Social Rules for Going to School on a Robot

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Abstract
This paper suggests guidelines of social behavior for students using robots to interact with their classmates in group settings. The guidelines allow for the establishment of some common expectations for both the remote student and classmates. It is important to have clear expectations for robot behavior in the classroom in order for the social dynamics of the classroom to be productive. When remote students and their groups (i.e., classmates) all have a clear understanding of the technology and expected robot behavior, they may experience improved group dynamics and performance. In addition, if technological difficulties occur, they may be able to engage in group-led problem solving to both adapt the current technology and advocate for improved design of future technologies to meet their needs.

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Telepresence; Education; Human Robot Interaction; Human Computer Interaction; Social Interaction.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous

Introduction
Robots are entering schools to actively connect homebound students with their school communities. Telepresence robots are not new technologies as they have existed since the late 1990s

[8,9] but the recent development of affordable robots such as Double, VGo, Beam+, and Kubi has allowed use of this technology to spread from medical and corporate settings into school systems across the U.S. Typically, a human operator in a remote location controls the robot in order to communicate and interact with colleagues in a distant location. In schools, these robots provide a bridge for human interactions by allowing the homebound student to have an active in-school physical presence via the robot. Our research conducts holistic case studies of this practice in real-world settings that capture the experiences of homebound students and their parents, teachers, classmates, and administrators. In this paper, we suggest social behavioral guidelines based on our research and supporting literature to gain feedback and engage in a meaningful discussion of best practices for the use of telepresence robots in collaborative student groups.

Student Group Dynamics

In our research, we seek to explore the social and technical challenges that homebound students face when they use a robot for social engagement with their peers and teachers. It is important for students to understand how to engage in these interactions through the robot. The nature of social interactions via telepresence robots is complex, as it requires human computer interaction combined with human robot interaction in order to achieve quality human to human interactions. Homebound students are at the center of these interactions and they benefit from understanding

- how their use of the robot influences the dynamics of group work
- how their behavior via the robot influences how classmates interact with the robot socially
- how a better understanding of the classroom environment (both social and physical) can guide their robot use to contribute to classroom success

Telepresence Robots: Tabletop and Floor Models

There are currently two types of telepresence robots being used in classrooms: tabletop and floor model robots. Tabletop robots such as Kubi [table 1] may provide capabilities such as a life-size face image, pan and tilt capabilities, and 300-degree neck rotation. These robots allow a remote person to control real-time synchronous communication but these robots do not allow for remote controlled mobility of the unit. The person embodied in the tabletop robot must rely on others for mobility.

Kubi

1.4 lbs (.64 kg)
$499 + cost of iPad (no access fees)

Table 1: Telepresence robot, tabletop model

Floor model telepresence robots such as Beam+, Double, and VGo [table 2] differ from tabletop models in that the person embodied in the robot does not have to rely on others to move around the building. The remote user can control the robot’s mobility through the same interface used to control the videoconferencing capabilities. A student using a floor model telepresence robot experiences increased autonomy as the robot is able to move about the classroom and school with equitable access as that of a student in a wheelchair. Research has shown that the most significant barrier to this use of technology is spotty Wi-Fi connectivity [5].

Beam+	Double	VGo
		
68 lbs (31 kg)	15 lbs (7 kg)	19 lbs (9 kg)
$1995 (no access fees)	$2499 + cost of iPad (no access fees)	$6500 ($120 monthly access fee)

Table 2: Telepresence robots, floor models

Robot Limitations

Every member of the group (e.g. schoolmates, classmates, faculty, and staff) where the robot is deployed needs to understand the limitations of the robots (e.g., spotty connectivity, issues with video feed) through active dialogue. This dialogue and understanding of the technology can provide realistic expectations and reduce frustrations. We feel that understanding how these robots operate in real-world settings and providing clear guidelines for human control of the robot may help direct any frustrations with the robot towards the technology and away from the remote user (i.e., homebound student). It is important to have clear expectations and guidelines for robot behavior in the classroom in order for the social dynamics of the classroom to be productive. When homebound students and their groups all have a clear understanding of the technology and expected robot behavior, when technological challenges occur, they may engage in group-led problem solving to both adapt the current technology and advocate for improved design of future technologies.

