



Artificial Intelligence Unplugged: Designing Unplugged Activities for a Conversational AI Summer Camp

Yukyeong Song, **Xiaoyi Tian**, Nandika Regatti, Gloria Ashiya
Katuka, Kristy Elizabeth Boyer, Maya Israel

Experience Report
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Outline

- Background and related work
- Context and iterative design process
- Five novel unplugged activities
- Lessons learned from design and implementation

Conversational AI Education

- **Conversational AI is ubiquitous in everyday life**
- **Teaching young students about conversational AI**
- **Benefits of learning about conversational AI**
 - Improved self-efficacy and persistence (Katuka et al., 2023)
 - Higher motivation in sharing (Song et al., 2023)
 - Better understanding of general AI (Van Brummelen et al., 2021)



Challenges in teaching conversational AI

- Main concepts are highly abstract and complex for young learners to understand
 - Intents, training phrases, and responses
- Learners may have limited access to the internet and digital devices

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We need to make conversational AI learning more accessible and engaging for all learners

Unplugged activities

Low-cost solution to teach complex CS concepts without using computers

- Fun and engaging (Bell and Vahrenhold, 2018)
- Provide breaks from screen time
- Encourage learners to move around and engage whole bodies

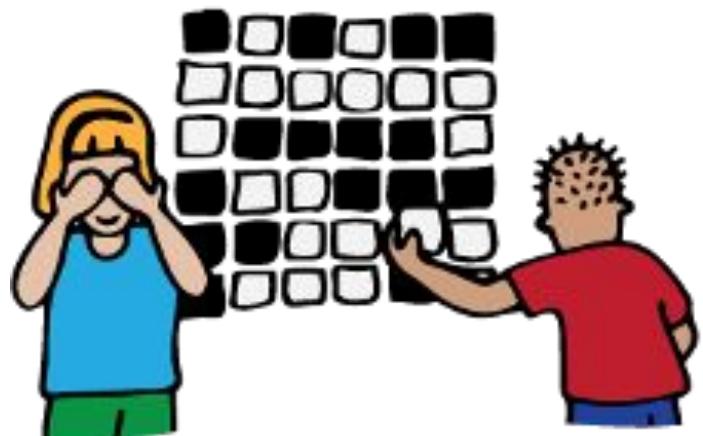


image source: csunplugged.org

Existing CS Unplugged activities



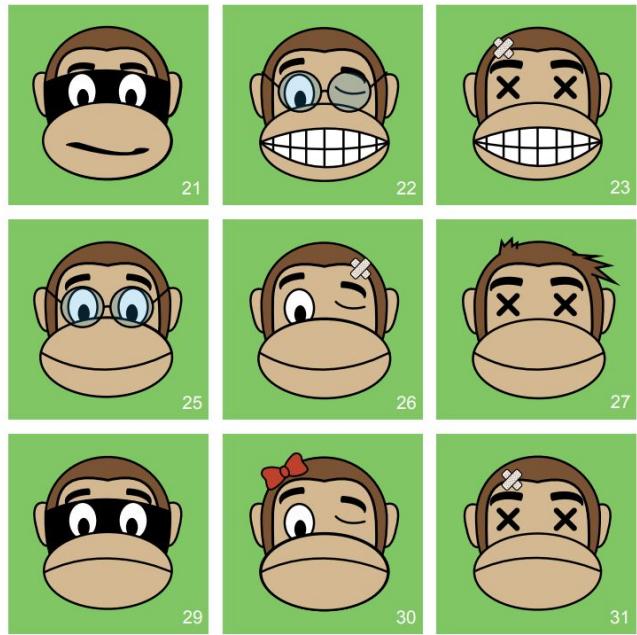
www.csunplugged.org



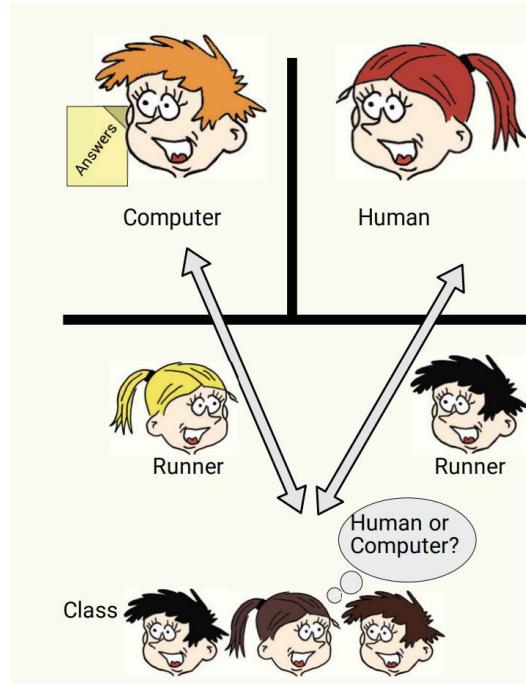
CS unplugged design patterns
(Nishida et al., 2007)

- 1) No computers
- 2) Games or challenges
- 3) Kinaesthetic
- 4) Student directed
- 5) Easy implementation
- 6) Growing body of ideas
- 7) Sense of stories

