Welcome to the NGCP National Webinar

Gender Equity in Online STEM Learning

Wednesday, September 2, 2020

Please respond to the poll below:
NGCP Vision

The National Girls Collaborative Project brings together organizations committed to informing and encouraging girls to pursue careers in science, technology, engineering, and mathematics (STEM).
NGCP Goals

1. Maximize access to shared resources within organizations interested in engaging girls in STEM.

2. Strengthen the capacity of programs by sharing exemplary practice research and models.

3. Use the leverage of a network to achieve gender equity in STEM.
NGCP Activities

Increased Collaboration Benefits Girl-Serving STEM Programs

- Helped us better serve girls: 82%
- Increased girls’ interest in STEM: 78%
- Helped my program be more effective: 77%
- Increased girls’ confidence in STEM: 77%

Source: NGCP 2015 Annual Survey
National Network of Collaborative Teams
Gender Equity in Online STEM Learning:

Dr. Amanda Sullivan: Researcher, Educator, and Author

Dr. Lecia Barker: NCWIT Senior Researcher and Associate Professor at University of Colorado at Boulder
Gender Equity in Online STEM Learning: Supporting Girls in Early Childhood & Early Elementary School

Dr. Amanda Sullivan, Ph.D.
What We’ll Discuss...

• Why Early Childhood Matters
• Supporting Girls’ STEAM Learning in the Early Years
• How Can Teachers Support Parents?
• Resources
Women make up half the U.S. Workforce but only...

13% of engineers are women

26% of computer scientists are women
What Does Early Childhood Have to Do with It?
The Impact of Stereotypes
Basic stereotypes begin to develop in children around two to three years of age (Kuhn, Nash, & Brucken, 1978; Signorella, Bigler, & Liben, 1993)

By age 5, children have developed a range of stereotypes about gender (Martin & Ruble, 2004)
In my own research I’ve found...

• Young children have gender stereotypes about many STEM tools, apps, and games (Sullivan, 2016)

• Gender differences in coding begin appearing in Kindergarten (Sullivan & Bers, 2016; Sullivan & Bers, 2013)

• By high school, females participating on robotics teams have less confidence than males and enter with less prior experience (Sullivan & Bers, 2019; Sullivan & Bers, forthcoming)
Early Childhood Interventions Matter!

Collaborative, creative, interdisciplinary, robotics and coding initiatives can significantly increase girls’ interest in engineering in grades PK-2 and can reduce gender stereotypes of both boys and girls (Sullivan, 2019; Sullivan & Bers, 2018; Sullivan, 2016)
Supporting Girls’ STEAM Learning in the Early Years
Choosing activities and materials that...

- Engage girls in **creating** rather than **consuming** technology and media
- Engage girls in **tinkering** and **exploring**
- Engage girls in **coding** and **engineering**
  - Foster **spatial reasoning**
- Engage girls in **building** and **design**
  - Builds off girls’ interests
What Early STEAM Learning Looks Like...
What Early STEAM Learning Looks Like in Virtual or Home-Based Settings...
Or Maybe...It Looks Like This: Online + Hands-On
Think About:

- Choosing activities that translate to virtual learning
- Home environment considerations
- Supporting & communicating with parents
<table>
<thead>
<tr>
<th>Activity Idea</th>
<th>Age Range</th>
<th>STEAM Areas</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Build the Tallest Tower</td>
<td>2+</td>
<td>Engineering, Math</td>
<td><a href="#">Toddler Towers Tutorial</a></td>
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<td><a href="#">Marshmallow Towers</a></td>
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<td><a href="#">Tallest Tower Challenge</a></td>
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<td>Building Bridges</td>
<td>3+</td>
<td>Engineering, Architecture, Math</td>
<td><a href="#">Building Bridges Pre-K Activity Instructions</a></td>
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<td><a href="#">Video: What Makes Bridges Strong?</a></td>
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<tr>
<td>Building Houses</td>
<td>4+</td>
<td>Art, Engineering, Architecture, Math, Storytelling</td>
<td><a href="#">Tutorial for LEGO House</a></td>
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<td><a href="#">Three Little Pigs Engineering Activity</a></td>
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<td><a href="#">Video: Three Little Pigs</a></td>
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Three Little Pigs’ Houses: Storybook STEAM

Age Range: 4-8*

Materials: Fan, Legos, plastic straws, popsicle sticks, crafts, recycled materials, blueprint planning sheets, any version of the 3 Little pigs story

Supplemental Books: If I Built a House and Dreaming Up

Duration: 2-3 hours
## Coding Activities

<table>
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<th>STEAM Areas</th>
<th>Resources &amp; Materials</th>
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<tr>
<td>Code a Story or Dance</td>
<td>4+</td>
<td>Technology Engineering Art</td>
<td>ScratchJr Printable Coding Blocks, Scratch, ScratchJr, Hour of Code Dance Party</td>
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</table>
A fun twist on Simon Says, Coder Says lets kids pretend to be Coders or Robots acting out code.

Coders may need to try a few times before the Robot does what they intended. Iteration is part of the fun!
Create a Girl-Powered STEAM Reading List... and Make Sure Boys are Reading Them Too!
In Virtual STEAM Learning Teachers Can Support Parents By…

- Communication
- Materials / material lists
- Balancing types of learning
- “At-Home STEAM Center”
- Suggestions for continuing learning
Parents and Teachers Can Support Young Learners By...

