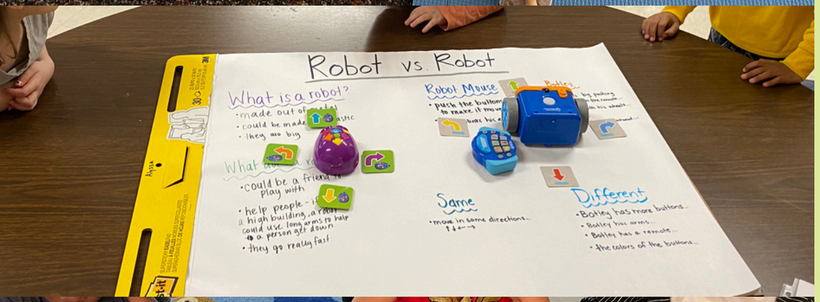
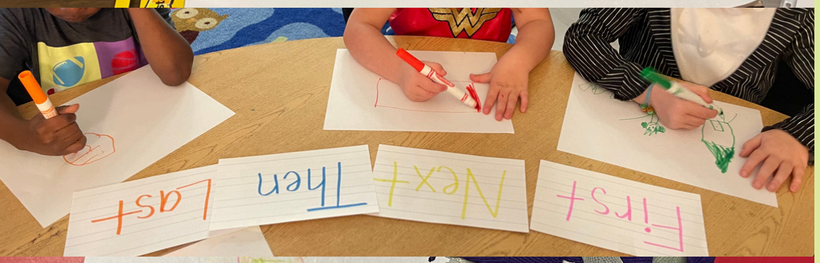




TEX:CS

EARLY CHILDHOOD COMPUTER SCIENCE

Jennifer Downs & Margaret Quinn

TEXAS A&M UNIVERSITY
School of Education & Human Development

SAINT THOMAS E.L.C.

WHO WE ARE AND WHAT WE DO

Texas A&M Team

Texas A&M Faculty
Graduate and
Undergraduate Students

School/Teacher Team

Teachers from three schools
in the Brazos Valley
Children and Families

TEX:CS PROGRAM

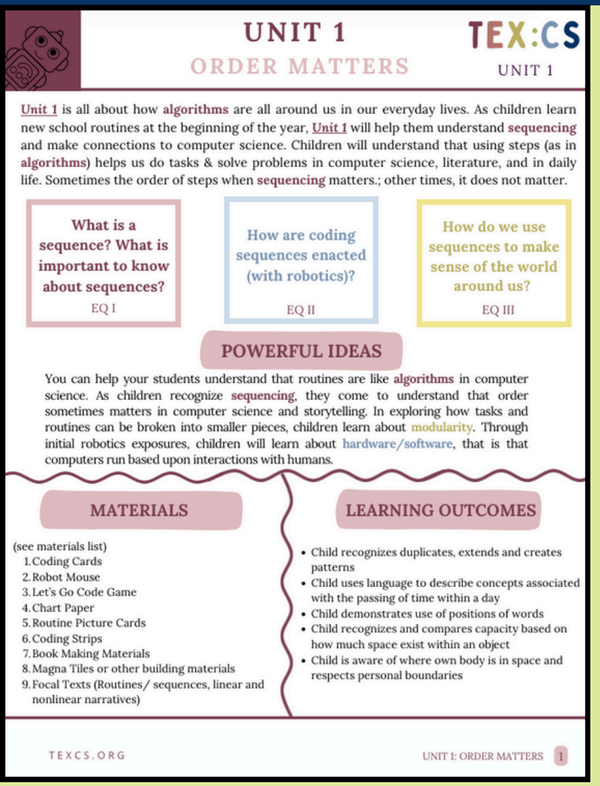
Catapult Funding from the College of Education and Human Development (TAMU)

- 4 Units (6-8 Weeks Long)
- Incorporates high-, low-, no-tech (mostly screen-free)
- Supplemental to regular classroom curriculum
- Leverages daily/regular experiences across the day
- Includes support repository with materials (videos, guides, links, etc.)
- Teachers implement activities and experiences

EACH CURRICULUM UNIT INCLUDES...

