Strategies for Recruiting and Supporting Girls in Technology Education

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The Connecticut Women's Education and Legal Fund (CWEALF) has over three decades of experience in gender equity and public policy and a long and distinguished history of partnering with the State Department of Education (SDE) and Technology Education programs. These combined efforts are an attempt to increase the success of all students, particularly females, in obtaining education and training leading to self-sufficient employment in nontraditional, high-wage, high-skill occupations.

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CWEALF also has an Information & Referral Service to provide legal information and referrals about gender equity issues. The I&R Service is available to callers Monday, Wednesday - Friday 8:30 a.m. - 5:00 p.m.

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The Connecticut Women's Education and Legal Fund (CWEALF) has over three decades of experience in gender equity and public policy work and a long and distinguished history of partnering with the State Department of Education. These combined efforts are an attempt to enhance the success of all students, particularly females, in obtaining education and training leading to employment in nontraditional, high-wage, high-skill occupations that allow for economic self-sufficiency and career advancement. In addition to research reports and gender equity projects, CWEALF provides technical support, professional development and training on gender equity, homophobia and sexual harassment to educators, administrators, parents and students.

Research conducted by the Vocational Equity Research, Training and Evaluation Center (VERTEC) over the last 15 years has identified several important factors influencing females to turn away from math, science and technology in high school. First, stereotypes about appropriate careers for women are still powerful and difficult to overcome without educators taking active measures to encourage female students. In Building Their Future II (Suzanne Silverman and Alice Pritchard, CWEALF, June 1994), we found that while boys and girls rejected the idea that males are inherently better at some subjects or jobs, the fact that there are few females in nontraditional occupations was often cited as a reason for girls not to take Technology Education, or consider a technological career.

Girls who chose not to take Technology Education were often reluctant to take classes in which they would be one of few girls. While only a few girls openly accepted stereotypes about appropriate careers for women, many girls felt uncomfortable with the picture of themselves in technical jobs. They often lacked confidence in their abilities and worried about the reaction of friends and family.

The operation of stereotypes is reinforced by the fact that many girls are less familiar with technology than are boys, since boys are more likely to have experience with technology outside of school. We found that girls who were taking Technology Education were often encouraged by relatives or family friends. We also found that many students (both boys and girls) lack information about the breadth and depth of technological careers. Our research indicates that students in technology classes often fail to make the connection between classroom learning and future technological careers. Many students lack a sense of economic realities, which could inform their career choice and help them make plans for further education and training after high school. Further, we found that female students tend to be less concerned with those economic realities than male students.

Our experiences in helping schools to address questions of inequity, whether they be in technical education classrooms or on the playing field, attest to the fact that you can't just 'add some girls and stir'. Adding girls to a nontraditional classroom and expecting that they will even feel welcome, much less excel usually does not work successfully. What we need to do as educators, policy makers and researchers is to dissect the meaning of gender and its impact on how we learn. Equitable pedagogy, through the design of educational programming and delivery, intentionally creates opportunities for learning that accommodate a variety of learning styles and takes into consideration variables like race, ethnicity, social class and gender.

The suggestions in this guide are derived from a combination of our work in the classroom and extensive literature and research compilation and overlap with the Connecticut Technology Education Standards. The goal of this guide is to help technology educators to recruit female students into their classrooms, retain them in their departments and increase the number of women entering into technology-related postsecondary programs and occupations.

A bibliography is included at the end of this guide.
The following suggestions should be used to improve everyday teaching practices. Our research has shown that sensitizing teachers to the need for equity, and giving them the tools to promote it, results in an increase in the frequency of positive interactions between teachers and females and increases the success and retention of female students. These strategies have been coordinated specifically for Technology Education departments that historically have had difficulty attracting and retaining female students to their classrooms. These strategies address a variety of barriers to student success that are often invisible to or unintentional on the part of the educator, but still diminish the ability of the student to connect with the curriculum, engage in the learning process and see themselves in nontraditional careers.

