Seeing ourselves in the computer: How we relate to technologies

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TECHNOLOGY

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Subject: Seeing ourselves in the computer:
       How we relate to technologies

Readers of this journal are familiar with the idea of stance in reading. As Rosenblatt (1978) showed, our response to literature can involve an efferent stance, in which we seek information, or an aesthetic stance, in which we respond to the text as an artwork. Others have identified ways that individual readers develop their own stances toward a text, everything from resistance to the idea of reading to deep immersion in which one's own life is played out in a fictional narrative.

   Although it is easy for us to see a novel or a poem as an artwork, and to imagine different stances one might take toward that work, it may be more difficult to envision a computer system in such a way. Our language leads us away from conceiving of the computer as worthy of a stance when we say "it's just a tool" or "it's only a bunch of 0s and 1s." But our stance toward a technology may be all the more powerful because we do not recognize it as such. When we think that we are simply operating a machine, we cannot see the many ways that our psychological processes shape how we use and interpret it.

   This month we have a report on the research of Punyashloke Mishra, Michael Nicholson, and Steven Wojcikiewicz from Michigan State University, East Lansing, USA. They take seriously the idea that we need a theory of response to technology as much as we need one for response to literature. Their research is fascinating in what it reveals about technology, but is even more so in what it reveals about people and the way we interpret the world around us.

Bertram C. Bruce

Does my word processor have a personality? Or Topffer's Law and the design of educational technology

From the Golem to Frankenstein, from Isaac Asimov's robots to Rosie, the mechanical maid in *The Jetsons* (the old U.S. TV cartoon show), people have been fascinated by the idea of human creations that become autonomous sentient agents. Embodying human-like qualities (such as intelligence) in computers has been the driving force behind the field of Artificial Intelligence (AI). There has been a resurgence of interest in creating anthropomorphic and believable software "agents" through the use of natural-language processing, affective computing, and multimodal interfaces. We can see examples of this trend everywhere. There is the little "paper-clip assistant" that ships with Microsoft Office; companies like Extempo and Inago that offer interactive agents for "hire"; and Hagglezone, an online shopping Web site, which lets you haggle with a software agent for the best price for anything from a lawnmower to a DVD player.

There are also products like MyPersonalTutor (2000, Microsoft), an early reading program that boasts of a social interface in the form of "the charming Professor P.T. Presto" who offers engaging "multimedia tutorials designed to help the child learn." Outside the realm of the personal computer are animatronic toys like Furby and My Real Baby, which are designed to show emotion and affect as well as to "learn" new behaviors and act in unpredictable ways. The key idea behind these products is that software agents (or artifacts) can be endowed to a greater or lesser degree with various elements of human personality that lead to more life-like interactions with the user.

Most educators, social scientists, and humanists have been wary of the strong claims made for AI. It has been argued that computer personalities would lack the vitality and dynamism of human personalities. Software personalities would appear scripted, stiff, and unnatural. People would see through the charade and would ignore or maybe even resent human-like responses from a computer. In this column, we would like to argue that, contrary to these expectations, it appears that it is not difficult to imbue computers with human personalities. In fact, it may be impossible not to do so. Responding socially to computers and other interactive media is something we do naturally, and generating these responses may not be as much dependent on powerful AI algorithms as it is on explicit scripting of expressive features to convey appropriate social cues. Responding socially to computers, we believe, has significant implications for media literacy—especially in today's digital world.

To introduce our argument, we begin with a brief digression to Rodolphe Topffer (1799–1846), an artist, designer, and (last but not least) amateur psychologist. He was involved in the development of a new medium for expression and communication, just as we are today. As we shall see, his insights have a great deal to offer us, although our world is very different from his.

Introducing Topffer's Law

1999 was the 200th anniversary of Topffer's birth. Though his name is not widely known today, Topffer's legacy is all around us. He is, as it turns out, the father of the modern comic book. His greatest contribution was to combine visuals and text within a sequence of frames to build a story. By juxtaposing pictures and text and drawing them one frame at a time, Topffer brought both time and narrative into the picture. He also invented some of the comic genre's standard stylistic elements (such as narrowing the panels to speed up the action, or flashing quickly between characters). Here are just some examples of his legacy: Art Speigelman's *Maus*, the Pulitzer Prize-winning Holocaust memoir-in-comics; Superman and Batman comic books; and Sunday morning newspaper cartoon sections.