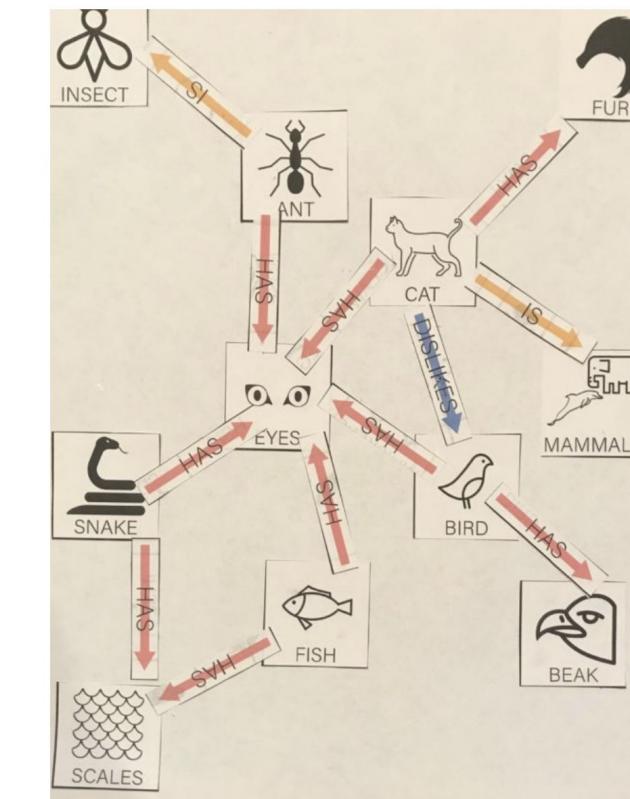
Existing AI Unplugged activities



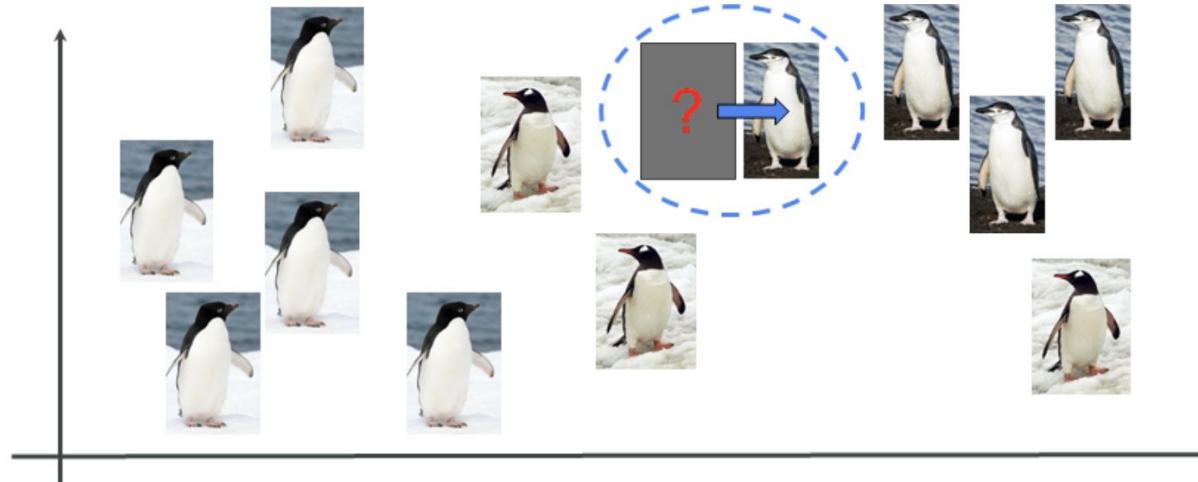
Monkey Classification
with Decision Trees
(Seegerer & Lindner)



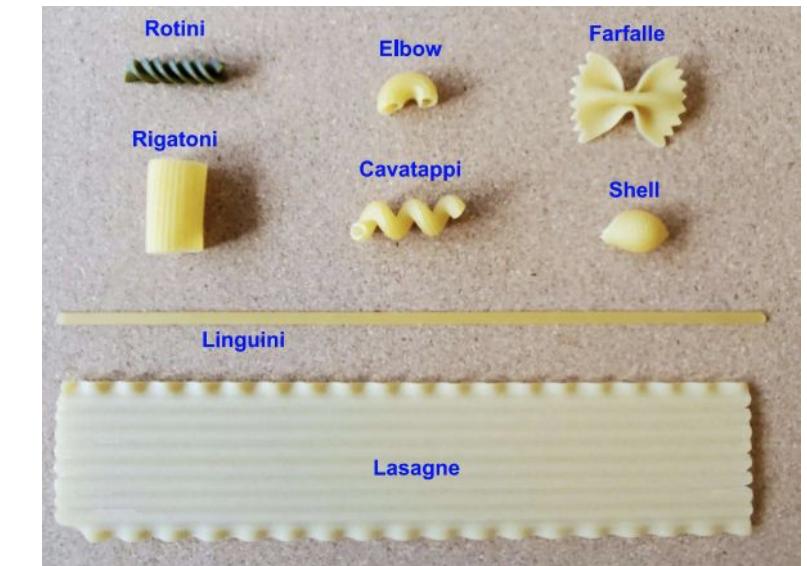
Turing Test
(Seegerer & Lindner)



Semantic Network
(Long et al. 2021)



Penguins-k-Nearest Neighbor (Ma et al., 2023)



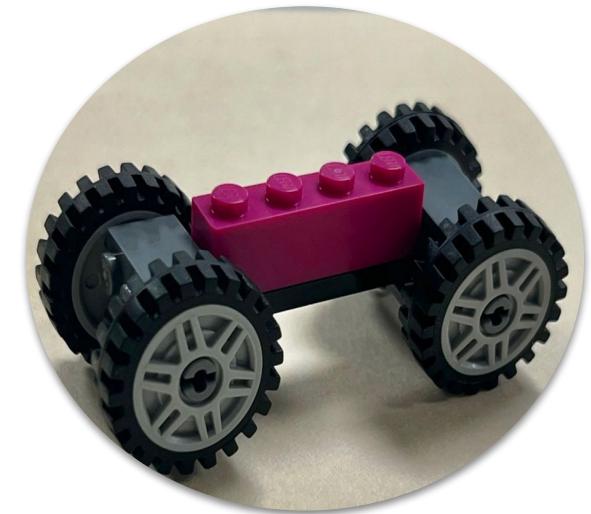
Pasta Land-Decision Tree
(Ma et al., 2023)

Context: Middle School AI Summer Camp

- **Two-week middle school AI summer camps over two years** (Katuka et al., 2023)
 - Camp Curriculum: general CS and AI lessons, conversational AI (AMBY) lessons, unplugged activities, chatbot project development (Song et al., 2023)
- **Iterative design approach to design the unplugged activities**
- **50 middle school learners and 13 camp facilitators**
- **Reactions and feedback channels:**
 - Learners: post-activity reflection notes, focus group interviews
 - Camp facilitators: daily reflections, post-camp interviews
 - Researchers: observation notes

