# Using Robotics to Teach Math

11.05.2019

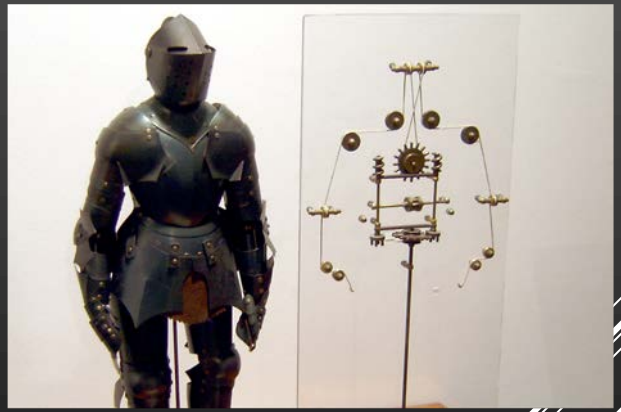
Harry Wood

National Technical Institute for the Deaf
NTID Regional STEM Center

AIDB
Alabama Institute for Deaf and Blind
Deaf. Blind. Limitless.

# Did You Know?

**Leonardo da Vinci sketched plans for a humanoid robot in the late 1400s. It was a mechanical knight.**



# Introduction

National Technical Institute for the Deaf
NTID Regional STEM Center

AIDB
Alabama Institute for Deaf and Blind
Deaf. Blind. Limitless.

# Sports or Robotics?

55% of robotics students go on to major in science or engineering.

National Technical Institute for the Deaf
NTID Regional STEM Center

AIDB
Alabama Institute for Deaf and Blind
Deaf. Blind. Limitless.

# NRSC Workshops - Accessibility

Have workshops for mainstream teachers

1. Addresses accessibility, hearing loss, interpreter use, etc.

1. Flexible - 2 hrs to all day

National Technical Institute for the Deaf
NTID Regional STEM Center

AIDB
Alabama Institute for Deaf and Blind
Deaf. Blind. Limitless.

# NRSC Workshops - Robotics

Have workshops for:

1. VEX Robotics

1. Robotics for the classroom

National Technical Institute for the Deaf
NTID Regional STEM Center

AIDB
Alabama Institute for Deaf and Blind
Deaf. Blind. Limitless.

# NRSC Workshops

- ACT Testing Strategies
- English/Literacy Strategies in classroom
- Cybersecurity
- Math
- Science

National Technical Institute for the Deaf
NTID Regional STEM Center

AIDB
Alabama Institute for Deaf and Blind
Deaf. Blind. Limitless.

# STEM Bus

# Robots help with STEM skills

Students learn:

- logic & patterns
- following step by step directions
- leads to understanding of complex machines
- frustration is normal and okay
- problem solving
- people skills

National Technical Institute for the Deaf
NTID Regional STEM Center

AIDB
Alabama Institute for Deaf and Blind
Deaf. Blind. Limitless.

# Curriculum Connections:

- Common Core (CC) for Math
- Standards for Technological Literacy (STL)
- Next Generation Science Standards (NGSS)
- ASL Standards (Clerc Center)

National Technical Institute for the Deaf
NTID Regional STEM Center

AIDB
Alabama Institute for Deaf and Blind
Deaf. Blind. Limitless.

# Common Core Math Connections

| Domain # | Grade | Cluster | Standard | Unit Activities |
|---|---|---|---|---|
| 4.OA | 4 | Operations and Algebraic Thinking | Use the four operations with whole numbers to solve problems. | - Idea Book Pages |
| 4.MD | 4 | Measurement and Data | Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit. | - Idea Book Pages |
| 4.MD | 4 | Measurement and Data | Represent and interpret data. | - Idea Book Pages |
| 6.EE | 6 | Expressions and Equations | Represent and analyze quantitative relationships between dependent and independent variables. | - Idea Book Pages |
| 7.RP | 7 | Ratios and Proportional Relationships | Analyze proportional relationships and use them to solve real-world and mathematical problems. | - Idea Book Pages |