- Background information - focal computer science powerful ideas, essential questions guiding the unit
- Key early learning standards, materials, goals, timeline
- Ideas for center implementation (i.e., what to include in each center, how to engage children with those materials, and what skills/areas to target)
- Four small group activities with lesson plans
- One focal/cumulative/summative experience with lesson plan for end-of-unit
- Read aloud books (suggestions for how to read aloud)
- Ideas for extension, further suggestions, and things to remember

A GLIMPSE:



UNIT 1
ORDER MATTERS
TEX:CS UNIT 1

Unit 1 is all about how algorithms are all around us in our everyday lives. As children learn new school routines at the beginning of the year, Unit 1 will help them understand sequencing and make connections to computer science. Children will understand that using steps (as in algorithms) helps us do tasks & solve problems in computer science, literature, and in daily life. Sometimes the order of steps when sequencing matters.; other times, it does not matter.

What is a sequence? What is important to know about sequences? EQ I

How are coding sequences enacted (with robotics)? EQ II

How do we use sequences to make sense of the world around us? EQ III

POWERFUL IDEAS

You can help your students understand that routines are like algorithms in computer science. As children recognize sequencing, they come to understand that order sometimes matters in computer science and storytelling. In exploring how tasks and routines can be broken into smaller pieces, children learn about modularity. Through initial robotics exposures, children will learn about hardware/software, that is that computers run based upon interactions with humans.

MATERIALS

(see materials list)
1. Coding Cards
2. Robot Mouse
3. Let's Go Code Game
4. Chart Paper
5. Routine Picture Cards
6. Coding Strips
7. Book Making Materials
8. Magna Tiles or other building materials
9. Focal Texts (Routines/ sequences, linear and nonlinear narratives)

LEARNING OUTCOMES

- Child recognizes duplicates, extends and creates patterns
- Child uses language to describe concepts associated with the passing of time within a day
- Child demonstrates use of positions of words
- Child recognizes and compares capacity based on how much space exist within an object
- Child is aware of where own body is in space and respects personal boundaries

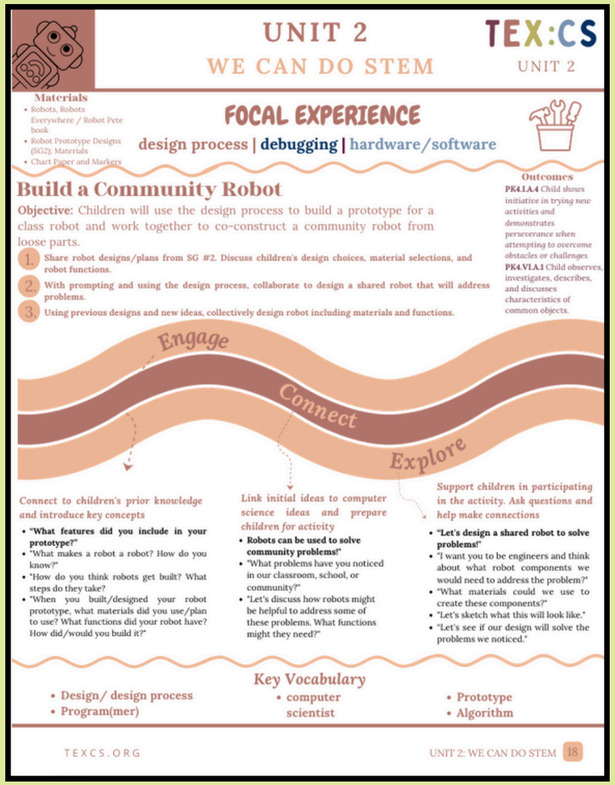
TEXCS.ORG UNIT 1: ORDER MATTERS 1

Unit 1: Order Matters

Supports algorithmic thinking and sequences

Unit 2: We Can Do STEM

Supports design-based thinking



UNIT 2
WE CAN DO STEM
TEX:CS UNIT 2

Materials
- Robots, Robots Everywhere / Robot Pete book
- Robot Prototype Designs (SG2); Materials
- Chart Paper and Markers

FOCAL EXPERIENCE
design process | debugging | hardware/software

Build a Community Robot

Objective: Children will use the design process to build a prototype for a class robot and work together to co-construct a community robot from loose parts.

