Opportunities to Teach Computational Thinking in Your Science Classroom

Please introduce yourself & where you teach in the chat

RI Science Community of Practice

Tuesday, March 15, 2022

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Updates from RIDE

- **STEM MiniGrants of up to $2500** are available from RIDE! Applications that outline STEM-focused projects (for PK-12) are currently being accepted. Application deadline is **March 25th**. Grants are reimbursement, and money needs to be distributed by mid-June. Details are on the RIDE STEM webpage (see blue tab halfway down page).
- **Cox Conservation Contest** (K-8) for students and educators in grades K-8 in RI public schools. The project must be grounded in research, data-driven, and sustainable. Cox Business has donated $5,000 to support projects at one or more selected Rhode Island schools. Applications are due April 22nd.
- GEMS-Net is hosting **Climate Literacy Conversations** event. Two identical virtual sessions from 4:00 pm - 5:00 pm on Tuesday, April 12th and Wednesday, April 13th. Register here.

Goals of our Community of Practice

- Examine teaching and learning strategies
- To engage in productive discussions with our peers that move our thinking forward
- Share strategies and resources
- To grow as reflective practitioners

Images: Schoolwires.net

Our Norms

NORM	WHAT IT LOOKS LIKE
Present	Engage in the conversation.
Respectful	Share air time with others. Keep an open mind to other's perspectives.
Positive Intentions	Maintain an optimistic mindset. Focus on productive solutions.

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RIDE Community of Practice
March 15, 2022

THE UNIVERSITY OF RHODE ISLAND

GEMS-Net
Guiding Education in Math and Science Network

Problem of Practice

FOSS Science Lesson

Students plant a miniature lawn in a cup of soil—rye grass seeds and alfalfa seeds. They draw, compare, and record the growth of the two plants over time.

CODE.ORG Lesson

In this lesson, students will relate the concept of algorithms back to everyday real-life activities by planting an actual seed.

Bridges Math Lesson

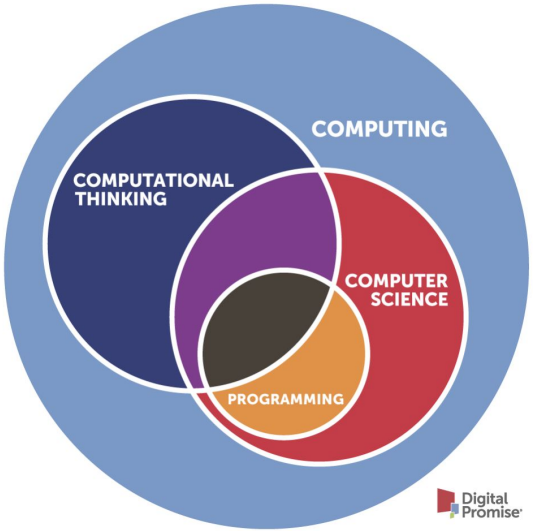
Students plant seeds. Then they measure, record and graph the height of their plant over time.

What is computational thinking?

https://www.menti.com/hmd83zqjd7

Go to **www.menti.com** and use the code **9390 5347**

What is computational thinking?