In striving for equity, individuals must begin by examining their own schools, classrooms and practice. This examination can begin by asking a series of questions that create a baseline from which to measure improvement or to serve as examples of strong or effective practice.

1. What is the enrollment of your classroom by gender/race?
2. Is your classroom attracting a majority of any single sub-group of students (i.e. all males, all African American males, all non-college bound students etc.)?
3. Why is your classroom attracting the students that are enrolled?
4. Have you asked your students why they selected your class?
5. Have you talked with your guidance department about encouraging more nontraditional enrollment?
6. Do you highlight as many career options as possible that utilize the skills learned in your classroom?
7. Do you highlight students' skills, communicate that they can make a valuable contribution to technical fields and discuss different aspects of the fields that may be nontraditional?
8. If you have a majority of males in your class, have you asked female students why they are not enrolling, and what would attract them to the class?

Once this baseline information has been gathered and analyzed, both the content and the delivery of the curriculum must be considered. In the following sections of the guide, the aspects necessary to move toward equity in the classroom are explored. They are:

- Safety and Security in the Classroom
- Recruitment for Nontraditional Classes
- Recruitment for Nontraditional Careers
- Student Encouragement and Support
- Attention to Learning Styles and Prior Experience
- Contextualizing the Lessons
SAFETY AND SECURITY IN THE CLASSROOM

The feeling of safety in the classroom and in the halls—not just physically but also emotionally and psychologically—contributes to an environment in which everyone can take appropriate risks and learn. Creating and enforcing an inclusive classroom behavior policy that creates high expectations for all students’ behavior and interactions is crucial to maintaining a classroom that is bias-free.

Recommended Strategies:

1. Discuss your school/district policy on sexual harassment with your students and discuss what constitutes sexual harassment and how to report it.

2. Ask students how they would like to discuss classroom behaviors that are offensive to them/interfering with their learning (i.e. comment or suggestion box, after school meeting etc.).

3. Meet/collaborate with students on setting expectations for classroom behavior and agreeing on consequences for not meeting expectations.

4. Do not hold female students responsible for male students’ behavior or have an expectation that girls will police the boys’ behavior (i.e. it is not acceptable to say to male students, "don’t act that way there is a lady present" or vice versa). Expectations should be gender neutral and unilateral.

5. Mix up project grouping so that both genders have the opportunity to work in single- or mixed-gender groupings. Less secure/confident students may find the mixed gender group intimidating and feel less comfortable contributing to class work.

6. Tune in to subtle interactions between students or groups of students. Female students in particular can participate in relational aggression (whispering, excluding, making comments, spreading rumors) that can be just as intimidating as more overt forms of harassment, and these types of behavior are also illegal.

Tune in to what kids are saying and set clear boundaries on verbal and physical interactions between your students. Pay attention to what they are doing in relation to one another, not just whether they are behaving or not behaving within classroom rules. Safety issues must be attended to vigilantly and must be addressed immediately. Issues between students often arise and it is difficult to know how to address them, especially if the "victim" does not seem to mind or brushes off the incident.

For example: a male student routinely comments on a particular female’s appearance with un-offensive language but using a suggestive tone. Although the female does not seem to mind, it is important to consider that she may not feel comfortable telling him to stop since she may set herself up for retaliation or an escalation of comments. It is also important to consider that, even if the female does not mind the comments or participates, other females in the classroom may feel uncomfortable, judged and otherwise not treated like classroom/academic peers. This infringement on comfort can impact the quality of their classroom experience.

It is important to set clear ground rules and enforce them, regardless of whether or not someone that would be offended is in the room. Discussing issues openly and allowing youth to connect to a code of acceptable behavior becomes vital to a healthy classroom environment.

As an instructor, making oneself accessible and communicating caring and concern for the health and safety of the classroom environment creates an atmosphere in which students feel comfortable asking for help if they experience bias or harassment.
RECRUITMENT FOR NONTRADITIONAL CLASSES

Recruitment efforts for nontraditional classrooms need to be intentional. Research on the impact of gender role stereotyping on the selection of occupations indicates that young men and women are making career choices based on their understanding of what careers are "suitable" for them to enter into, based on their gender role expectations.