1. Share robot designs/plans from SG #2. Discuss children's design choices, material selections, and robot functions.
2. With prompting and using the design process, collaborate to design a shared robot that will address problems.
3. Using previous designs and new ideas, collectively design robot including materials and functions.

Outcomes
PK4.LA.4 Child shows initiative in trying new activities and demonstrates perseverance when attempting to overcome obstacles or challenges
PK4.VI.A.1 Child observes, investigates, describes, and discusses characteristics of common objects.

Engage — Connect — Explore

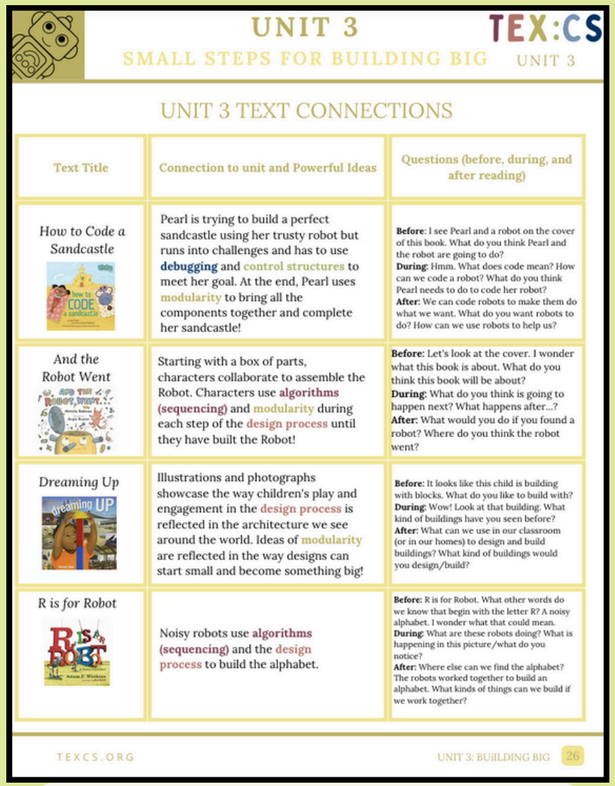
Connect to children's prior knowledge and introduce key concepts
- **"What features did you include in your prototype?"**
- "What makes a robot a robot? How do you know?"
- "How do you think robots get built? What steps do they take?
- "When you built/designed your robot prototype, what materials did you use/plan to use? What functions did your robot have? How did/would you build it?"

Link initial ideas to computer science ideas and prepare children for activity
- **Robots can be used to solve community problems!"**
- "What problems have you noticed in our classroom, school, or community?"
- "Let's discuss how robots might be helpful to address some of these problems. What functions might they need?"

Support children in participating in the activity. Ask questions and help make connections
- **"Let's design a shared robot to solve problems!"**
- "I want you to be engineers and think about what robot components we would need to address the problem?"
- "What materials could we use to create these components?"
- "Let's sketch what this will look like."
- "Let's see if our design will solve the problems we noticed."

Key Vocabulary
- Design/ design process
- Program(mer)
- computer scientist
- Prototype
- Algorithm

