"Botley, You Need to Listen!" Exploring Young Children's Interactions With Robots While Learning To Code

Selendra Lewis  
*Utah State University*, selendralewis3@gmail.com

Rebecca Peterson  
*Utah State University*, rebecca.peterson@usu.edu

Kathleen Bullock  
*Utah State University*, kbullock1999@gmail.com

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“Botley, you need to listen!”
Exploring Young Children’s Interactions with Robots while Learning to Code

Selendra Lewis, Rebecca Peterson, & Kathleen Bullock

Mentors: Drs. Jody Clarke-Midura, Jessica F. Shumway, & Deborah Silvis

Fall Student Research Symposium, Dec 10, 2020
Introduction
Context: The surge of research about child-robot interactions as robots are being used in classrooms and homes in increasing numbers

Problem: Knowledge gap for children/robot interactions

Purpose: Understand the ways students interact with and respond to the robots
Coding Toy Robots

Cubetto by Primo Toys

Botley by Learning Resources
Survey based

Capabilities (Saylor et al., 2010)

Machine-like nature (van Straten et al., 2020)

Inconsistent reasoning (van Duren & Scaife, 1996)

Physical appearance (Jipson & Gelman, 2007)
Methodology
Research Question:

In what ways do students interact with and respond to the robots?
Participants and Data Sets

- 32 Kindergarten Students
- 2 Public Elementary Schools
- 6 small group computer science lessons using robots

Case Study #1: Luke
Case Study #2: Lauren
### Data Sources and Analysis

**Video Data for All Students**
- 1,440 minutes of video
- Content Logging
  - 6 30-minute lessons per group, 48 total
  - Open Coding
  - Code Transcriptions
    - 743 Interactions
  - Frequency Table
    - Robot Capabilities, Robot Talk/Sounds, & Robot Care
  - Code Summaries

**Video Data for 2 Case Students**
- Identify Case Studies
- Narrative Summaries
Results and Conclusion
<table>
<thead>
<tr>
<th></th>
<th>School 1</th>
<th>School 2</th>
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</thead>
<tbody>
<tr>
<td><strong>Robot Capabilities</strong></td>
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<td></td>
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<tr>
<td>Robot Capabilities</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Personifications</td>
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<td>5</td>
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<td>Anthropomorphizing</td>
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<td>Addressing the Robot</td>
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<td>19</td>
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<tr>
<td>Interpreting Robot Sounds</td>
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<tr>
<td><strong>Robot Care</strong></td>
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<td>Robot Care</td>
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<td>17</td>
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<tr>
<td>Concern for Robots</td>
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<td>3</td>
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<tr>
<td>Robot Maintenance</td>
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<td>10</td>
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<tr>
<td>Encourages</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Compliments</td>
<td>3</td>
<td>8</td>
</tr>
</tbody>
</table>
### Robot Capabilities

- **Luke**
  - "They move whatever you tell them to move."
  - "She's not listening!"

- **Lauren**
  - Robots have wants and feelings
  - "Botley, you have to listen!"
**Robot Talk/Sounds**

<table>
<thead>
<tr>
<th>Luke</th>
<th>Lauren</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Do you want to go to the cheese factory?&quot;</td>
<td>Directly addresses robot multiple times</td>
</tr>
<tr>
<td>Gets on robot's &quot;visual&quot; level</td>
<td>Gets on robot's &quot;visual&quot; level</td>
</tr>
<tr>
<td>Describes what the robot is doing without noises</td>
<td>Uses noises to describe what the robot is doing</td>
</tr>
</tbody>
</table>
Robot Care

- Luke
  - Mechanic
  - Biological needs
  - Asking robots' opinions

- Lauren
  - Cheerleader
  - Social needs
  - Policing others
Conclusions
In what ways do students interact with and respond to the robots?
Implications and Future Research

Patterns of understanding
Contributions of teachers
Pedagogy and curriculum
Other work by the Coding in Kindergarten (CiK) research team, funded by the National Science Foundation grant #1842116


Further questions can be directed to selendra.lewis@usu.edu


Definition

“The conceptual foundation required to solve problems effectively and efficiently (i.e., algorithmically, with or without the assistance of computers) with solutions that are reusable in different contexts” (Shute, Sun, & Asbell-Clarke, 2017).
Definition:

The “mental activity involved in the abstraction and generalization of mathematical ideas” (Wood, Williams & McNeal, 2006), and our study includes the processes of numerical reasoning, spatial reasoning, and problem solving as students construct mathematical understandings individually and with peers.