Our Designed Unplugged Activities

CS Unplugged Activities



Lego Algorithm

Conversational AI Unplugged Activities



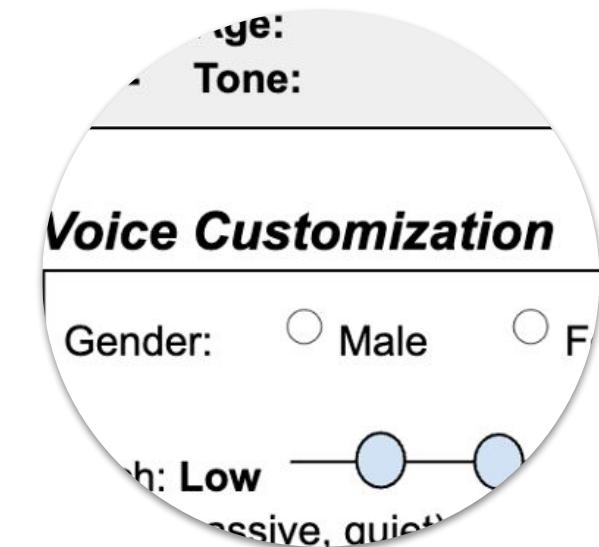
User, Developer,
Agent card game



Yoga from Scratch



Mission Agent
Training



Chatbot Personality

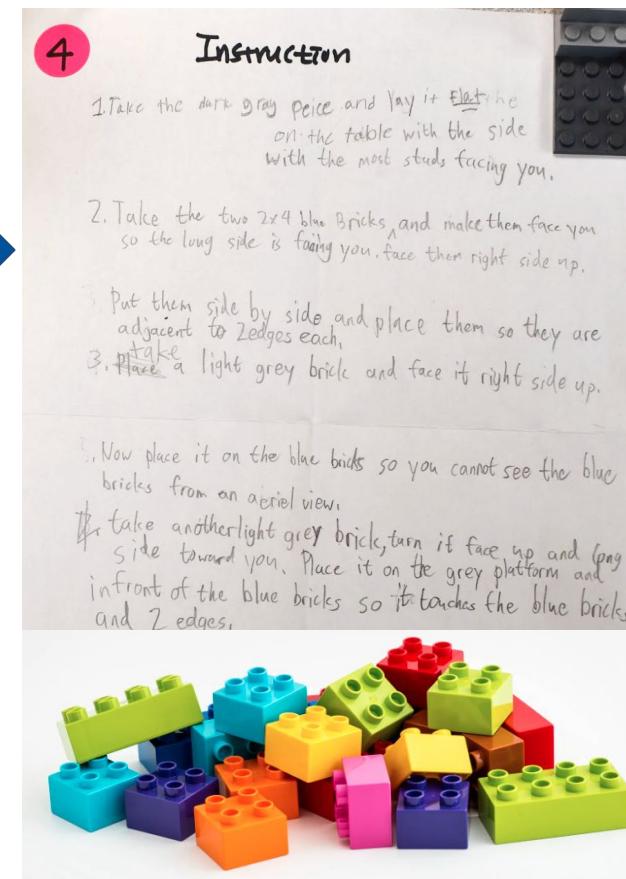
1. Lego Algorithm

Learning objective: I can demonstrate the process of computer task execution and describe the differences between a human, a computer, and AI.

Related camp lesson: Intro to CS/AI



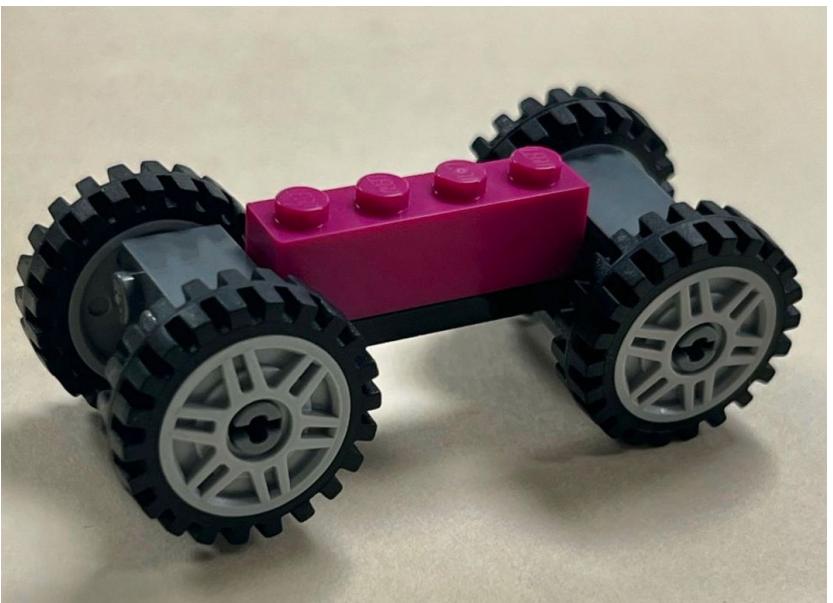
Groups write instructions on how to build the given lego figure



Another group follow the instructions to build the figure

1. Lego Algorithm

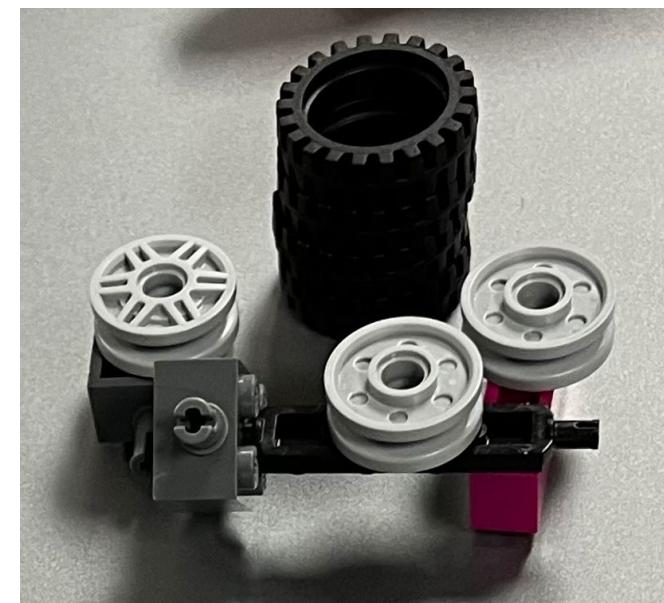
Original Figure



Given Instruction:

"Put the rim on the wheel * 4"

Resulting figure



Learner reflections:

"You have to be very specific with a computer because they can't make assumptions like us"

"I learned how important specifics are in computer coding, also how AI makes it easier."

