Coding Science Internships

NSTA Engage: Spring 2021

Leslie Stenger, The Learning Design Group at UC Berkeley’s Lawrence Hall of Science
A deep collaboration

The Lawrence Hall of Science + Amplify. = AmplifyScience

Poll - who is here today?
Plan for the session

- Strategies for enabling broader participation in computer science
- Introduction to the Coding Science Internship
- Q&A

Use the chat to ask questions and to interact in the session

An increasingly computational world
Inequitable participation

The Bureau of Labor Statistics projects computer science research jobs will grow 19% by 2026. Yet, women only earn 18% of computer science bachelor’s degrees in the United States.

What are your ideas about what might be barriers to equitable participation in computer science?

☐ Share your responses in the chat.
Coding Science Internships

Project aim:
Create student learning experiences that confront known barriers to broader participation in computer science in a way that provides a path to sustainable, scalable implementation.

Strategies for enabling broader participation

BARRIERS
Limited opportunity and exposure
Strategies for enabling broader participation

**BARRIERS**

Limited opportunity and exposure

**STRATEGIES**

Expand opportunities to engage in coding learning experiences
Integrate code-to-learn experiences in core courses

Computational thinking is central to science practice.

Crowdsourcing protein folding game FoldIt informs computational protein structure models

Increasingly sophisticated global climate models

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Coding Science Internship: Coral Restoration

- Aligned with NGSS science standards
- Also addresses concepts and practices in K12 Computer Science framework

Strategies for enabling broader participation

**BARRIERS**
- Limited opportunity and exposure
- Negative perceptions of coding

**STRATEGIES**
- Expand opportunities to engage in coding learning experiences
  Integrate code-to-learn experiences in core courses
Strategies for enabling broader participation

**BARRIER**

Negative perception #1: Coding is only for “computer” problems, of little real-world significance

**STRATEGY**

Coding in service of meaningful real-world problems
Strategies for enabling broader participation

BARRIER
Negative perception #2: Computer science work is solitary and isolating

STRAEGY
Collaboration and discourse-rich approach with intentional classroom norms and routines
Strategies for enabling broader participation

**BARRIERS**
- Limited opportunity and exposure
- Negative perceptions of coding
  - #1: Coding is only for “computer” problems, of little real-world significance
  - #2: Computer science work is solitary and isolating

**STRATEGIES**
- Expand opportunities to engage in coding learning experiences
- Integrate code-to-learn experiences in core courses
- Coding in service of meaningful real-world problems
- Collaboration and discourse-rich approach with intentional classroom norms and routines

Coding Science Internship: Coral Restoration

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**Immersive internship**

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Strategies for enabling broader participation

STRATEGY
Coding in service of meaningful real-world problems
On the grid below, which locations would be good to transplant a coral?

Key
- Macroalgae
- Existing Coral
- Bare Rock

Coral reef

Coding tool

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**collaboration:** working together with others to complete a task

Collaboration in coding produces better code than working alone.

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**Collaboration Norms**

- Ask questions.
- Pause to listen.
- Check your understanding.
- Take turns.
  - Pair programming: Switch roles often.
- Share ideas.
  - Pair programming: Talk about how to improve code
**critique:** to look closely at something to figure out what is good about it and what could use improvement

The Critiquing Code strategy helps you analyze and find ways to improve code.
Strategies for enabling broader participation

STRATEGY
Collaboration and discourse-rich approach with intentional classroom norms and routines
Other threats to coral reefs

A coral reef overgrown with macroalgae.

Crown-of-thorns starfish (COTS) feeding on coral.

Vacuuming macroalgae

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Injecting crown of thorn starfish

Coding the reef cleaning bot
Introduction to conditionals

if you are WEST of the Mississippi River
then type your favorite ice cream into the chat

if you are EAST of the Mississippi River
then type your favorite color into the chat

Coding the reef cleaning bot
DAY 7

A New Coding Task

Hi interns,

The hard work you’ve done so far will certainly pay off. The restoration bots will be valuable tools to support new coral growth.

It’s also critical that we address the underlying reasons that coral populations are not growing. Certain environmental factors, such as increasing water temperature and pollution, are bad for coral health. The Coral Reef Restoration Association (CRRA) wants to educate the public about these environmental factors. They’ve asked Futura to create a digital reef health model to put on their website to help people understand how environmental factors are harming the reefs.

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Chocolate Chip Cookie Sim

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No cookie made yet.

Enter your ingredients and bake time then press “Play” to see your results.
RESULTs

Color
Beige

Sweetness
Medium

Texture
Gooey

COOKIE VIEW

BAKE TIME

INGREDIENTS

Butter

none low med high

Sugar

none low med high

Chips

none low med high

Play (Bake) ▶

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Model of reef health

**Inputs:**
- Temperature increase
- Nutrients
- Acidification level

**Outputs:**
- Coral health
- Crown of Thorns growth
- Macroalgae growth
Model of reef health

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Internship structure

Strategies for enabling broader participation

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Negative perceptions of coding
  #1: Coding is only for “computer” problems, of little real-world significance
  #2: Computer science work is solitary and isolating

STRATEGIES
Expand opportunities to engage in coding learning experiences
Integrate code-to-learn experiences in core courses
Coding in service of meaningful real-world problems
Collaboration and discourse-rich approach with intentional classroom norms and routines
Coding Science Internships

By integrating coding within core science courses and engaging students in authentic discourse and collaboration structures to solve compelling real-world problems, Coding Science Internships activate a greater diversity of learners to embrace coding as a powerful and essential tool for addressing problems they care about.
Questions?

Thank you for your participation!
Check the chat for a survey link.

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