# Telepresence Robots as Embodied Agents in the Classroom

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**Abstract:** Telepresence robots are emerging as a way for distant or homebound students to attend face-to-face classes, but their influence on the classroom environment is not yet well understood. This in-progress study explores the experiences of students in a face-to-face classroom where one student attended via telepresence robot. The focus of this study is the extent to which the robot is perceived as an embodied agent in a shared physical space.

Telepresence robots are emerging as a way for distant or homebound students to attend face-to-face classes (Goodman, 2017). It is therefore important to understand how the use of these robots influences the classroom environment. This in-progress study explores the experiences of students in a face-to-face doctoral level course where one student attended class using a telepresence robot that allowed her to connect remotely but still maneuver through a shared physical space with her classmates.

## Learning with robots in shared space

The physical space of a classroom can affect the learning process by, for example, encouraging students and instructors to move around in the room when engaged in collaborative tasks (Brooks, 2012; Gurzynski-Weiss, Long, & Solon, 2015). While remotely-located students connecting to their classrooms through videoconferencing may be excluded from this physical engagement, or be dependent on others (e.g., relying on a classmate to move the device on which they are connecting), a telepresence robot allows remote students to move independently in the shared learning space. The presence of a robot in the classroom, however, has the potential to alter the classroom experience for both remotely-located and physically-present students in ways that are not yet well understood.

Research has shown that people tend to anthropomorphize machines, attributing human-like features to technology tools (Nass & Moon, 2000; Nass, Steuer, Tauber, & Reeder, 1994) and to perceive robots as embodied agents (Epley, Akalis, Waytz, & Cacioppo, 2008). That is, they perceive the robot as having a physical body and having agency over how that body moves in the physical space and interacts with humans. Perceptions of robot agency and independence are enhanced by a robot's ability to interact with humans within a shared physical space (Brincker, 2016). Brincker discusses interactions between agents in the context of *affordance spaces*. Gibson (1977) defined *affordance* as an opportunity for action provided by the environment. Brincker (2016) shifts the focus from "what the environment can be said to abstractly furnish one person seen in isolation" to an acknowledgment that "there are necessarily at least two perspectives and two embodied agents standing in...relation to the same environment" (p. 452). We can perceive other agents as either existing in their own affordance space or as sharing ours, allowing for "some level of mutual and reciprocal perceptible influence on each other's affordance field" (p. 452).

A remotely-located student connecting with classmates via telepresence robot is an embodied agent in his or her own affordance space, but how students in the classroom perceive a person mediated through a telepresence robot, and how this perception affects the learning environment, is not yet fully understood. When a medical issue prompted one student to attend class via telepresence robot for a large portion of one semester, we had an opportunity to explore students' experiences as embodied agents in a shared learning space in the presence of a robot. This in-progress study addresses the following research questions: (1) How did the remotely-located student experience the shared learning space when attending class using a telepresence robot? (2) To what extent did the student attending class via telepresence robot feel like an embodied agent? (3) How did face-to-face students experience a shared learning space that included a classmate attending via telepresence robot? (4) To what extent did the face-to-face participants view their remotely-located classmate to be an embodied agent?

## Methods

This study focuses on participants' subjective experiences of their interactions in the shared learning space. The setting is a doctoral level course in counseling psychology with an enrollment of 10 students. The course met face-to-face once per week for three hours and consisted mainly of student-led discussions on reading assignments. One student used a *Double 2* telepresence robot to attend class at a distance for the first 11 weeks of the 16-week semester. In the 12th week of the semester, she was able to begin attending class in-person.

Data for this initial exploratory study consisted of interviews with the student who used the telepresence robot and her classmates who interacted with her. The interview format was unstructured, giving the participants an opportunity to speak freely about their experiences with the robot, and allowing the researchers to adapt the interview based on the thoughts and ideas provided by the participants. However, the researchers were particularly interested in the degree to which the in-person students viewed the user of the robot as an embodied agent sharing their learning space, and the extent to which the robot user felt like an embodied agent in the classroom. Data were analyzed using the approach outlined by Saldaña (2009) to discern important themes that capture the essence of participants' experience.

## Significance

Results of this study will provide greater understanding of the experiences of learners in classrooms that contain a mix of face-to-face and remote students. This will help instructors design and manage these experiences to maximize the benefits of learning in a shared space while maintaining the increased access that telepresence robots provide.

## References


Brincker, M. (2016). Dynamics of Perceptible Agency: The Case of Social Robots. *Minds and Machines, 26*(4), 441-466.

Brooks, D. C. (2012). Space and consequences: The impact of different formal learning spaces on instructor and student behavior. *Journal of Learning Spaces, 1*(2), retrieved from http://libjournal.uncg.edu/index.php/jls/article/view/285/275.

Epley, N., Akalis, S., Waytz, A., & Cacioppo, J. T. (2008). Creating social connection through inferential reproduction: Loneliness and perceived agency in gadgets, gods, and greyhounds. *Psychological Science, 19*(2), 114-120.

Gibson, J. J. (1977). The Theory of Affordances. In R. Shaw & J. Bransford (Eds.), *Perceiving, acting, and knowing: Towards an ecological psychology* (pp. 67-82). New York: Lawrence Erlbaum Associates.

Goodman, J. (2017). Meet Sheldon, the Robot Student. Retrieved from https://www.insidehighered.com/digital-learning/article/2017/04/26/robots-classrooms-connect-distance-learners-classrooms

Gurzynski-Weiss, L., Long, A., & Solon, M. (2015). Comparing Interaction and Use of Space in Traditional and Innovative Classrooms. *Hispania, 98*(1), 61-78.

Nass, C., & Moon, Y. (2000). Machines and mindlessness: Social responses to computers. *Journal of Social Issues, 56*(1), 81-103.

Nass, C., Steuer, J., Tauber, E., & Reeder, H. (1993). Anthropomorphism, agency, and ethopoeia: computers as social actors. In *INTERACT'93 and CHI'93 conference companion on human factors in computing systems* 111-112. ACM.

Saldaña, J. (2009). *The coding manual for qualitative researchers*. Thousand Oaks: Sage Publications: Thousand Oaks, CA.