# STL Connections

| | | | | |
|---|---|---|---|---|
| 3.C | 3-5 | Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study. | Various relationships exist between technology and other fields of study. | - Matching Exercise<br>- Optional Research Activity<br>- Optional Idea Book Exercise |
| 3.F | 6-8 | Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study. | Knowledge gained from other fields of study has a direct effect on the development of technological products and systems. | - Matching Exercise<br>- Optional Research Activity<br>- Optional Idea Book Exercise |

# Next Generation Science Standards

| Grade | Category | PE Code | Performance Expectation (PE) | Unit Activities |
|---|---|---|---|---|
| 4 | Energy | 4-PS3-1 | Use evidence to construct an explanation relating the speed of an object to the energy of that object. | - Challenge Robot Build<br>- Idea Book Pages/ Engineering Notebook |
| 4 | Energy | 4-PS3-4 | Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. | - Challenge Robot Build<br>- Idea Book Pages/ Engineering Notebook |
| 3-5 | Engineering Design | 3-5-ETS1-1 | Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. | - Challenge Robot Build<br>- Idea Book Pages/ Engineering Notebook<br>- Following Challenge Rules |
| 3-5 | Engineering Design | 3-5-ETS1-2 | Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. | - Challenge Robot Build<br>- Programming Activities<br>- Idea Book Pages/ Engineering Notebook<br>- Following Challenge Rules |

# Next Generation Science Standards

| | | | | |
|---|---|---|---|---|
| 6-8 | Energy | MS-PS3-5 | Construct, use, and present arguments to support the claim that when the motion energy of an object changes, energy is transferred to or from the object. | - Challenge Robot Build<br>- Idea Book Pages/ Engineering. Notebook |
| 6-8 | Engineering Design | MS-ETS1-2 | Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. | - Challenge Robot Build<br>- Idea Book Pages/ Engineering. Notebook |

More

# ASL Standards -

## Discourse and Presentation-

- Engage effectively in a range of collaborative discussions (e.g., one-on-one, in groups, teacher-led) with diverse partners on grade 6(and 7&8) topics, texts, and issues, building on others' ideas and expressing their own clearly.

## Language -

- Demonstrate command of the standard ASL grammar and usage when signing (live and published).Use knowledge of language and its structure when signing and viewing (live and published).

# Code & Go

It is fun and introduces very BASIC coding.

Good for developing counting and pattern skills.

National Technical Institute for the Deaf
NTID Regional STEM Center

AIDB
Alabama Institute for Deaf and Blind
Deaf. Blind. Limitless.

# Code & Go

Has cards with challenges

Students can design their own maze.

National Technical Institute for the Deaf
NTID Regional STEM Center

AIDB
Alabama Institute for Deaf and Blind
Deaf. Blind. Limitless.

# Code & Go

Activity -

need a volunteer!

National Technical Institute for the Deaf

NTID Regional STEM Center

AIDB

Alabama Institute for Deaf and Blind

Deaf. Blind. Limitless.

# BeeBot

Another BASIC coding robot.

Can use with younger ages.

Topics:

counting, ABCs, insects

# Wonder Workshop - Dash and Dot

Works well with math.

Good with shape lessons.

Apps are available and free.

# Wonder Workshop - Dash

Activity - Need a volunteer!

National Technical Institute for the Deaf
NTID Regional STEM Center

AIDB
Alabama Institute for Deaf and Blind
Deaf. Blind. Limitless.