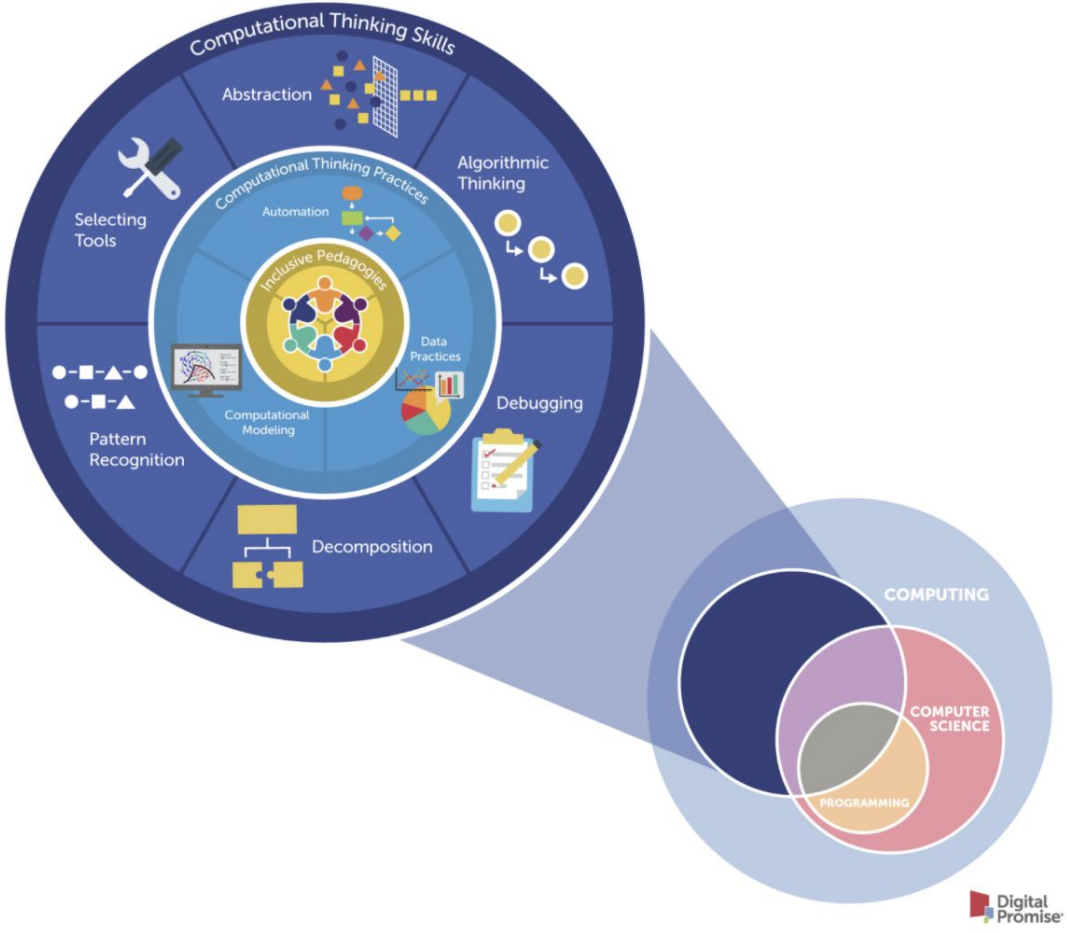


Computational Thinking for Educators

g.co/computationalthinking

What is Computational Thinking?

Computational Thinking (CT) is a problem solving process that includes a number of characteristics and dispositions. CT is essential to the development of computer applications, but it can also be used to support problem solving across all disciplines, including the humanities, math, and science. Students who learn CT across the curriculum can begin to see a relationship between academic subjects, as well as between life inside and outside of the classroom. (Google Computational Thinking for Educators)


Computational Thinking Skills
Abstraction
Algorithmic Thinking
Debugging
Decomposition
Pattern Recognition
Selecting Tools
Computational Thinking Practices
Automation
Inclusive Pedagogies
Data Practices
Computational Modeling
COMPUTING
COMPUTER SCIENCE
PROGRAMMING
Digital Promise