Topffer, however, saw his work with picture stories as a simple hobby, devoid of any significant artistic merit, something he did "mainly to brighten his evening hours" (Wiese, 1965, p. x). He believed that his most significant and lasting contribution would be to the psychology of art and caricature, something to which he devoted many of his final years. Long before psychological laboratories and controlled experiments, Topffer began a series of systematic experiments on the art of caricature. The results of this work are presented in a slim volume entitled *Essay on Physiognomy* and published a year before his death.

The success of the picture book, Topffer argued, came from one thing, and one thing only—a knowledge of physiognomics and human expression. The picture-book artist must create convincing personalities with readable characters and expressions. During his experiments, which involved drawing hundreds of carica-

tures of human faces, Topffer came to realize that creating convincing personalities was not difficult. He found that it was impossible *not* to do so. This led him to frame a law, which Gombrich (1972) eponymously called Topffer's Law: Any human face, however poorly and childishly drawn, possesses necessarily, by the mere fact of existing, some perfectly definite expression. In other words, any squiggle that we can interpret as a face will have a distinct individual personality. As the art critic Gombrich said,

> The most astonishing fact about these clues of expression is surely that they may transform almost any shape into the semblance of a living being. Discover expression in the staring eye or gaping jaw of a lifeless form, and what might be called "Topffer's Law" will come into operation—it will not be classed just as a face but will acquire a definite character and expression, will be endowed with life, with a presence. (p. 289)

Modern science bears out Topffer's psychological insight. It seems that humans have an instinctive ability to see faces everywhere. Be it the front grille and headlights of a car or the three holes of a wall socket, faces are all around us. Scientists who study the brain have argued for a specific module in the brain that is "tuned" to recognize faces. There are people with damage to specific regions of the brain (or with congenital brain deficits) who *cannot* recognize faces, a deficit called prosopagnosia or face-blindness.

Topffer's Law, interesting though it may be, has remained a curiosity with limited relevance outside the psychology and art of caricature. However, we would like to argue that Topffer's Law holds true for more than just squiggles on paper, and that it may allow us to understand some recent research findings on people's psychological responses to interactive media—computers. Personality is not something inherent in face-like sketches or in wall sockets; it is something we read into the world around us. We are meaning-making, pattern-seeking creatures, and it seems that just as we read personality into squiggles of ink on paper we read personalities into all kinds of interactive artifacts, such as word processors and ATM machines. This may seem a bit strange at first glance—a word processor with a personality!

Topffer's Law and interactive media

Over the past decade there has been some fascinating research to indicate that people often respond to computers (and other media) as they would to real people and events—as if the computer were an autonomous agent with feelings and thoughts. People seem to follow all kinds of social rules when interacting with computers, however bizarre or silly this may seem. This line of research was first conducted by the Social Responses to Computing Technologies group at Stanford University (Stanford, California), led by Clifford Nass and Byron Reeves (see Reeves & Nass, 1996). Over the past year, we at Michigan State University have been extending this line of research. This research indicates that people are polite to machines (Nass, Moon, & Carney, 1996), read gender and personalities into them (Nass, Moon, & Green, 1996), are flattered by them (Fogg & Nass, 1996), and treat them as teammates (Nass, Fogg, & Moon, 1996). People stereotype computers as being native or non-native speakers and, even more strangely, they rate the non-native computer as less competent than a native one (Alvarez-Torres & Mishra, 2000; Alvarez-Torres, Mishra, & Zhao, in press).

People are flattered by computers that praise them and rate computers that flatter them as being "better" and more "user friendly" than ones that criticize them, even when they are told that this flattery has no basis (Fogg & Nass, 1996). People read personality characteristics, such as dominant or submissive traits, into computer tutorials (Moon & Nass, 1996), and there is some evidence that they prefer interacting with the submissive computer, though it seems that they learn more from the dominant one (Mishra, Tan, & Zhao, 2000). It is easy for people to form a social contract with a computer—when they perceive that the computer has treated them unfairly they punish it (Ferdig & Mishra, 2000).

Though space limitations prohibit us from offering details of these studies, we offer one example. Consider the common-sense idea (and one that is supported by research in social psychology) that any person, for example one of the authors, would be more willing to reveal personal information about himself to another person if that person were to reveal some personal detail to him. For instance, if you were to ask Punya to tell you the greatest disappointment in his life, he would reveal more to you if, prior to asking, you were to reveal something that has disappointed you. Strangely enough, it appears that people apply this "social rule" even when interacting with computers.