# Wonder Workshop - Dash

1. Show me 7 on the number line
2. Create a number sentence
3. Create a shape

# Using Blockly app with Dash to make a number

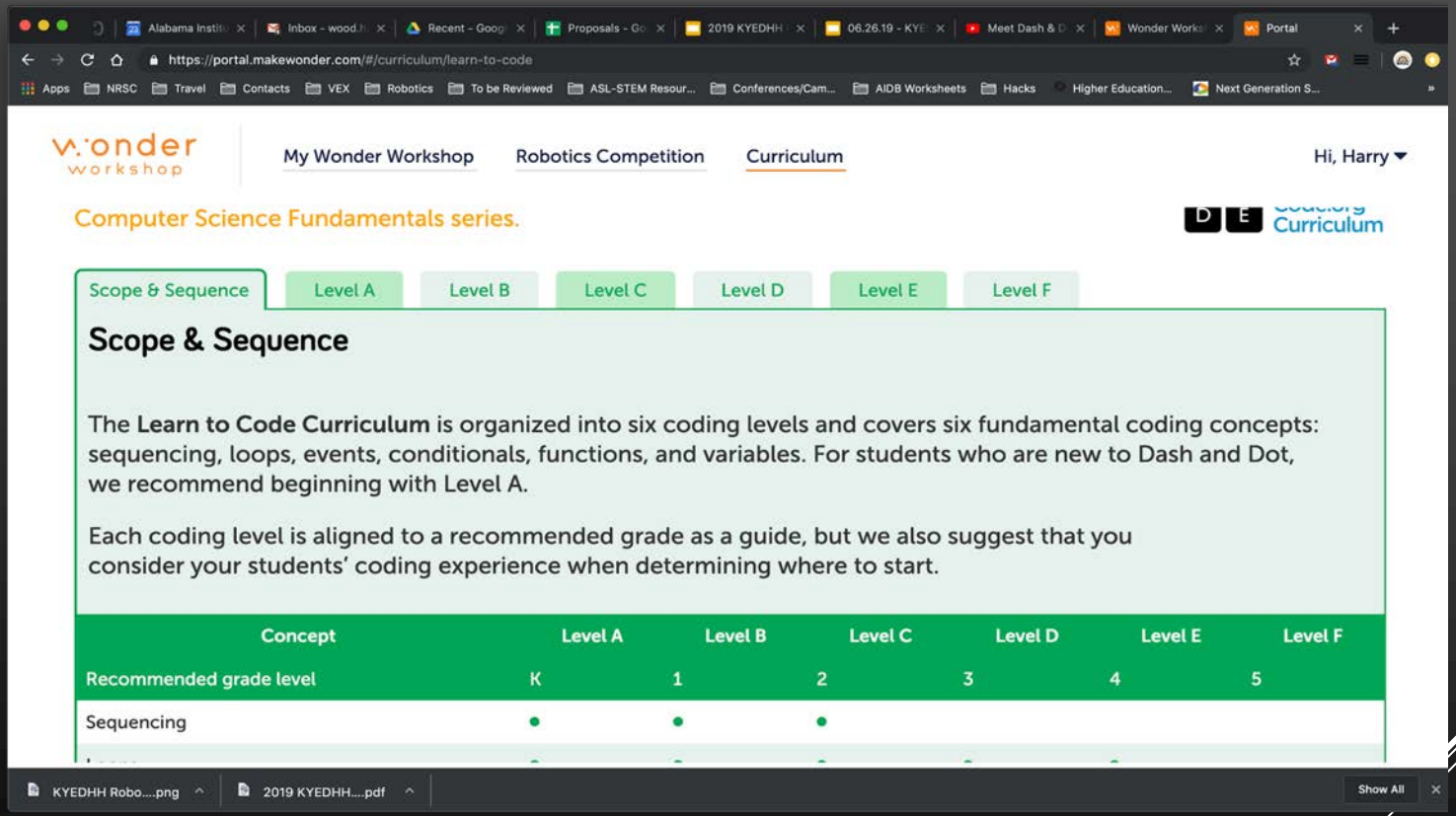
Level 1 challenge - Pick a number between 1 and 10 - make Dash move that many times forward and/or backward.

Level 2 challenge - How can you use coding blocks to move forward 100cm or 200cm in 2 movements? 3 movements? Record on paper or digitally. How do we know if our distances with Dash are accurate?

# Using Blockly app with Dash to make a number

Level 3 challenge -

How can you use coding blocks to move forward or backward tp end up 100cm or 200cm ahead after 3 movements? 4? 5?  Record your number sentence with addition and subtraction on paper or digitally.