TEXCS.ORG UNIT 2: WE CAN DO STEM 18



UNIT 3
SMALL STEPS FOR BUILDING BIG
TEX:CS UNIT 3

UNIT 3 TEXT CONNECTIONS

Text Title	Connection to unit and Powerful Ideas	Questions (before, during, and after reading)
How to Code a Sandcastle	Pearl is trying to build a perfect sandcastle using her trusty robot but runs into challenges and has to use **debugging** and control structures to meet her goal. At the end, Pearl uses modularity to bring all the components together and complete her sandcastle!	**Before:** I see Pearl and a robot on the cover of this book. What do you think Pearl and the robot are going to do? **During:** Hmm. What does code mean? How can we code a robot? What do you think Pearl needs to do to code her robot? **After:** We can code robots to make them do what we want. What do you want robots to do? How can we use robots to help us?
And the Robot Went	Starting with a box of parts, characters collaborate to assemble the Robot. Characters use **algorithms (sequencing)** and modularity during each step of the design process until they have built the Robot!	**Before:** Let's look at the cover. I wonder what this book is about. What do you think this book will be about? **During:** What do you think is going to happen next? What happens after...? **After:** What would you do if you found a robot? Where do you think the robot went?
Dreaming Up	Illustrations and photographs showcase the way children's play and engagement in the design process is reflected in the architecture we see around the world. Ideas of modularity are reflected in the way designs can start small and become something big!	**Before:** It looks like this child is building with blocks. What do you like to build with? **During:** Wow! Look at that building. What kind of buildings have you seen before? **After:** What can we use in our classroom (or in our homes) to design and build buildings? What kind of buildings would you design/build?
R is for Robot	Noisy robots use **algorithms (sequencing)** and the design process to build the alphabet.	**Before:** R is for Robot. What other words do we know that begin with the letter R? A noisy alphabet. I wonder what that could mean. **During:** What are these robots doing? What is happening in this picture/what do you notice? **After:** Where else can we find the alphabet? The robots worked together to build an alphabet. What kinds of things can we build if we work together?

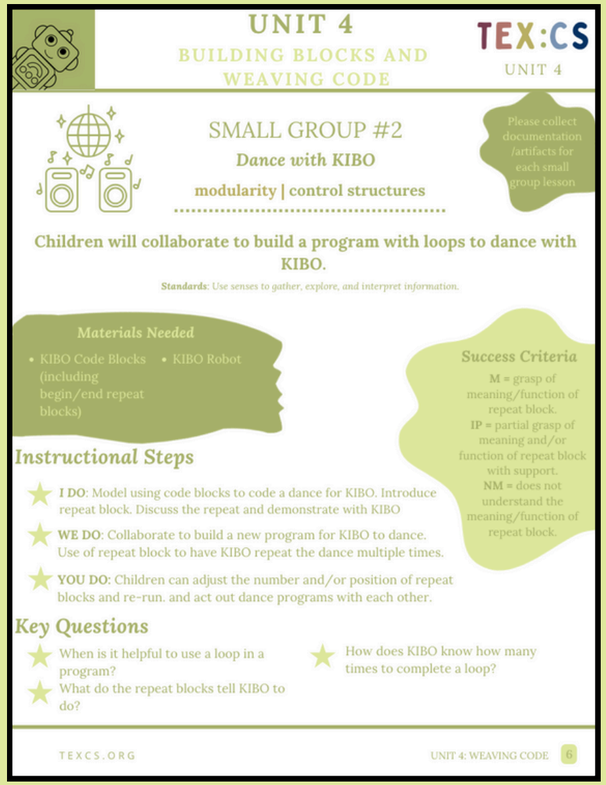
TEXCS.ORG UNIT 3: BUILDING BIG 26

Unit 3: Small Steps for Building Big

Supports modularity

Unit 4: Building Blocks and Weaving Code

Supports control structures



UNIT 4
BUILDING BLOCKS AND WEAVING CODE
TEX:CS UNIT 4

SMALL GROUP #2
Dance with KIBO
modularity | control structures

Please collect documentation /artifacts for each small group lesson

Children will collaborate to build a program with loops to dance with KIBO.

Standards: *Use senses to gather, explore, and interpret information.*

Materials Needed
- KIBO Code Blocks (including begin/end repeat blocks)
- KIBO Robot

Success Criteria
M = grasp of meaning/function of repeat block.
IP = partial grasp of meaning and/or function of repeat block with support.
NM = does not understand the meaning/function of repeat block.

Instructional Steps
- **I DO:** Model using code blocks to code a dance for KIBO. Introduce repeat block. Discuss the repeat and demonstrate with KIBO
- **WE DO:** Collaborate to build a new program for KIBO to dance. Use of repeat block to have KIBO repeat the dance multiple times.
- **YOU DO:** Children can adjust the number and/or position of repeat blocks and re-run. and act out dance programs with each other.