In a study conducted by Moon (2000), participants were interviewed by a computer on a variety of topics, and their responses were telling. In one condition they were asked questions about something personal, for example: "What has been your biggest disappointment in life?" In another condition they were asked the same question prefaced by the following:

> This computer has been configured to run at speeds up to 266 MHz. But 90% of computer users don't use applications that require these speeds. So this computer rarely gets used to its full potential. What has been your biggest disappointment in life?

Notice that nowhere does the computer describe itself in first-person terms or indicate that it has emotions, feelings, or attitudes. Despite that, people were significantly more willing to reveal personal information in the second condition than in the first. Essentially, people were applying the social rule of "disclosure begets disclosure" to a computer; they were responding to the computer just as they would respond to another person.

Do any of the study participants seriously believe that a 266 MHz computer can feel disappointed? Or, as the findings of the other studies indicate, do they think that a computer can have personality, gender, and ethnicity? None of the participants in our studies (and the studies conducted at Stanford) claimed to do so when directly asked about it. What is fascinating, though, is that what the participants said did not match what they did. This "intentional stance" (Dennet, 1987) appears to be unconscious, instinctual, and independent of age, experience, and expertise (Reeves & Nass, 1996; Turkle, 1984; Weizenbaum, 1976). It is important to note that these counterintuitive effects are achieved not by designing some fancy agent-based, AI-driven, high-tech computer program that requires a couple of million dollars to develop, but rather with the simplest of text or voice-driven interfaces.

The evidence suggests that generating personality in a piece of software is not difficult. As Topffer realized with respect to his caricatures, it may be impossible to prevent personality from kicking in. Thus, we can extend Topffer's Law into the digital age and argue (a) that almost all interfaces, however badly developed, have personality; and (b) that personality can be generated through the subtlest of cues (these could be the manner in which text messages are phrased or the layout, as well as the use of images and other media). Of course, the use of anthropomorphic agents, such as those described earlier, will only enhance this effect.

Implications for media literacy

Literacies and technologies have always been intricately connected. New technologies, with their new constraints and affordances, reveal new ideas of what constitutes literacy. We believe that Topffer's Law (in the new and expansive version we present here) has a lot to contribute to our understanding of media literacy, especially with respect to the new interactive media.

A key aspect of literacy is becoming a sensitive and critical user of media. Advocates of agent-based anthropomorphic technologies often talk of how wonderful these new tools will be (Baylor, 1999). However, there is a darker side to these tools to which we must become sensitive. It is clear that this reading of agency into interactive media is something that can be used against us as information consumers. Advocates of media literacy have often argued for awareness of how information is presented and for sensitivity to techniques that could be used by partisan groups and individuals to manipulate our responses. The ability to instantiate stereotypes, to enhance certain social behaviors over others, can be used to manipulate us for good and for ill. That we are often unaware of these effects makes them even more insidious.

Hagglezone, a Web site that uses software agents to market goods, is a good example of using social cues to promote buying behavior. The Web site for NetSage claims to have a "radical approach to managing online relationships." Its creators label it "Social Intelligence" and argue that "it changes customer behavior." Most children's software uses anthropomorphic agents to involve and motivate children. There is some evidence (Turkle, 1984) that children are more susceptible to these social media than adults are, though this is an area that needs much more research. A greater awareness of Topffer's Law will allow us to recognize these manipulative techniques and thus become smarter in how we deal with these new technologies.

Media literacy is not just about becoming smarter media users, but is also about becoming creative, flexible media creators. We believe that if Topffer's Law holds true it has implications for how we train the next

generation of educational technology designers. Though the findings we describe here have been applied in a variety of settings, from the development of voice-mail systems to the design of productivity software (Nass, 1997), they have not had much impact on theory, research, and design related to educational technology. There are two main reasons for this. First, the study of psychological responses to media is an extremely new area of research. Second, this research has not focused on issues of learning. Reeves and Nass (1996), the premier researchers in this domain, said their goal was rather straightforward:

> We are interested in making technologies more "likeable." And just as "liking" leads to various secondary consequences in interpersonal relationships (e.g., trust, sustained friendship, etc.), we suspect that it also leads to various consequences in human-computer interactions (e.g., increased likelihood of purchase, use, productivity, etc.). (p. 138)

Educators have to consider more than just creating a "likeable" computer personality. They have to consider issues of student cognition, affect, and pedagogy as well.

