

maker space:

# Promoting Engagement of the California Community Colleges with the Maker Space Movement

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STEM/STEAM  
SKILLS FOR  
THE CREATIVE  
ECONOMY

INNOVATIONMAKER3  
SYMPOSIUM



**CCST**  
CALIFORNIA COUNCIL ON  
SCIENCE & TECHNOLOGY

# what is making?

Creating.  
+  
Communal  
Interdisciplinary  
STEM/STEAM-focused  
Diverse  
Process  
Open-ended, inquiry-based  
Fun and playful  
Empowering

maker space

# what can students learn?

Making & makerspaces are complementary

"4 C's" of 21<sup>st</sup> Century Skills:

Creative Thinking ❖ Critical Thinking ❖ Collaboration ❖  
Communication

Soft Skills:

Problem solving ❖ oral & written communication ❖  
teamwork/collaboration ❖ leadership ❖ creativity/  
innovation ❖ self-direction ❖ professionalism/work ethic

# the robots are coming



21<sup>st</sup> Century  
Skills are  
increasingly  
important

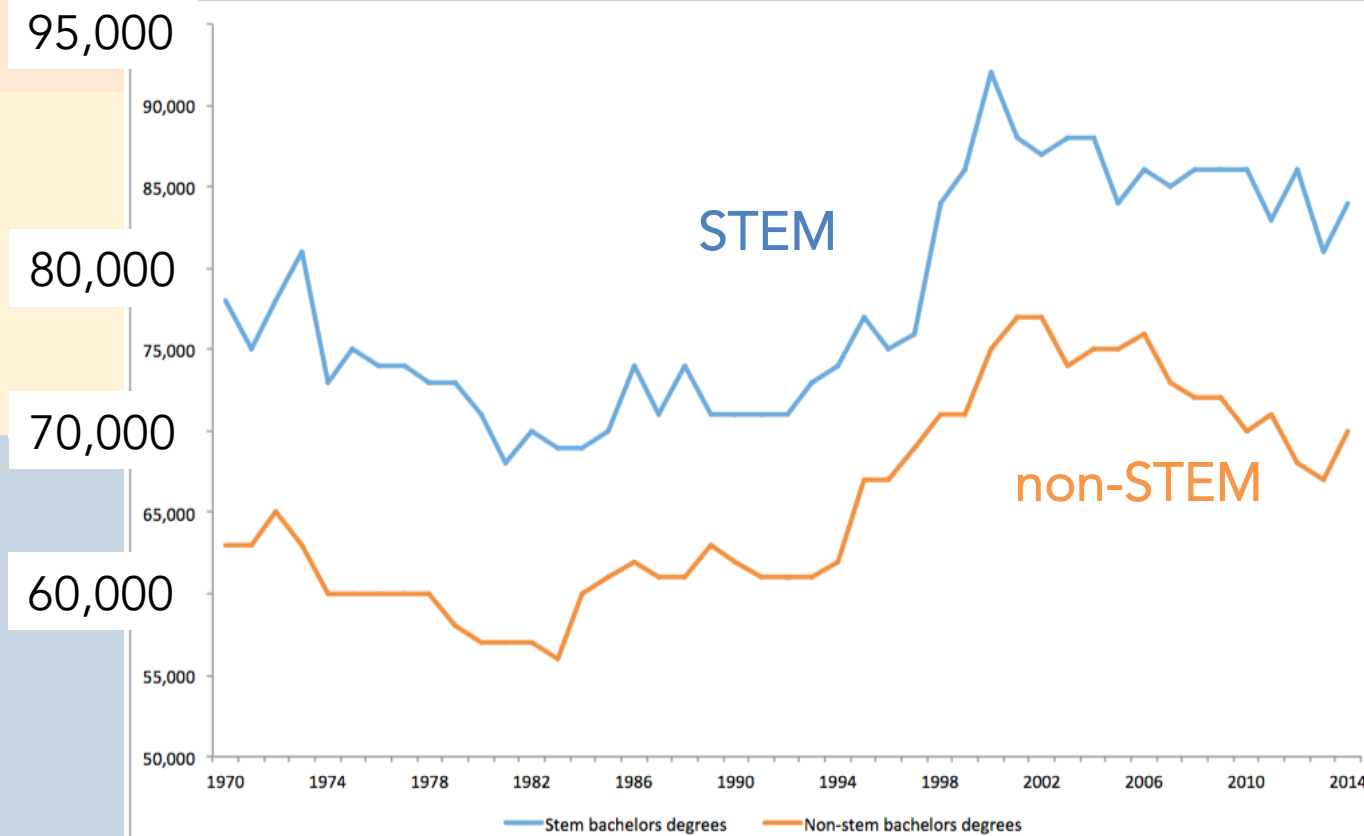
Via *MIT Technology Review*:  
Image courtesy of Simbe  
Robotics; image courtesy of  
Savioke; image courtesy of  
Knightscope; image courtesy of  
Starship Technologies

