Using Robots and Coding to Promote Math and Language

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TEXAS WOMAN'S UNIVERSITY

As we move through this presentation,

If there is any fear or hesitation about the idea of including coding & robotics in your classes just remember,

It’s not what you know, it’s what they **think** you know.

Agenda

- Introduction to the TWUFCL
- Rationale for Coding & Robotics
- Getting Started
- Using Coding & Robotics Across the Curriculum
- Where to Go from Here?



Texas Woman's University
Future Classroom Lab

Introduction

Introduction to the TWUFCL

The Texas Woman's University Future Classroom Lab (TWUFCL) is an innovative, technology-rich, flexible learning environment to train future teachers, K-12 teachers, and K-12 students.

Putting the Need in Perspective

Related to Technology

Generational Experiences

LABEL	YEARS	IMPACT
Generation Y / Millennials	1981-2000	Never known life without technology
Generation Z / Boomlets	2001	Never known life without the Internet
Generation Alpha	2020	Never known life without social media

What is the impact?

Just because today's generations can use technology such as smartphones, social media, YouTube…

Doesn't mean they're prepared to use technologies for educational, coding, or design purposes.

Why teach coding & robotics?

If the average life span in the US is approximately 80 years, that means some of the kids in pre-school today will live in the **21st and 22nd centuries**.

"The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn."

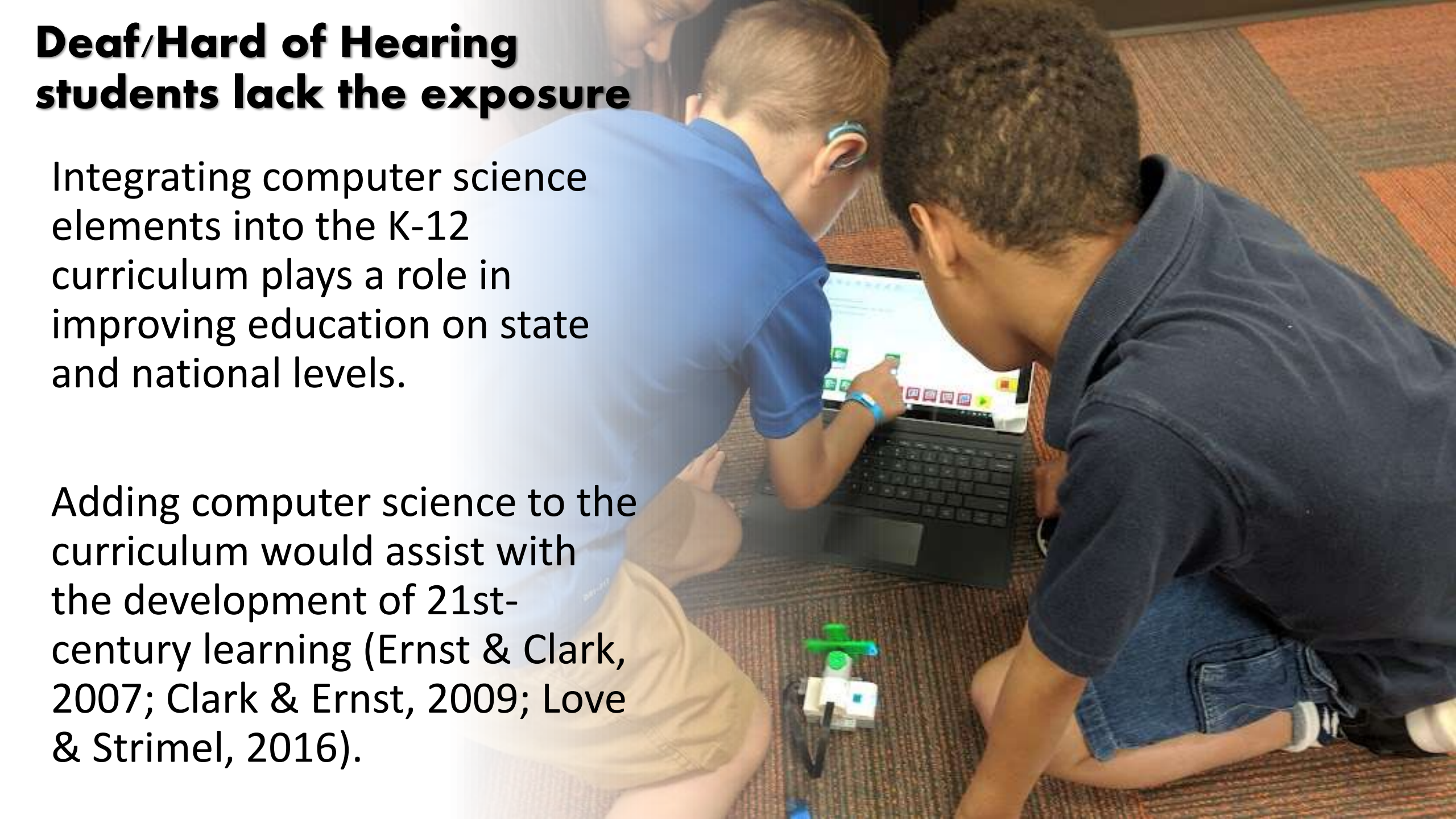
Quote often attributed to Alvin Toffler, author of *Future Shock*, 1970.


If you don’t prepare your students, who will?

Deaf/Hard of Hearing students lack the exposure

Integrating computer science elements into the K-12 curriculum plays a role in improving education on state and national levels.

Adding computer science to the curriculum would assist with the development of 21st-century learning (Ernst & Clark, 2007; Clark & Ernst, 2009; Love & Strimel, 2016).



Using Coding & Robotics Across the Curriculum

Robotics offer students of all ages with hands-on learning opportunities for coding and computer science skills (Sauppé, et al., 2015).