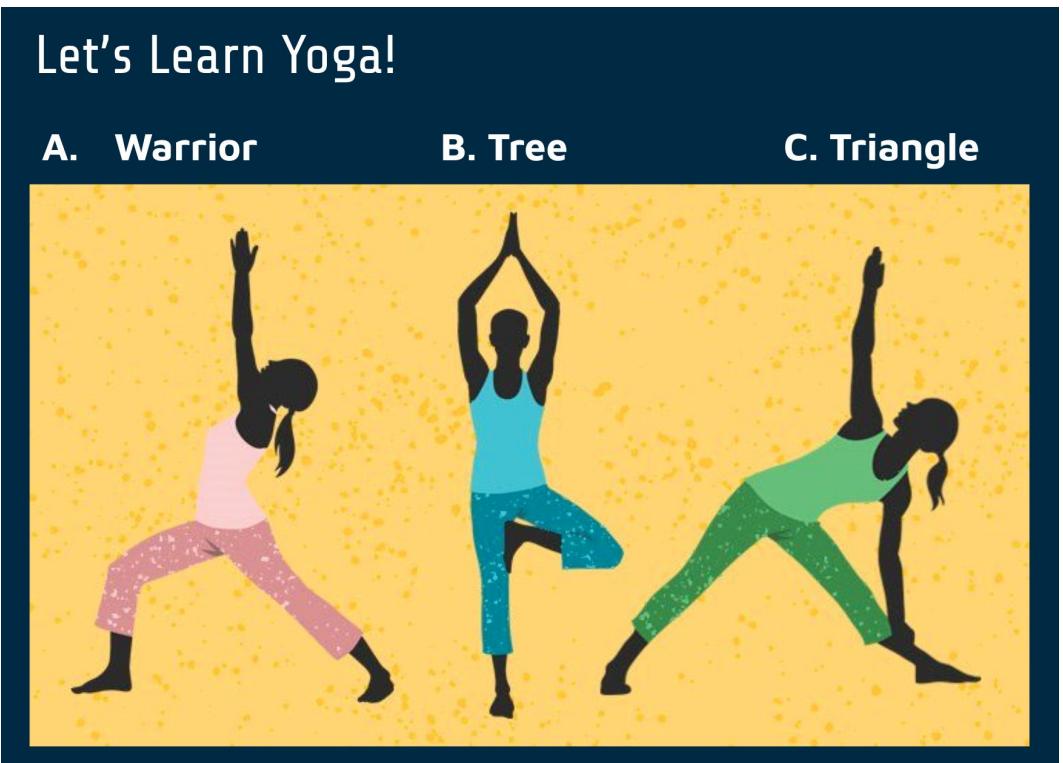
2. Yoga from Scratch

Learning objective: I can explain the purpose and usage of loops and conditionals in a block coding language and use my body to follow the coded program.

Related camp lesson: (in a broad sense) Intro to CS/AI



2. Yoga from Scratch



1. Instruct Yoga poses
2. Introduce Scratch blocks

3. Student groups write yoga programs using the given blocks

2. Yoga from Scratch



4. Collect the Yoga programs and put them on the white board

5. All students follow the block code written by each group

2. Yoga from Scratch

Mixed learner reactions:



"I learned a lot more about blocks and what they do"

"I liked when we did the poses from the other teams, following their instructions"



"I learned that I already know how to use Scratch."

"I didn't learn anything"

Facilitator reflection:

"I think the kids that said 'that didn't teach me anything' are the **ones that have block-coded before and done things more complex**. So they didn't really learn anything different. And we also **never really talked about things like these, 'if then else' statements in our camp**, that's a statement you use in regular programming. So I think **making that connection** maybe would **foster their interest** a little bit more in the yoga activity."

