Steps Needed in Conducting a Research Study

Stephanie Talalai

New Jersey City University

Topic of Study

For the purposes of this study, the researcher will evaluate the use of a Humanoid Robot (Nao) on the rate of skill acquisition in preschool aged students with various disabilities.

Topic Rationale

Children today are being brought up as digital natives in a world where they are expected to use technology on a daily basis and in a variety of settings. Children with disabilities are also being exposed to these technologies at home, however, more research is needed to understand if these emerging technologies affect their rate of skill acquisition.

Technologies dedicated to the treatment and education of children with Autism Spectrum Disorder (ASD) have been present in educational institutions and therapeutic practices for decades. The study of the use of robots with persons with ASD dates from 1999 and has gradually increased to date (Aresti-Bartolome & Garcia-Zapirain, 2014). The predictable behavior, controlled social situations, and simplistic interactions of robots make them a useful treatment option for children with ASD (Aresti-Bartolome & Garcia-Zapirain, 2014). Researchers believe that a robot with human characteristics including the ability to verbalize, blink its eyes and exhibit human-like movements, would be more likely to elicit communication and reduce autistic-like behaviors (Yussof et al., 2012). Human-Robot Interactions have the possibility of increasing the bonds between the child and the robot potentially enhancing their social skills (Yussof et al., 2012).

ASK NAO (Autism Solution for Kids) is designed to assist teachers and engage students with Autism and other cognitive disabilities in an educational program aimed at developing social and cognitive skills through encouragement, rewards and interaction with Nao through

playing games. "The engaging, predictable and safe nature of robots suggests that robots could be a useful tool for teachers in special education especially when working with children with profound and multiple disabilities" (Hedgecock, Standen, Beer, Brown, & S. Stewart, 2014, p. 112). This study will attempt to solidify this rationale and test the hypothesis.

Framework

The primary sources used in this research project will be the data collected during the interview phase with the classroom teacher and the data produced by the NAO Robot software program. Secondary sources will be identified in reviewing the literature for this study. The researcher will focus on three key topics which will attempt to synthesize previous research and contribute to the overall structure of the study. Previous studies involving using humanoid robots with Autistic children to will focus on Human-robot interaction, an increase in communication and the use of robotics in therapy sessions. The literature review will also attempt to look at how robotics have been used to support children with multiple disabilities. Finally, the researcher will investigate how research has been previously used with preschool aged children. A literature map will be created as a means of organization and creating connections within the literature (see Appendix 1).

Research Approach

In this study, the researcher will use an exploratory sequential mixed methods research approach. According to the Creswell (2014), in this research method the researcher "first begins with a qualitative research phase and explores the views of participants" (p. 16). For this phase the researcher will start with interviews of the participating preschool disabled classroom

