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Hybrid Learning in Higher Education: The Potential of Teaching and Learning With Robot-Mediated Communication

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Disciplines

Curriculum and Social Inquiry | Educational Assessment, Evaluation, and Research | Educational Methods | Educational Technology | Higher Education

Comments

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Abstract

Blended learning, which combines online and face-to-face pedagogy, is a fast-growing mode of instruction as universities strive for equitable and alternative pathways to course enrollment, retention, and educational attainment. However, challenges to successfully implementing blended instruction are that *social presence*, or students' ability to project their personal characteristics into the learning space, is reduced with potential negative effects on student engagement, persistence, and academic achievement. Instructors are experimenting with robot-mediated communication (RMC) to address these challenges. Results from a study of RMC at a large public university suggest that it offers advantages over traditionally used video-conferencing, including affordances for fostering students' embodiment in the classroom, their feelings of belonging and trust, and their ability to contribute ideas in authentic ways.

Objectives

A synthesis of a decade of research (1996-2008) on online learning suggests that *blended or hybrid learning*, which combines face-to-face and online learning, is the most promising approach for K-12 and higher education (Means et al., 2010). Today, advances in technologies make possible new models for hybrid education. One such model features hybrid learners' synchronous *online* attendance of face-to-face courses with other students *physically present* on-campus, in the classroom (Roseth, Akcaoglu & Zellner, 2013). This model has the potential to enrich students' learning and make teaching and resource allocation more efficient, but poses several challenges. One is that students' ability to establish *social presence*—defined as learners' ability to project their personal characteristics into the learning environment—may be particularly challenging to establish in synchronous hybrid learning models. Social presence has been shown to be critical to course satisfaction, students' engagement, development of a community of inquiry and student learning outcomes. Low social presence leads to diminished learning outcomes. This study examines whether incorporating mobile social robotic systems (i.e., Double and Kubi robots) enhances *social presence* and *embodiment* within a synchronous hybrid course. Such research not only advances the knowledge base on the emerging field of social robotic telepresence but also provides needed insights about designs for new models of hybrid education.

Perspectives

Online learning is a fast-growing component of the field of education. However, research on the effectiveness of online learning approaches compared to traditional face-to-face instruction has shown mixed results (Means et al., 2010). Today, many scholars agree that *blended or hybrid learning*, which combines face-to-face and online learning, is the most promising approach for increasing access to higher education and students' learning outcomes (Means et al., 2010). In fact, the number of universities utilizing blended courses is growing rapidly. Some estimate that between 80 and 90 percent of college and university courses will

someday be hybrid (Young, 2002) and suggest that the amount of blended learning classrooms has increased 30 percent annually from 2001 to 2011 (Horn & Staker, 2011).

In blended learning, portions of the course content are delivered online, typically through asynchronous instruction, supplementing face-to-face instruction in traditional classrooms. One model includes hybrid students attending face-to-face courses with students in brick-and-mortar classrooms. This synchronous hybrid education (in which online students learn through a technology-mediated 'face-to-face' learning environment) promises enriched learning opportunities for the class as a whole by bringing together student perspectives from different educational backgrounds and contexts that may otherwise have remained separate (Bell, Sawaya, & Cain, 2014).

On the other hand, implementing synchronous hybrid learning poses challenges for students and instructors. One challenge is that social presence —an important aspect of a successful learning experience (Chickering & Gamson, 1987) — is often more difficult for online students to form. Online students, especially, often complain about feeling disconnected from their instructor in the learning environment (Smith & Taveras, 2005). Establishing *social presence*, or the ability of students to project their personal characteristics into the community of inquiry, thereby presenting themselves to other participants as 'real people' (Garrison, Anderson, & Archer, 2000, pp. 89) has proven to be very important for student satisfaction (Gunawardena and Zittle, 1997); the development of a community of learners (Rourke, Anderson, Garrison, & Archer, 2001); and students' learning (Richardson and Swan, 2003). This is important because (both online and offline) students' abilities to establish relationships with faculty and with other students have a direct and significant effect on their level of scholarly engagement and learning outcomes (Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008).

Looking for ways to increase social presence within synchronous hybrid learning models, researchers today have begun to examine a new mobile technology: *social robotic telepresence systems* (SRTS) and their ability to foster social interaction between individuals (Kristoffersson, Coradeschi, & Loutfi, 2013). SRTSs facilitate social interactions through an LCD screen, a web camera, microphone, and speakers —with the added functionalities of moving/steering the system to various locations —allowing communication between remote and local parties. SRTSs, such as the Double and Kubi robots, can be moved around by a remote user who is not situated at the robot site. (See Figure 1 for examples).



Figure 1: Social robotics telepresence systems used in hybrid doctoral education.

Thus, SRTs offer users the unique potential for *embodied* communication which facilitates social presence. Embodiment may be experienced as the feeling of being within, having control over, and/or owning a given body (Kilteni, Groten, Slater, 2012), as the incorporation of an apparatus into body schema (Haans & Isslestein, 2012), or as close connection between the virtual and physical body (Biocca, 2014). Embodiment contributes to social presence by facilitating the sense of being co-located (Biocca, Harms, & Burgoon, 2003).

This may occur when interaction partners are embodied physically (e.g., in robots; Lee, Jung, Kim, & Kim, 2006) or virtually (e.g., in avatars; Bente, Rüggenberg, Krämer, & Eschenburg, 2008). Further, embodied social presence has been found to enhance cognitive engagement and performance in shared activities (Mennecke et al., 2011), making it a particularly important topic in the examination of SRTSs within education settings.