Our Designed Unplugged Activities

CS Unplugged
Activities



Conversational
AI Unplugged
Activities



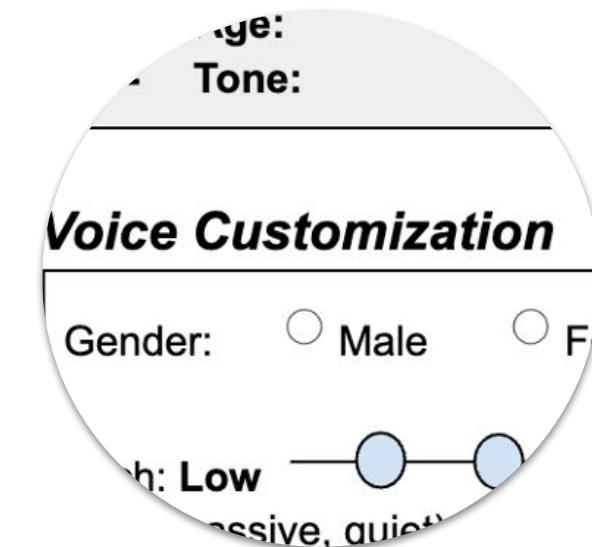
User, Developer,
Agent card game



Yoga from Scratch



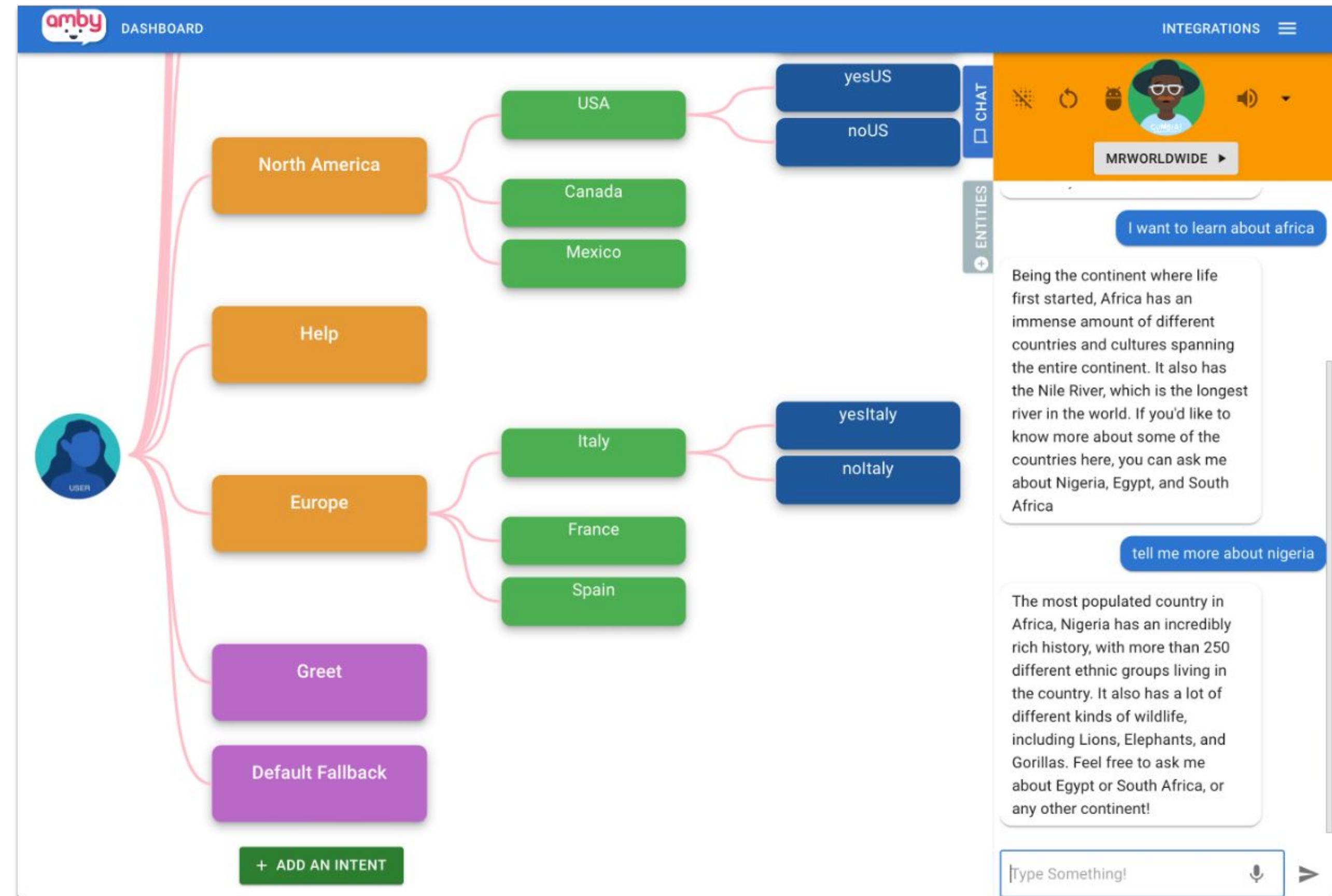
Mission Agent
Training



Chatbot Personality

AMBY Interface

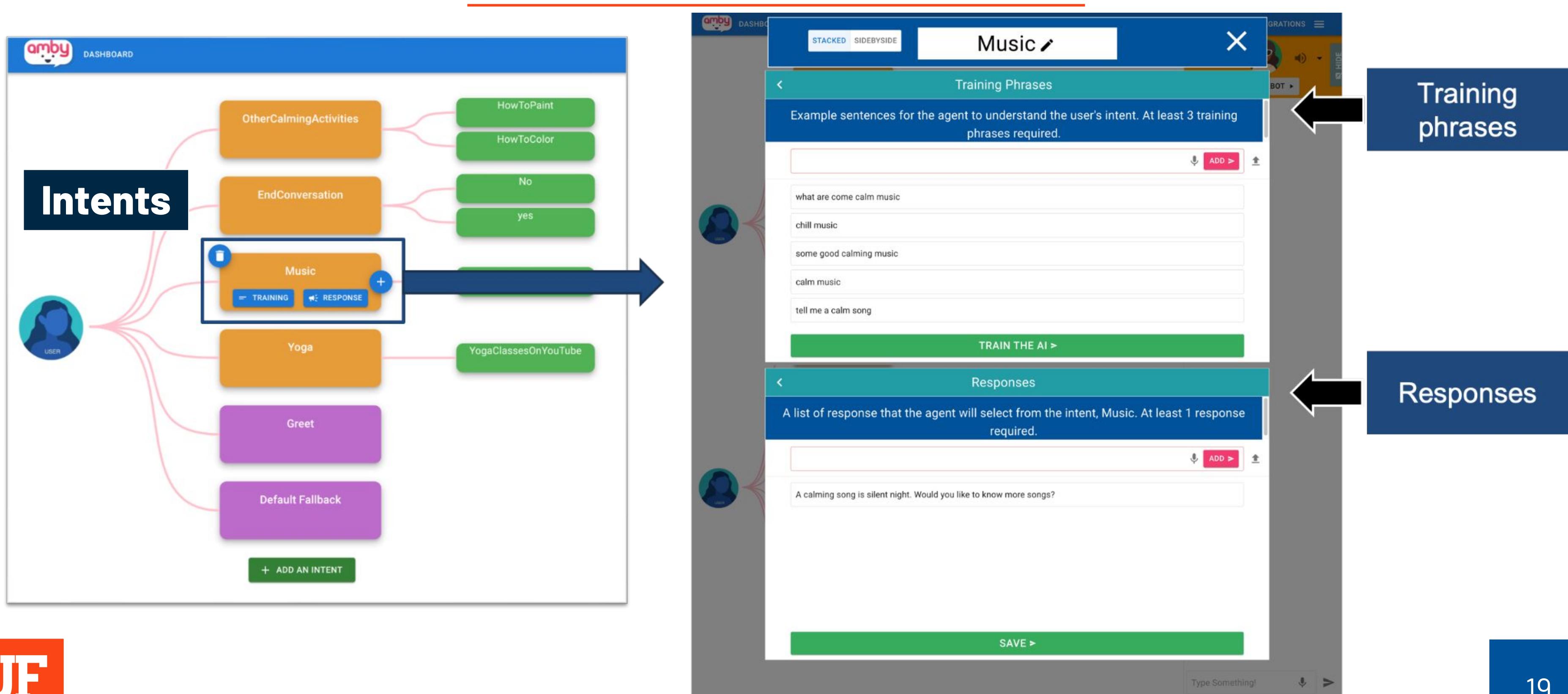
Developer



User

Agent

AMBY Interface



3. User, Developer, Agent Card Game

Learning objective: I can identify and explain the “user”, “agent,” and “developer” roles in the design and development of chatbots.

