WeDo STEM
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NIU Doctoral Candidate

Technology Integration Specialist for Naperville SD203

Professional Certifications:

● LEGO Education Academy Certified Trainer
● Apple Foundations Trainer
● Google Certified Educator Levels 1 & 2
● Carnegie Mellon Robotics Academy EV3 Instructor Certification (Gold)

Professional Passions:

● STEM and Robotics
● FIRST LEGO League Coach
● FIRST LEGO League Jr. Coach and LEGO Foundation Grant Recipient
● Innovative and Emerging Technologies

Personal Passions:

● Spending time with Family & Friends
● Travel
History of LEGO Education
Why Robotics in the Elementary School?

Definition of Robotics - the design and application of robots

- 1 of 6 important developments in educational technology
  - Time to Adoption - 2 to 3 years
- Global *robot population* is expected to double to *4,000,000 by 2020*
- Enable people to *simulate, observe* and *make sense of complex tasks*
- Promote *Critical* and *Computational Thinking* as well as *Problem-solving*
- Effective way to introduce and bolster *STEM learning*
- Governmental STEM Education strategies based on robotics activities

- *New Media Consortium Horizon Report: 2016 K-12 Edition*
What is LEGO WeDo 2.0?

LEGO WeDo 2.0 combines

- LEGO Bricks
- Coding Software
- NGSS Correlated Lessons
- Open Ended Investigations

STEM learning experiences!
<table>
<thead>
<tr>
<th>Guided Projects</th>
<th>Pulling</th>
<th>Speed</th>
<th>Robust Structures</th>
<th>Frogs Metamorphosis</th>
<th>Plants and Pollinators</th>
<th>Prevent Flooding</th>
<th>Drop and Rescue</th>
<th>Sort to Recycle</th>
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<td><strong>Life Sciences</strong></td>
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<td>3-5-ETS1-2</td>
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<td>K-2-ETS1-2</td>
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## WeDo 2.0 and the NGSS Standards

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<td><strong>Open Projects</strong></td>
<td>Predator and Prey</td>
<td>Animal Expression</td>
<td>Extreme Habitats</td>
<td>Space Exploration</td>
<td>Hazard Alarm</td>
<td>Cleaning the Ocean</td>
<td>Wildlife Crossing</td>
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<td>K-2-ETS1-2  K-2-ETS1-2</td>
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When Might You Use These Lessons

- **Formal Learning Experiences - Classrooms and MakerSpaces**
  - To address NGSS Standards
  - To address ISTE Standards
  - To provide problem solving opportunities
  - To provide SEL learning opportunities

- **Informal Learning Experiences**
  - STEM and Robotics Clubs
  - FIRST LEGO League Jr.
Science Lab Lobby

- Launch the Intro Video
- Launch New Programs
- Rename Programs
- Access the Teacher Guides and Resources
Getting Started with Milo the Robot

**Phenomenon:** How do scientists and engineers reach remote places?

Explore...Create...Share

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A. Milo the Science Rover  
B. Milo's Motion Sensor  
C. Milo's Tilt Sensor  
D. Collaborating

| Motion Coding | Distance Sensor Coding | Tilt Sensor Coding | Collaboration Problem Solving |
Robust Structures

4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
Prevent Flooding

2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

3-ESS2-1. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.
What is **Computational Thinking**?

A problem-solving process that includes...

- **Decompose**: Break down in small parts
- **Generalise**: Recognise patterns
- **Think algorithmically**: Solving a problem one step at a time
- **Evaluate**: Improve and debug
- **Abstract**: Conceptualise and explain ideas

- LEGO Education
What is *Computational Thinking*?

Dispositions or attitudes that are essential dimensions of Computational Thinking.

- **Confidence** in dealing with complexity
- **Persistence** in working with difficult problems
- **Tolerance** for ambiguity
- The ability to deal with *open-ended problems*
- The ability to *communicate and work with others* to achieve a common goal or solution
Moonbase

K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

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.

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.

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
Model and Program Library

Variety of builds based on function

Variety of programs based on programming components
Assessment
Science Notebook
Measuring student learning involves documentation:

- using various types of media.
- of every step.
- organized and complete.
### Self-Assessment Statements

<table>
<thead>
<tr>
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<th>Directions: Circle the brick that shows how well you did. The bigger brick, the better you did.</th>
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</thead>
<tbody>
<tr>
<td>I defined the question or problem.</td>
<td><img src="image" alt="Brick" /> <img src="image" alt="Brick" /> <img src="image" alt="Brick" /> <img src="image" alt="Brick" /></td>
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<tr>
<td>I built a LEGO Model and programmed a solution.</td>
<td><img src="image" alt="Brick" /> <img src="image" alt="Brick" /> <img src="image" alt="Brick" /> <img src="image" alt="Brick" /></td>
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<tr>
<td>I tested my solution and made improvements.</td>
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<tr>
<td>I documented and shared my ideas.</td>
<td><img src="image" alt="Brick" /> <img src="image" alt="Brick" /> <img src="image" alt="Brick" /> <img src="image" alt="Brick" /></td>
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I positively collaborated with my partner by

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Teacher-Led Assessment

Observation Checklists

- Emerging
- Developing
- Proficient
- Accomplished

### Assessing Computational Thinking Skills

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<td>Describe the problem in your own words.</td>
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<tr>
<td>The student is unable to describe the problem in their own words.</td>
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<td>Describe how you will know whether or not you have found a successful</td>
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<td>solution to the problem.</td>
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<td>The student is unable to describe success criteria.</td>
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<td>Describe how you can break the problem down into smaller parts.</td>
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<td>The student is unable to break down the problem.</td>
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<td>With prompting, the student is able to break down the problem into smaller</td>
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<td>parts.</td>
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<tr>
<td>The student is able to break down the problem into smaller parts.</td>
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<td>The student is able to describe the links between each of the parts.</td>
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Name: [__] Class: [__]
Assessing Computational Thinking Skills

Observed Performance

- **DECOMPOSITION** - Describe the problem in your own words.
- **GENERALIZATIONS** - Describe the program you have used.
- **ALGORITHMIC THINKING** - Describe the list of actions to program.
- **EVALUATION** - Describe the ways you have tried to solve the problem.
- **ABSTRACTION** - Describe the most important parts of your solution.
References


LEGO Education WeDo 2.0 Software. Retrieved from https://education.lego.com/en-us/elementary/explore/stem


Computational Thinking for All. Retrieved from https://www.iste.org/explore/articleDetail?articleid=152