Welcome to the NGCP National Webinar

Gender Equity in Online STEM Learning

Wednesday, September 2, 2020

Please respond to the poll below:

NATIONAL GIRLS COLLABORATIVE PROJECT

National Girls Collaborative Project

ASTC Association of Science and Technology Centers

Afterschool Alliance

AccessSTEM

SciGirls

Google

STUDENT RESEARCH foundation

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).

NATIONAL GIRLS COLLABORATIVE PROJECT

National Girls Collaborative Project

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.

NATIONAL GIRLS COLLABORATIVE PROJECT

National Girls Collaborative Project

NGCP Activities

THE CONNECTORY

FabFems

IF/THEN® Collection

Increased Collaboration Benefits Girl-Serving STEM Programs

Helped us better **serve girls**	Increased girls' **interest in STEM**	Helped my program be more **effective**	Increased girls' **confidence in STEM**
82%	78%	77%	77%

Source: NGCP 2015 Annual Survey

NATIONAL GIRLS COLLABORATIVE PROJECT

National Girls Collaborative Project

National Network of Collaborative Teams

NATIONAL GIRLS COLLABORATIVE PROJECT

National Girls Collaborative Project

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

NATIONAL GIRLS COLLABORATIVE PROJECT

National Girls Collaborative Project

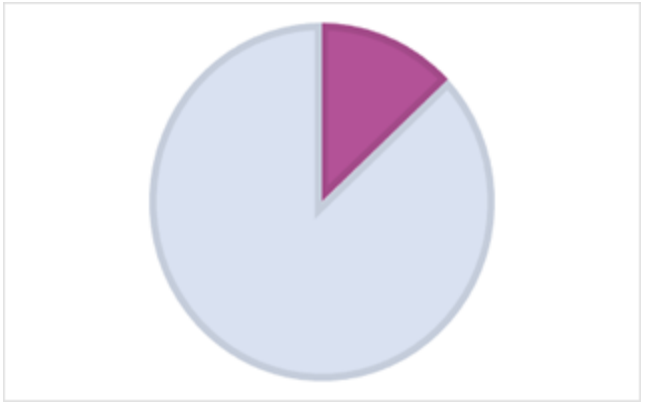
Gender Equity in Online STEM Learning: Supporting Girls in Early Childhood & Early Elementary School

Dr. Amanda Sullivan, Ph.D.

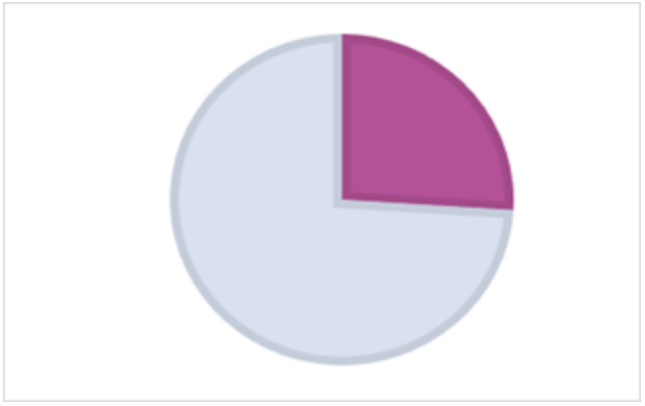
What We'll Discuss...

- 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

Stereotypes in Early Childhood

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*)

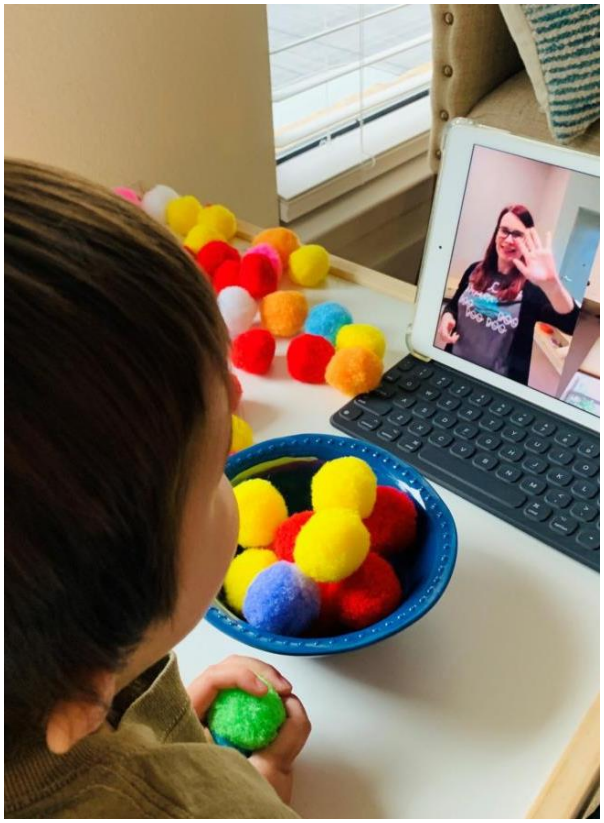
Supporting Girls' STEAM Learning in the Early Years