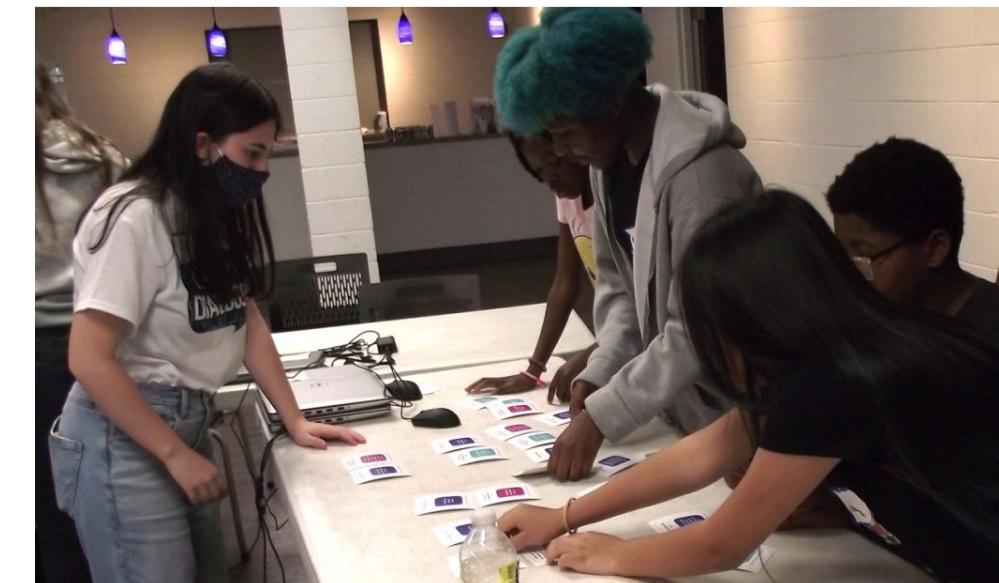
AI Big Ideas #2. Representation and Reasoning

Related camp lesson: Intro to Chatbots, Chatbot

Development

Facilitator Reflections:

“I think the kids were very engaged. They really seemed to respond well with the competitiveness.”



4. Mission Agent Training

Learning objective: I can describe how the conversation between an agent and user develops depending on training phases.

AI Big Ideas #3. Learning

Related camp lesson: Intro to Chatbots, Intro to Data and Machine Learning, Intro to Intents, Intro to Special Intents



4. Mission Agent Training

(1) Round 1: Agent knows NOTHING.

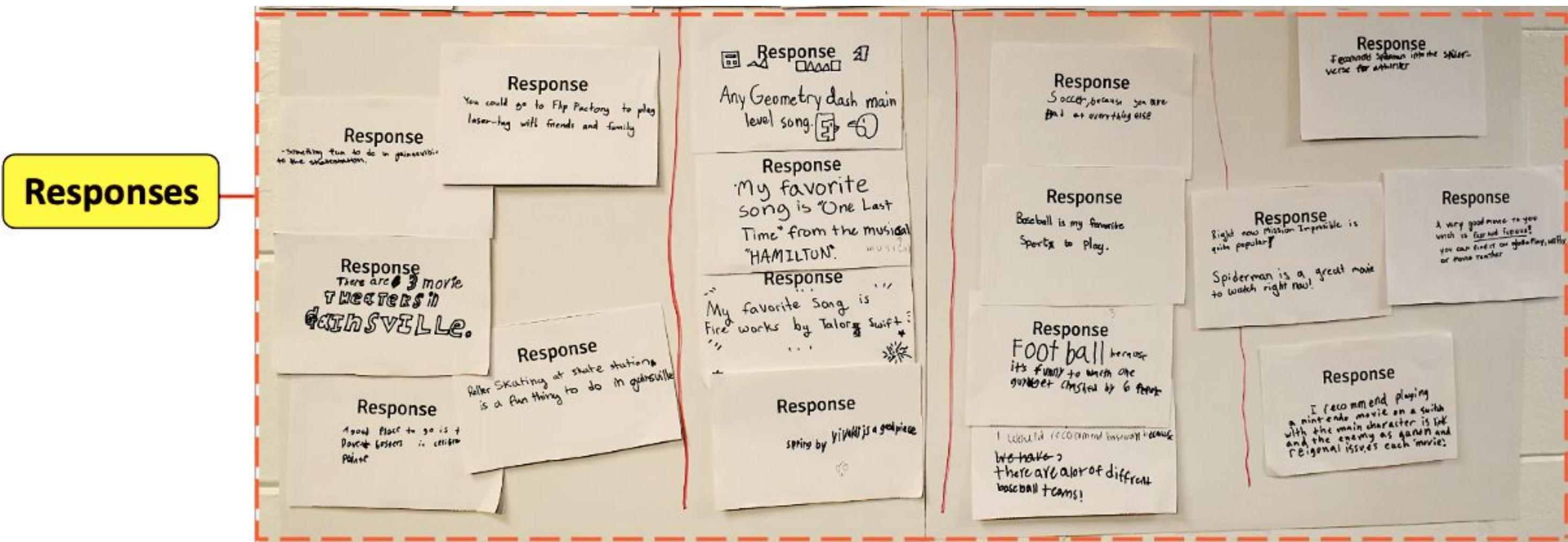
The diagram illustrates a user question selection process and a training interaction. On the left, a yellow box labeled "User Questions" contains a red arrow pointing to a row of nine boxes, each representing a different question. The questions are:

- DQ 1. What can I do for fun in Gainesville?
- DQ 2. Are there any cool things to do in Gainesville?
- DQ 3. What are some of your favorite songs?
- DQ 8. Tell me about songs you like to listen to!
- 4. What are your favorite sports to play?
- DQ 6. Can you recommend any sports to play?
- DQ 5. Tell me some movies that are popular right now!
- DQ 7. What movies do you recommend in theaters?
- DQ 9. What is your favorite animal?