The same stereotyping impacts the classes into which young women and men elect to enroll. Teachers and guidance counselors need to seek out students that are under-represented in these classrooms and encourage them to enroll. Leaving the door open is not the same thing as inviting a student into the classroom. Recruiting, by definition, is the active attempt to attract an individual to a team or project. Inherent in this action is the idea that the individual is perceived as having skills that will enhance the team or project. Students need to feel as though their skills are valued and desired in order to take the risk of going into a classroom that is nontraditional for their gender, race or socioeconomic status.

Recommended Strategies:

1. Hold an "Invite a female friend to class" day. Have your female students invite one of their friends along to the class and have special activities planned.
2. Arrange for 7/8th grade female students to visit your classroom.
3. Have female high school TE students run a Technology Education fair for middle school students.
4. Showcase female student work around the school, not just in the Technology Education wing of the building.
5. Post a bulletin board with information about TE careers, including salary expectations and community linkages/impacts. Use a space near the library or cafeteria to enhance the visibility of Technology Education and generate interest.
6. Link to other classrooms (both CTE and Academic) that may have more young women. Interdisciplinary materials and joint projects can help to cross-recruit students into new areas.
7. Put yourself on the weekly/monthly guidance department meeting agenda. Talk about your courses and why you are interested in increasing your female enrollment.
8. Work with the middle school TE department to help identify young women that are engaged and interested in TE and send these students (and parents) a letter requesting their skill set and communicating that they are important to the program. Have them meet the high school teacher and/or have the middle school teacher recommend the high school program.
9. Talk to your female students about next steps/classes within the department; introduce them to the instructor (if it is not you). Encourage them to bring their skills back to the next level of the class (and your department).
Despite experiencing success in courses that are nontraditional for their gender, female students may not see themselves in technical careers because of the lack of exposure to these skills and careers. It is important not to assume that students are fully informed about their career possibilities. Students should be exposed to individuals from their own communities who are working in these fields. It is difficult for a student to visualize herself as being successful in a nontraditional career if she has no examples of women who are thriving in the field.

Counselors, parents and teachers often make stereotyped suggestions on where girls should focus their talents.

For example: a girl that is a strong math student is told that she should teach math, a boy is told to become an engineer or physicist. A girl that likes to draw may be told to be an artist, while a boy may be told to be an architect. A girl that is good with computers is told to be a graphic designer or a web designer, a boy is told he should be a software or hardware designer.

The pipeline from these classrooms to careers is beset on all sides with difficulties. Students who are underrepresented may feel isolated; may feel that their voice or perspective has less authority since it is going against that of a dominant group; may react more strongly to nonsuccess (a student that feels that she might not belong in a field is more likely to internalize a mistake as an innate inability than a normal process of learning); and are more likely to drop out of the education and/or the career itself for these reasons.

Recommended Strategies:

1. Include women in nontraditional occupations in Career Fairs.
2. Link class lessons and skill sets to careers. Tell students that if they enjoy a project that they could do similar work as a career and talk to them about the kinds of careers.
3. Invite professionals in nontraditional careers into your classroom to talk to students.
4. Explore a wide variety of careers that incorporate technology and technical skills within your curriculum.
5. Discuss economic self-sufficiency and help students to understand the need to earn a livable wage.
6. Understand that economics are often not enough to attract nontraditional students to a career area and discuss the human, environmental, cultural, social impact of careers in these areas.
7. Explain that there is teamwork and collaboration in most of these areas and that technical/technology-related work is not isolating or solely dealing with machines.
8. Look at the population that you are trying to attract to your classes (i.e. Latinas, African American girls, etc.) and make sure that you provide role models that look like them.

