Designing a Robot for Cultural Brokering

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The increasing number of English language learning children in U.S. classrooms and the need for effective programs that support these children present a great challenge to the current educational paradigm. The challenge may be met, at least in part, by an innovative humanoid robot serving as a cultural broker that mediates collaborative interactions among young children who come from diverse cultural and linguistic backgrounds. The pedagogical design principles proposed in the paper may help to create an equitable socio-technical learning context that embraces learner diversity.

The Educational Challenge

In the United States today, English language learning children make up about 21% of the current K-12 school-age population (NCES, 2010). These children typically enter school already behind in academic and social skills due to their developing English skills. In fact, these children consistently score lower than their native English-speaking counterparts in all subject areas measured nationally. Recent National Assessment of Educational Progress results indicate an achievement gap and a very flat trajectory for lower-performing students, especially English language learners (ELLs). One in nine students in U.S. public schools is not yet English proficient with 60% of ELLs enrolled in English-only programs. On the 2011 NAEP, only 3% of fourth-grade ELLs scored at the proficient level in reading compared to 55% of their native English-speaking peers.

More problematically, deficit thinking and marginalization prevalent in the classroom have taken a toll on ELL children's identity as learners and their performance. ELL

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children 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). Viewing the children as deficient in language, social, and academic skills positions them as marginal to the mainstream school population, which negatively affects their learner identity. This marginalization can start as early as preschool and contributes to the children's disengagement from schooling, a gap that grows wider as children age. Even when many ELLs reach the desired English proficiency level as they move through their school years, their school achievement does not improve. Rather, the dropout rates of ELLs increase as they age (Boone, 2013). These phenomena imply that efforts to help develop ELLs' positive identity and learning should be coordinated. Given this trend, I view that supporting ELLs' positive identity development seems to be more urgent than, or, at least as important as, supporting their academic skill development.

An Alternate Constructive View: Culturally and Linguistically Diverse Learners

Encouraging English learning children to develop positive affect by helping them to identify with the school learning community and boosting their confidence while they learn unfamiliar topics is warranted. Learning a new language requires not only cognitive skill development but also reconfiguration of cultural perspectives. Many social factors, such as power imbalance, language stigma, and a marginalizing school climate, can derail second language learning efforts and negatively affect educational outcomes (Baker, 2011). Also, positive ethnic, cultural, and language identity correlates with positive self-esteem and confidence, which can catalyze minority children to become resilient to challenges and sustain learning of unfamiliar, difficult topics (Gonzalez, Eades & Supple,

2014). Supportive interactions and positive learning experiences are particularly necessary, in that these children have to learn with enormous efficiency to catch up with their native English-speaking peers as they do double the work -- developing English proficiency while learning content in English.

All children should be valued for bringing in their cultural and linguistic resources to the classroom learning community. Redefining English learning children as *culturally and linguistically diverse (CLD)*, rather than just as English learning seems to be a necessary condition for CLD children's growth into successful learners. An effective intervention, therefore, should recognize cultural and linguistic diversity as an asset and provide an opportunity to share the children's home language and family stories. This invitation to be an active participant in and contributor to their learning activities is very likely to allow the children to feel included and respected and also facilitate equitable relationship building among children. Offering such a supportive learning community can lead them to full engagement in their learning and thereby to educational success.

Early intervention seems to be especially necessary since the early school years are a critical period when children are first exposed to academic English. At about this age, children become aware of themselves in relation to peers and begin comparing their performance to peers' performances in the classroom. That is, they start defining themselves as learners, i.e., constructing their learner identities. Nonetheless, it is less likely that the current classroom climate and instructional practices could be improved to reposition CLD children as valuable contributors to the classroom any time soon. Rather, this may take strenuous societal endeavors beyond a specific school context over the long term. In the meanwhile, advanced technology such as humanoid robots can play a role

and fill this gap, modeling the creation of an inclusive collaborative learning community among children. Furthermore, it is well acknowledged that technology-based programs are more effective when they are implemented in early age. This is, perhaps, due to children's natural affinity to digital toys and their malleable minds.