Research in educational technology can focus on harnessing this natural reaction to interactive media to our advantage. These findings emphasize the importance of the social relationship that can develop between a computer and the learner. For instance, research shows that indiscriminate flattery gives users a better feeling toward the computer program (Fogg & Nass, 1996). Flattering users, irrespective of context, may make sense for commercial software producers, but its application to educational technology is problematic. It may give learners a false sense of accomplishment, which may do more harm than good in the long run. Research on student attribution indicates that, in certain contexts, teacher praise may have a negative impact on student self-efficacy (Meyer et al., 1979). The research on stereotypical behavior toward gender and nativeness raises many complex questions for the designer. It would be unacceptable to use a male or native-speaker voice as a narrator in educational software just because research indicates that such a tutor is perceived as more authoritative and knowledgeable. An educator's goal is as much to undermine the insidious effect of such stereotyping as it is to teach content.

Thus, designers of educational software tools have to go beyond the purely cognitive aspects of working with computers and factor in the social and psychological aspects as well. This makes our task far more challenging, bringing as it does an immense domain of social and personality psychology to bear on educational technology. For instance, consider the design of software characters and personalities, a domain that educational technologists do not know much about.

The idea of designing characters is a complicated one, and, as one designer of interactive media said, "Character creation is a black art. No one ever wrote a book on how to be good at it" (White, 2000). In this we can learn from the true experts, the people who create interactive characters for a living: people in theater. Designers of interactive media, especially those who work at the forefront of new media, are sensitive to this. As Nathan Shedroff, a designer of interactive Web sites, said,

> Few people are ever taught to create successful, satisfying experiences for others. Mostly, these folks are in the performing arts: dancers, comedians, storytellers, singers, actors, etc. I now wish I had more training in theater and performing arts to rely on...especially in improvisational theater. That's like the highest form of interactivity. (quoted in Bruce, 1997, p. 291)

Final thoughts

Two hundred years after Rodolphe Topffer's birth, in March 1999, the Swiss Post Office released a series of six stamps honoring his comic art. Carrying images from his picture books, these stamps are a welcome honor, given to Topffer for developing an art form that is so important today. Ironically, as we have seen, these picture books were not something he felt were his greatest contribution; they were, in his mind, whimsical and effervescent. Of far greater value, in his opinion, was what came out of his work on the picture books—his musings on the nature of caricature and the language of physiognomy. It seems particularly appropriate that this work (which has been neglected for so long) is once again offering insights and perspectives to a new generation of artists and designers as they begin to understand and develop a new medium. As one of his early admirers, the poet and scientist Wolfgang Goethe, said, Topffer (and Topffer's Law) might indeed, in the future, "produce things beyond all conception."

Just Think Foundation (www.justthink.org) is a media-literacy Web site committed to educating children, especially at-risk children, about how to comprehend what is being said in media and how to create media messages in various forms. The site consists of reports of projects completed; information for parents and teachers, including lesson plans and recent news events; and a list of resources on media literacy for inquiring minds. However, you will not find much there about issues raised in this column (such as reacting socially to interactive media). Issues of the psychology of human-computer interactions and of attributing personality to media have important implications for the creation and presentation of media; thus far they have not received the degree of attention, we believe, they deserve.

Some other sites of special interest

Affective Computing (www.media.mit.edu/affect/). This is a Web site at Massachusetts Institute of Technology. Led by Rosalind Picard, the affective computing group focuses on creating personal computational systems endowed with the ability to sense, recognize, and understand human emotions, together with the skills to respond in an intelligent, sensitive, and respectful manner toward the user and his or her emotions.

Botspot (www.botspot.com/). The term *bot* is abbreviated from *robot* and is a piece of software that runs automatically. Bots have been developed for a variety of purposes, and you can find an extensive list of them at Botspot as well as latest news on bot technology. Be sure to try out some of the "chatterbots" that can be accessed from this site.

Hagglezone (www.hagglezone.com/). This is a business Web site that allows you to haggle for the best price with a variety of "software hagglers." According to the site, this is the place "where everything is negotiable." Each haggler has a distinct face and personality.

Extempo (www.extempo.com/) and Inago (inago.com/). These two develop software agents for hire. As the first site claims, "Extempo enables businesses to automate real-time customer care over the Internet through the personalized services of smart, interactive agents." Go to these Web sites to chat with software agents such as Erin, the virtual bartender.

irobot (www.irobot.com/). This company produces robots for the consumer market. Their latest is My Real Baby, a product they describe as an "interactive, robotic, artificially-intelligent, emotionally-responsive baby doll." This is among the first of a new breed of interactive toys.

