and ethnicity. This can demonstrate what is possible and educate students on possible career paths (e.g., NEPRIS, technolochicas.org).
- Create a bridge between the classroom and the community through events such as Family Code Night and Show-and-Tells where students can present their projects to families and communities.
- Treat CS as a core subject, rather than another passing initiative. Computers aren't going anywhere, and the jobs of tomorrow will be computer-related. We need to prepare girls for a world where computers are everywhere.
- Develop open-ended, creative, project-based learning assignments to increase girls' self-efficacy. Give them "a voice and a choice."
- Given that prior experience influences later outcomes, expose girls to computer science concepts as early as possible. Connect with elementary school STEM teachers.

Reflection Questions

- Reflect on the number of interactions you have in and out of the classroom with students. Is the number different for students of different genders?
- What practices exist in your classroom or department to improve girls' self-efficacy?
- What do you do at your school to invite girls into computing?
- How do you model or explain the ways that computing relates to fixing social problems?

Did you know?

Confidence and self-efficacy are different. Confidence is a general term that refers to strength of belief, but it does not necessarily specify the certainty about it. For example: "I can be supremely confident that I will fail a class." Self- efficacy, on the other hand, refers to belief in one's own capabilities in attaining a certain skill level. For example, "I am confident that I can program the robot to move across the room."

Resource List

The National Center for Women & Information Technology has information on how to engage families to encourage girls' interest in computing.

Scratch is a free program created by the MIT Media Lab. It is designed to helps students learn how to code by creating programs, stories, games, and other projects.

Girls Who Code offers resources for running clubs and summer camps for girls to learn about coding.

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