

# Co-designing a Social Robot for Newcomer Children's Cultural and Language Learning

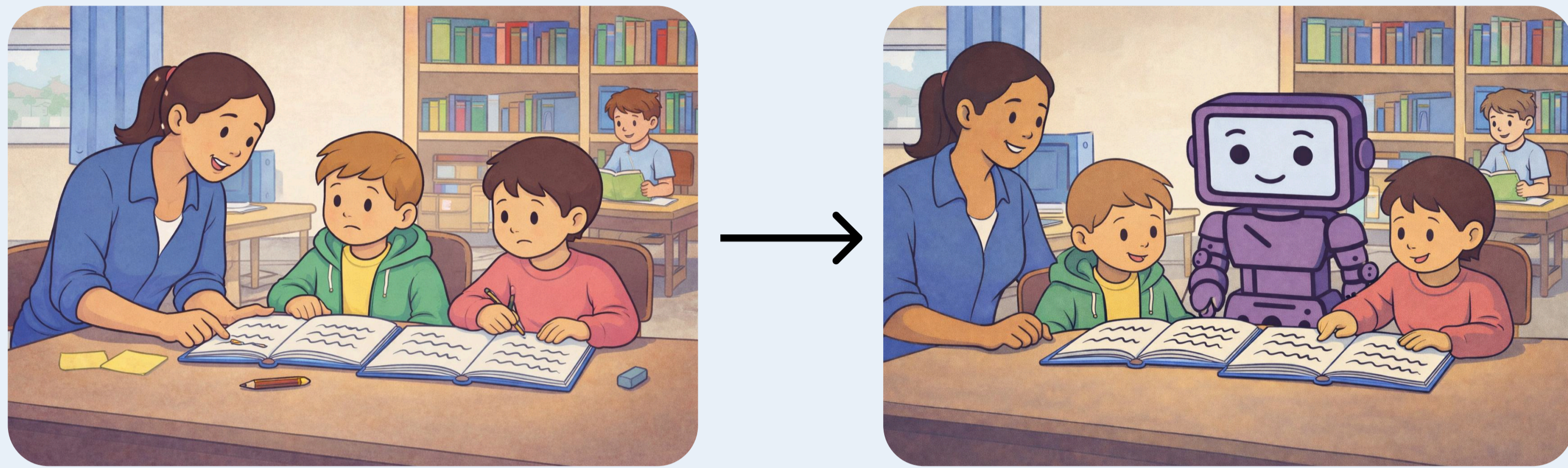
Neil Fernandes\*, Tehniyat Shahbaz†, Emily Davies-Robinson†, Yue Hu\*, Kerstin Dautenhahn\*

\*University of Waterloo, Waterloo, Ontario, Canada †United for Literacy, Toronto, Ontario, Canada