- Fostering a Growth Mindset/Praising the right way
- Modeling a willingness to fail
- Modeling positive attitudes
- Fostering fun, silly, artsy experiences
More Resources

- ScratchJr At Home
- ABC’s of STEAM
- Inspiring STEM Learning for Young Girls
- STEAM Learning at Home: How to Break Stereotypes & Inspire Young Children

@AASully  @keikisullivan
THE IDEA YOU DON'T HAVE IS THE VOICE YOU HAVEN'T HEARD.
NCWIT. Inclusion changes what's possible.
Framing a Supportive Classroom Climate
Setting Up and Maintaining a Frame

Lecia Barker, Senior Research Scientist, NCWIT
September 2, 2020
Overview

What does it mean to frame classroom climate?

How is framing accomplished?

- Set the frame with “survey” results
- Maintain the frame throughout the term with teaching practices
Each piece sold at auction for over $120,000
Why did people hesitate to buy Banksy art on the street for $60, but others spent $120,000 when they were presented as museum pieces?
We draw meaning about situations and events through interpretive frames: structures of beliefs, perceptions, and values specific to those situations. For the most part, these remain unspoken until somehow called into question.
Thinking about classroom situations

Convey knowledge, skills
Hope these end up in students’ heads and hands
Facilitate learning experiences

Concerns about others’ perceptions
Aware of show offs, quiet folks, in-between
Desire to belong
Factors unrelated to the concepts being taught or the quality of instruction can have unexpected, powerful influences on student learning.
Groups without preparatory privilege at risk
Groups without preparatory privilege at risk

The most visible students can distort perceptions
I DON'T BELONG
I'M DONE
Teachers can…

*Design* the classroom social experience through framing

*Preempt*

- Experiences that trigger beliefs that one doesn’t belong or lacks the qualities needed for success
- Stereotype threat
Framing is creating a context or perspective that strongly influences interpretation of events.
Framing Summary

Set up the interpretive frame at beginning of term
- Conduct survey or interactive poll
- Present results describing expectations for how students interact, what they already know,

Maintain the frame through teaching choices
- In class: encourage interaction
  randomly call on individual students, pairs, or groups
- Application, practice
  Collaborative learning
  pair programming, scaffolding for debugging, evaluation of others’ work,
  grading criteria: inclusivity
Setting up the Frame

Ask a series of questions that allow you to set the stage for expected behavior and teaching practices.

Connect to students’ emotions, desire to express themselves, and compare themselves to their peers.
People in this class have varying backgrounds and experience with programming.

How much experience do you have with programming?

Scale: 1=Nothing, I’ve never programmed
4=A lot: I have learned >1 programming language
Downplay the value of experience: display less learning

Make it clear that no prior knowledge is expected, but that students vary in their background

We don't expect you to already know C++. 
We can describe people based on how confident and outgoing they seem. Of course, this has nothing to do with what people actually know about or know how to do, just how they appear to others. How often are the following statements true of you?

I'm quiet in class: I generally let other people talk and I just listen. If others take charge, that's fine with me.

I'm loud in class: I often learn by hearing myself talk during classroom discussion. I don't mind being the center of attention.

Scale: 1=Never, 4=Always
Go outside of your comfort zone, a good opportunity for professional development and contributing to everyone’s positive class experience.
We can broadly characterize people based on how they react to making mistakes. Tell us where you lie between these two extremes:

I hate mistakes. Making mistakes makes me feel stupid. It's even worse if it happens in front of people.  

I like mistakes. You can't learn without making some mistakes. Most mistakes are nothing to be ashamed of or worried about.  

Scale: 1=Never, 4=Always
People learn through trial and error; this classroom is a safe environment to make mistakes students can learn from. Mistakes contribute to everyone’s learning.
I expect to learn a lot in this class.
I expect to improve my discussion skills.
I expect to work hard toward a good course outcome.
I expect to be able to use what I learn in this class in other classes, at work, or in college.

Scale: 1=Strongly Disagree; 4=Strongly Agree
Show excitement about the field, how important this knowledge is. Be sure to ask as “what” rather than a yes/no question, to imply that they should be excited.
Explain: learning to program can be hard, but you think they are up to the challenge. All students will need help. Students are not alone in their concerns. You are teaching the course in a way that help will always be available.
Discuss what will students know as a result of taking this class that can benefit them in the future. Acknowledge that they may be looking forward to just getting through the class.
Maintaining the Frame

Avoid favoring the most vocal students by random selection

Adjust classroom dynamics with think/pair/share, small group problem solving

Use collaborative learning for application and practice to reinforce belief that students can and should learn from each other

Classroom décor
Full-class experiences

Randomly select participation with trading cards

**Rules**

Ask question first

Turn over card

- Students can partially answer
- Ask a question of their own
- Pass (card goes back in the deck)

*Have a plan for students who continue to blurt*

*Ask students to make their own cards!*
Full-class experiences

Randomly select participation with a random name picker

Rules
Ask question first
Randomize
Students can partially answer
Ask a question of their own
Pass (equal chance of being called on for next question)

Have a plan for students who continue to blurt
Full-class experiences

Use cooperative techniques to reduce fear of speaking up

Think/pair/share

Group problem solving

Giving feedback in online documents
Classroom décor

I use computing to take pictures of black holes.

Digital agriculture to address hunger worldwide

Fireflies have internal clocks!

I build smarter robots.

A Visual History of Satellites

Show students that they can use computing in all sciences.
Application and practice

Collaborative learning techniques

E.g., Pair programming

With instruction for structure and behaviors

ncwit.org
Resources & Templates

Google survey form for Setting Up the Frame

Google presentation form for sharing survey results

Framing Classroom Climate Summary and Instructions
http://bit.ly/FramingInstructions

Virtual Classroom Décor and Classroom Climate
Webinar & Annotated Slides
www.ncwit.org/virtual-classroom
THANK YOU!
Questions?

Dr. Amanda Sullivan

Dr. Lecia Barker
Upcoming NGCP Webinars

Neurodiversity and STEM Education
Monday, September 21, 2020

Register on the NGCP website