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…

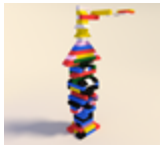




Or Maybe…It Looks Like This: Online + Hands-On

Think About:

- Choosing activities that translate to virtual learning
- Home environment considerations
- Supporting & communicating with parents

Building & Engineering Activities

Activity Idea	Age Range	STEAM Areas	Resources
Build the Tallest Tower 	2+	Engineering Math	Toddler Towers Tutorial Marshmallow Towers Tallest Tower Challenge
Building Bridges 	3+	Engineering Architecture Math	Building Bridges Pre-K Activity Instructions Video: What Makes Bridges Strong?
Building Houses 	4+	Art Engineering Architecture Math Storytelling	Tutorial for LEGO House Three Little Pigs Engineering Activity Video- Three Little Pigs

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

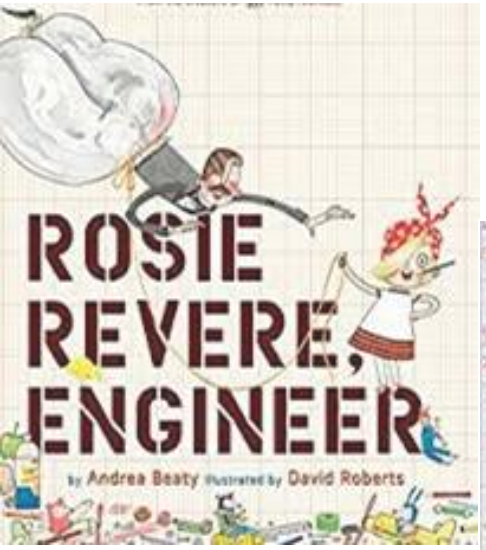
Activity Idea	Age Range	STEAM Areas	Resources & Materials
Coder Says game 	2+	Coding Communication Math	Code.Org Simon Says Tutorial LittleCodr Card Game KIBO Says Game
Code a Robot 	3+	Technology Engineering Math	Robot Turtles Board Game Code-A-Pillar KIBO Robot
Code a Story or Dance 	4+	Technology Engineering Art Storytelling Math	ScratchJr Printable Coding Blocks ScratchJr Scratch Hour of Code Dance Party

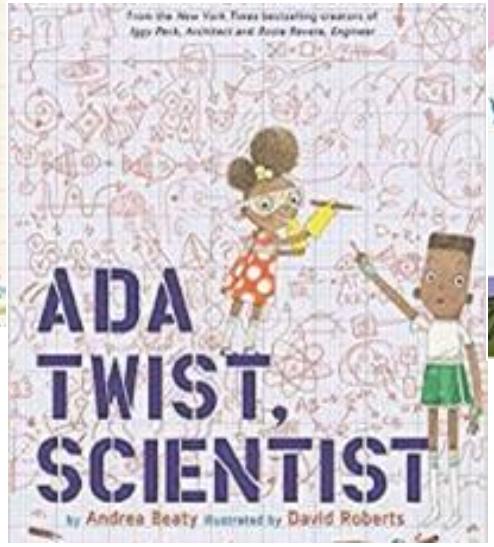
Coder Says

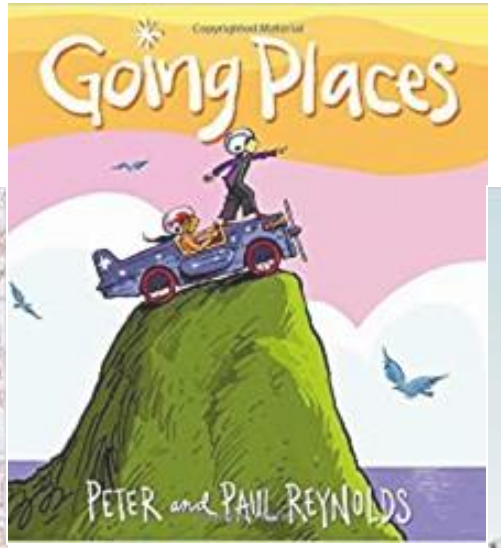
A fun twist on Simon Says, Coder Says lets kids pretend to be Coders or Robots acting out code.