## Introduction

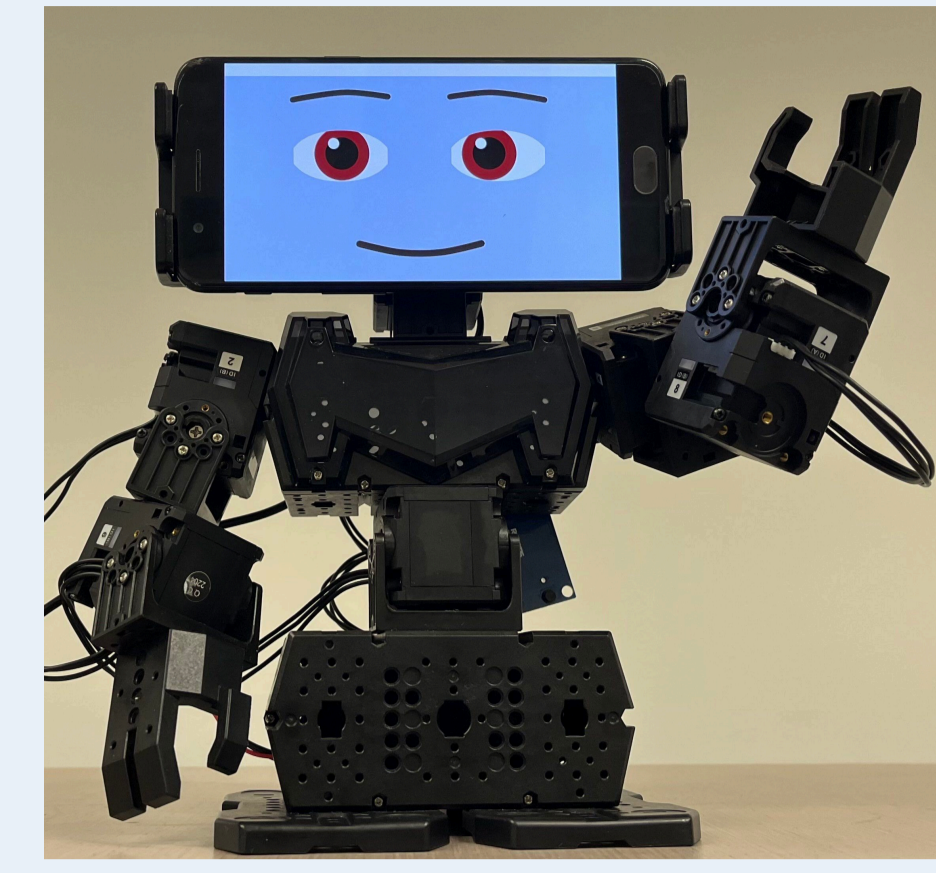
Newcomer children (immigrant or refugee backgrounds, arrived in Canada within the past five years) may learn English while also adapting to new school systems and socio-cultural norms. Community literacy programs face challenges, making individualized support difficult. Here is where Socially Assistive Robots can help!

We partnered with United for Literacy to co-design Maple and derive expert-grounded design guidelines for tutor-mediated, peer-like robot support.



## Methods and Procedures

**ROBOTIS**



Maple is a tabletop humanoid built to have an interactive experience using a Tablet UI.

Maple is built from a ROBOTIS kit, powered by ROS Noetic and PyLips and connected to the UI via React.js

Co-designers comprised of two L2 tutors and 2 HRI Researchers.

One 60 minute group co-design meeting was organized, discussing literacy program constraints and to demonstrate the Maple Robot Prototype to brainstorm ideas.



## Results

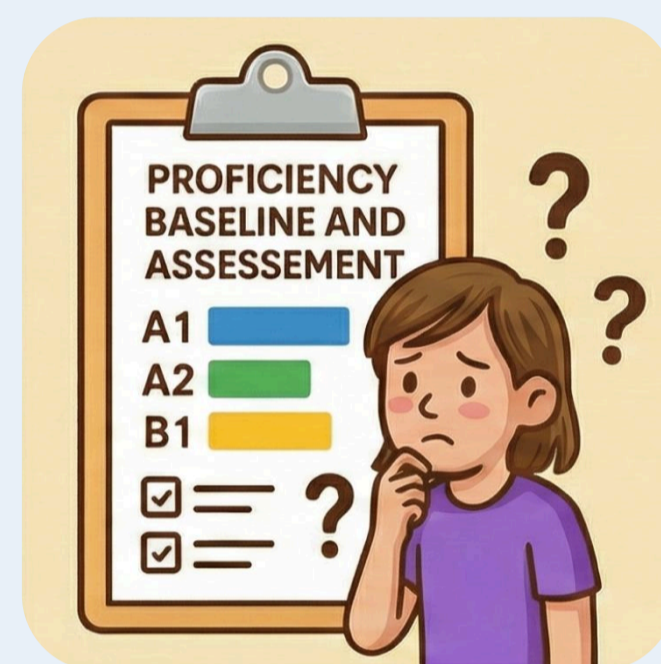
### Challenges Faced by Community Language Learning Programs



Language Barriers & Skill Levels



Lack of Motivation & Attention



Absence of Formal Proficiency Baselines



Lack of 1-1 Attention & Support



"[...] do not speak a single word of English [...]"



