2018 NSF ATE PI Conference
Thursday, October 25, 2018, 10:15 – 11:00 AM

Makerspaces for CTE/STEM:

Strategies for Teaching, Inclusion, and Workforce

1. Introducing “Growing CTE/STEM Teachers”
2. Teacher shortage in the San Francisco Bay Area
3. Reflecting on the teacher shortage and impacts on CTE/STEM
4. Maker Reflection & Discussion
5. Creating MakerSPHERE at City College of San Francisco
6. Recruiting and Retaining Underrepresented Students
7. Growing CTE/STEM Teachers: CCSF Teacher Prep Center

Facilitators
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Project Grant “Growing CTE/STEM Teachers” 10/1/18 – 09/30/21
NSF DUE Award #1801099
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Project Grant “Growing CTE/STEM Teachers”  
NSF DUE Award #1801099

California faces a shortage in qualified CTE/STEM instructors who have the work experience, proficiency in academic subject areas, and pedagogical knowledge to effectively prepare HS and Comm college students for careers.

With 32 trade and technical schools and 28 community colleges offering CTE programs in the San Francisco Bay Area alone, the need for well-prepared CTE teachers in this region is enormous. Teacher shortages in the SF Bay Area represent 25% of shortages in California. San Francisco Bay region has significant barriers to teaching careers. All STEM and CTE Pathway growth is dependent on teachers. Only 40% of projected shortfall is in the pipeline in California.

City College of San Francisco's "Growing CTE/STEM Teachers" project aims to ensure that clear pathways exist for future STEM/CTE teachers at the high school and community college levels. These pathways will include resources, support, information, courses, and partnerships with employers.

The project focuses on the priority or emerging industry sectors identified by the CA Community Colleges Chancellor’s Office.

- Advanced manufacturing
- Advanced transportation and renewables
- Agriculture, water and environmental technologies
- Energy efficiency and utilities
- ICT/digital media
- Life sciences/biotechnology

This project will carry out four primary activities in pursuit of its goal of increasing the pool of qualified STEM teachers at the secondary and community college level.
1. Engage in outreach to recruit high school students, community college students, and individuals already in the workforce into CTE/STEM teacher preparation pathways.
2. Provide student support to increase persistence and completion rates.
3. Provide technical assistance and professional development to other colleges in the region and statewide, and serve as a clearinghouse for technical assistance and professional development, especially in CTE/STEM teacher preparation.
4. Advocate for CTE/STEM teacher preparation as a vital part of the statewide infrastructure supporting STEM-based CTE industries.

Discussion

- How many are facing teacher shortages in CTE and STEM?
- High schools or community colleges?
- Who is (and who is not) entering teaching prep pathways to teach CTE/STEM? Gender? Ethnicity? Socio-economic status?
- Impacts to your pathways? What factors are influencing student career choice?
- Can faculty professional development and recruitment efforts be improved?

Maker and Teacher Pipeline both CCCCO Priority projects and Regional Joint Ventures in the San Francisco Bay Area
Connecting Making to Education

• Makerspaces complementary learning environments to traditional classroom
• Develops skills different from those developed in traditional student projects and learn-by-doing classes.
• Spaces (labs) are makerspaces, hackerspaces, hacker labs, fab labs, innovation centers
• Tinkering, 3D printing, sewing, laser cutting, CNC and machining, additive manufacturing, design, coding, textiles, rapid prototyping, paper crafting, computational tinkering, glue guns, felt, pipe cleaners, micro-controllers, robots, LEDs and more.
• Interdisciplinary – Participatory - Peer-supported learning
• Students design and invent among a community of other makers
• Rapidly growing around the world
• Crosses age and employment levels, from kindergarten to mid- and late-career

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<th>Maker Movement</th>
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Discussion: Your First Maker Experience

- When was the first time you remember making something?
- What did you make and how did you go about making it?
- How did it engage you, how did it make you feel?
- What skills were necessary?
- What were the challenges?