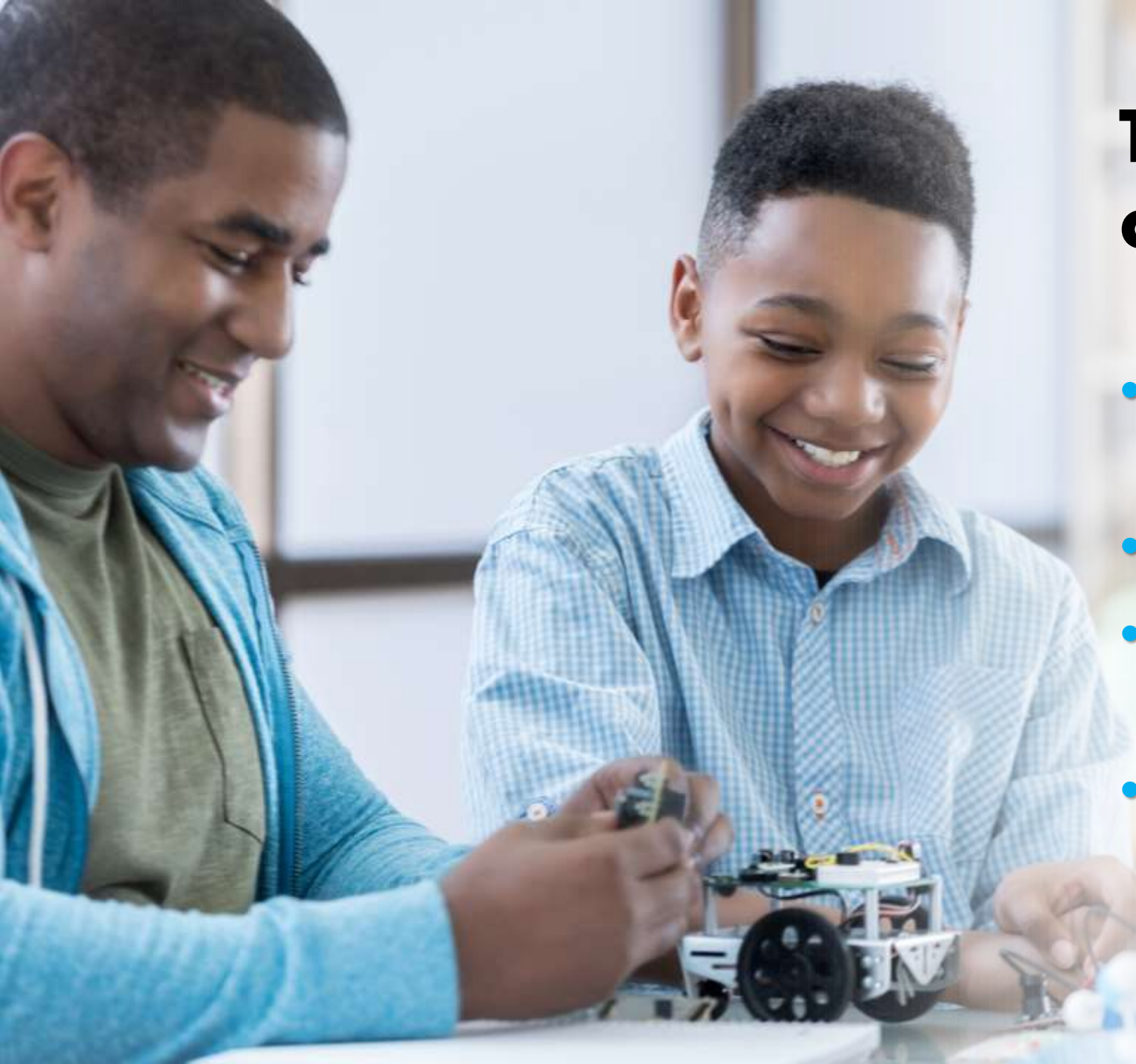
Robotics are beneficial for motivating diverse and under-represented students in STEM fields with critical thinking domains such as mathematics and computing, while also providing students with opportunities to experience technology in society (Osborne et al., 2010).

Fitting Coding & Robotics into School

- Teachers must find ways to incorporate opportunities to incorporate computer science into K-12 content areas (Kay, et al., 2014)
- Incorporating technology into K-12 education has been shown to improve reading comprehension, writing, and social studies performance (Moran et al., 2008; Kucirkova et al., 2014;Cramer & Smith, 2002; Combs, 2010; Berson et al., 2000; Berson et al., 2012).

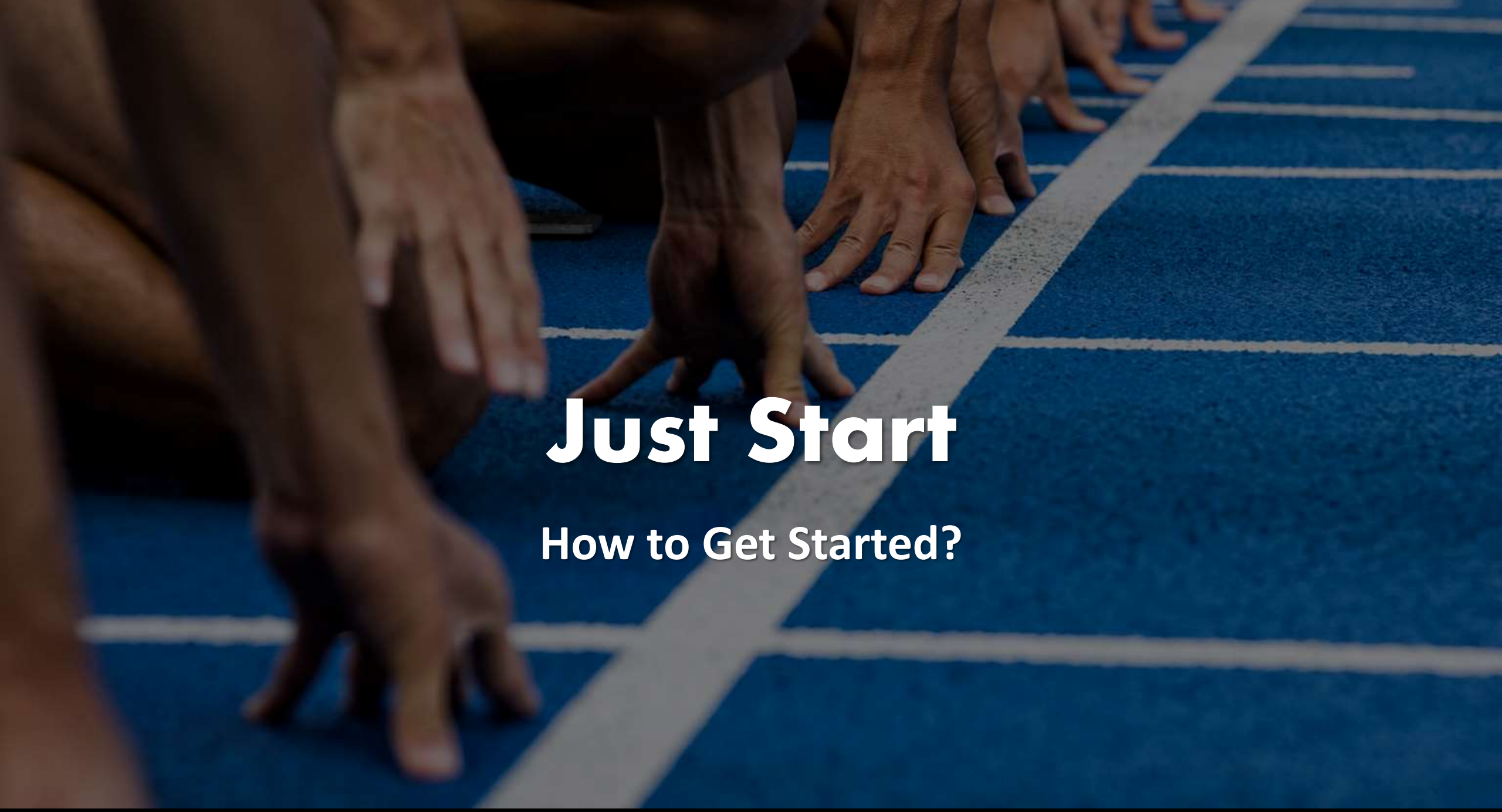
You don't need to be a computer scientist...