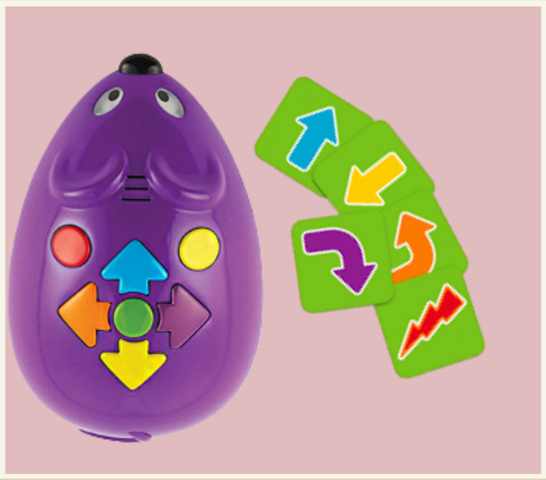
Key Questions
- When is it helpful to use a loop in a program?
- What do the repeat blocks tell KIBO to do?
- How does KIBO know how many times to complete a loop?

TEXCS.ORG UNIT 4: WEAVING CODE 6

A GLIMPSE:

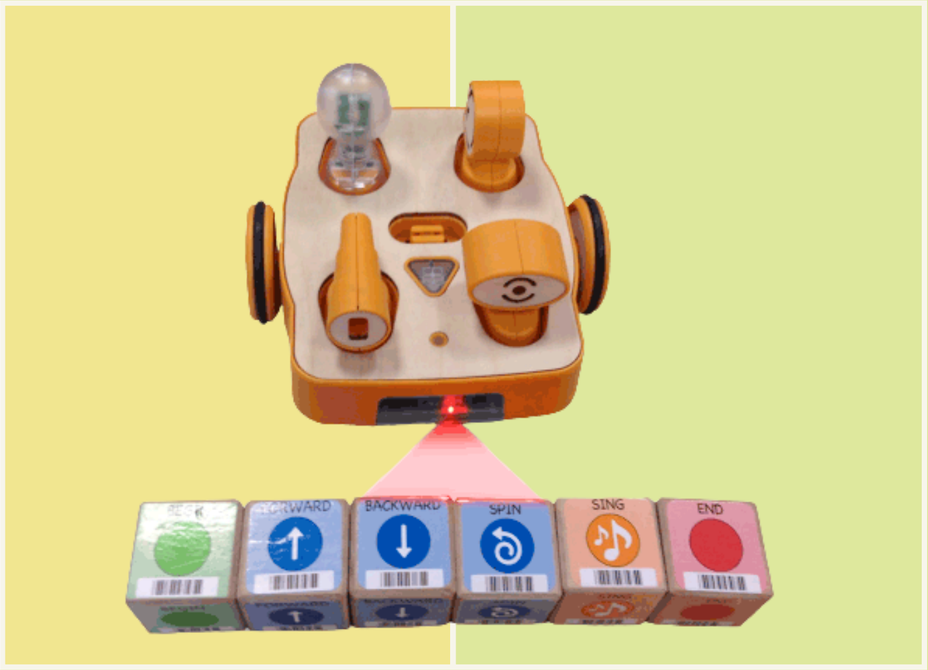
Unit 1: Order Matters

Robot #1: Robot Mouse



Unit 2: We Can Do STEM

Robot #2: TaleBot



Unit 3: Small Steps for Building Big

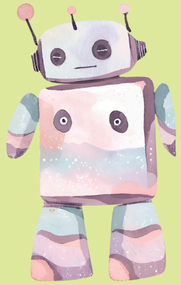
Robot #3: KIBO

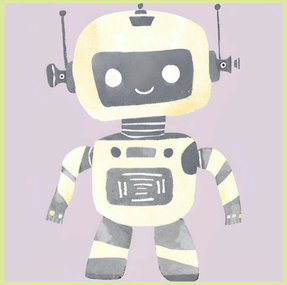
Unit 4: Building Blocks and Weaving Code