teachers to ascertain their comfort level with technology and robotics as well as the physical and cognitive abilities of their students. The researcher will also use the interview stage to develop the specific skill set that the Nao robot will perform to measure the rate of skill acquisition of the preschool children identified in the study. The students will be divided into two groups. Group one will be taught the skill during regular classroom instruction by their teacher. Group two will be taught the skill using the Nao Robot. Pre and Post tests will be conducted as well as data that is collected through the ASK NAO software will encompass the quantitative portion of the mixed methods approach.
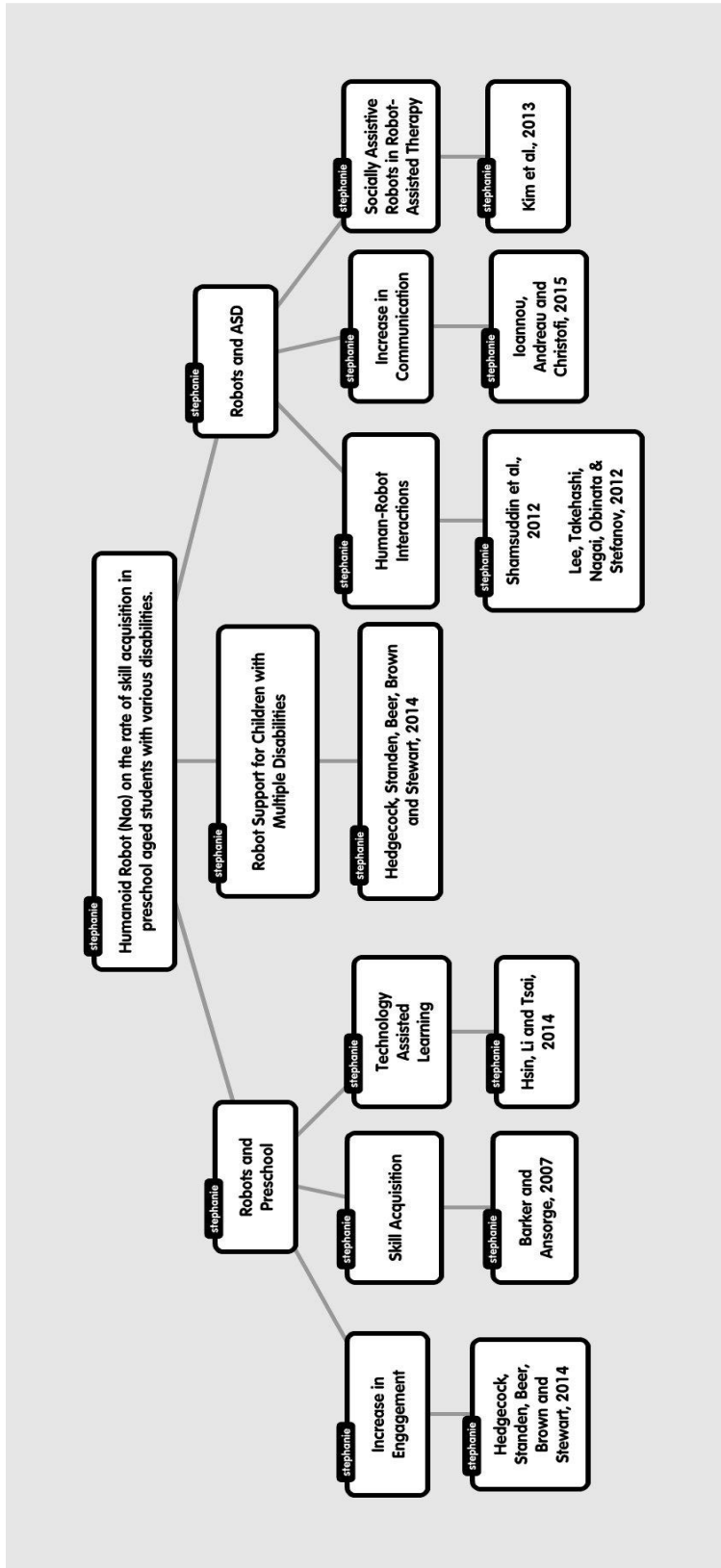
For a mixed methods researcher, a pragmatic worldview allows for the freedom "to choose the methods, techniques, and procedures of research that best meet their needs and purposes" (Creswell, 2014, p. 11). In this study, the mixed method approach is used to provide an understanding of the views of technology and robotics from the classroom teacher's point of view (qualitative) as well as the rate of skill acquisition by the preschooler (quantitative). The use of technology and robotics in 21st century learning is relevant to the pragmatic worldview of research which occurs in the social and political contexts of education and achievement of a national set of core standards for all children.

Significance of Study

As a result of a brief examination of the literature on robotics and disabilities, many of the studies focus on Human-Robot Interaction (HRI), Robot-Assisted Therapy (RAT) and the use of socially assistive robots to alleviate or lessen the characteristics of ASD. Many of these studies have taken place outside of the United States. Few studies have been conducted that focus on using robots to increase communication, language acquisition or skill acquisition for students with ASD or other cognitive disabilities, especially in preschool-aged children.