Tutors often "[...] do not know the English proficiency levels [...]" of newcomer children

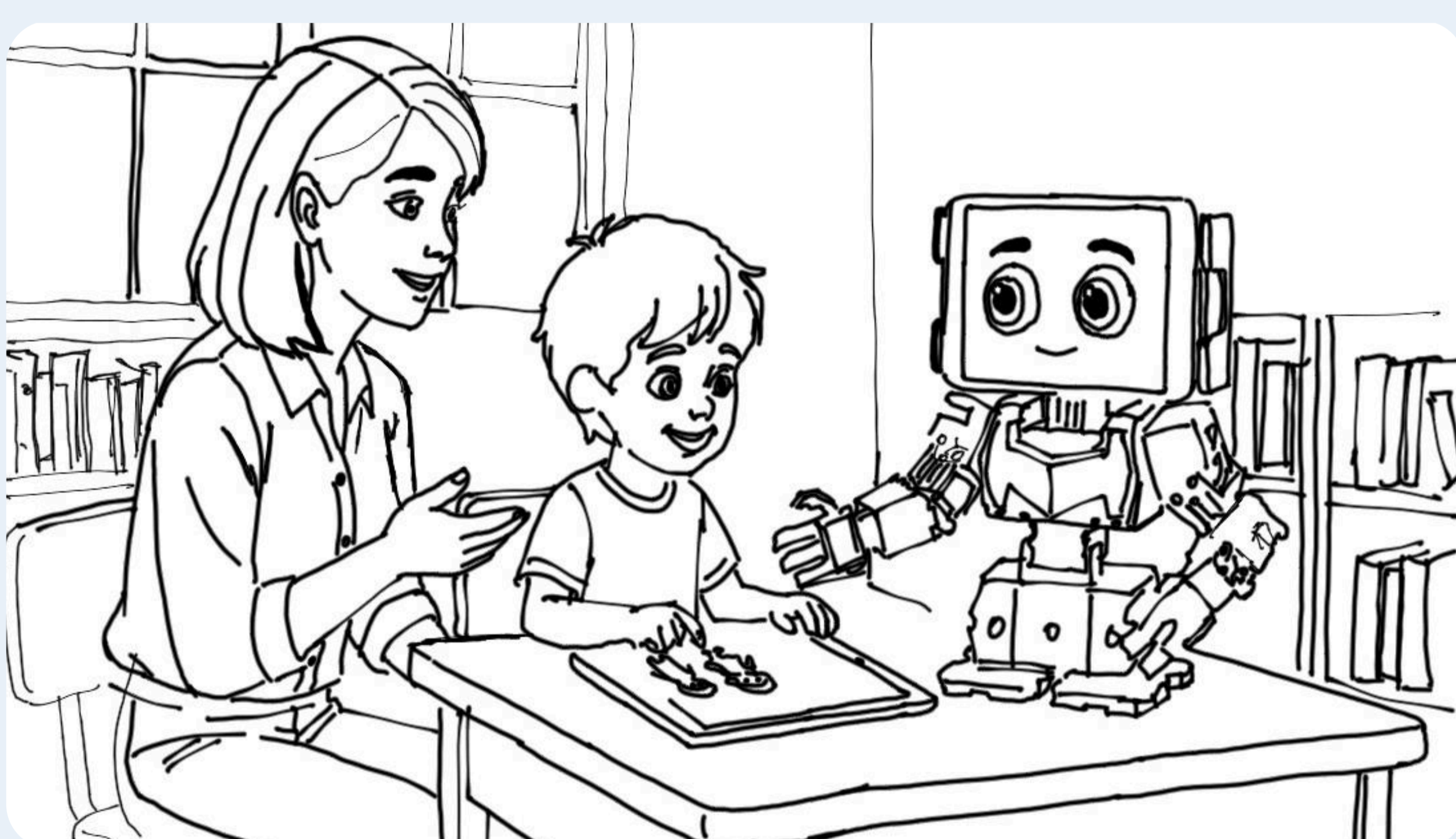


Paper based worksheets are "hard for learners to just learn through work-sheets"