# making and WBL

Work-based learning programs:

- Improve completion rates
- Develop workplace skills (teamwork, creative problem solving)
- Increase student interest in potential career paths

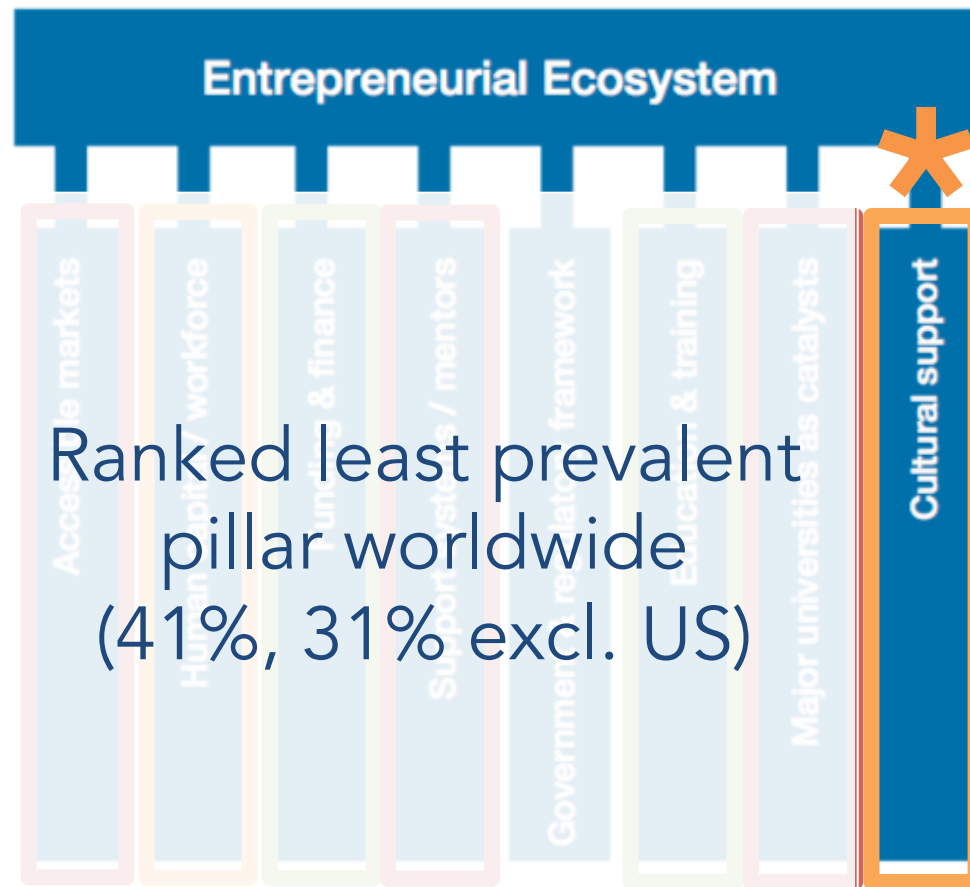
# STEM: life-long impacts



Mean earnings for **STEM** vs. **non-STEM** bachelor's degree holders from 1970 to 2014.

(Source: University Ventures Letters, Volume VI, #5. March 4, 2016.)