The Computational Thinkers

concepts

Logic
Predicting & analysing

Evaluation
Making judgements

Algorithms
Making steps & rules

Patterns
Spotting & using similarities

Decomposition
Breaking down into parts

Abstraction
Removing unnecessary detail

approaches

Tinkering
Changing things to see what happens

Creating
Designing & making

Debugging
Finding & fixing errors

Persevering
Keeping going

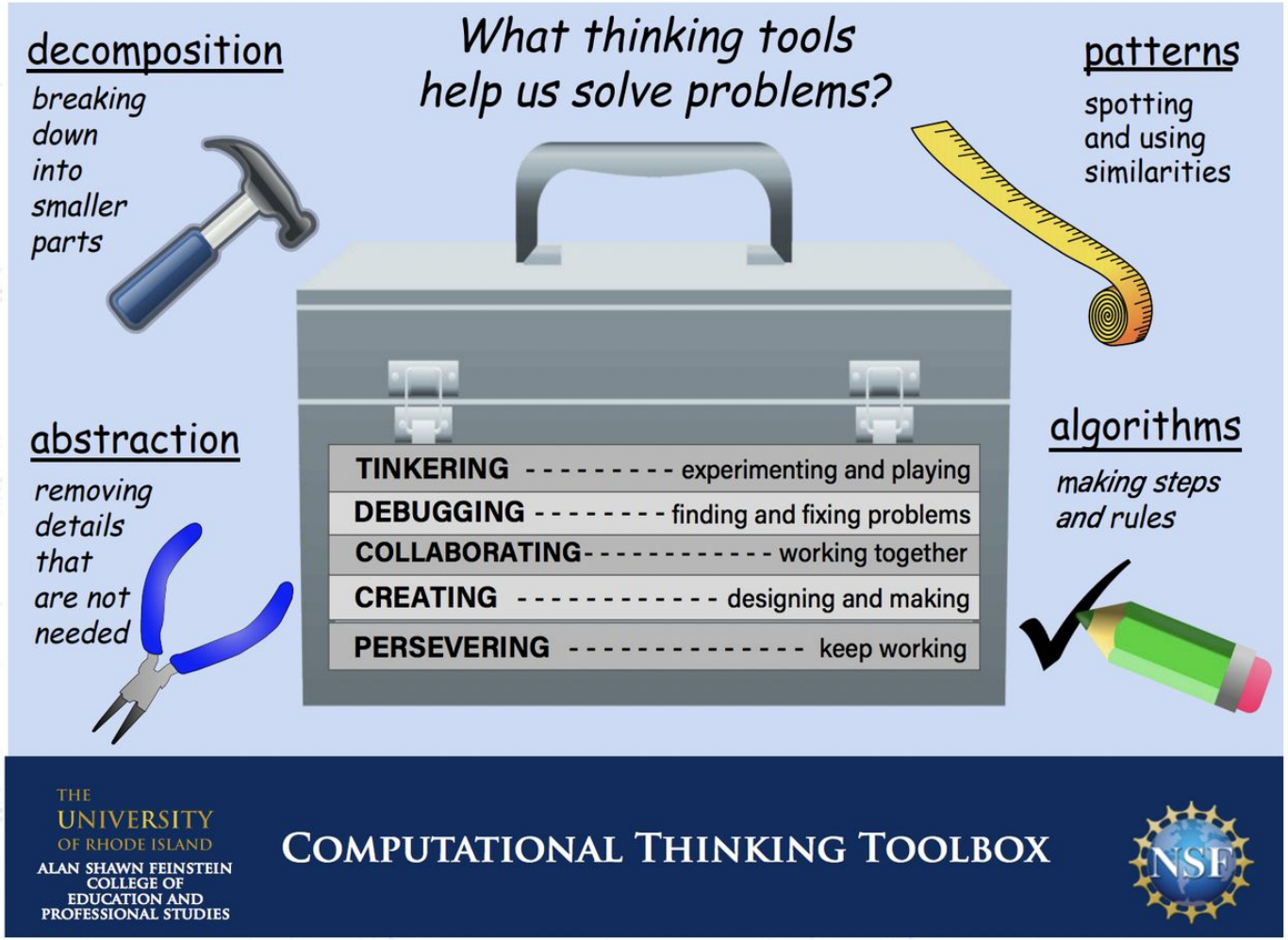
Collaborating
Working together

We're all computational thinkers here!