Tutors must "[...] float around [...]" the room and shift their attention, rather than dedicating time to a single child

### Perceived Social Role of Maple



Even when supporting the assessments, Maple should remain a supportive peer rather than a tutor

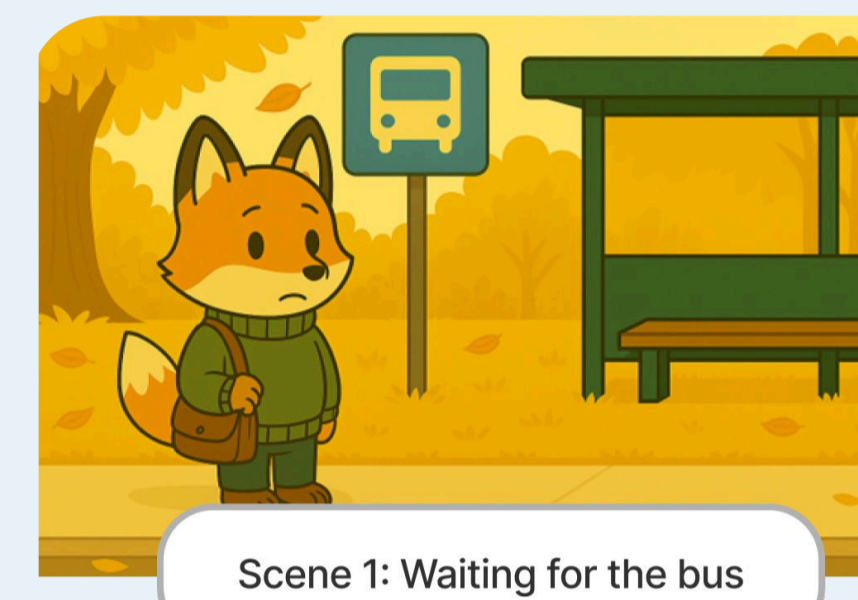


Experts converged on the idea of Maple being a peer-like companion towards children

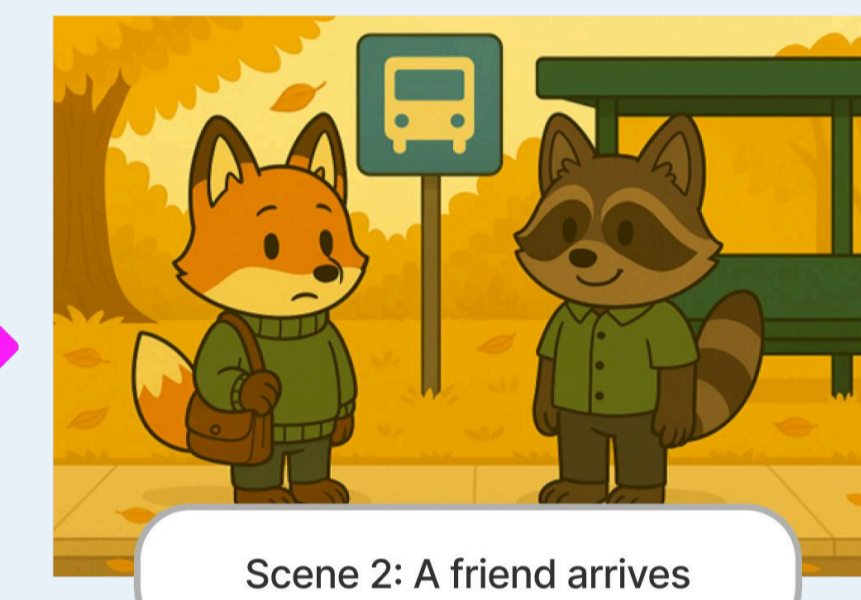


Experts stressed that Maple should not replace tutors and should interact within a "tutor-child-robot triadic" interaction