Remote User Guidelines

In this paper, we draw from relevant literature and our research in schools to provide some suggested social behavior guidelines (i.e., rules) for remote students who are using these robots to interact with classmates at school. Our research draws on the social dynamics of school interactions to evaluate the experiences of homebound students using these robots to interact with peers. By providing guidelines for the homebound student who is controlling the robot, we are establishing expectations for both the homebound student and the classmates. With mutual understanding and expectations of robot-behavior, the participation of the robot in school activities may be more easily accepted and group social engagement may increase. Since both tabletop and floor model telepresence robots are being used in schools, the guidelines are divided into two sections according to capabilities: 1) videoconferencing (head and neck) and 2) mobility (body). The guidelines are worded as direct first-person narratives to the homebound student who will be using the robot to attend school. The wording of the guidelines is conversational and represents notes from our observations and feedback from teacher and administrator participants in our studies. Since these guidelines are based on aggregate experiences, they are not direct quotations. Supporting references to relevant literature that align with our observations and teacher/administrator experiences are listed underneath each guideline.

Videoconferencing

This section includes guidelines for both models of robots (i.e., tabletop and floor models) and covers capabilities that typically represent head and neck features.

Eye contact is important [4,6]

The robot is a new addition to school; pay attention to how classmates react. They can see your face, make sure you can see theirs.

Remote user should have strong audio awareness [2,3,6]

Watch out for 'yell-talking,' adjust your volume when you change locations. The volume you use in the lunchroom should not be the volume you use in the classroom. Look for clues: if classmates are moving away from you, you may be too loud; if they are leaning in really close, you may be too quiet--don't be afraid to ask, "am I too loud/quiet?"

Life-size face image is important [3,6]

Make sure your camera captures your full face and possibly your shoulders (in case you shrug, tip your head, etc.). If you are using a tablet to log in to your robot, place it in a fixed location so your classmates are able to see you in a consistent way. Holding it so they have a view of your nostrils or just half your face is not always appealing.

Importance of getting ready for school [6,7]

Your home should not be a new addition to the school; do not share too much personal information. Just because you are home does not mean everyone gets to see your house. Try to have your own classroom 'corner' at home. Remember, when you are on the robot, you are at school. Some suggestions:

a. Comb your hair and wear a clean shirt
b. Put up a school-related poster behind you
c. Use headphones and a microphone when controlling your robot

Robots need help to accomplish some tasks [5]

You can use your robot to socialize but know robot limits—the robot cannot:

a. Eat or drink for you, so you will not be able to do this at parties. If someone is bringing in a special meal, and you really want to taste it, it may be best to avoid this activity. However, you can eat lunch at the same time as your friends and socialize then.
b. Tap someone on the shoulder—you must use your voice or lights to get your friend's attention. Friends may not always be in tune to what you need and your body language is limited. Your voice is your best friend and you need to use it to communicate what the robot cannot.
c. Open doors—you will have to ask people for help on this.

Mobility

This section includes guidelines for floor models of telepresence robots and cover capabilities that typically represent body and feet features.

Some remote users personalize (e.g., put shirts or other articles of clothing on the robot) their robots to represent their identity [4]

Make it yours: Your robot is YOU. Personalize it--put a t-shirt, wig, dress, whatever you like to wear on your robot. Your friends dress themselves; you get to dress your robot!

The first law of robotics-- 'a robot may not injure a human being…' [1]

Learn to walk: When you are on your robot, humans always have the right of way. Remember, you only weigh 15-68 lbs.

A map may be useful for navigating the robot [2]

Be an explorer: know how far you can go on the Wi-Fi. Get a map of the school so you know where you have to go for all your activities. Test-drive the Wi-Fi with your classmates and mark on the map exactly how far your connectivity can get you. There's no map of the school? No problem, you and your classmates can make one!

Adjustable height is desirable for interactions at standing or sitting heights [2–4]

Stand up or sit down: adjustable height is for standing and sitting so you can make eye contact—it is not for staring at people's stomachs, blocking your friend's view, etc.

Discussion

The suggested guidelines presented in this paper are drawn from our ongoing case studies in schools. We believe that they apply beyond the classroom to other settings where a remote user needs to interact with more than one person in a group setting. We do not believe these guidelines are by any means comprehensive or complete--in fact, it is our goal to seek continual improvement of these guidelines as our knowledge of this practice grows. Mutual understanding of the social behavior guidelines by both the homebound student (i.e., remote user) and the classmates (i.e., interactant group) will facilitate integration of the robot into the existing social fabric of the school community.

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