A Robot to Broker Equitable Friendship and Collaboration

Young children develop and learn while they play. Children's psychological and behavioral changes often occur through vicarious experiences while playing with others and, more importantly, through working together with others toward a shared interest and goal (Bers, 2012). Moreover, the boundaries between real and virtual are blurred to many young children (Turkle, 2011). Children interact socially with digital technologies much like they do with humans (Reeves & Nass, 1996). Not surprisingly, children develop emotional attachments to digital toys and personal relationships with a sociable robot, viewing the robot as their playmate (Breazeal, 2002).

We can envision an embodied robot as a cultural broker that encourages young children to build friendships and collaboratively learn and play in an equitable way. In a small learning community consisting of the robot, a native English-speaking child, and a CLD child, the bilingual robot will welcome both children into the community and invite the children to share their native languages and cultural knowledge and experiences. This interactive triad may facilitate both children to expand the boundaries of their linguistic and cultural communities and feel included as valuable participants. This way, all children, whether native English speakers or English learners, will be positioned as culturally and linguistically diverse (CLD) children with prior knowledge and skills that are valued by the community.

Pedagogical Principles for Designing Inclusive Robot Mediation

It seems that the design of a robot as a cultural broker for young children's positive identity while it assists with learning is an innovative and challenging task. Referring to literature in culturally responsive pedagogy, developmentally appropriate pedagogy, and second language acquisition, I have drawn pedagogical design principles whose efficacy has been tested and confirmed in a robot-based English-learning application (Kim & Smith, 2015). More information about the robot application can be found at http://create.usu.edu.

Culturally responsive pedagogy (CRP) asserts that all cultures should be valued equally and that cultural characteristics should be respected throughout curricula, pedagogy, and school policy (Ladson-Billings, 2009). CRP approaches offer a kind of third space where a child's home language and culture are positioned as assets and where children become fully engaged participants in the classroom community. As Moje and colleagues (Moje et al., 2004) explain, a third space "merges the 'first space' of people's home, community, and peer networks with the 'second space' of the discourses they encounter in more formalized institutions" (e.g., school and classroom) (p. 41).

According to literature on child development, kindergartners improve in fine and gross motor skills and like to engage in fantasy play. They are rarely able to sit quietly for long periods and like to spend their time with peers. As they start to master basic academic skills, they also start to compare their performance with that of peers. Their family and cultural backgrounds greatly influence their developmental characteristics. Not surprisingly, large individual differences are observed in all areas of development.

Language *acquisition* is the process of learning a language naturally through participating in social interaction. Common early language and literacy skills are best developed through repeated exposures in interactive contexts for both English-speaking and English-learning children. The use of home language skills to help develop English skills is an effective instructional strategy recommended by the National Reading Panel. More importantly, bridging differences in interpersonal communications between home and school can contribute to children's enhanced engagement in and motivation toward classroom learning. Since there are big individual differences greatly influencing their English language and academic skill development, children should be encouraged to help each other and learn from each other in their home language and in English.

The core ideas from culturally responsive pedagogy, developmentally appropriate pedagogy, and second language acquisition have led to six focal principles presented below for guiding the design of robot-mediated collaborative activities that promote CLD children's development of identity and learning.

Learning in Play. Children learn while they play with others, imitating others, expanding what they observe, and cultivating their imagination. While playing, children learn, imagine, and negotiate to construct meanings. Importantly, children not only like to have a sense of companionship while they play, but they are also motivated to do things when they feel *liked* or *included*. A robot should be designed to act as a friend who plays with the children, sometimes even asking them for help.

Multiple Channels for Interaction. Young children are active and like doing things. Many children develop cognitive capabilities while they engage in haptic and kinetic activities using bodily movements and gestures. Moreover, some cultures value students'

active behavioral engagement, which is often viewed by the mainstream as disruptive in the traditional classroom. In the robot-mediated activities, children should be encouraged to move as the robot moves, speak to and touch the robot, and communicate with the robot through various sensors embedded in the robot's body.

Fantasy Storyline. A fantasy storyline not only increases students' interest in learning but also helps students who struggle to learn. As they interact with the robot, children can visualize the robot as not only a fun tool but also as a character in a unique story-world, which can spark the children's imagination in larger play contexts. In the robot-mediated interactions, children should be invited to access their cultural knowledge and use their native language as they construct missing components of the robot's story.