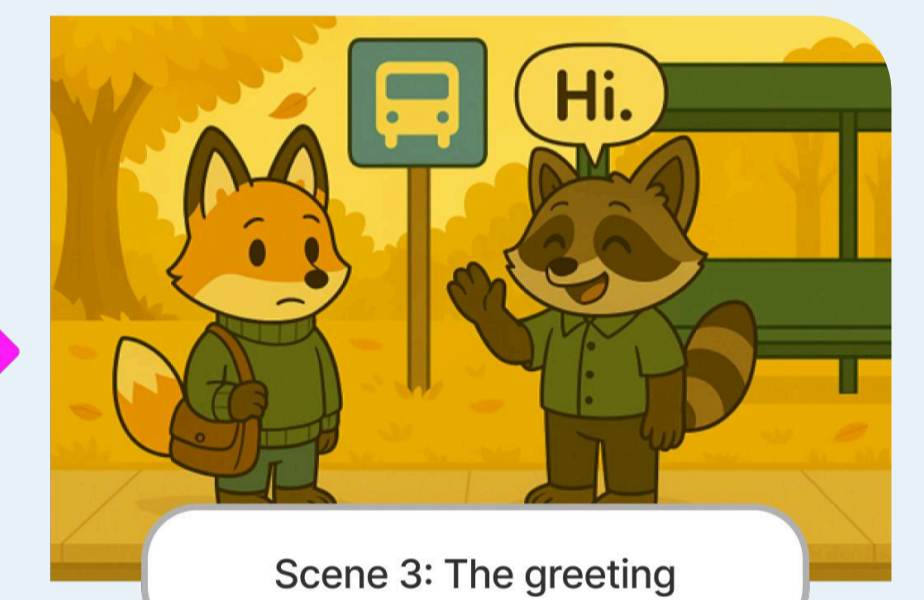
### Build Cultural Orientation & Community Belonging



