

# Brokering Collaborations Among Children for Equity

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**Abstract:** This paper presents our work exploring the design of embodied technologies to mediate collaborative interactions among kindergarten-aged children, who come from diverse cultural and linguistic backgrounds. This mediation will focus on helping children develop positive learner identities and equitable friendship in a techno-socio triad of a robot, native English-speaking children, and English-learning children. Using design-based research, our theory-driven designs will be refined through ethnographic observations and interviews in iterative cycles.

**Keywords:** Educational robots, Social Robotics, Diversity and Inclusion, ESL, Elementary children

## Major issues addressed

Although the growing number of language minority students in public education is a trend worldwide, the number of English language learners (ELLs) in the United States has almost tripled over the last decades. The National Assessment of Educational Progress results indicate an achievement gap and a very flat trajectory for lower-performing students, especially ELLs. Because of their developing English skills, ELLs consistently score lower than their native English-speaking peers in all subject areas measured nationally. More problematically, deficit thinking and marginalization prevalent in the classroom have taken a toll on ELLs' identity and learning. They are often viewed by educators and classmates as having deficits because they come from families, cultures, and language groups considered less knowledgeable and supportive than the American mainstream (Valencia, 2010). They are also viewed as *not* being able to contribute to the classroom due to their developing English skills and, therefore, less competent and capable than their native English-speaking peers.

Schools and classrooms should be learning communities, where students are encouraged to collaborate with peers and teachers for the purpose of academic success. Those deficit perspectives regularly position ELLs as outsiders to the mainstream learning community; ELLs learn to identify themselves with marginalized communities (Marx & Saavedra, 2014). The high dropout rate for ELLs in US schools is likely tied to this marginalization from the mainstream learning communities of schools and classrooms (Gándara, 2010). These students are less likely to see the availability of mainstream paths to success through schooling. This identification with marginalization can start as early as preschool and becomes more entrenched as children grow older. In fact, even when ELLs reach desired English proficiency levels in later school years, the achievement gap does not improve. Rather, the dropout rates of ELLs increase as they age.

The early school years are an especially critical period when children are first exposed to academic English and also when they become aware of themselves in relation to peers and begin comparing their performance to that of their peers in the classroom. There is an urgent need for early intervention to disrupt such deficit positioning and reposition English learning children as valuable contributors to the classroom so that they can develop positive identities as learners. Finding effective ways to support ELL achievement seems to be a priority nationally; however, supporting their positive identity development may be more urgent than or, at least as important as, supporting their academic skill development.

We view ELLs as a *culturally and linguistically diverse (CLD)* group who can enrich the mainstream school culture with their cultural and linguistic assets (Vasquez et al., 2011). We envision technology that serves as a cultural broker, helping all learners to expand the boundaries of their intellectual, social, and cultural communities and feel included as valuable participants in a learning community (Gutierrez, Rymes, & Larson, 1995; Murata, 2013). In this study, we explore the creation of a small socio-technical learning community for CLD children that recognizes cultural and linguistic diversity as an asset and provides an opportunity for them to share their cultural resources, including their home language and family stories. We understand that young children are very likely to develop social relationships with animated characters, virtual pets, and robots (Breazeal, 2002; Kim, 2013). We build on this understanding by introducing a robot that can mediate the interactions between English-speaking and English-learning children in ways that invite both to learn from each other and to learn to interact in equitable ways.

## Theoretical and methodological approaches

Our study centers on the development of robot-mediated interaction activities in an iterative cycle of design, development, and testing. The questions for our design research include i) *What does it take to design robot-mediated collaborative interactions to support children's development?* and ii) *How do children's identities and learning develop as they participate in the collaboration?* Our iterative development processes will be orchestrated with two types of data collection: ethnographic observations in a natural classroom and interviews with the children, parents, and teachers. Children's interactions with the system will be recorded as supplementary data.

We take into consideration the rhetorical and socio-cultural perspectives of communication theories as we develop a theoretical model to guide initial scripts for the robot's mediating utterances (Bahktin, 1987). In particular, we use the Wizard of Oz method, in which the robot utterances are added, corrected, and refined as we observe children's participations in the interactive triad. The product of the study is a corpus of interactive utterances of the robot, which can be used by other researchers developing similar technologies to mediate collaborations.

The design of collaborative activities for children is grounded in the literature in culturally responsive pedagogy, developmentally appropriate pedagogy, and second language acquisition, with the goal of facilitating children's positive identity formation. Culturally responsive pedagogy asserts that cultural characteristics should be respected throughout curricula (Ladson-Billings, 2009). Developmentally, around kindergarten age, children improve in fine and gross motor skills and like to engage in fantasy play. Language acquisition is the process of learning a language naturally through repeatedly participating in social interaction. The core ideas from these theories frame six focal strategies that guide the initial design of the robot-mediated interactions: i) learning in play, ii) multiple channels for interaction, iii) fantasy storyline, iv) autonomy support, v) from the familiar to the new, and vi) repeated participation (Kim & Smith, 2017).

## Significance of the work

This study explores a new way of using technology as a cultural broker and sheds light on how artificial beings can be designed to mediate the equitable collaborative interactions of young children from diverse cultural and linguistic backgrounds, whether they take the shape of pedagogical agents (on-screen animated characters), embodied robots, or holograms. Also, the invitational rhetoric to be developed will likely allow CLD learners to feel included and respected in the socio-technical learning community. It may also facilitate equitable relationship building among students. Offering such a supportive learning community can lead all students to feel fully engaged in their learning, a critical harbinger of educational success.

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