Below this, a photograph shows two people in a room. One person, labeled "Agent", is holding a white card with a face on it and a book. The other person, labeled "User", is facing them. A blue speech bubble from the User contains the text: "Sorry, I can't answer that. Please try again!". Another blue speech bubble from the Agent contains the text: "Can you recommend a sports to play?".

4. Mission Agent Training

- (1) Round 1: Agent knows NOTHING.
 - (2) Between rounds: Agent needs HELP.



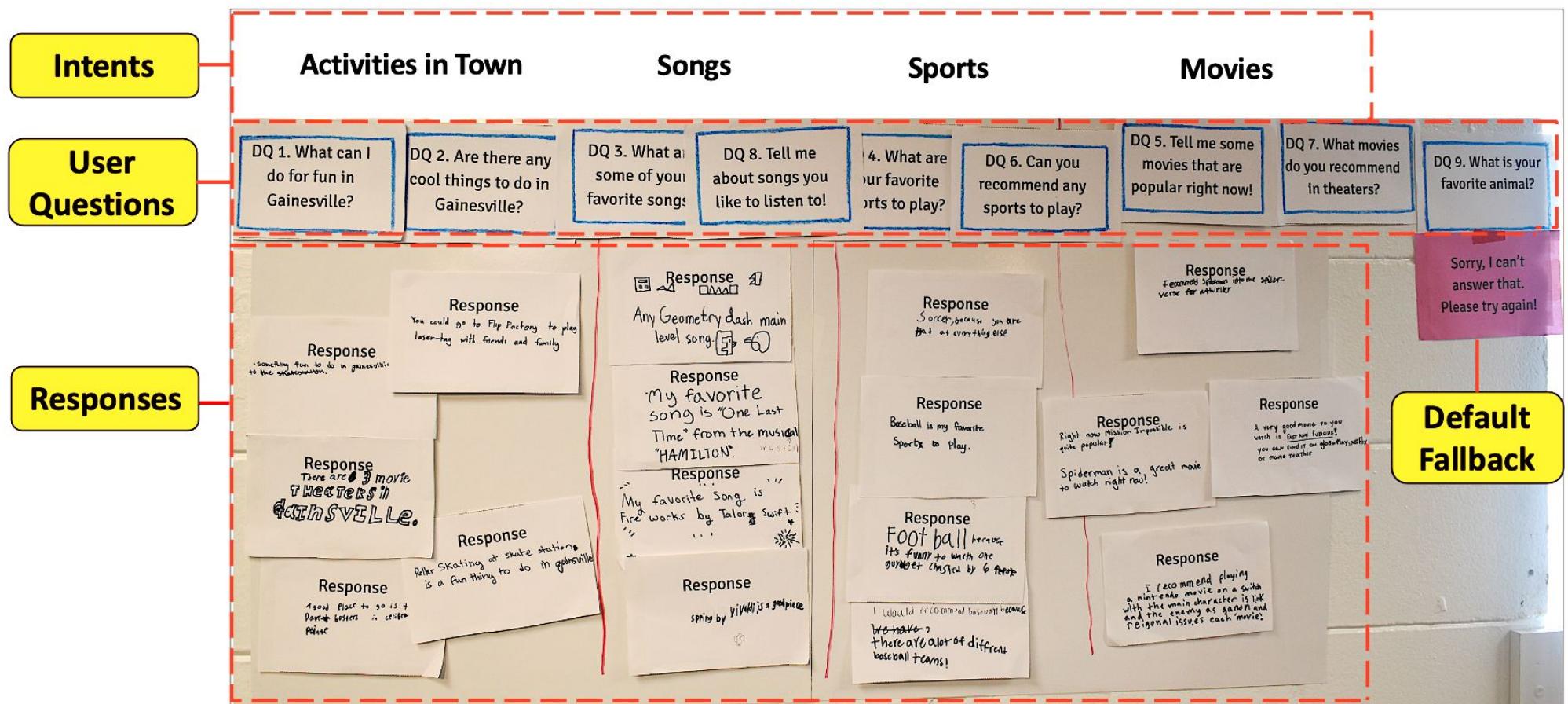
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Learner Reflections:

"I learned that you need intents to categorize the responses for the agent to respond with a good answer."

"I learned that if you put 2 words that can go for 2 categories, the agent might put it in the wrong category."