National Technical Institute for the Deaf

# NTID Regional STEM Center

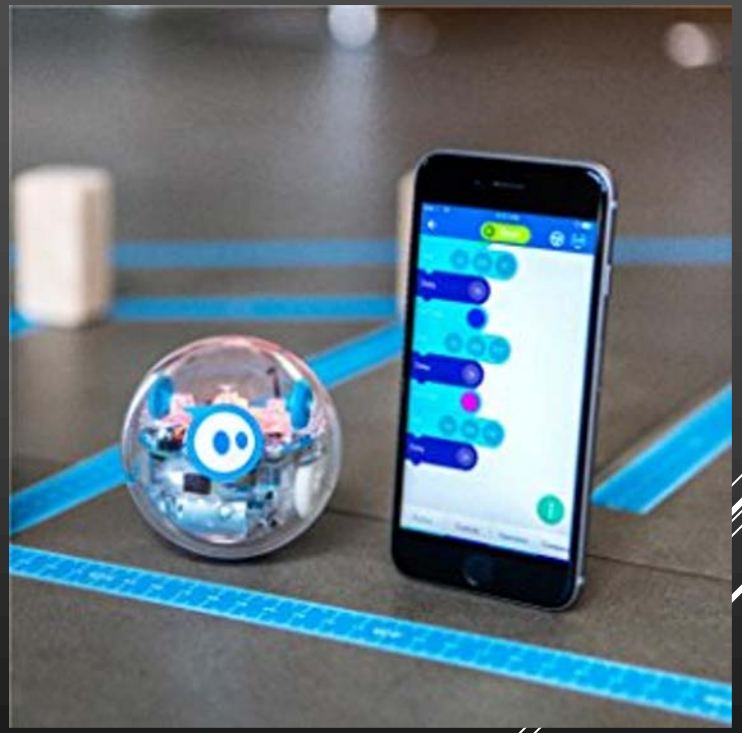
AIDB

Alabama Institute for Deaf and Blind

Deaf. Blind. Limitless.

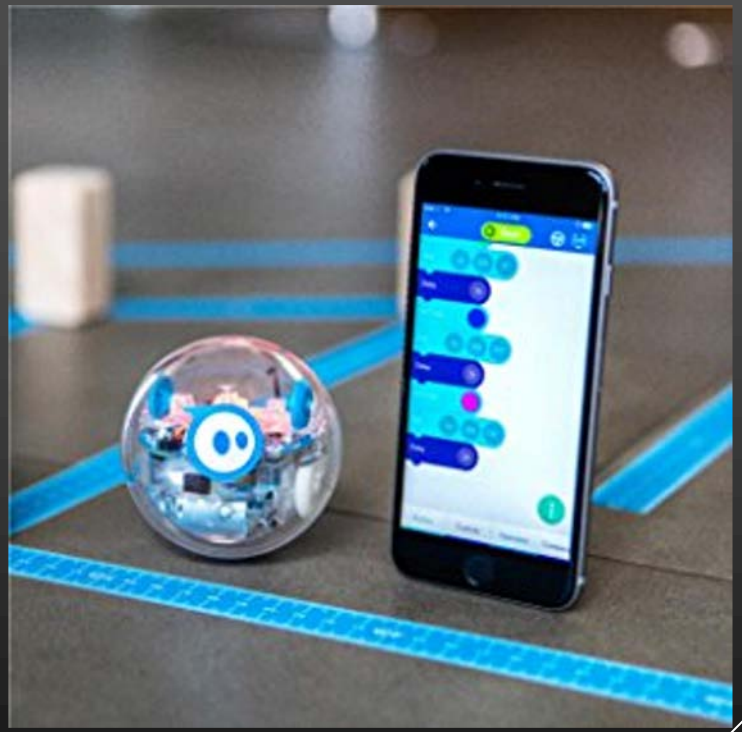
# Sphero

- Very grade flexible
- Basic to complex code
- Deals with more complex math
    - Degrees, minutes, angles
    - Geometric shapes
    - Physics