Intentional stance—Dennet (1987) argued that when we characterize a system, either natural or artificial, in terms of beliefs and desires, we adopt "the intentional stance." In this column we use the term somewhat differently to categorize how people respond to interactive media as if it were a psychological being or actor. There is increasing evidence that this intentional stance appears to be an unconscious response, independent of age and expertise.

Interactive agents—semi-autonomous, proactive, and adaptive computer programs. Agents do not necessarily have human-like qualities (such as language-processing abilities and so on). However the development of human-like agents (with beliefs, intentions, knowledge, and even emotions) is a growing area of research.

Physiognomy—the art of studying outward appearance (such as facial features and expression) in order to discover temperament, character, and personality.

Topffer's Law—as defined by Gombrich (1972) and based on work by Rodolphe Topffer: Any human face, however poorly drawn, possesses necessarily, by the mere fact of existing, some perfectly definite expression and character. In the present context, we extend Topffer's Law to include the perception of personality and character into interactive artifacts (such as animatronic toys or computer software), however poorly they may be designed.

References

Alvarez-Torres, M.J., & Mishra, P. (2000, April). *Computers with accents: Stereotypes, credibility and learning.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA.

Alvarez-Torres, M., Mishra, P., & Zhao, Y. (in press). Judging a book by its cover: Stereotypical responses to interactive media and its effect on the recall of text information. *Journal of Educational Media and Hypermedia.*

Baylor, A. (1999). Intelligent agents as cognitive tools for education. *Educational Technology, 39*(2), 36–40.

Bruce, B.C. (1997). Literacy technologies: What stance should we take? *Journal of Literacy Research, 29,* 289–309.

Dennett, D. (1987). *The intentional stance.* Cambridge, MA: MIT Press.

Ferdig, R.E., & Mishra, P. (2000). *Emotional responses to computers: Experiences in unfairness and spite.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA.

Fogg, B.J., & Nass, C. (1996). *Silicon sycophants: The effects of computers that flatter.* Paper presented to the annual meeting of the International Communication Association, Chicago.

Gombrich, E.H. (1972). *Art and illusion: A study in the psychology of pictorial representation.* London: Phaidon Press.

Meyer, W., Bachmann, M., Biermann, V., Hempelmann, P., Ploger, F., & Spiller, H. (1979). The informational value of evaluative behavior: Influence of praise and blame on perceptions of ability. *Journal of Educational Psychology, 71,* 259–268.

Mishra, P., Tan. S., & Zhao, Y. (2000). *Dominant and submissive computer programs? What does this mean for the learning experience?* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA.

Moon, Y. (2000). Intimate exchanges: Using computers to elicit self-disclosure from consumers. *Journal of Consumer Research, 26,* 324–340.

Moon, Y., & Nass, C.I. (1996). How real are computer personalities? Psychological responses to personality types in human-computer interaction. *Communication Research, 23*(6), 651–674.

Nass., C.I. (1997) Interviewed by Rob Killheffer. *Omni Magazine.* Retrieved November 17, 2000 from the World Wide Web: www.omnimag.com/archives/chats/br050297.html

Nass, C.I., Fogg, B.J., & Moon, Y. (1996). Can computers be teammates? *International Journal of Human-Computer Studies, 45,* 669–678.

Nass, C.I., Moon, Y., & Carney, P. (1996). *Are respondents polite to computers? Social desirability and direct responses to computers.* Paper presented at the annual meeting of the International Communication Association, Chicago.

Nass, C.I., Moon, Y., & Green, N. (1996). *How powerful are gender stereotypes? An experimental demonstration.* Paper presented at the annual meeting of the International Communication Association, Chicago.

Reeves, B., & Nass, C.I. (1996). *The media equation: How people treat computers, television, and new media as real people and places.* Cambridge, England: Cambridge University Press/CSLI.

Rosenblatt, L.M. (1978). *The reader, the text, the poem: The transactional theory of the literary work.* Carbondale, IL: Southern Illinois University Press.

Turkle, S. (1984). *The second self: Computers and the human spirit.* New York: Simon & Schuster.

Weizenbaum, J. (1976). *Computer power and human reason.* San Francisco: Freeman.

White, P. (2000). Interviewed by *Newmedia* magazine. Retrieved July 12, 2000 from the World Wide Web: www.newmedia.com

Wiese, E. (1965). *Enter the comics.* Lincoln, NE: University of Nebraska Press.

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