You just need to create the opportunity

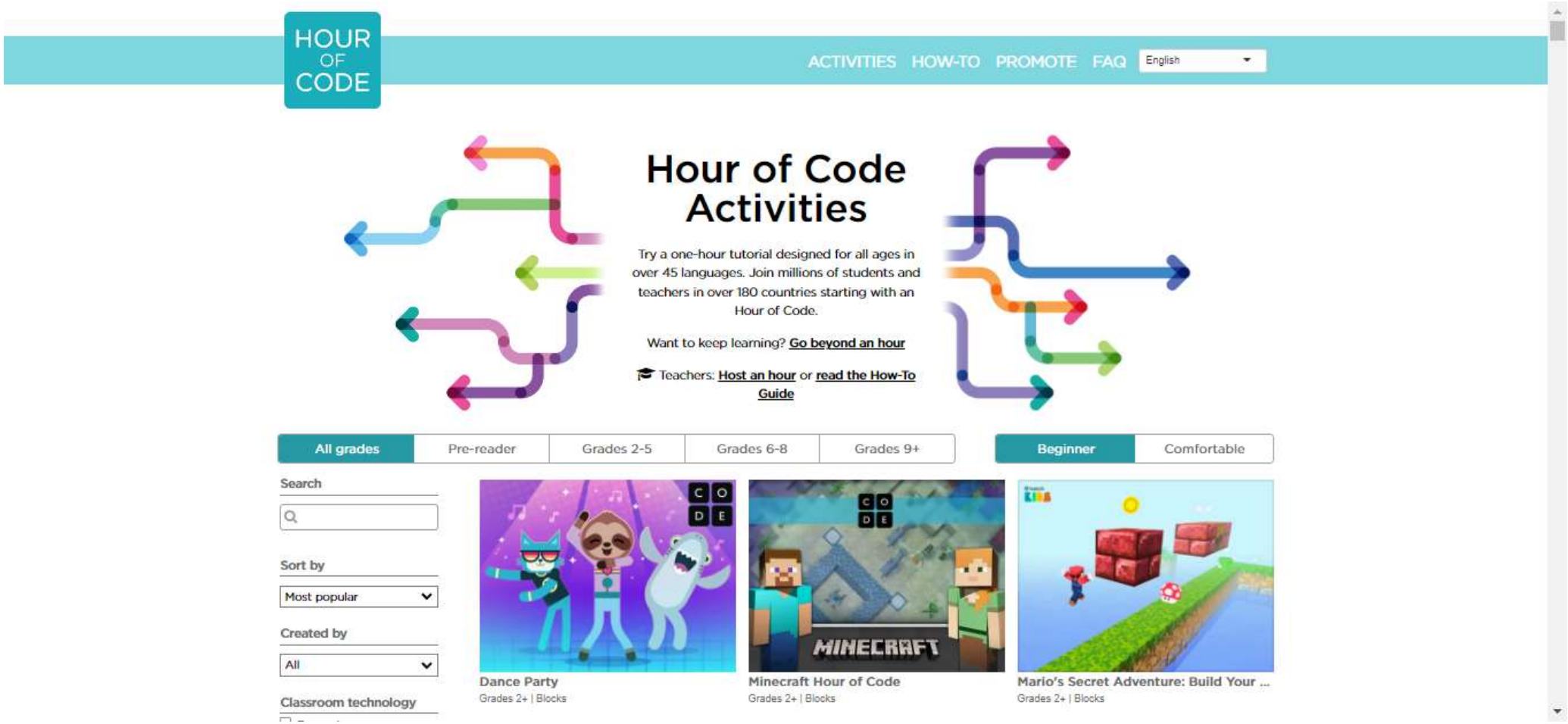


Things to remember as you start…

- **REMEMBER**, It doesn't need to be complicated.
- **START** somewhere.
- **CONNECT** everything back to print experiences.
- **FIND** MATH/STEM lessons online for your coding.


Just Start
How to Get Started?

No Technology Purchases Required



Use **HOUR OF CODE** during ELAR to get students & teacher accustomed to coding activities.

Start simple

https://studio.code.org/s/frozen/lessons/1/lev...