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…

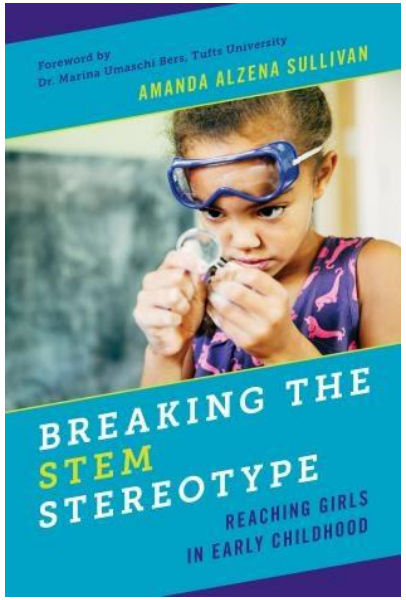
- Communication
- Materials / material lists
- Balancing types of learning
- “At-Home STEAM Center”
- Suggestions for continuing learning

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.
national center for women & INFORMATION TECHNOLOGY

national center for women & INFORMATION TECHNOLOGY

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


SPRAY ART
$60


SPRAY ART
$60

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

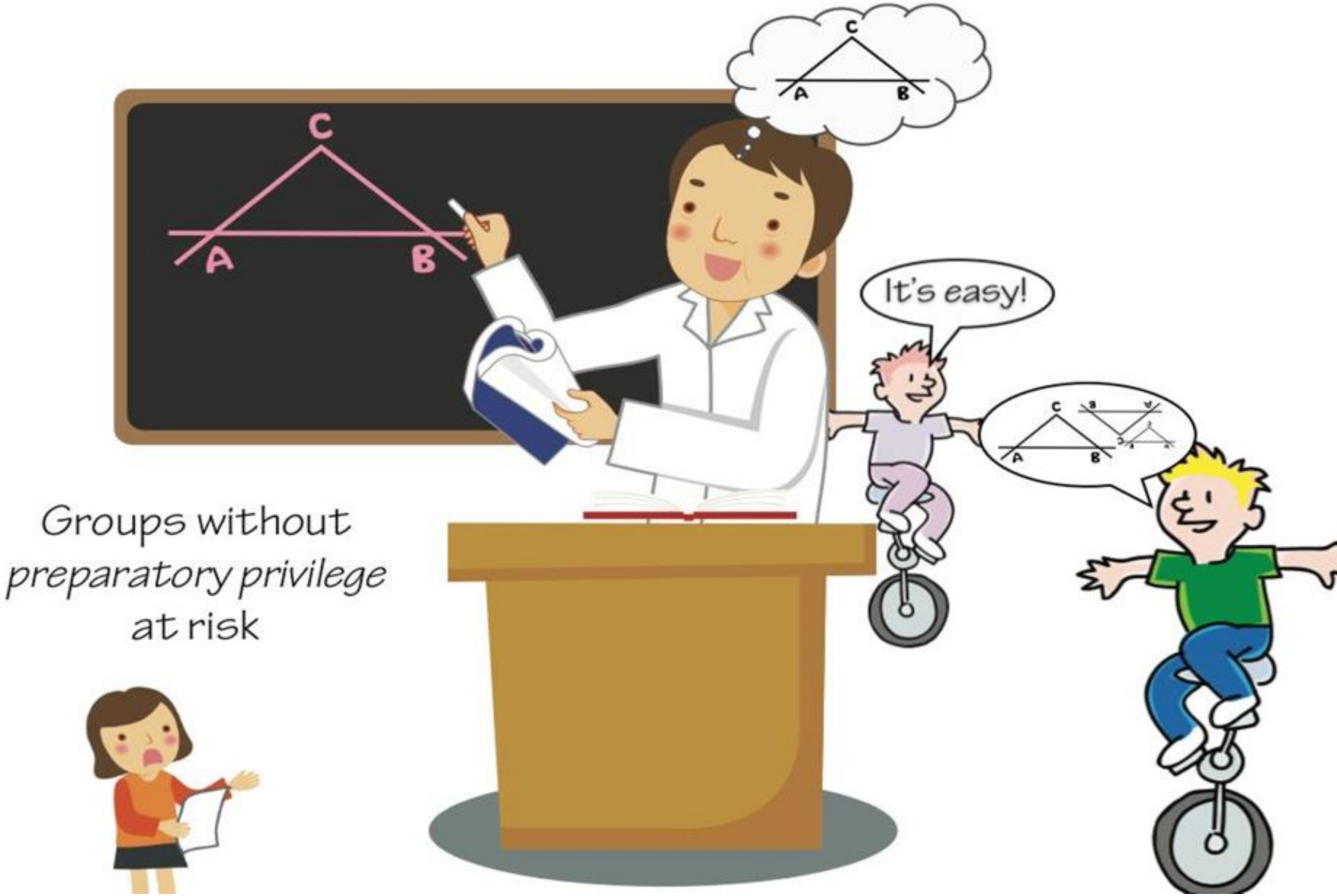
Facilitate learning experiences

Concerns about others' perceptions

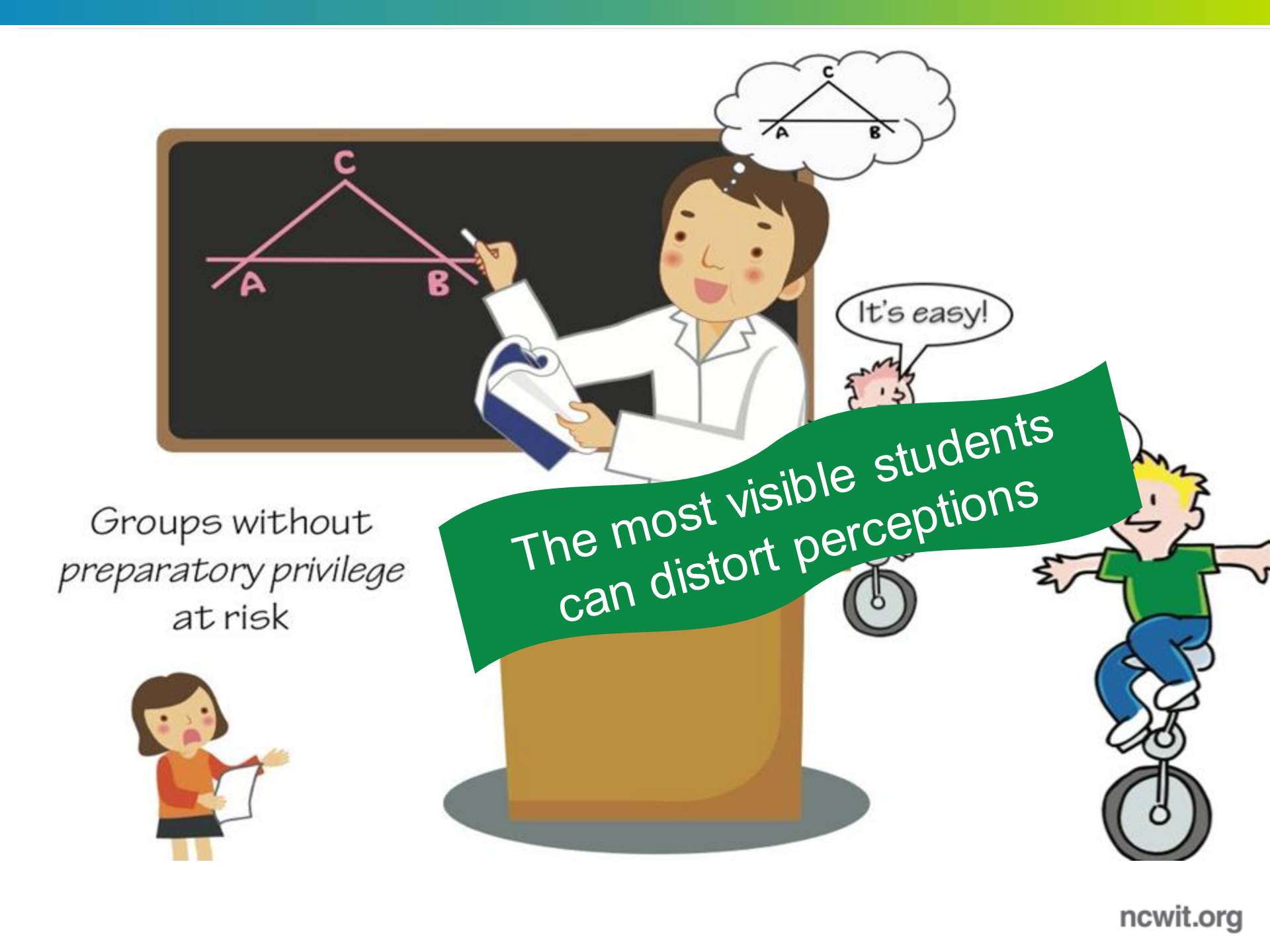
Aware of show offs, quiet folks, in-between