Scene 1: Waiting for the bus



Scene 2: A friend arrives



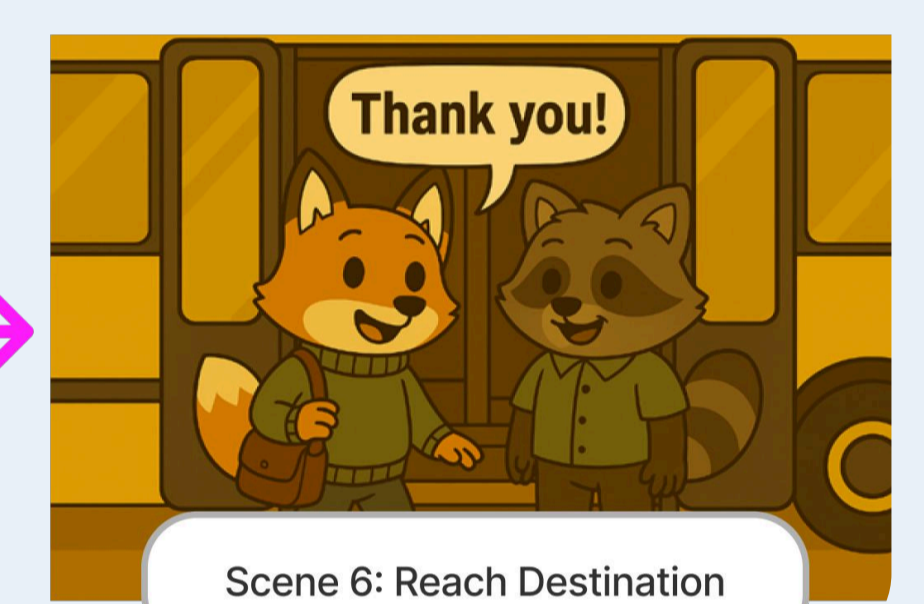
Scene 3: The greeting



Scene 4: Boarding the bus



Scene 5: Driver asks a question



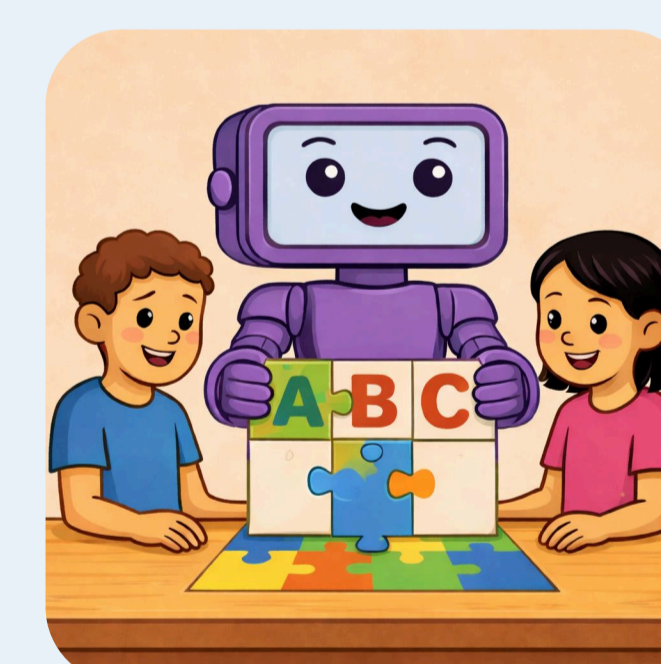
Scene 6: Reach Destination

Experts repeatedly framed the language program as a space for cultural orientation and community building

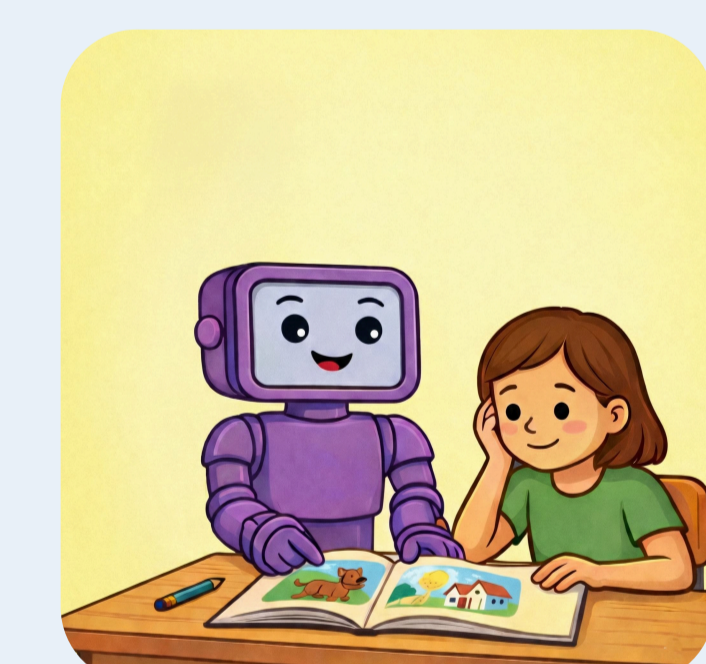
Create stories grounded with scenarios from everyday life and portrayed as Canadian Animals

Tutors highlighted activities that explicitly embed cultural references from Canada (e.g. What's a Toonie? Or a Loonie?)