# Sphero

Ordered Pairs

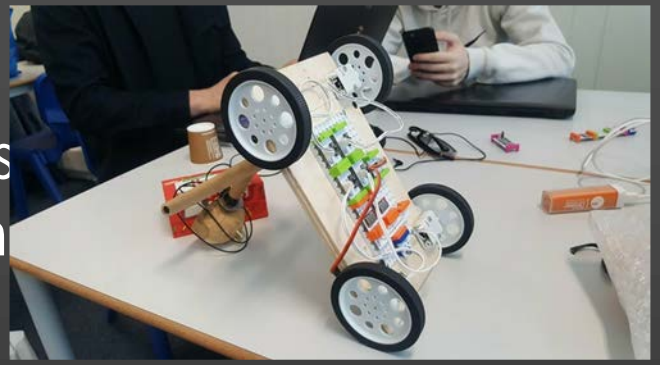


National Technical Institute for the Deaf
NTID Regional STEM Center

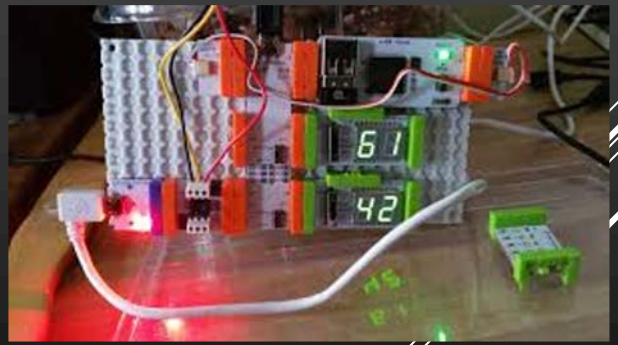
AIDB
Alabama Institute for Deaf and Blind
Deaf. Blind. Limitless.

# LittleBits

- Makes a platform of eas
  to-use electronic buildin
  blocks



- Blocks are
  - Color-coded
  - Magnetic
  - Reusable




National Technical Institute for the Deaf
NTID Regional STEM Center

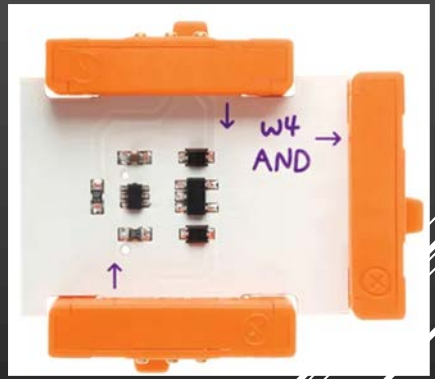
AIDB
Alabama Institute for Deaf and Blind
Deaf. Blind. Limitless.

# Each Bit is color-coded by its function in the circuit.

Power

Input

Output




Logic

National Technical Institute for the Deaf
NTID Regional STEM Center

AIDB
Alabama Institute for Deaf and Blind
Deaf. Blind. Limitless.

# Activity - Money Scales

National Technical Institute for the Deaf
NTID Regional STEM Center

AIDB
Alabama Institute for Deaf and Blind
Deaf. Blind. Limitless.

# VEX Robotics

Students learn how to:

1. plan robots - design/planning skills
2. build robots - engineering skills
3. program robots - coding skills
4. teamwork - soft skills
5. troubleshoot - logical/problem solving skills

National Technical Institute for the Deaf
NTID Regional STEM Center

AIDB
Alabama Institute for Deaf and Blind
Deaf. Blind. Limitless.