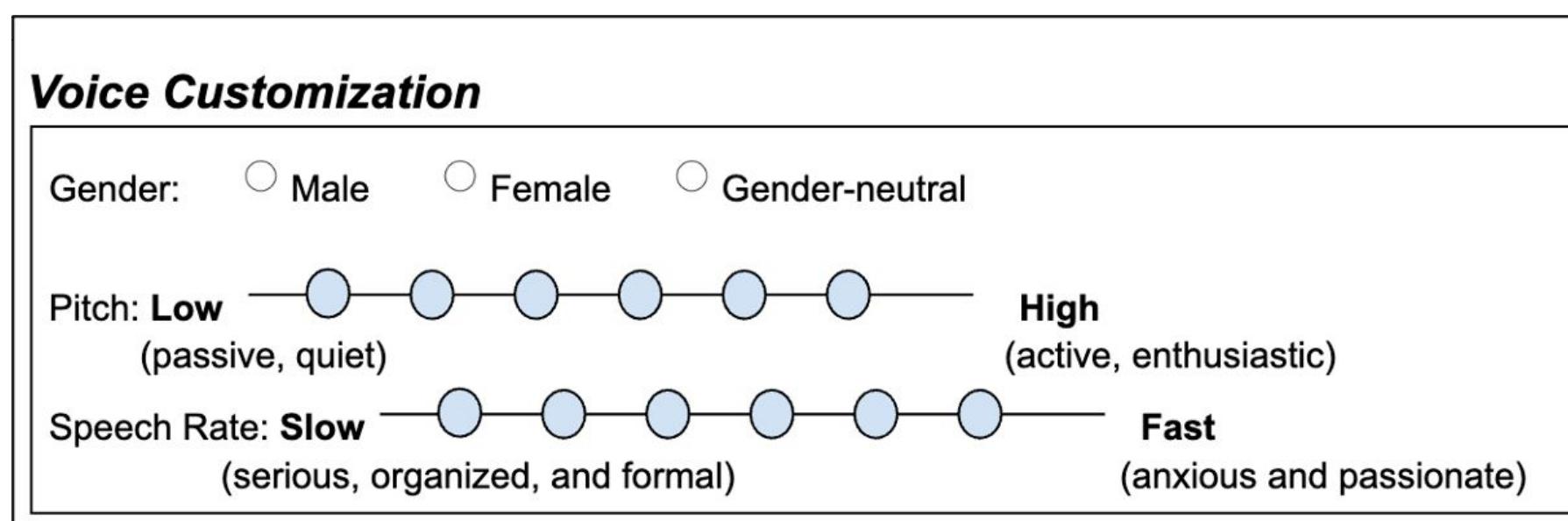
5. Chatbot Personality

Design a chatbot personality through voice traits and language use, act out this personality, then receive peer feedback.

Learning objective I can explain how different voice traits can influence the personality of a voice-based chatbot and infuse proper personalities into my chatbot.

AI Big Ideas #4. Natural Interaction

Related camp lessons Chatbot Personality Design, Chatbot Development



Lessons Learned

- 1. The “CS Unplugged” design patterns apply to AI unplugged activities**
- 2. Unplugged activities should be closely tied to lessons**
- 3. Provide multiple means of action and expression for diverse learners**
- 4. Offer diverse kinaesthetic opportunities**
- 5. Be adaptive and flexible**

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Conclusion

- We present five novel CS and AI unplugged activities in detail
- We describe the iterative design process and the feedback of middle school learners and undergraduate camp facilitators
- We share lessons learned from two years of camp experience
- Future work: scale up the implementation of activities, introduce quantitative evaluations (e.g., surveys) in addition to qualitative data (e.g., reflection notes)



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Thank you

Presented by: Xiaoyi Tian (tianx@ufl.edu)

Authors



Yukyeong Song



Xiaoyi Tian



Nandika Regatti



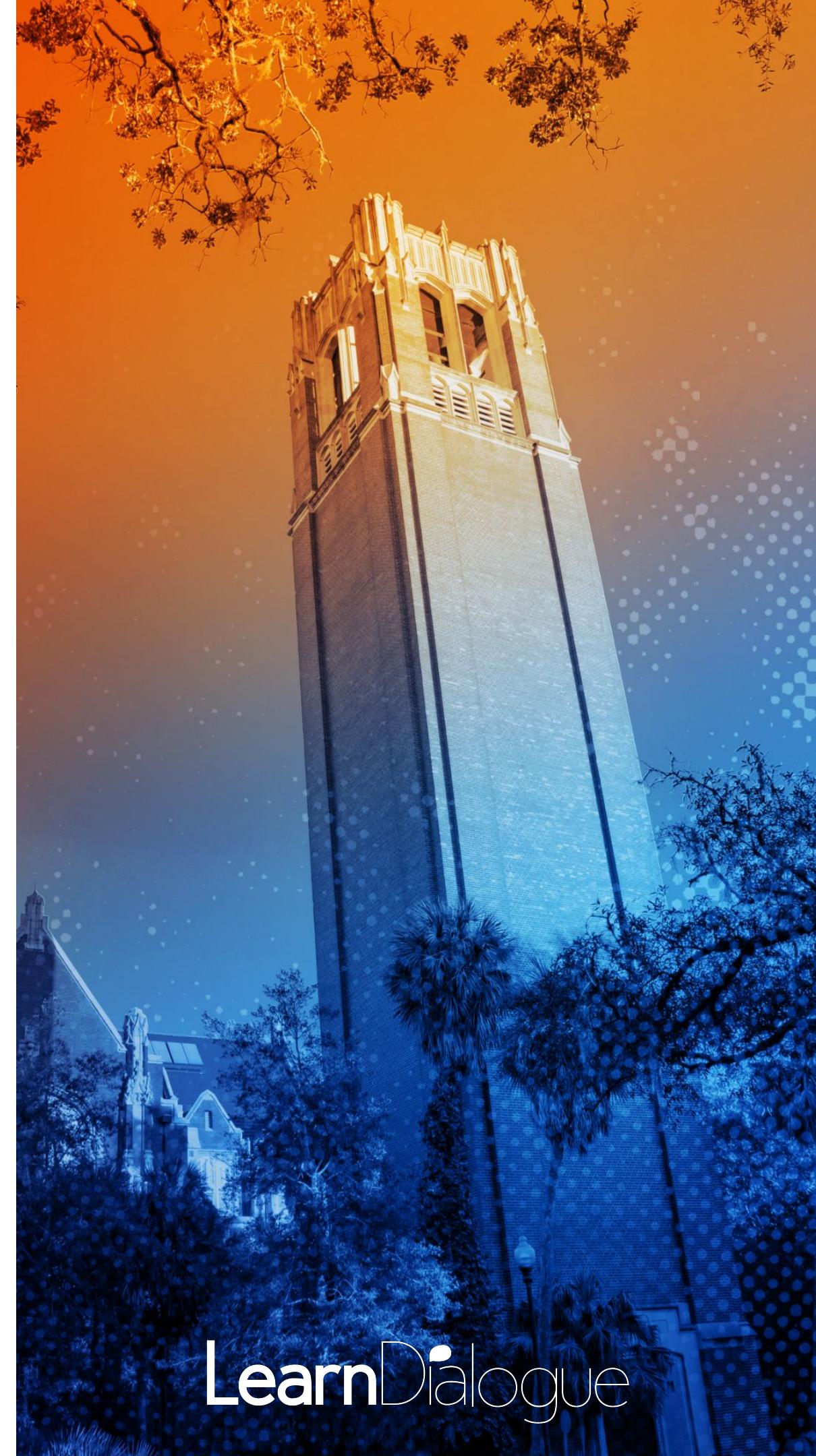
Gloria Katuka



Kristy Boyer



Maya Israel



LearnDialogue