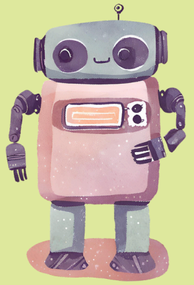
TEX:CS

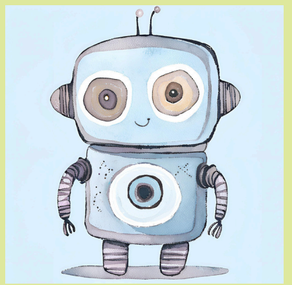
IN ACTION

Introduction
My Context/Classroom
How I Got Involved in TexCS









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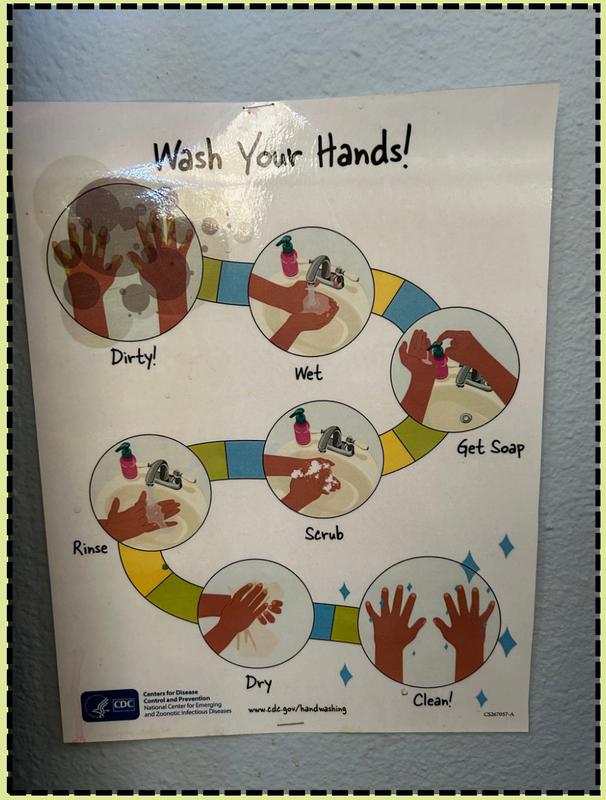
IN ACTION

Where we started

- “Robot Day”
- TexCS as a separate curriculum, not integrated into everyday activities
- Unit 1 lessons and experiences (Program the Teacher and Hand Washing Algorithm)



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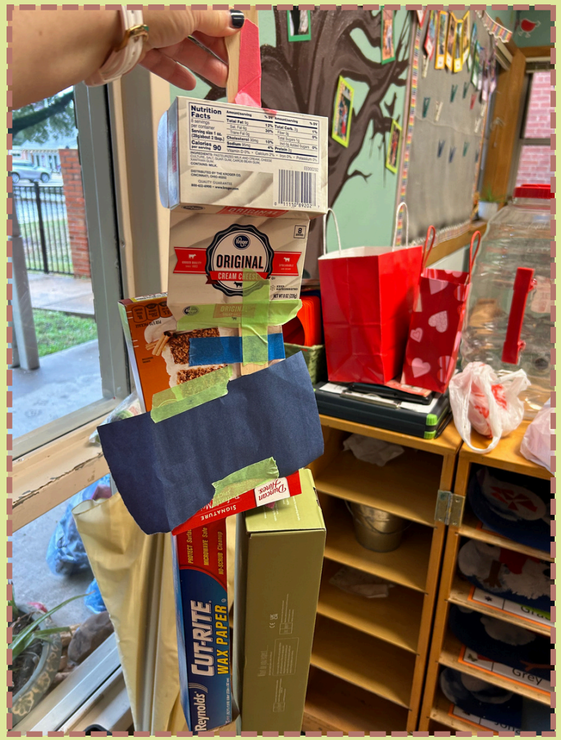
IN ACTION

Where we are now:

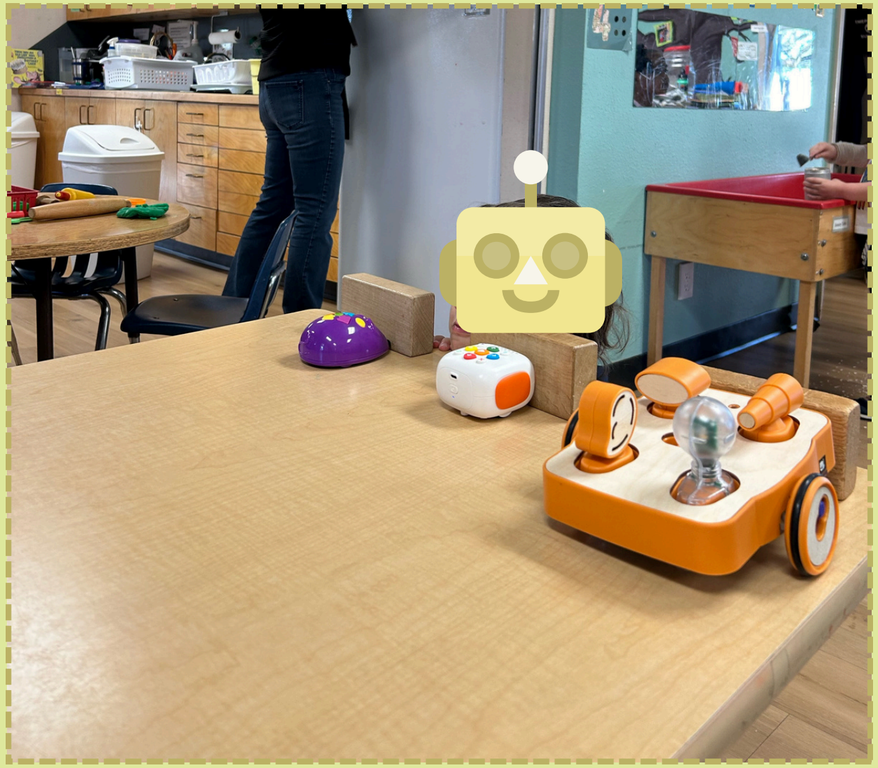
- Activities embedded throughout the day
- Making it my own - TexCS is a starting point
- Unit 2 lessons and experiences (Design/build a robot; baking bread)

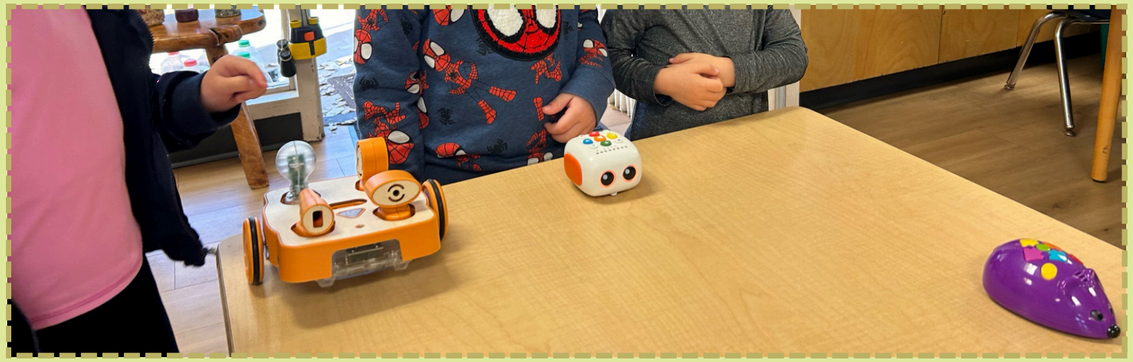


TEX:CS IN ACTION

Where we are going:

- Continuing to implement TexCS
- Supporting children's autonomy and leadership
- Overall experiences with focal robots





TEX:CS

EARLY CHILDHOOD COMPUTER SCIENCE

Want to learn more or take part?

Email: mquinn@tamu.edu

Visit: texcs.org

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