When you think about it, whether we're parents, pupils or teachers – we're all natural computer scientists, capable of computational thinking.

Our brains, like computers, process, debug and make simple algorithms every day!

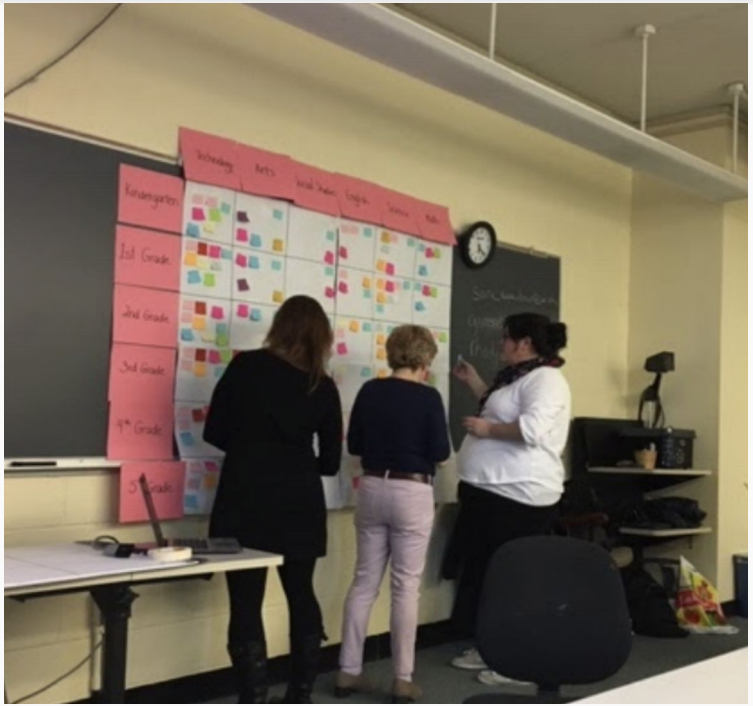
CAS Barefoot
Supported by BT

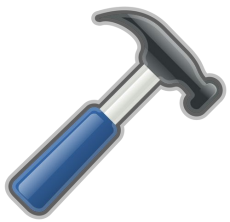


STEM CT Research Project - Working Definition

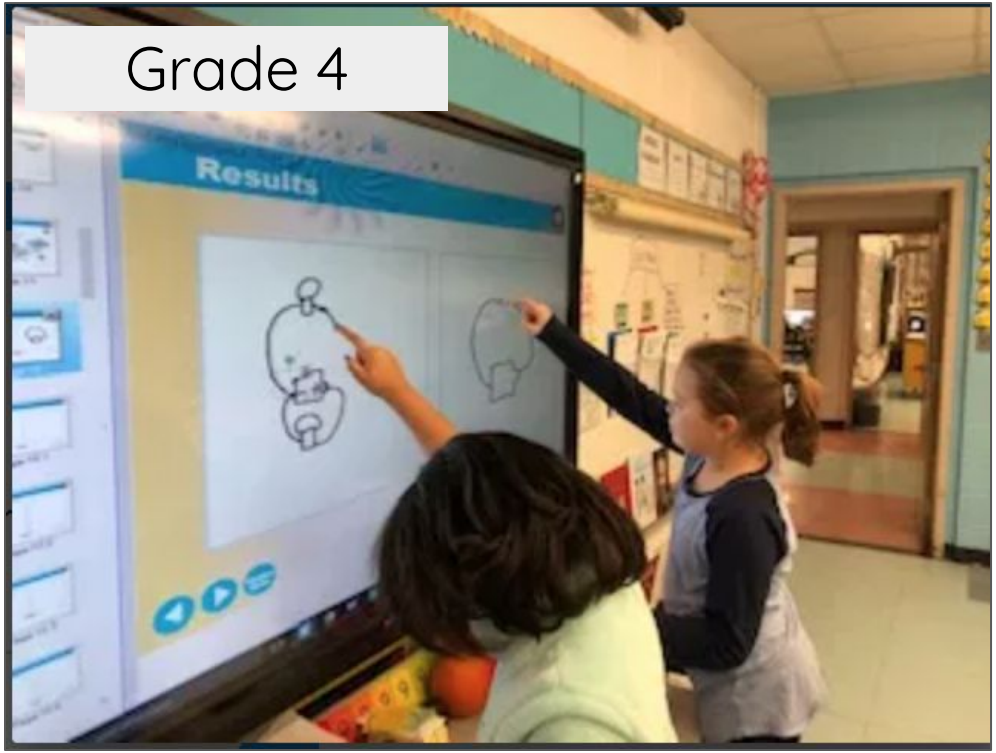
Logical thinking pathways that help to efficiently organize and identify relationships between concepts in order to make meaning.