Methods

Building on this gap in the educational research literature concerned with blended or hybrid learning environments, we inquired: What is the relationship between students' embodiment, social presence, and their classroom experience in robot-mediated learning?

Data sources

We examined this question in an educational technology doctoral course at a large U.S. university. The course included twelve online students enrolled in a hybrid doctoral program and one face-to-face student enrolled in the on-campus doctoral program. We collected data from surveys, focus groups, and student reflections, focusing on their perceptions of social presence, embodiment and transactional distance in terms of frequency of interaction, quality of interaction, sense of closeness/connectedness, and attention distribution. (Due to space constraints, we report findings from focus group data only but will expand this in the final paper.) Ten of twelve online students and the one face-to-face student took a post-semester survey. Three focus groups of 3-4 students/group (n=11; Krueger, 2013) were conducted at the end of the semester. Below, we draw from the students' quotes to describe the themes that emerged from these discussions.

Results

Embodiment. All ten of the online students who participated in our study and experienced the class through RMC mentioned a general theme of physical presence or *embodiment*: a sense of being able to control a given body or see, hear, and be in a particular space. For instance, Lisa mentioned “embodied experience,” and Chris said he felt like he had a “physical presence” in the classroom. For some students, the feeling of control in RMC — e.g., “being able to move the screen up” — afforded a “sense of freedom” that made the students “feel more physically and virtually present in the class.” This experience was “more similar to being in the classroom [than video conferencing].” Some students noted that embodiment in RMC made it easier “to specify who [students were] addressing” and “to observe the nonverbals” of others. This created an awareness that “people can see what you’re looking at,” which one student noted “helps me pay attention.” This was especially apparent during interactions with the professor, who was “clearly looking at you” and “addressing you directly” during RMC, which made one student “scared to death [she would] get caught dozing.” Similarly, one student recalled a day when his robot’s “head was broken.” Unable to turn his robot-head as he would normally do, he “felt disrespectful because [he] wasn’t turning toward the speaker.” The visual affordances of using the robots to see others facilitated learners’ embodied experience. Stephanie, for instance, talked about being able “to see who you [other students] were.” Moreover, three of the ten online students interviewed discussed the affordance of being able to move; Kevin said that the robot allowed him to get a “lay of the land,” and Cai mentioned that “you can move” which

she said felt “natural.” Hannah mentioned that since the robots “could go,” and “proximity is important,” the robots helped her to “stay focused.” The ability to control social interactions — e.g., “choose the proximity with the other” through moving the robot around the room — seemed to facilitate social presence.

On the other hand, students also reported obstacles to embodiment via RMC; five of the ten online students in our study mentioned “audio” or “hearing” as a challenge to using the robots. Stephanie explained, “it was much more difficult to hear and to see my peers” and Lisa said, “The biggest one for me was volume,” while Chris noted, “the audio was one disadvantage,” noting that the audio was acceptable, but became “faint” farther away from the robot. Furthermore, three-quarters of the online students reported that the “visual” experience was challenging when using the robots, not for seeing their in-class instructor and peers but for seeing other students in robot form. For instance, Michael commented, “It was really hard to see them [other robot-mediated peers]. It was hard to see their face.” Cai reported, “sometimes you’re not clear. You know, the picture.” Kevin said, “I couldn’t see as well, especially if they [the robot-mediated peer] were turned.” Abby explained, “I couldn’t see everybody either and some people, yeah, would just keep their iPad facing one person so then you wouldn’t really interact with them during the whole class discussion.”

Two people mentioned the challenge of moving the robot or getting it in the ideal position. Chris explained, “The robot was kinda slow and clunky to move.” Hannah described, “Being close enough without being awkward and then not being so far away that you have problems like seeing and hearing and things like that.”

Social presence. Online students generally agreed that RMC facilitated their participation in the classroom community of inquiry and encouraged students to contribute ideas. Abby, for instance, mentioned that this experience allowed her to feel a sense of “belonging” as a result of using the robots. Another student noted: “using the robots helped me feel like I was there.” One student remarked, “it felt like we were having a legitimate conversation” in RMC, which helped reinforce and support her own contributions. Another student felt that RMC encouraged her to “focus on what people are saying” and make connections to course content. Students mentioned that RMC helped them contribute ideas and develop a rich discussion, noting that the conversation was “germane” and “authentic.” Aligned with Rae (2013), who found that people using a telepresence robot (like the one used in this study) were trusted more than those using a simple tablet, this study found that students who used a telepresence robot reported an increased sense of connection through RMC. For example, one student in the class reported that the use of the robots in class supported “our trust and our willingness to be open.”

At the same time, students in RMC recognized the relationship between the use of robots in a classroom and the pedagogical organization of the class. For example, students reported that “sitting in a circle” with the robots allows students to “look at each other,” which seemed an appropriate pedagogical strategy.

These findings demonstrate that for many students, the use of the robots for teaching and learning felt “natural” and helped them facilitate “legitimate conversation.” RMC supported the development of rich discussion and co-constructed idea contribution; through the affordances of the robot mediated communication, students’ social presence was engaged and aligned with their intellectual growth and development.

Significance

As colleges and universities continue to find ways to increase their enrollments such as offering expanded and alternative pathways to education for all students, especially nontraditional or under-represented students, hybrid or blended learning programs are a promising solution. This first-of-its kind study of robot-mediated blended learning suggests that RMC can offer several advantages over traditionally used videoconferencing systems for fostering social presence. Additional design studies are needed to examine the interaction of hybrid pedagogy and robot technology over a longer period than a one-semester course and with additional groups of students (e.g., undergraduates) and connect these with student learning outcomes.

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