### Preliminary Design Guidelines



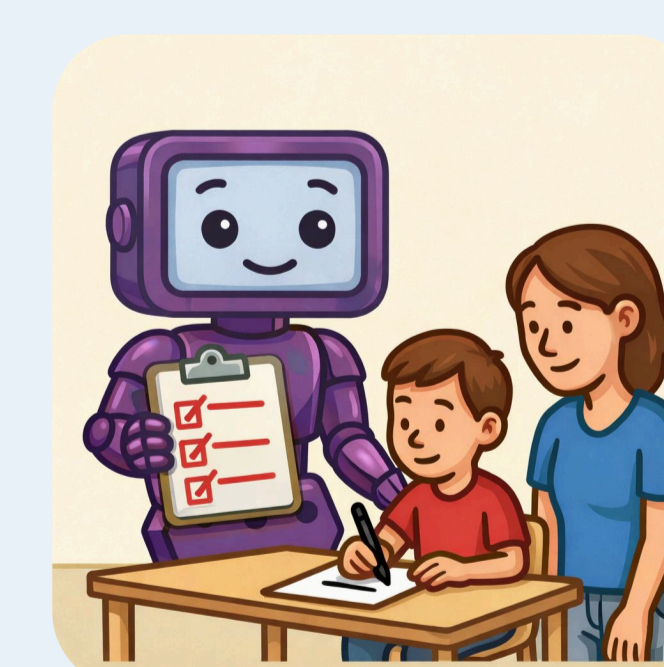
Guideline 1: Provide multimodal scaffolding for language barriers



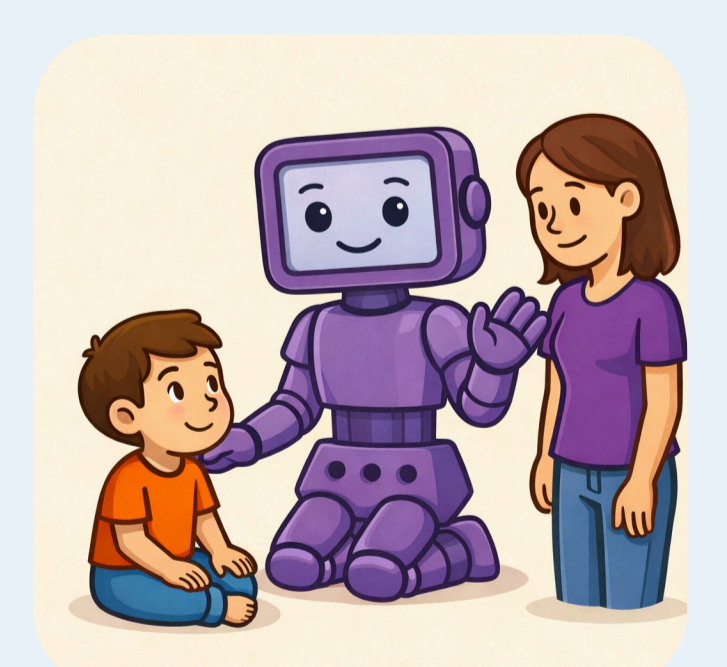
Guideline 2: Use story-based activities to support attention & motivation



Guideline 3: Learn a second language through cultural orientation



Guideline 4: Embed formal assessments into playful interactions



Guideline 5: Support 1-on-1 attention in a triadic interaction

## Conclusion & Future Work

This poster presented a co-design study with UFL staff to design Maple, a peer-like socially assistive robot for newcomer children's language learning and cultural orientation, within community programs. We identified several key results, along with a set of preliminary design guidelines that position the robot to act as a peer, while complimenting the tutor's instruction as a tutor based tool.

## Acknowledgments

Thank you to Cheng Tang, Nathan Dennler and Ali Yamini for their help on Maple. Thank you to Tiffany Trinh for her guidance on design. This research was undertaken in part, thanks to funding from the Canada 150 Research Chair Program.



Check out Maple in action