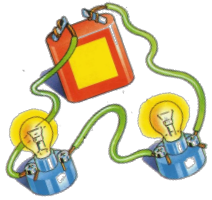
Where are there opportunities to teach CT across the curriculum?





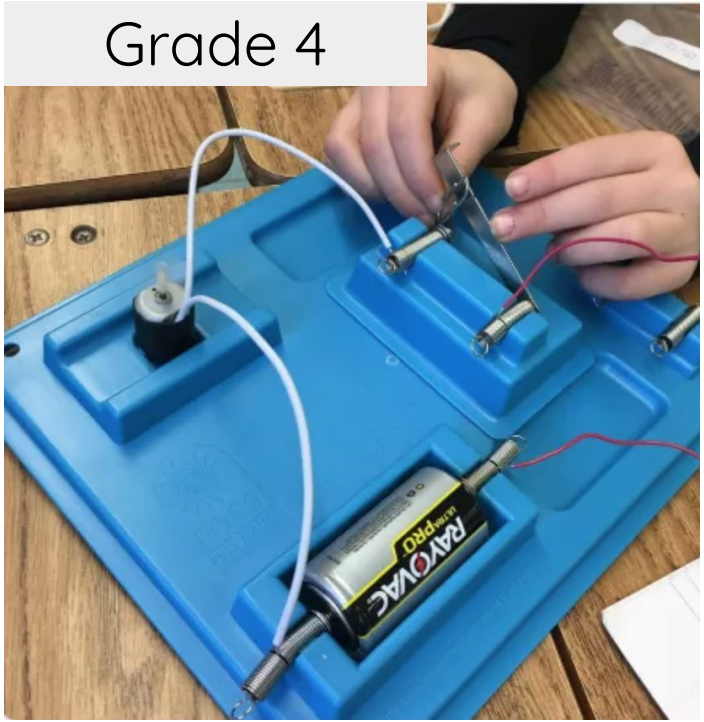
Decomposition is breaking bigger things down into parts.





Tinkering is experimenting and playing.

Grade 4



Grade 3

Grade 1

Research Questions for Exploratory Survey

RQ1 - How often do CT concepts and approaches occur in K-5 science classrooms?

RQ2 - How does science curriculum impact the amount of time teachers spend on CT approaches and concepts during science instruction?