Assistive technology has historically been thought of as technology for special education, however, today it also encompasses instructional technology and universal design for learning (Edyburn, 2013). Researchers should "focus on current and emerging technological trends in order to define a collaborative agenda building process that directs research, policy development, theory, and practice" (Edyburn, 2013, p. 16).

Appendix 1

A concept map with the central node "Humanoid Robot (Nao) on the rate of skill acquisition in preschool aged students with various disabilities." branching into three main categories:

Robots and ASD
- Socially Assistive Robots in Robot-Assisted Therapy
  - Kim et al., 2013
- Increase in Communication
  - Ioannou, Andreau and Christofi, 2015
- Human-Robot Interactions
  - Shamsuddin et al., 2012
  - Lee, Takehashi, Nagai, Obinata & Stefanov, 2012

Robot Support for Children with Multiple Disabilities
- Hedgecock, Standen, Beer, Brown and Stewart, 2014

Robots and Preschool
- Technology Assisted Learning
  - Hsin, Li and Tsai, 2014
- Skill Acquisition
  - Barker and Ansorge, 2007
- Increase in Engagement
  - Hedgecock, Standen, Beer, Brown and Stewart, 2014

References

Aresti-Bartolome, N., & Garcia-Zapirain, B. (2014). Technologies as support tools for persons

    with autistic spectrum disorder: A systematic review. *International Journal of*

    Environmental Research and Public Health, 11(8), 7767-802.

Barker, B. S., & Ansorge, J. (2007). Robotics as means to increase achievement scores in an

    informal learning environment. *Journal of Research on Technology in Education, 39*(3),

    229-243.

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods*

    approaches (4th. ed. ed.). Thousand Oaks, CA: Sage.

Edyburn, D. L. (2013). Critical issues in advancing the special education technology evidence

    base. *Exceptional Children, 80*(1), 7-24.

Hedgecock, J., Standen, P. J., Beer, C., Brown, D., & S. Stewart, D. (2014). Evaluating the role

    of a humanoid robot to support learning in children with profound and multiple disabilities.

    Journal of Assistive Technologies, 8(3), 111.

Hsin, C., Li, M., & Tsai, C. (2014). The influence of young children's use of technology on their

    learning: A review. *Educational Technology & Society, 17*(4), 85.

Ioannou, A., Andreou, E., & Christofi, M. (2015). Pre-schoolers' interest and caring behaviour

    around a humanoid robot. *TechTrends, 59*(2), 23-26.

Kim, E. S., Berkovits, L. D., Bernier, E. P., Leyzberg, D., Shic, F., Paul, R., & Scassellati, B.

(2013). Social robots as embedded reinforcers of social behavior in children with autism.

Journal of Autism and Developmental Disorders, 43(5), 1038-1049.

Lee, J., Takehashi, H., Nagai, C., Obinata, G., & Stefanov, D. (2012). Which robot features can

stimulate better responses from children with autism in robot-assisted therapy? *International

Journal of Advanced Robotic Systems, 9*, 72.

Shamsuddin, S., Yussof, H., Ismail, L. I., Mohamed, S., Hanapiah, F. A., & Zahari, N. I. (2012).

Humanoid robot NAO interacting with autistic children of moderately impaired intelligence

to augment communication skills. *Procedia Engineering, 41*, 1533-1538.

Yussof, H., Ismail, L. I., Shamsuddin, S., Hanapiah, F. A., Mohamed, S., Piah, H. A., Zahari, N.

I. (2012). Human-robot interaction intervention therapy procedure for initial response of

autism children with humanoid robot. Retrieved from

https://asknao.aldebaran.com/sites/default/files/publications/yussofismailshamsuddin_2013_

humanrobotinteractioninvterventiontherapy.pdf