Welcome! Please introduce yourself in the chat:
Name, Role, Institution/Organization

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Introductions

Erin Walker

Cassandra Kelley
Waterfall Activity:
What comes to mind when you think about robots in the classroom?
Robots as companions
How do we design robotic companions to foster student learning?

Social Behaviors

Collaborative Scenarios

Programmable Features
How do we design robotic companions to foster student learning?

Social Behaviors

Collaborative Scenarios

Programmable Features

Team: Dr. Nichola Lubold, Dr. Amy Ogan, Dr. Heather Pon-Barry
Can we leverage the benefits of learning by teaching?
Meet Nico

Nico says...

Sadly, I'm not waterproof. But I want to go swimming with my friends. Will you help me figure out how much waterproof paint I need to cover my legs and torso based on the size of my feet?

<table>
<thead>
<tr>
<th>Step</th>
<th>Body Part</th>
<th>Surface Area (sq inches)</th>
<th>Volume of Paint (Fluid oz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 0</td>
<td>Feet</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Step 3</td>
<td>Legs</td>
<td>12</td>
<td>332</td>
</tr>
<tr>
<td>Step 2</td>
<td>Torso</td>
<td>399</td>
<td>6</td>
</tr>
</tbody>
</table>

Nico introduces first problem
Social Behaviors Design

Social Dialogue

Yuliana  Because we know that 2.5 can go into 10 four times

Nico  Oh, I get it! Thank you for explaining, Yuliana. You’re a great tutor. So, then we have 1 over 4?

Pitch Entrainment

Pitch 1

Pitch 2

Topic 1  Topic 2  Topic 3
Study

69 middle school students taught Nico in 1 hour sessions across three conditions: non-social, social, and entraining+social.

Students in the entraining+social condition learned the most.

Some evidence that the more social the condition, the more rapport students experienced.
How do we design robotic companions to foster student learning?

Team: Tristan Maidment, Yuya Asano, Nhat Tran, Jay Patel, Dr. Nikki Lobczowski, Dr. Adriana Kovashka, Dr. Tim Nokes-Malach, Dr. Diane Litman
What if two students work together to teach the robot?  

Chi & Wylie, 2014; Miller & Nourbakhsh, 2016; Lubold, 2018
14 undergraduate dyads taught Emma ratio problems over Zoom in 90 minute
sessions.

Currently exploring how group dynamics might predict outcomes of interest.

For example, the more similar students’ prior knowledge, the more they perceive
rapport with Emma and with each other.

Some groups had one student dominating the interactions, or had students simply
alternating between steps without interacting with each other.
SA: You take that number and multiply at by 3, because 15 times 3 is 45
Emma: So, is this a multiplication problem? Student B, so, what do we do?
SA (to SB): We take the total cost and multiply it by 3.
SB: We take the total cost and multiply it by 3.
Emma: We can just multiply $32.25 by 3? How do you know we can do that?
SA (to SB): Because we know that 15 times 3 is 45, so we can do the same thing to the other side.
SB: Because we know that 15 times 3 is 45, so we have to do that to the other side.
Emma: If we have three times as many hot dogs, it will cost three times as much.
SA (to SB): Yes.
SB: Yes, correct.
Emma: So then 3 times 32.25 is $96.75. Student B, is that how much it will cost?
SB: Yes, correct, that is the total cost.

What if Emma could learn how to improve group dynamics?

By referencing a particular student, Emma involves that student in the interaction.
How do we design robotic companions to foster student learning?

Team: Yinmiao Li, Jennifer Nwogu, Amanda Buddemeyer, Jaemarie Solyst, Dr. Angela Stewart, Dr. Tara Nkrumah, Dr. Amy Ogan, Dr. Kimberly Scott
Culturally-Responsive Computing

Can’t learn about technology without thinking about who designs it and who benefits.

Goal: technosocial change agency

Learners switch between reflections on power & identity, community-building activities, & meaningful tech-related tasks.

Scott, Sheridan, & Clark, 2015; Scott & Garcia, 2016
What are the benefits of making a social robot programmable?

In this example, the robot and the student might work together to **co-create** a robot’s dialogue behaviors.
Co-Design: What does it mean to be a co-creator?

15 middle school girls participated in 5 participatory design sessions.

I was thinking the robot would be a bit sassy, so I chose the eyes that looked annoyed.

[allowing robots to decide their] clothes, how they act, preference for name, gender, who they make friends with is a way to express itself.

Overall, participants gave robots a limited amount of agency as long as they remained in control over the robots’ tasks and functionality.
How do we design robotic companions to foster student learning?

- Social Behaviors
- Collaborative Scenarios
- Programmable Features
Ethics of robotic learning companions

Transparent behavior

Yields agency

Promotes AI literacy

https://circls.org/ai-and-education-policy
Sharing Research as Curriculum

The Concepts and Practices of the K–12 Computer Science Framework

**Core Concepts**

1. Computing Systems
2. Networks and the Internet
3. Data and Analysis
4. Algorithms and Programming
5. Impacts of Computing

**Core Practices**

1. Fostering an Inclusive Computing Culture
2. Collaborating Around Computing
3. Recognizing and Defining Computational Problems
4. Developing and Using Abstractions
5. Creating Computational Artifacts
6. Testing and Refining Computational Artifacts
7. Communicating About Computing

K-12 Computer Science Framework. Credit: K–12 CS
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Five big ideas in AI. Credit: AI4K12 Initiative.
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Example Learning Outcomes:

- **Understand and explain key terminology** associated with the field of AI, including describing what natural language processing is and how it works.

- Solve a math problem step-by-step and through the process, **develop a natural language dialogue script using keywords and conditional statements** (e.g. if/then format).

- **Add social elements** (e.g. gaze, gesture, movement, pitch, positive words or praise, etc.) to the natural language dialogue and **run a sentiment analysis** to determine the emotional state of the virtual agent. Discuss how the virtual agent’s sentiment might make others who interact with it feel.

- **Test the natural language dialogue script developed using an AI simulation** to evaluate if it seems human-like.

- Explore other students’ natural language dialogue scripts to provide peer feedback and evaluate strengths/weaknesses.

- Reflect on “aha moments” from this process and brainstorm ideas for how artificial intelligence might help students with learning. Share ideas and **participate in a culminating discussion about the impact AI can have in education and society overall.**
Questions?

We can use robotic learning companions to support learning via social behaviors, collaborative scenarios, and adding programmable features.

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Discussion

What is your experience with robots or teaching robotics curriculum?

How might robots be helpful in your school/classroom in the future?

What are your current needs from robotics-related curriculum?

What do you wish researchers and developers knew when developing these technologies and curricula?
Reflection:
What insights or questions do you have?

Social Robotics

What are your thoughts and insights about today's discussion on social robotics in education?

What questions do you still have?

Share your thoughts
Summer Discussion Series

Upcoming Sessions

July 18th: Overview of Emerging Technologies and AI in Education
July 20th: Assessment, Identity and Agency
July 25th: Collaborative Learning and Community Building
July 27th: Equitable and Ethical Practices and Interactions
August 2nd: Social Robotics
August 15th: Learning and Productivity

Everyone is welcome! You do NOT need to apply for or attend the convening to participate!
August 3rd, 1-2PM ET: Drop in to ask about the CIRCLS ‘23 Convening and learn how to apply.
Thank you

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