Research Study

Design of Study

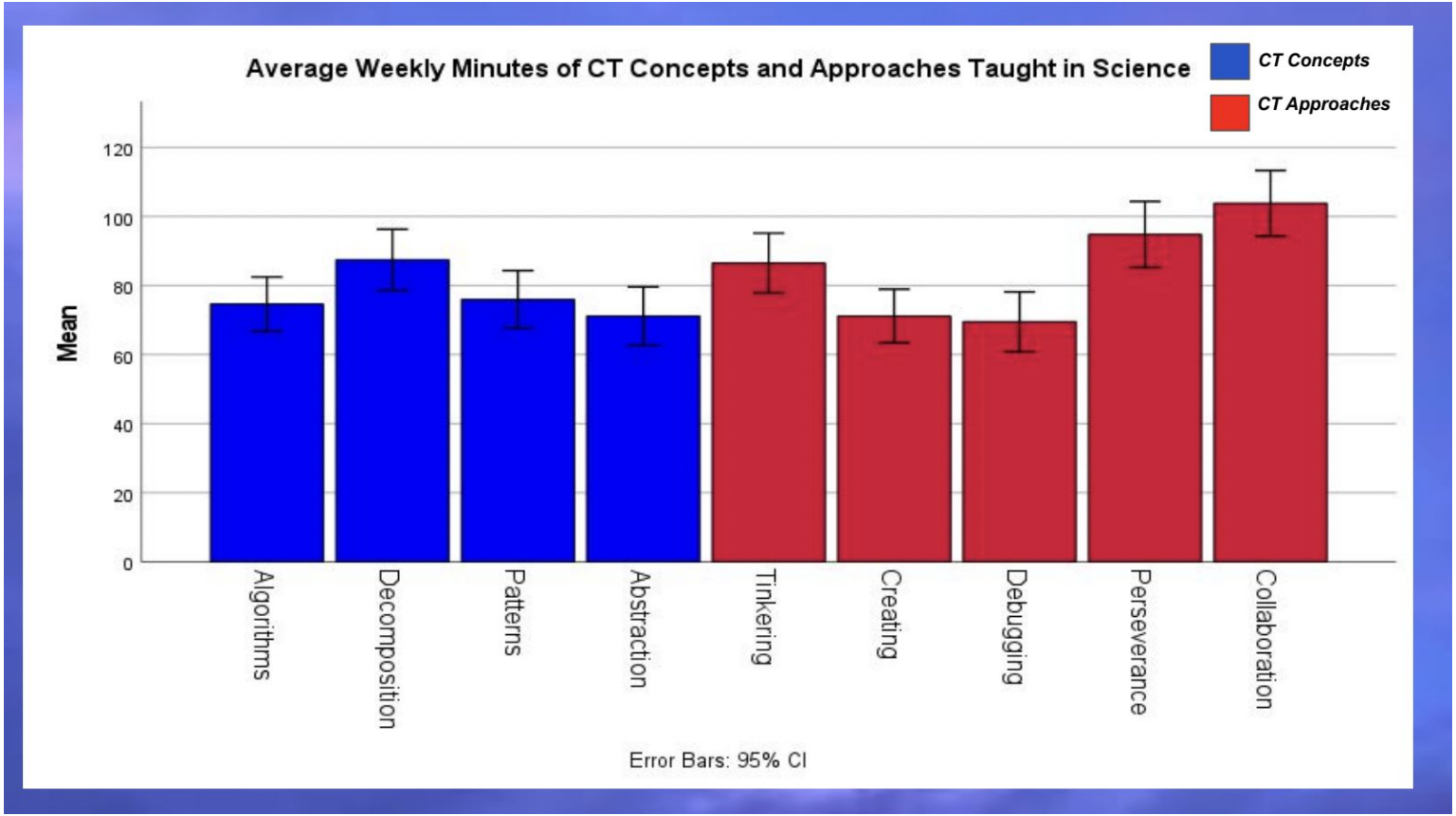
Survey

- 55-question cross-sectional web-based survey (open and closed-ended questions) given winter 2019-spring 2020.
- Educative in describing the concepts and approaches involved in computational thinking by using definitions, pictures, and examples of the different elements taken from Barefoot Computing at School curriculum.
- Frequency levels of use for concepts and approaches were asked based on minutes teaching science and % of time.
- Survey was examined for content and face validity. Test retest reliability was measured with pilot survey of 125 teachers from March to June 2019- reliability 0.840, p<.01.