Outlook Web App | TWU FCL - YouTube | Microsoft Office Ho... | 2019 Most Commo... | My Courses - Texas... | Other favo

Code with Anna and Elsa 4 I finished! Sign in

Run

ed help?

these videos and hints

English

Instructions

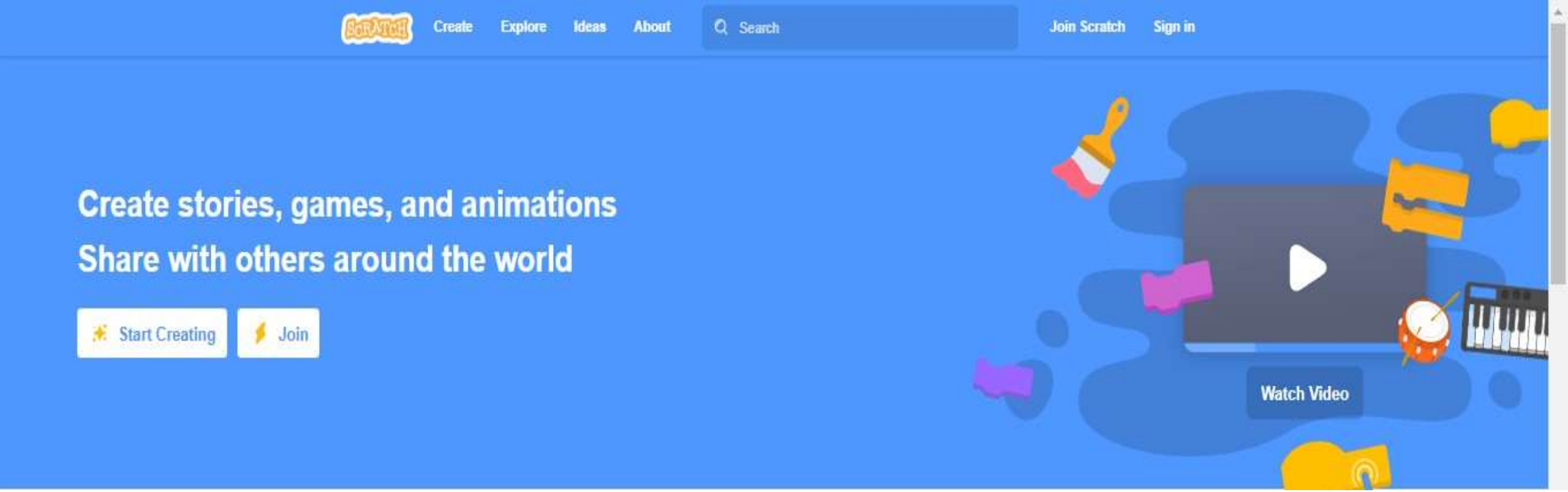
Hi, I'm Anna of Arendelle! Let's make a square with the "Repeat" block, which uses fewer blocks. How many times (???) should the "Repeat" block loop the blocks inside it to make a square?

Workspace: 4 / 4 blocks Start Over Show Co

Students read the directions, complete the task & run to check.

What MATH elements can you identify here?

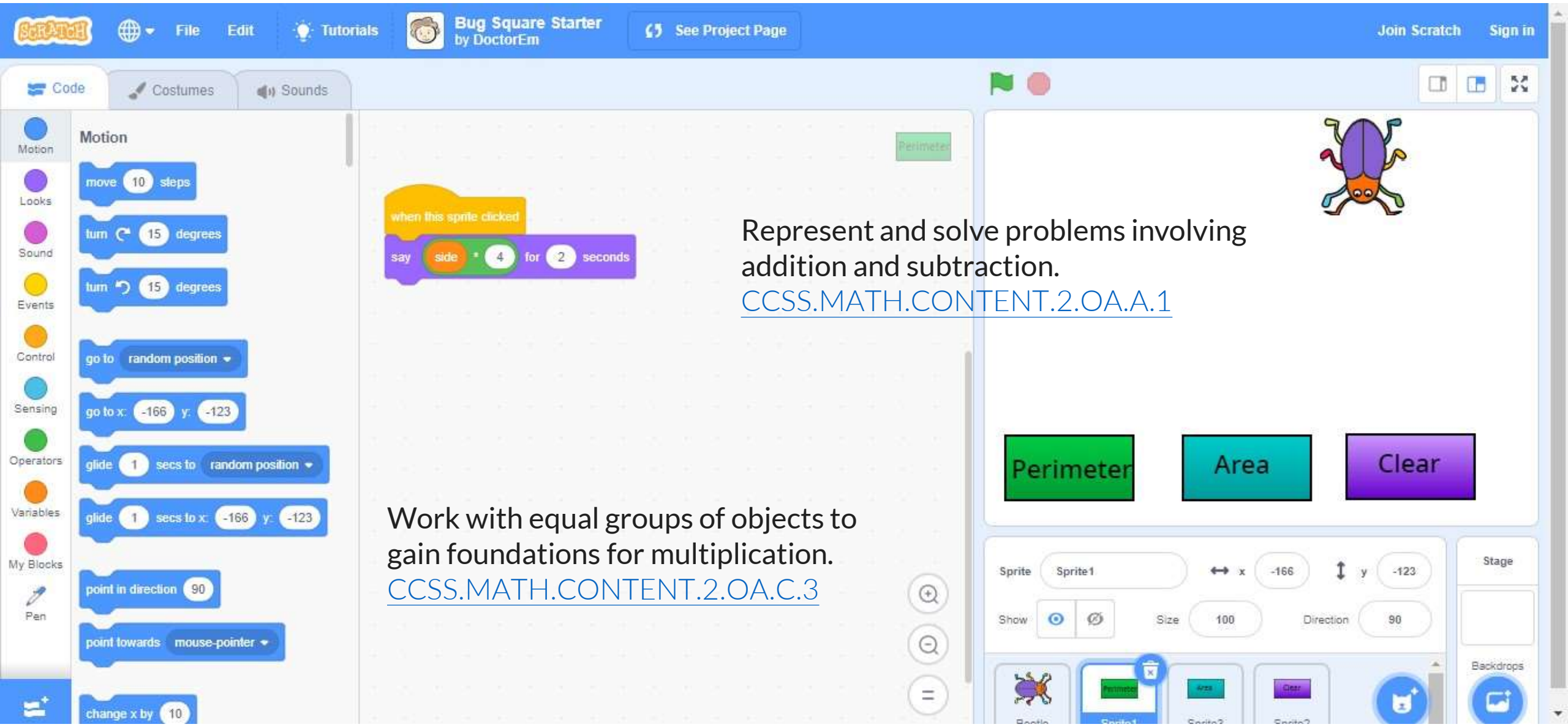
What ELAR elements can you identify here?



