Chapter 7
E–Collaboration Between People and Technological Boundary Objects: A New Learning Partnership in Knowledge Construction

Sandra Y. Okita
Columbia University, USA

ABSTRACT

Computerized instruction has become more common over the years. Students can now learn from computerized images of people in virtual environments. A new learning partnership can develop with a Technological Boundary Object (TBO) that simultaneously belongs to mutually exclusive categories. The TBOs may have human-like appearance and behavior that naturally elicit a social response. As learning environments become more human-like, should TBOs maintain a boundary-like state or aim for perfect human mimicry? The challenges to high fidelity seem to outweigh the benefits. Three common categories in TBOs: animate and inanimate, real and virtual, and self and other, are exemplified through empirical studies. The findings draw attention to the different learning partnerships that can be developed with TBOs and their future potential.

INTRODUCTION

People learn from various sources. Traditional sources involve learning from people or objects. Recently, people have started to learn more from computerized instructions that blends the natural properties of people and objects. For example, virtual environments include computerized people. Learning can even occur with life-sized humanoid robots.

The chapter proposes a new learning partnership between people and Technological Boundary Objects (TBO). TBOs are artifacts that simultaneously belong to mutually exclusive categories. For example, a robot dog would simultaneously reside in categories of animal and machine. TBOs that involve human-related categories typically have a human-like appearance and behavior. Appearance and behavior elicit strong social responses in TBOs that invite active engagement and can develop peer-learning relationships. Ideally, TBOs will support
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factual learning, knowledge construction, and the development of metacognitive skills.

The chapter begins by introducing TBOs. The chapter then organizes learning environments into categories of socially indifferent, socially implicit, and socially explicit. As learning environments become more human-like should TBOs aim for higher fidelity to the point that no boundary-like state remains? The challenges and issues to high fidelity seem to outweigh the benefits. Three common TBO combinations—animate and inanimate, real and virtual, and self and other—have been mapped to empirical studies to measure the effects of TBOs. The studies draw attention to the different possible learning partnerships that can be developed. The chapter will then share possible future work, and concludes with a summary. The objective of this chapter is to shine light on new potentials with TBOs, and provide some initial evidence to this interest.

TECHNOLOGICAL BOUNDARY OBJECTS (TBO)

The term “Boundary Object” was originally introduced by Susan L. Star and James R. Griesemer (1989). Boundary objects referred to ideas that serve as an interface across different communities of practice. For example, “affordance” in ecological psychology (Gibson, 1977, 1979) means all action possibilities of the environment for a specific organism. In Human-Computer Interaction (Norman, 1988), the concept of “affordance” is relational, and refers to perceived action possibilities such as “to suggest” or “to invite”. People in the two communities can use the word “affordance” to communicate, despite the different theoretical commitments hidden behind the term.

Here, the term “boundary object” is used differently. Boundary objects refer to artifacts that simultaneously belong to mutually exclusive categories. For example, Frankenstein belongs to categories of both alive and dead. Boundary objects often elicit strong responses that bewilder the beliefs in them. People acknowledge quite easily that Frankenstein and Werewolf are fictional, or that what they see “is only a movie”, but they continue to be afraid of the idea. Similarly, visiting Disney’s haunted mansion, or watching a vampire movie, generates affective responses regardless of one’s beliefs. Many combinations of categories trigger similar responses that elicit primitive reactions, often fear, despite people’s beliefs. Ideally, technology should be able to design and create boundary objects that capitalize on their atypical cognitive status but are geared toward learning, not fear.

Technological Boundary Objects (TBO) are subsets of boundary objects. TBOs involve technological devices such as computers and robots. For example, a robotic dog is a machine that can take on similar forms and motions as a real dog. Therefore, the robotic dog resides in categories of both animal and machine. TBOs can be “physically real” like humanoid robots, or “virtually real”, like a game character in the computer. Most TBOs are interactive, which increases their potential for engagement.

Interactive and human-looking TBOs naturally elicit a social response. The human-like appearance is appealing and attention grabbing. Human-like interactions often involve movements that give an animate impression. Movements like looking, talking, or body language, invite social interaction, and suggest a possible method of communication. For example, children may try to communicate by “showing” if a TBO is looking, by “speaking” if a TBO is talking, and by “gesturing” if a TBO shows body language. Human-like appearance and behavior can also trigger familiar schemas and responses. Familiarity taps into people’s prior knowledge and experience. Familiarity may easily trigger affective responses, attributions, and stereotypical behaviors. For example, a learner may recognize a familiar gesture from a robotic cat (stretch), make attributions toward them (cat must...