Sample

- Convenience Sample of 560 K-5 Teachers in a Northeast state from 32 districts. Completed Surveys by Science Teachers (N=259)
- Majority Caucasian women > 10 years of experience. In current position < 3 years.
- More than 70% < 3 hours of computer science, computing, or computational thinking professional development.

What patterns do you notice?



Activity 1

Circuit Construction Kit: DC-Virtual Lab

How can you make two light bulbs shine brightly with one battery?

What materials conduct electricity?

What else can you discover about circuits?

What's your evidence?

Remember: The goal is not to successfully complete the activity rather it is to think about which computational concepts and approaches are evident throughout. At the end of the session, you and your group will have time to record which CT concepts/approaches you saw on the Jamboard provided.

Activity 2

Community Infection Spread

How do behaviors and policies impact the spread of infections within a community?

What would happen if…?

How does _____ affect _____?

What's your evidence?

Remember: The goal is not to successfully complete the activity rather it is to think about which computational concepts and approaches are evident throughout. At the end of the session, you and your group will have time to record which CT concepts/approaches you saw on the Jamboard provided.

Problem of Practice

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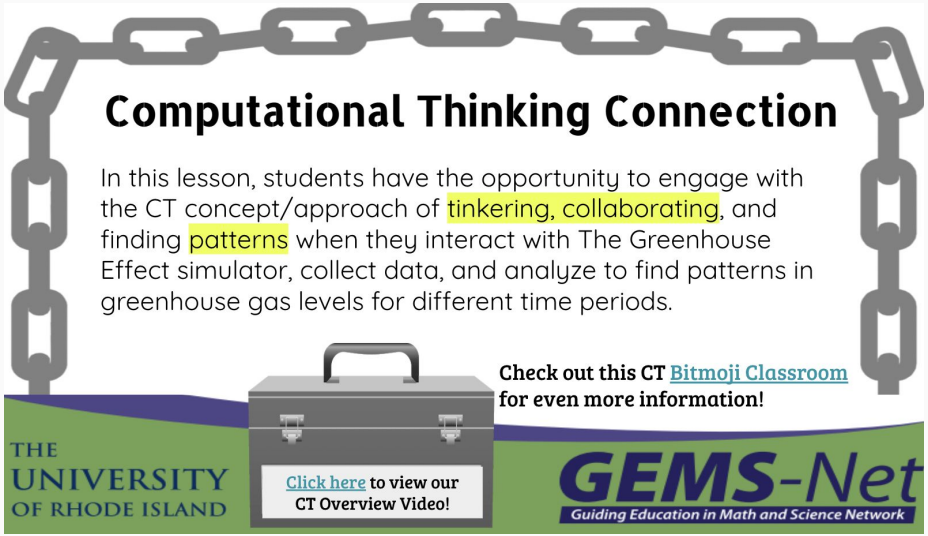
Next Steps: Developing a Shared Language

Reflection Questions

Where are computational thinking opportunities already embedded in your curriculum?

How can we make computational thinking opportunities explicit to our students in science?

Making CT Explicit to Students



Useful CT Resources

- Barefoot.org
- Barefoot Computational Thinking
- CS K-12 Framework - Pages 67 - 71
- CS K-12 Framework Computational Thinking
- Computational Thinking for Educators
- ISTE Computational Thinking Competencies
- RICS Standards
- ISTE Blog: How To Develop Computational Thinkers
- Computational Thinking - Digital Promise

GEMS-Net Resources

- CT Video
- CT Poster
- CT Bitmoji Classroom

Save the Dates!

Each meeting will start at 4:00 pm. Registration for each is found on the RIDE Science Page in the Science Community of Practice section.

- April 12
- May 17

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Carolyn Higgins, STEM Specialist carolyn.higgins@ride.ri.gov

RIDE Rhode Island Department of Education

Wrap up:

1. Complete the exit ticket for this session.
2. We will send a letter documenting your attendance.
3. Don’t forget to to bookmark and utilize the [RI Science Curriculum Frameworks!]