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


C
A
B
C
A
B
It's easy!
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

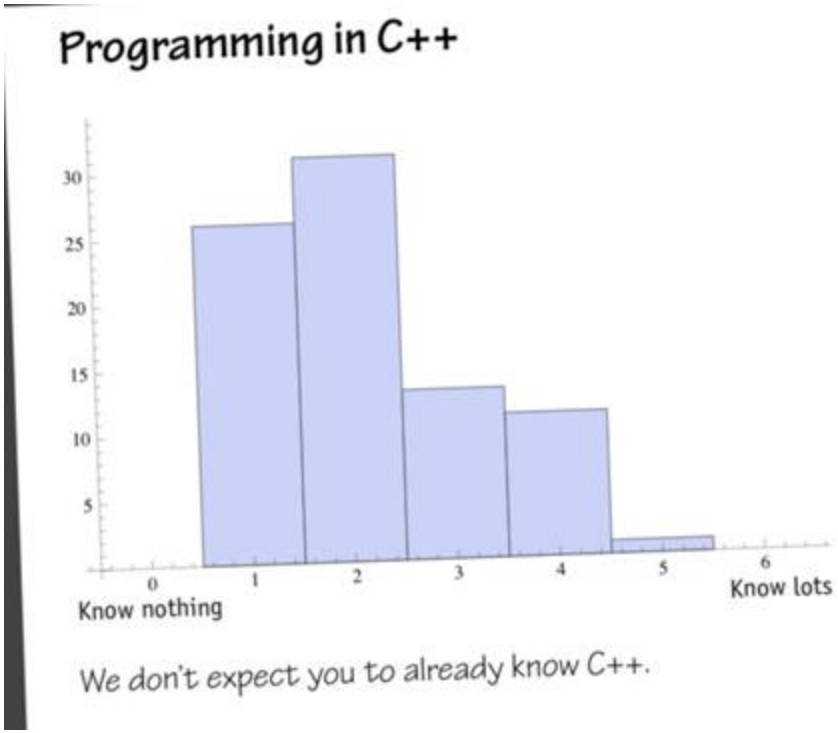
People in this class have varying backgrounds and experience with programming.

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



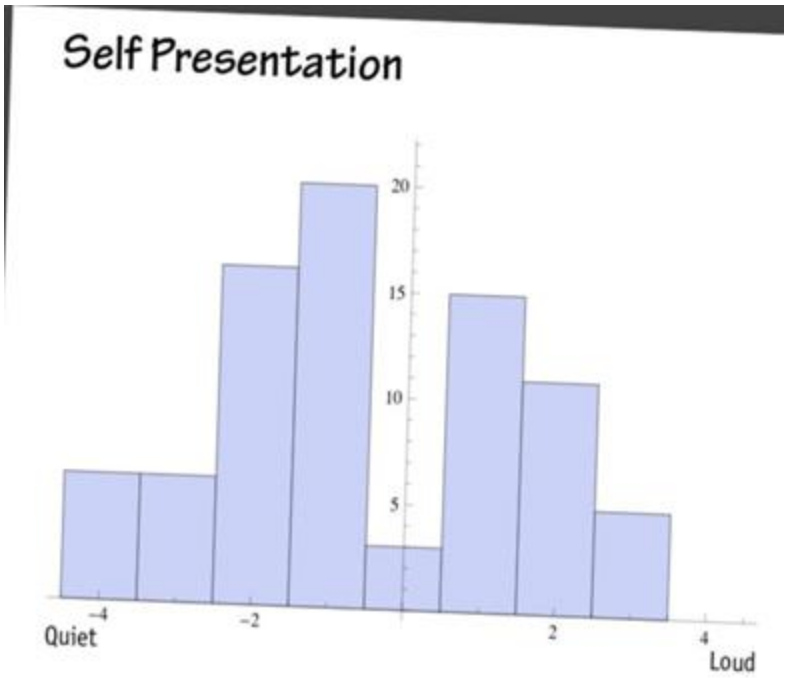
We can describe people based on how confident and outgoing they seem. Of course, this has nothing to do with what people actually know about or know how to do, just how they appear to others. How often are the following statements true of you?