Once you've tried the **Hour of Code** tutorials, move to **Scratch** and explore.

Scratch

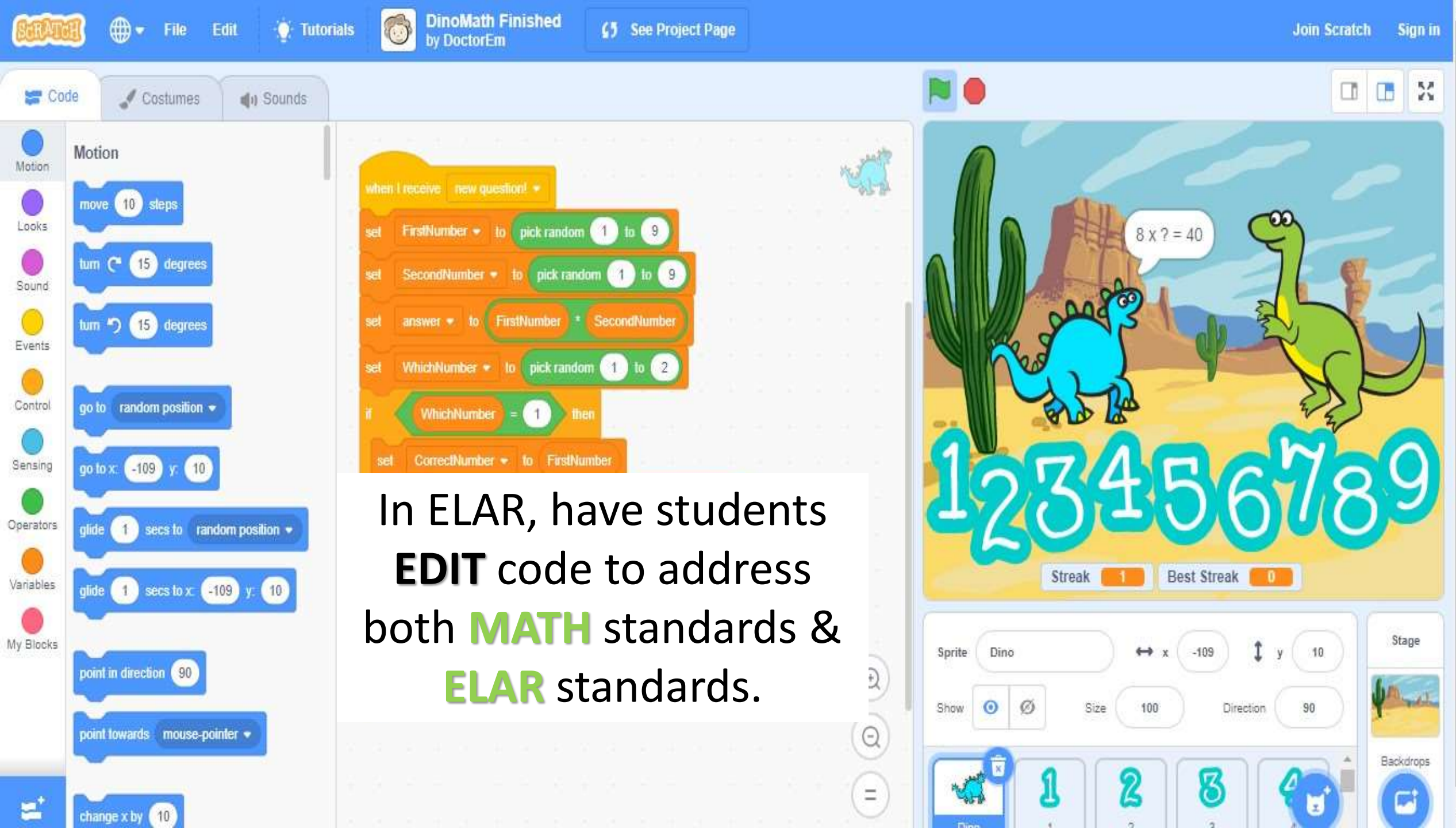
- **Description-** free, online coding application in for students to create coding projects.
- **Applications-**
- **CODE A STORY**- They can select sprites to be their characters, set the background, and add movement to bring their stories to life.
- **MAKE A GAME** - older students can use Scratch to create games. The students can work independently or as a group to plan, design, and program their games. After they are complete, they can explain the rules to their classmates and teach them how to play the game.



Represent and solve problems involving addition and subtraction.
CCSS.MATH.CONTENT.2.OA.A.1

Work with equal groups of objects to gain foundations for multiplication.
CCSS.MATH.CONTENT.2.OA.C.3