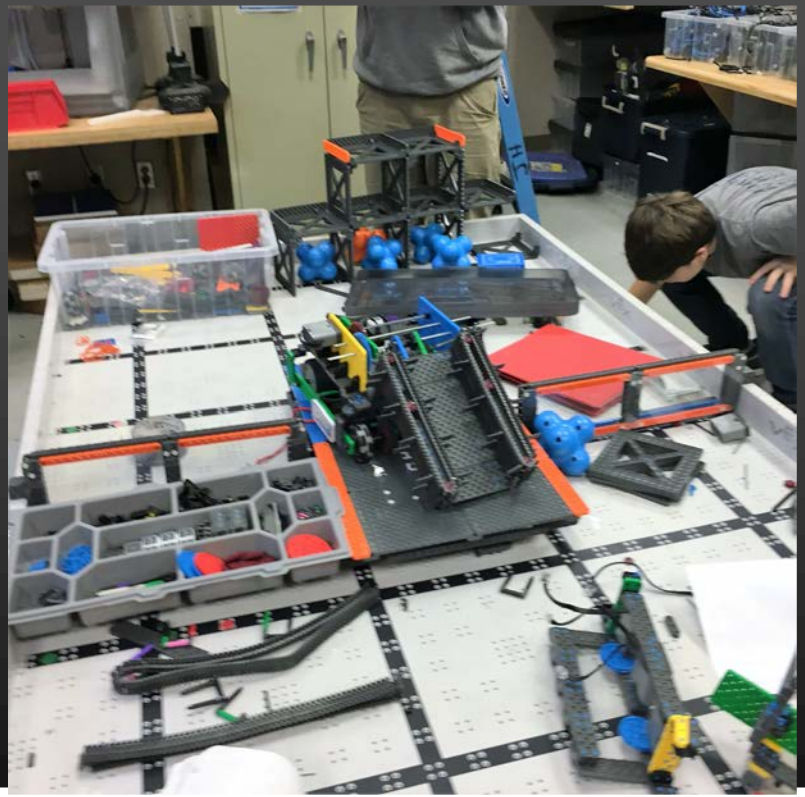
# VEX Robotics

Have competitions at regional, state, and world levels

We can get you started with a robotics team!

National Technical Institute for the Deaf
NTID Regional STEM Center

AIDB
Alabama Institute for Deaf and Blind
Deaf. Blind. Limitless.



National Technical Institute for the Deaf

# NTID Regional STEM Center

AIDB

Alabama Institute for Deaf and Blind

Deaf. Blind. Limitless.

National Technical Institute for the Deaf

# NTID Regional STEM Center

AIDB

Alabama Institute for Deaf and Blind

Deaf. Blind. Limitless.

# VEX Robotics

Curriculum - Project Lead the Way can be used

VEX does have their own curriculum to support their platforms

VEX IQ - 3rd - 8th grades
VEX VRC - 6th - 12th grades

# NRSC Online

Website - www.aidb.org/nrsc

Facebook - NTID Regional STEM Center

Twitter - @nrscenter

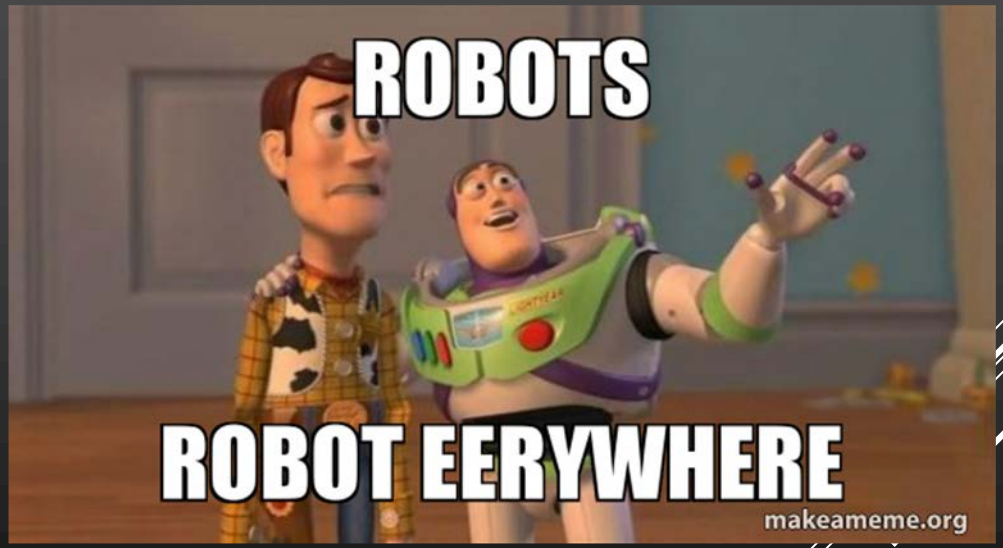
Instagram - @nrscenter

National Technical Institute for the Deaf
NTID Regional STEM Center

AIDB
Alabama Institute for Deaf and Blind
Deaf. Blind. Limitless.

# Thank you for attending!

Harry Wood
wood.harry@aidb.org
256-474-0243 (VP)
256-589-0494 (text)
(or grab my business card)




National Technical Institute for the Deaf
NTID Regional STEM Center

AIDB
Alabama Institute for Deaf and Blind
Deaf. Blind. Limitless.