Creating MakerSPHERE at City College of San Francisco

- What challenges could a makerspace help address?
- Who is in your Maker ecosystem
- Who could join your Community of Practice? Champion, teach, participate?
- What Curriculum opportunities exist?
- Internships, partners

Makerspace is one of Several Strategies to Support Future Teacher Development at CCSF

- Recruiting the “high hanging fruit”
- Dual – enrollment Pathways including credit recovery and support for students not enrolled in college
- FREECCSF
- Regional data sharing and survey of Human Resources Community College administrators
- Grow Your Own starting at high school in partnership with SFUSD
- Paid teacher assistants in STEM/CTE classrooms
- Annual STEM/CTE Teacher Conference with MAKERspace strand

Recruiting & Retaining Underrepresented Students

- Handouts
- Survey results
- Recruitment results
CCC Maker Initiative Funding:
California Community College State Chancellor’s Office

- First statewide community college initiative to:
  1. Grow a statewide network of college makerspaces.
  2. Develop a CCC Maker ‘Community of Practice’ model.
  3. Align 21st century skills with STEM/STEAM research and practice.
  4. Support work-based opportunities for students.
  5. Disseminate information and resources to ecosystem.
Bibliography and Resources

California Community College Chancellor’s Office Teacher Prep Programs; 2018  http://teacherprepprogram.org/

CCC Maker Website  http://www.cccmaker.com


You Will Learn:

**Females in Maker Space: Key Factors for Recruitment**
- Top three Maker Space recruitment strategies & how to put them to use
- How to adopt a program-wide “female friendly” Maker Space approach
- How to communicate the benefits of Maker Space at each stage of the recruitment process
- Effective strategies to involve faculty & staff in your recruiting effort

**Gender Diversity in Maker Space: Boosting Enrollment & Implementing New Culture**
- Barriers to recruiting women to Maker Space & how to overcome them
- How to identify your target audience for recruitment and low-hanging fruit
- Success in Maker Space: See actionable examples of successful Maker Space programs with female students

**Strategies to Keep Female Students in Maker Space on Course & Improve Graduation Rates**
- How to make female students feel welcome and what not to do
- Ways to bolster confidence in female Maker Space students to ensure success
- Strategies to help your female students be successful in the lab
- Building block skills to help close the experience gap

**Addressing the Maker Space Challenge: Appeal to Women Who Aren't Excited by Maker Space**
- How faculty can teach to female learning styles
- How to connect students with female role models & create community
- An "ah-ha" moment on spatial reasoning - what you need to know

**Building a Leadership Team Model for Women in Maker Space: Strategies for Success**
- Ways to partner with faculty, administrators, student services & others
- No educator is an island: How to work together & boost Maker Space retention
- Top 3 qualities of an effective Leadership Team & how to employ them
"Maker work is complicated, and it’s such a big area that it can be easy to lose focus on what’s important. The WomenTech Makerspace Training brought our team together and was expertly facilitated. It led us through the process of capturing our busy faculty's ideas, and collected them in a very effective way. Now we have an action plan for a short timeframe, so we can be ready for students the next semester.

I don't think we could have gotten to this point without Donna's facilitation. I knew from my past experience with IWITTS that Donna could help us create a plan that would produce results. The materials, the research-based strategies, the PowerPoint slides, and the sample Student Leads Sheets were all so valuable and engaged faculty in the process.

I am confident that CCSF will now be able to achieve our grant’s goals to make our Maker space inclusive to ALL students from day one.”

~Maura Devlin-Clancy, MakerSPHERE Coordinator at City College of San Francisco

Your Institution Can Achieve Results Like These:
- CCSF: New Maker 100 Course Enrollment: 12 women and 12 men – 50% female enrollment in 7 weeks
- CCSF MakerSPHERE Club Demographics; Club went from 4 male students to 65 students – now 40% women. Plus, club president is now a female student!

You Will Take Away:
1. An easy-to-implement Recruitment Plan to greatly increase the number of women and girls in your Maker Space.
2. A Retention Plan for your school to increase the completion rate of your female (and male students), starting this semester.
3. The knowledge and confidence you need to put these plans into action right away, and the bonus tools that will help you be even more successful. (See Ready to Go Outreach Materials section below)

More Information
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