Recruitment for Nontraditional Careers

The Connecticut Technology Education Standards include career exploration as expected performances throughout the content standards. Although this is encouraging, this exploration alone may not be as effective for young women if they have never considered a career in this area and if their understanding of the breadth of careers is more limited. Furthermore, recruitment and support for women entering into nontraditional careers must be intentional and consistent to ensure success.
STUDENT ENCOURAGEMENT AND SUPPORT

The feeling that a student has an important role and contribution to make to the classroom and to the field is crucial to any students’ self-esteem and sense of self-efficacy. It is necessary for the teacher to make this acknowledgement explicit. However, it becomes particularly important to students that may have never visualized themselves as having a career in a nontraditional area. Girls must overcome many barriers to feel comfortable and entitled to go into these classrooms—boys do not. Boys, from a very young age, are taught that they have inherent skills and belong in these areas. This is why these classes, while ostensibly open to everyone, are less open to young women.

Once girls are in the classroom, focusing on the process of working on a project helps create confidence that there will be a satisfying outcome. By giving encouragement for what they have done right, asking them to draw on their own knowledge to help solve the problem (i.e. treating them like experts), allowing them to re-work or re-do the project, and grading on many levels of work, not just the finished project, can bolster student confidence and create less chance for "nonsuccess."

Females generally internalize failure and externalize success; males generally internalize success and externalize failure. Girls often interpret "failure" as meaning that they are without skills and that they have nothing to contribute. Girls may react to failure by shutting down or not participating, although they may also become disruptive. Boys often see failure as meaning that the skill is not useful to them or "stupid". They often see the skill as irrelevant and, as such, dismiss the knowledge as superfluous. Boys tend to react to failure through "acting out" behavior. These gendered reactions to nonsuccess have a particularly negative effect on a girl's ability self-concept and confidence in her skills. Couple this reaction with stereotypes that are operating about boys being more competent in math, science and technical skills and it is easy to see how female students disengage in these areas.

Recommended Strategies:

1. Interview students to find out what their interests are and how these can be incorporated into their projects.

2. Provide praise and reasons for the praise when reviewing student work or response.

3. Ask a student to act as a teacher-aide on certain lessons/activities because of their skill set or interest which may not be directly related to the task. This can help students understand the relevance of their skills and increase self-efficacy.

4. When students are working in groups, monitor the roles they are playing. Make sure that the girls have roles other than secretary/recorder and have input into the design of the project.

5. Ask a female student for her opinion/input and give specific praise for her response/contributions.
Educators often focus on the ideas and concepts that they want their students to learn; these concepts are then explored through the lessons and become the foundation to build upon toward more complex concepts. Much of the content for these instructional units draws on examples that assume a certain kind of experience.

For example: in a course that constructs bridges from balsa wood for a construction module, the females entering into this classroom may have a skill set that is stereotypically female with no frame of reference for this project. Often her male classmates have been encouraged to experiment and tinker with tools and technology, perhaps even built model airplanes or cars since they were quite young and will therefore be better prepared to participate in the project. This lack of familiarity can create isolation, a feeling of not belonging and the internalization of “not understanding” as failure in female students. For this reason, assuming that all students will immediately understand the purpose and/or relate to the project and will gain the same meaning from the project might be misguided.

There is a great deal of research that has shown that a learner's prior knowledge often informs the manner in which they process new information. Sometimes an educator's best effort to deliver ideas accurately does not resonate with an individual student because the baseline experience is not present in that student. Therefore, using examples that relate to the experiences of your students becomes paramount. If students are female, consider that many females may have had less experience with the equipment, concepts and even play activities that you draw on to explain projects.

These perspectives layer on top of the more traditional concepts of learning styles such as auditory, kinetic, visual, active, reflective, etc. Educational theorists have a variety of models that discuss the impact of learning style on how the individual acquires and masters knowledge. Consider the impact that prior knowledge and socialization may have on students when you are modifying your delivery in order to accommodate as many learners as possible.

Students that do not see the relevance of the skills they learn in the classroom to careers are less likely to engage in, and less likely to pursue, these areas of study. Further, making space within the classroom for alternative approaches to problem-solving and encouraging the diverse perspectives from which students learn and from which they contribute, can create an environment that welcomes and cultivates all perspectives.