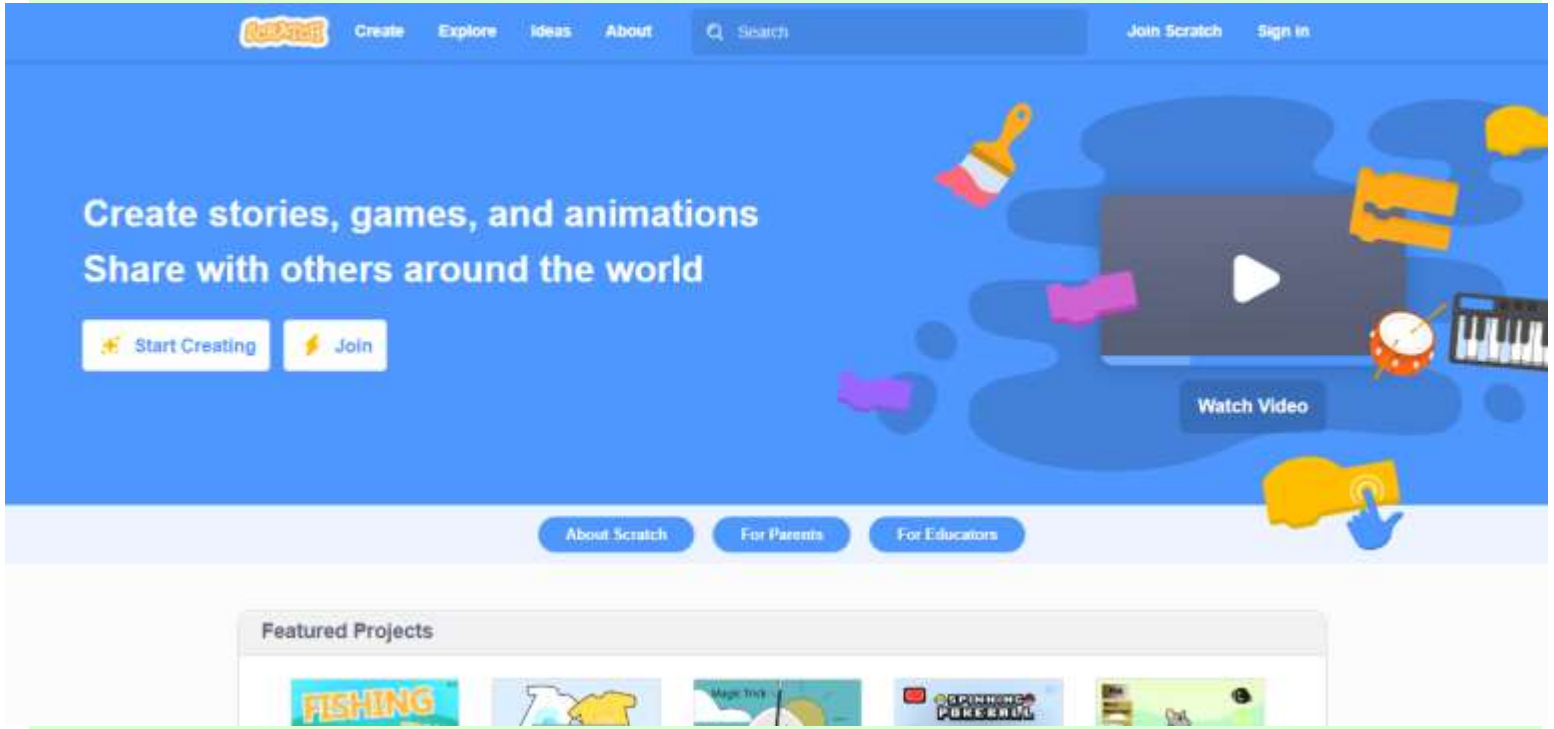
Math Standards in Coding



In ELAR, have students **EDIT** code to address both **MATH** standards & **ELAR** standards.

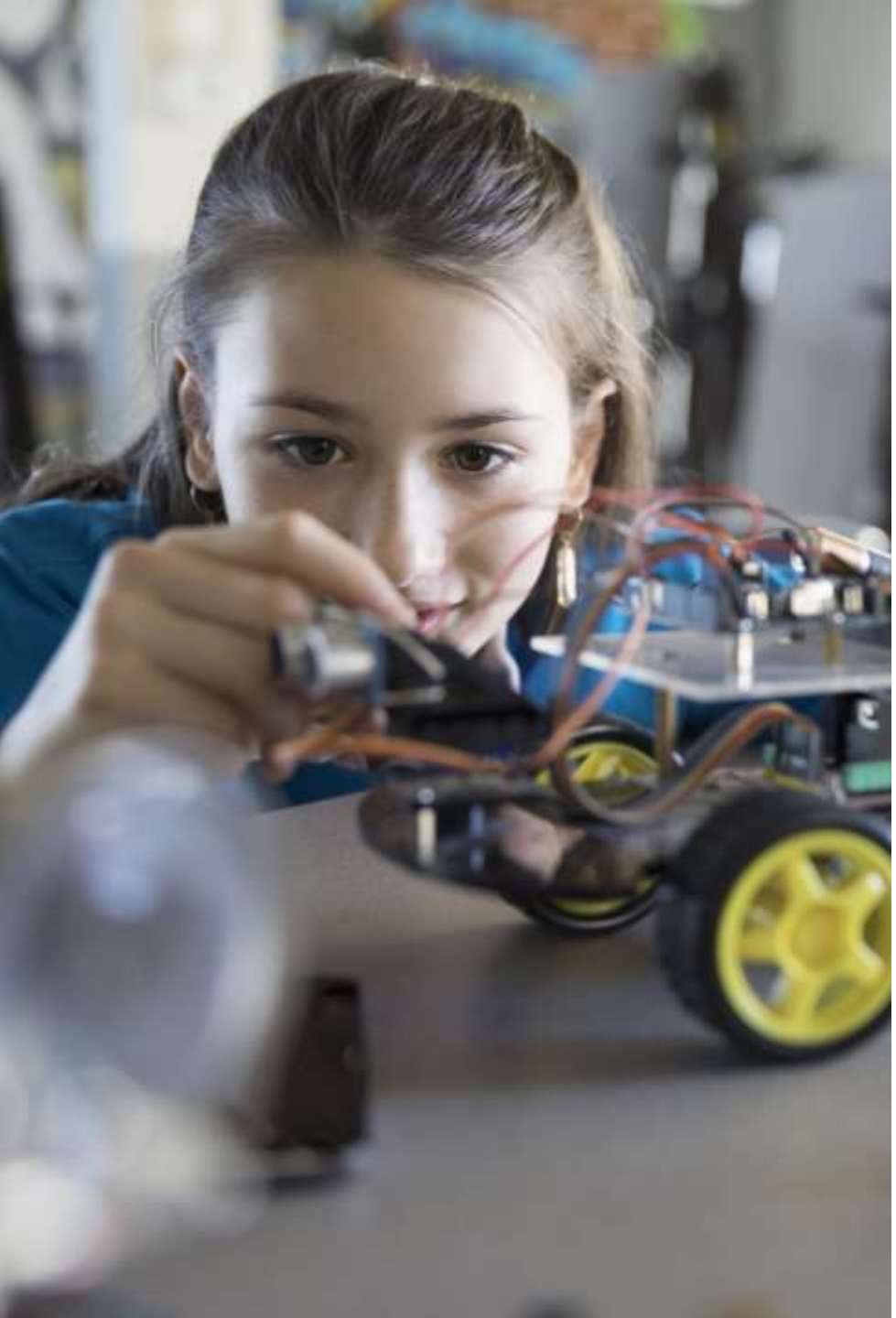
Moving On

https://scratch.mit.edu/



CONTINUE with the Scratch tutorials & activities with students;

LET students work regularly on activities and become familiar with block coding;



Teach the Language of the Content

Teach students to interact in the content via

ASL / LISTENING SPOKEN LANGUAGE & PRINT

The goal can’t be the coding.