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



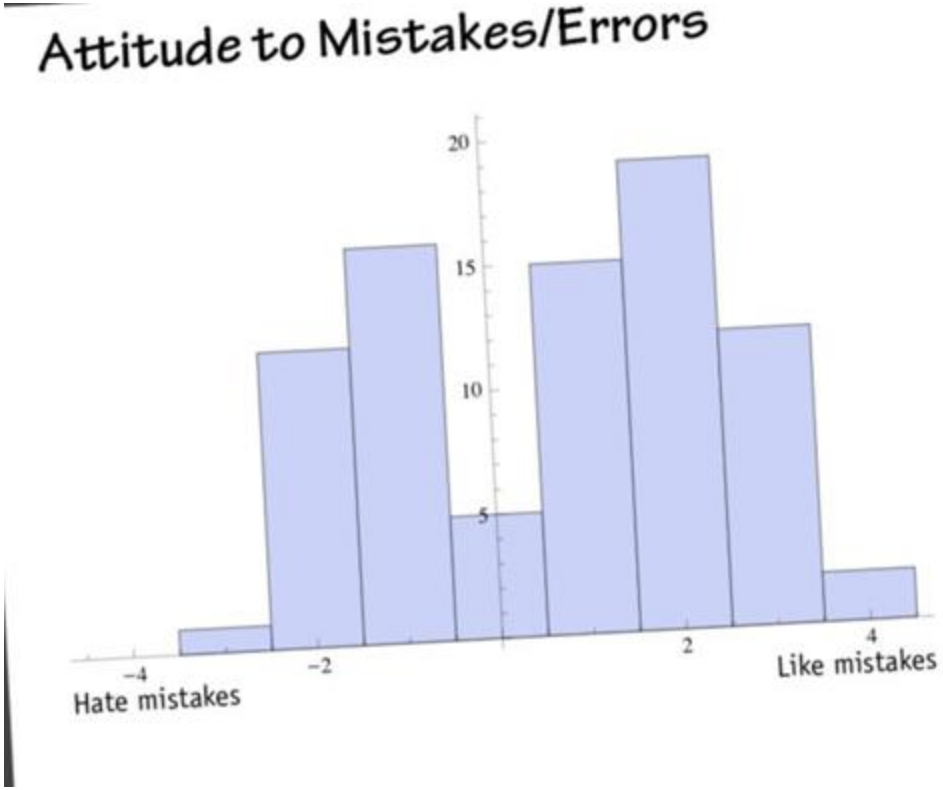
We can broadly characterize people based on how they react to making mistakes. Tell us where you lie between these two extremes:

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.