Equity is not about providing the same opportunities for girls and boys, but about providing opportunities that are equal in meaning to girls and boys. We need to rethink teaching to address learning styles, to take into consideration variables like class, race, ethnicity and gender, and to reflect on how those dimensions may change the way students need to receive information in order for it to be meaningful to them. To understand how these factors influence the construction of meaning that occurs in educational instruction, it is important to consider how prior knowledge and experience influence the way students construct meaning.
**Recommended Strategies:**

1. Ask students in a class meeting how they would like to be graded, receive instruction and work (in groups or independently, etc.) and listen to their responses.

2. Be mindful of group dynamics. Make sure that students rotate responsibilities in the group and have equal use of tools, computer, design, etc.

3. Emphasize the process of learning not just the final product. Example: creating a design brief and giving partial credit for each phase of the finished project and allowing students to redo or retry parts of the project; praising the work that has been done and allowing for multiple solutions.

4. Make space for collaborative learning and let students work in small groups.

5. Show students the finished product at the beginning of the project to help them visualize the end product.

6. Increase wait time for responses to questions, provide options for responses to questions (i.e. written, computer, group response, etc.).

7. Pay attention to where your students are sitting; ensure that your movement in the classroom during lecture and during instruction includes all students.

8. Ask students if your examples make sense to them and ask them if they understand why the project and skill set is important.
**Recommended Strategies:**

1. **Explain the "bigger picture" to students when teaching a specific lesson or explaining a project.** Students with less experience and exposure to TE may need help with understanding the relevance of the activity to life, career, culture, and society. Nontraditional students are often less likely to understand these links intuitively because they have not been socialized within these areas.

2. **Give the problem or project a narrative.** Female students in particular are more likely to respond to a problem that has a context, particularly one that relates to other people or to a greater good. For example, instead of giving an assignment of a bridge building project with only design brief requirements, explain that this bridge must transport school buses or emergency vehicles and work specific details of this into the design brief. Provide some context as to why this kind of work is important and how it impacts people and society.

3. **Incorporate other fields into subject-specific teaching.** Multidisciplinary projects can allow students who may be most comfortable with one learning style, or who may feel more confident in another subject area, to contribute to projects and provide for multiple interpretations of a project. For example, when designing a bridge in class, offering historical or literary information may bring in students who can apply other skills to the project completion.

**For example:** students are asked to design/construct a portable lever that is as lightweight as possible but can still lift a large weight. Students are then told that the lever will be used by a rescue crew to pull people out of wells or crevices of mountains and must be able to be carried comfortably by one person because the rescue sites will likely be remote or confined spaces. Using these types of contextual details makes the project compelling, places it in a caring context and relates it to a larger need.

**Contextualize the Lessons**

The Connecticut Technology Education Standards include expectations that students will understand both the human impact of technology and the creativity necessary for innovation. Exploring the relationship between technology and society, culture and ethics, as well as the improvements and enhancements to life, can place technology in a context that students can relate to their own lives and can see influencing the lives of others.
CONCLUSION

For Technology Education programs to thrive, they must pursue diversity in their student population and, in particular, recruit young women. According to a 2000 report by the Congressional Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development, “If we are to compete effectively in the global marketplace, we must advance the full and equitable participation of all Americans in science, engineering and technology fields. Our economy will not only be positively affected by bringing more women, underrepresented minorities, and persons with disabilities into the SET workforce, but our high-tech, scientific, and engineering industries will benefit from their diverse viewpoints and approaches as well as their skills (p.6).”

These programs, and these occupational areas, have seen little advancement in gender segregation using a "wait and see" attitude that assumes that not discouraging is equivalent to actively encouraging. Efforts to recruit young women need to be thoughtful, intentional and ongoing. Once in the classroom, young women need further encouragement and support to ensure that they feel welcome and that their perspectives and skills are valued. Further, they must obtain the skills and the confidence to continue on in future classes and careers where they may still be one of the few females.
BIBLIOGRAPHY