# making strong ecosystems



Cultural support  
(tolerance of risk  
Mentoring, training  
and failure,  
Curr.-based learning  
celebration of  
Culture of Respect,  
innovation, etc.,  
positive image of  
entrepreneurship)  
Etsy; Ebay

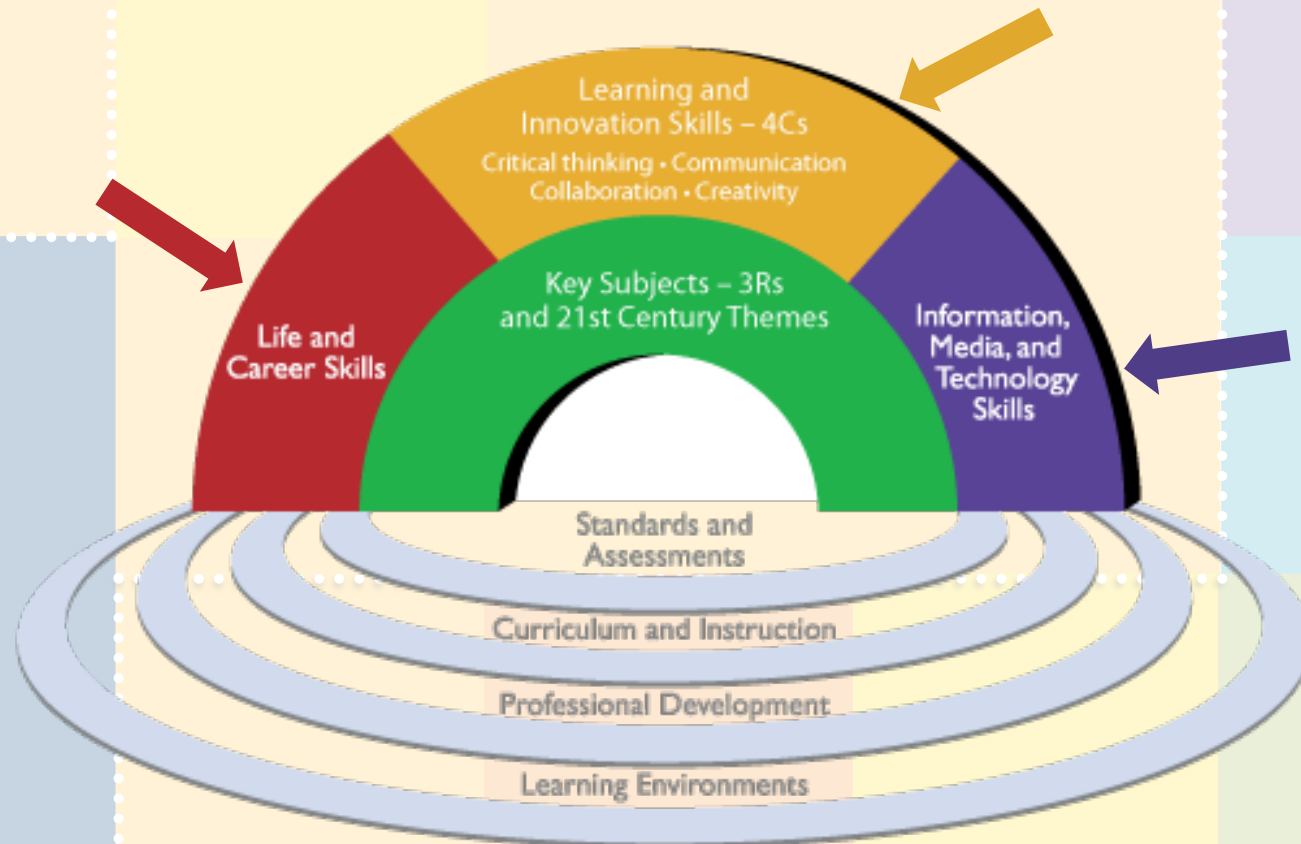
• Kickstarter: Indiegogo  
MAKER MINDSET