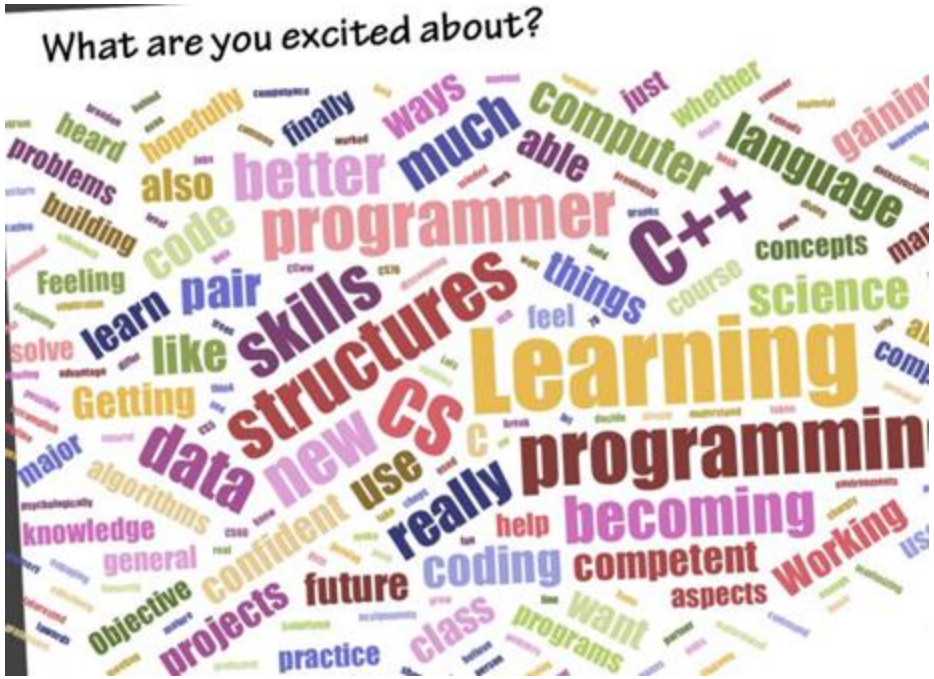


Explain class content and what students will learn, but reiterate that they are not expected to know it now. Explain how you have designed for their learning, but emphasize their need for hard work (growth mindset). Connect the learning to real life.

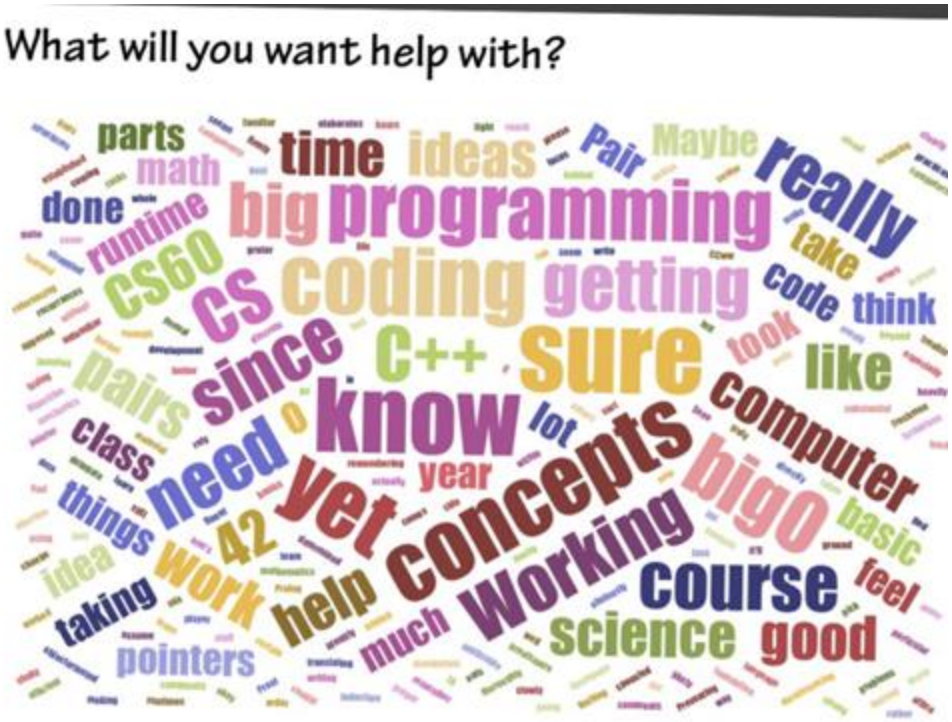
I expect to learn a lot in this class.
I expect to improve my discussion skills.
I expect to work hard toward a good course outcome.
I expect to be able to use what I learn in this class in other classes, at work, or in college.