From the Familiar to the New. Familiar cultural and familial resources, or funds of knowledge, help children maintain a positive identity and transfer knowledge and skills from home to school. Also, digital media and print tools each have unique complementary affordances mediating children's learning experiences. Many digital technologies use metaphors of familiar print materials when presenting educational content, such as flashcards and storybooks.

Autonomy Support. Young children develop their own intuitive theories of their worlds, test hypotheses, and make inferences based on their observations of surroundings (Gopnik, 2012). It is necessary that early childhood interventions allow room for experimentation and occasional failure. Autonomy, which involves the opportunity for self-directed discovery and decision-making, is one key determinant of motivation and engagement across age groups. Respecting children's autonomy not only facilitates their learning, but also leads them to build quality relationships.

Repeated Participation. Children develop socially and intellectually through repeated participation in an interactive context in which they also can receive rich feedback on their trials. The benefit of learning technologies is acknowledged as a way to repeatedly expose children to a task and reinforce what they have already learned. The robot-mediated activities allow children to interact continually to learn and help others to learn, building meaningful connections through rich interactive activities supplied by advanced robot features (e.g., speech recognition and generation, various sensors, bodily movement, and so on).

Conclusion

Current educational challenges associated with increasing learner diversity demand that educators re-think prevalent instructional practice in the classroom. Viewing CLD children as deficit while positioning them in marginalized groups like "remedial" or "ESL" kids makes it less likely that they will see mainstream paths to educational success. I believe that supporting CLD children's strong sense of who they are ethnically, culturally, and linguistically will lead them to identify as successful learners and ultimately help them to become persistent and confident in academic work. The challenges also invite researchers and designers in educational technology to produce creative ways to use technological tools. I hope that the use of artificial beings like a humanoid robot as a cultural broker and the design principles proposed in this paper will stimulate continued discussion about the design of emerging technologies in such a way as to fill gaps in the real world.

References

Baker, C. (2011). *Foundations of bilingual education and bilingualism (5th edition)*. Bristol, UK; New York, US; Ontario, Canada: Multilingual Matters.

Bers, M. U. (2012). *Designing digital experiences for positive youth development*. New York: Oxford University Press.

Boone, J. H. (2013). ¡Ya Me Fui! When **English** learners consider leaving school. *Education and Urban Society, 45*(4), 415-439.

Breazeal, C. L. (2002). *Designing sociable robots*. Cambridge: MA: The MIT Press.

Gonzalez, L., Eades, M., & Supple, A. (2014). School community engaging with immigrant youth: Incorporating personal/social development and ethnic identity development. *School Community Journal, 24*(1), 99-117.

Gopnik, A. (2012). Scientific thinking in young children: Theoretical advances, empirical research, and policy implications. *Science, 337*(6102), 1623-1627. doi:10.1126/science.1223416

Kim, Y., & Smith, D. (2015). Pedagogical and technological augmentation of mobile learning for young children. *Interactive Learning Environments, Online First Publication*. doi:10.1080/10494820.2015.1087411

Ladson-Billings, G. (2009). *The dreamkeepers: Successful teachers of African American children* (2 ed.). San Francisco: Jossey-Bass Publishers.

Moje, E. B., Ciechanowski, K. M., Kramer, K., Ellis, L., Carrillo, R., & Collazo, T. (2004). Working toward third space in content area literacy: An examination of everyday funds of knowledge and discourse. *Reading Research Quarterly, 39*(1), 38-70.

NCES. (2010). Status and trends in the education of racial and ethnic minorities. Retrieved from http://nces.ed.gov/pubs2010/2010015/tables/table_8_2a.asp

Reeves, B., & Nass, C. (1996). *The Media Equation: How people treat computers, television, and new media like real people and places*. Cambridge, MA: Cambridge University Press.

Turkle, S. (2011). *Alone together: Why we expect more from technology and less from each other*. New York: Basic Books.

Valencia, R. (2010). *Dismantling contemporary deficit thinking: Educational thought and practice.* New York: Routledge.

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