2013 World Economic Forum survey of 1,000 entrepreneurs: 8 pillars of entrepreneurial ecosystem

# making assessments

## Academic: P21 Framework


**P21 Framework for 21st Century Learning**  
21st Century Student Outcomes and Support Systems





# making assessments

## Entrepreneurial: Entrepreneurial Ecosystem Vibrancy— Connectivity (Strangler and Bell-Masterson, 2015)

Indicator	Measure	Possible Sources
 CONNECTIVITY	Program connectivity	Under development
	Spinoff rate	Possibly: CrunchBase; LinkedIn
	Dealmaker networks	Private databases, including Capital IQ

Connections matter, and a dense network of connections, among a small number of programs, is arguably more important than a sparse network among a larger number.<sup>16</sup>

# making considerations

- 10+ Makerspaces statewide
- Lead institution
- Geographically dispersed
- Connect CCs to regional economies
- Offer links to jobs, WBL

# making considerations

- Strong support from CTE, STEM/STEAM
- Staff commitment
- Mutually beneficial interactions between MSs and traditional course offerings
- Integrate with traditional instruction framework
- Complement existing course offerings

# how might the network look?

- Lead – responsible for growth and success
- Steering committee – draw from outside
  - CEOs from MSs outside network
  - Execs from businesses & foundations
  - Reps of key Maker orgs (Maker Media, Fab Lab)
- Regularly meet/share knowledge
  - Webinars (every other month, rotating topics)
  - Annual in-person meeting @/near Maker Faire

# how might the network look?

- Sharing of staff resources
  - Pool buying power for equip/software
  - Pool staff time for grant applications/requests for donations
- Shared methodology for identifying how each MS will meet network's goals

# start measuring success

## Questionnaire-style:

- # of measurable products
- # workshops, badges, etc. completed
- # CC students, faculty, etc. served
- User demographics
- Is MS receiving contributions from local bus & gov't?
- Do regional employers recognize and value badges, etc. earned at MS?

## Behavioral Metrics:

Learning Dimensions Rubric framework (Exploratorium, 2015)

Facilitation Field Guide		
the tinkering studio		exploratorium
Facilitation Goals	Practices	Techniques
<b>Spark</b> initial interest	<ul style="list-style-type: none"><li>• Welcome people and invite them to the space</li><li>• Introduce the activity and set the mood for the interaction</li></ul>	<ul style="list-style-type: none"><li>• Smile and introduce yourself</li><li>• Orient learners to the available tools and materials</li><li>• Offer a place to start working</li><li>• Meet them at eye level when explaining or modeling</li><li>• Show examples that demonstrate a variety of thinking</li><li>• Suggest a prompt that generates possibilities</li></ul>
<b>Sustain</b> participation by following the learner's ideas	<ul style="list-style-type: none"><li>• Value tentative ideas, "mistakes," and wrong directions</li><li>• Support their process in moments of failure and frustration</li></ul>	<ul style="list-style-type: none"><li>• Observe learners for a bit before jumping in</li><li>• Ask questions about their process</li><li>• Listen to their ideas</li><li>• Restate statements or questions</li><li>• Offer new materials or tools</li><li>• If you don't know the answer, work together</li><li>• Give learners suggestions instead of directions</li><li>• Show enthusiasm about their ideas</li></ul>
<b>Deepen</b> understanding through making connections	<ul style="list-style-type: none"><li>• Guide people to go a little bit further than they could on their own</li><li>• Surface connections between projects and links to outside learning experiences</li></ul>	<ul style="list-style-type: none"><li>• Encourage people to look around the space for inspiration</li><li>• Point out shared goals around the room</li><li>• Offer technical terms only when relevant</li><li>• Let participants explain their thoughts and define the next steps</li><li>• Encourage risk-taking and experimentation</li><li>• Offer challenges that allow learners to go further down their own path</li><li>• Discuss how the experience might relate to outside interests</li><li>• Celebrate moments of wonder, surprise, and joy</li></ul>

<http://tinkering.exploratorium.edu/learning-and-facilitation-frameworks>

# start making

## Startup checklist:

- ☐ Goals
- ☐ Staff
- ☐ Activities
- ☐ Tools/Equipment
- ☐ Space/Infrastructure
- ☐ Community and Campus Support
- ☐ Website and Database
- ☐ Funding Strategy

# thank you!

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