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

<u>Rules</u>

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

<u>Rules</u>

Ask question first

Randomize

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

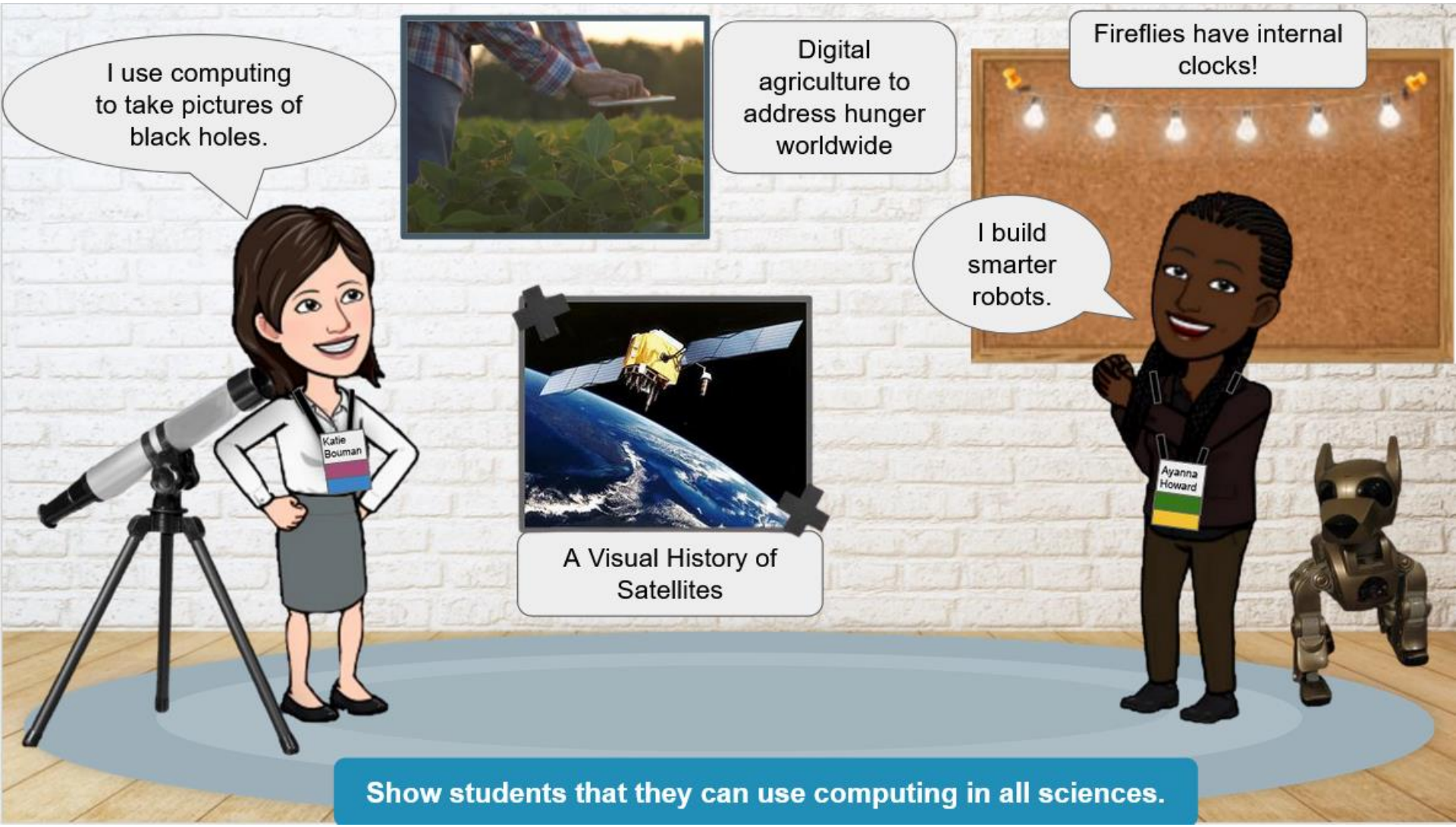
Have a plan for students who continue to blurt

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



Application and practice

Collaborative learning techniques

E.g., Pair programming

With instruction for structure and behaviors

Resources & Templates

Google survey form for Setting Up the Frame
http://bit.ly/SetUpFrameForm

Google presentation form for sharing survey results
http://bit.ly/FramingPresentation

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

Virtual Classroom Décor and Classroom Climate Webinar & Annotated Slides
www.ncwit.org/virtual-classroom

national center for women & INFORMATION TECHNOLOGY

THANK YOU!

LIFETIME PARTNER

STRATEGIC PARTNERS

INVESTMENT PARTNERS

Questions?

Dr. Amanda Sullivan

Dr. Lecia Barker

Upcoming NGCP Webinars

Neurodiversity and STEM Education

Monday, September 21, 2020

Register on the NGCP website

NATIONAL GIRLS COLLABORATIVE PROJECT

National Girls Collaborative Project