The goal must be thinking and communicating about the coding.

PALETTE

SCRIPT

STAGE

Teach the parts of a coding layout…
Use the vocabulary in discussions & directions.

SPRITE

File Edit Tutorials Join Scratch Sign in

Code Costumes Sounds

Motion
Looks
Sound
Events
Control
Sensing
Operators
Variables
My Blocks

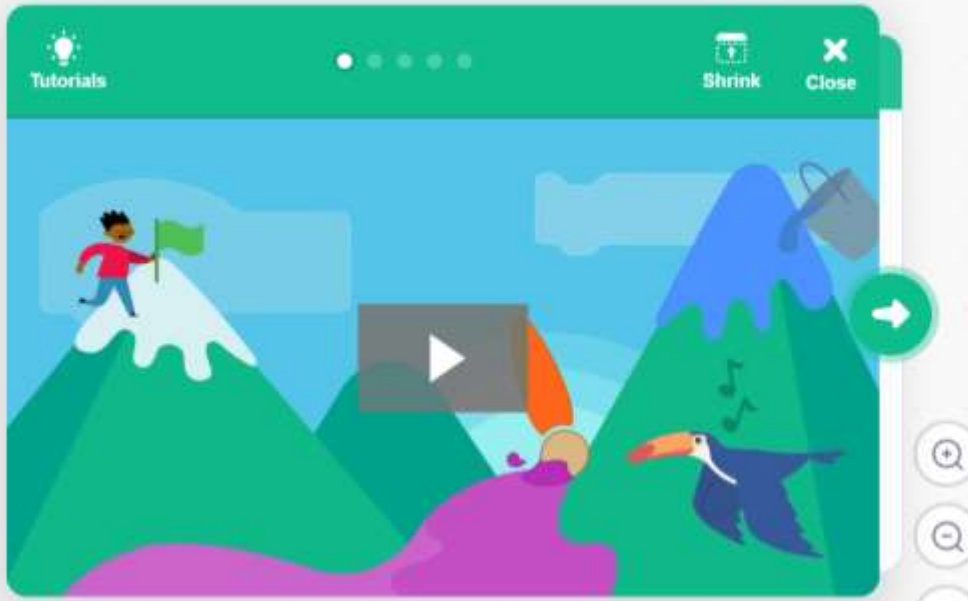
Motion

move 10 steps
turn 15 degrees
turn 15 degrees
go to random position
go to x: 0 y: 0
glide 1 secs to random position
glide 1 secs to x: 0 y: 0
point in direction 90
point towards mouse-pointer
change x by 10
set x to 0
change y by 10
set y to 0

when clicked
move 10 steps
turn 15 degrees
move 10 steps

To test a script, click the **GREEN FLAG.**

Drag & connect blocks to the script area



Sprite Sprite1 x 0 y 0
Show Size 100 Direction 90
Stage
Backdrops 1
Sprite1

Technology Purchases Required

Codable Robotics Kits

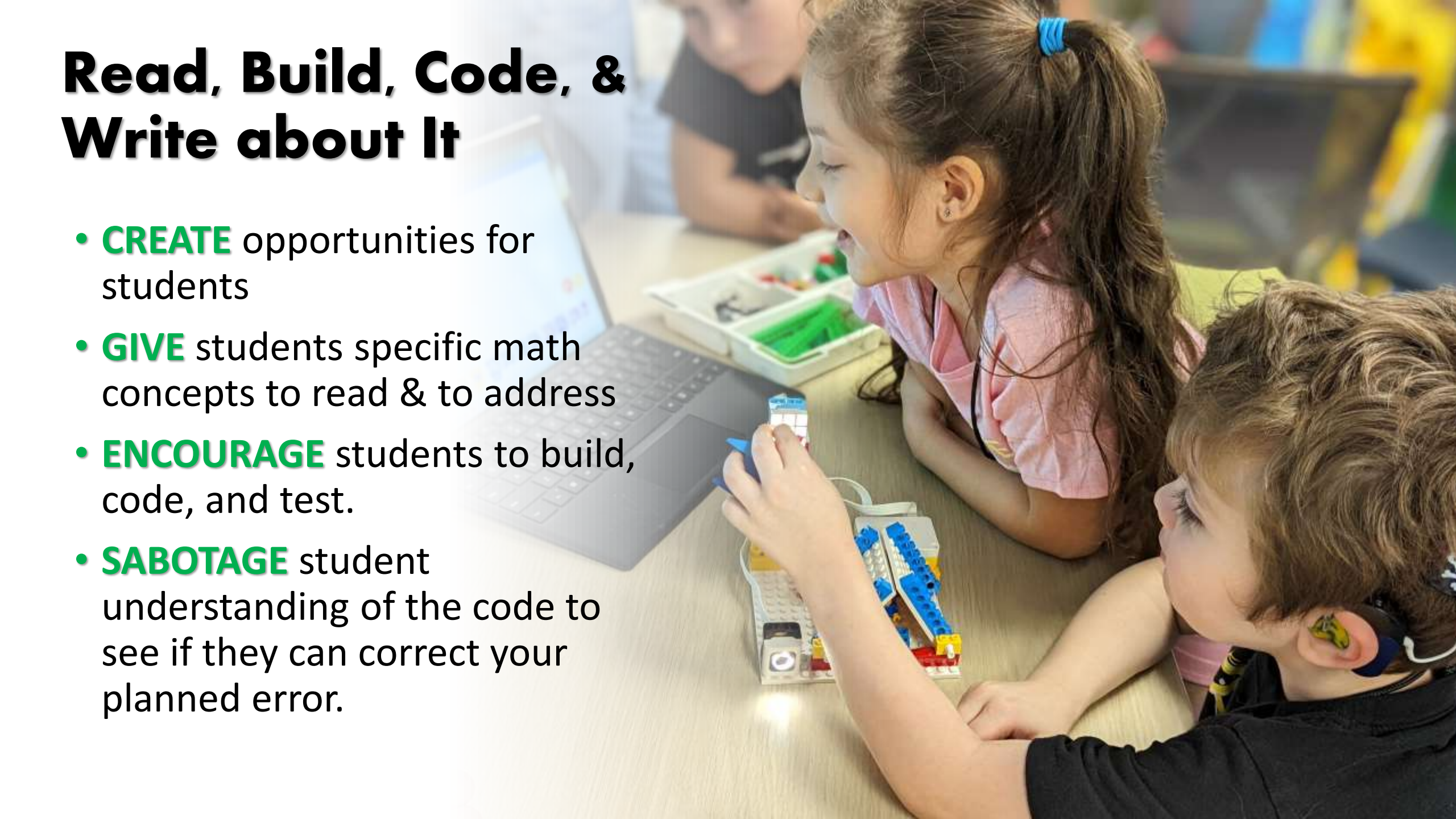
Find codable robotics kits that you can afford. These are just some examples:

LEGO Ideas

- Spike
- WeDo 2.0
- Boost
- Mindstorm

Read, Build, Code, & Write about It

- **CREATE** opportunities for students
- **GIVE** students specific math concepts to read & to address
- **ENCOURAGE** students to build, code, and test.
- **SABOTAGE** student understanding of the code to see if they can correct your planned error.



Sphero Ideas

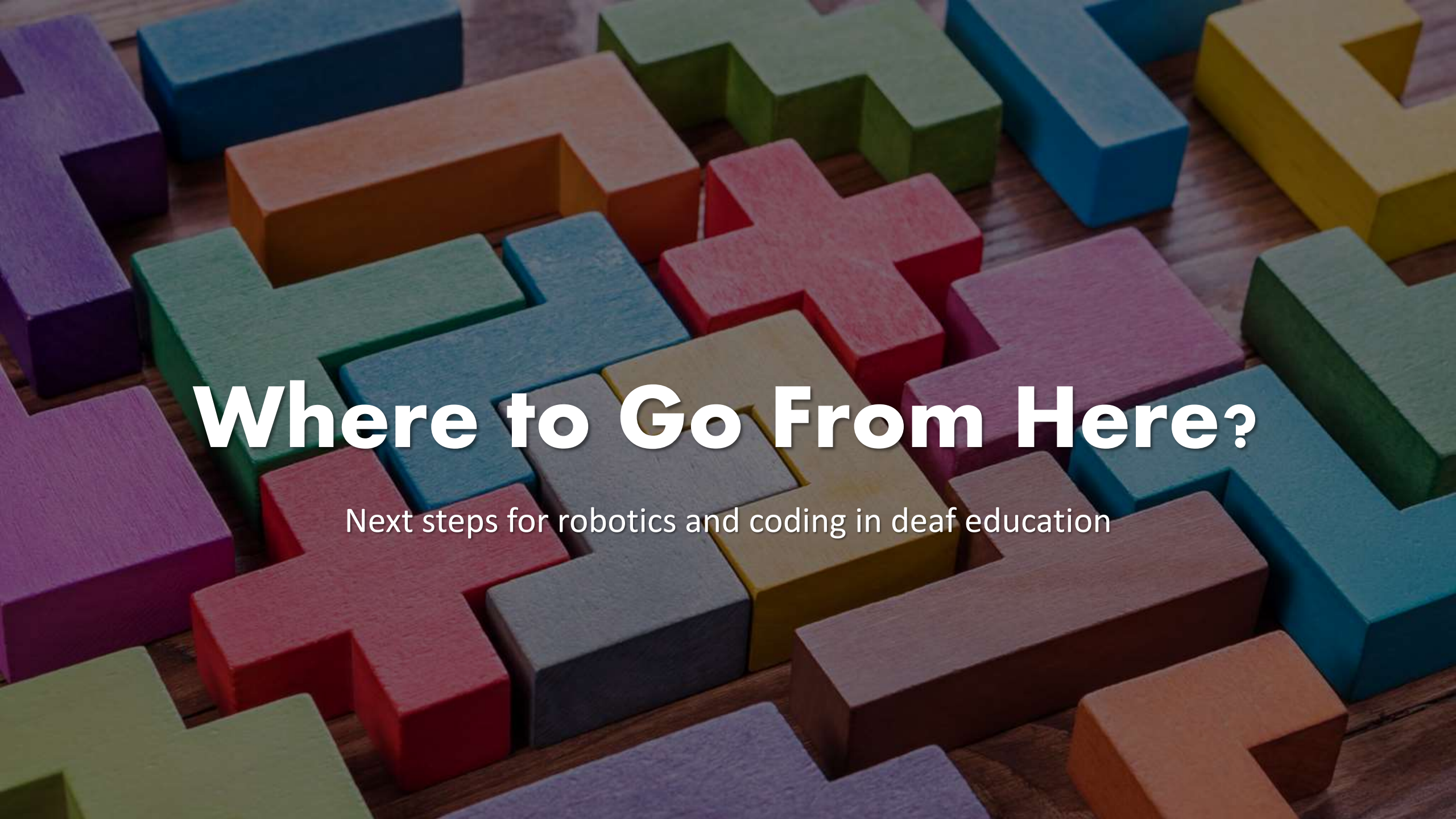
- **Description-** Sphero is a small robot that uses Bluetooth to connect to smartphones, computers, tablets, or other devices. Within the Sphero Edu app, Sphero can be programmed using block code or driven manually.

Code it, Track it, & Record It

- **USE** block coding (Scratch-like) to create path or task
- **EDIT** code number elements, speed, distance, time
- **COMPARE** code in different situations
- **EXPLORE** coding specifics in content areas like art, ELAR, social studies

Sphero in Games

- **CODE** Sphero to play shuffleboard
- **USE** number for elementary students
- **USE** formulas for secondary students



Where to Go From Here?

Next steps for robotics and coding in deaf education

When you're back at school...

MATH

- **IDENTIFY** standards needed
- **LOOK** for math & number concepts in coding
- **START** simple, but be consistent
- **STAY** focused on state standards

ELAR

- **IDENTIFY** standards needed
- **IDENTIFY** opportunities for reading & writing
- **USE** print behaviors students can manage inside coding content
- **TEACH** the language for interacting in the coding

Apps

Coding apps are available online for computers, phones, & tablets that you can use with students and families. Get families involved!


Children must be taught how to think,
not what to think.
- Margaret Mead

- ‘I never teach my pupils; I only attempt to provide the conditions in which they can learn.’ – ***Albert Einstein***

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