

Cognitive and Affective Benefits of an Animated Pedagogical Agent:  
Considering Contextual Relevance and Aesthetics

George Veletsianos

Veletsianos, G. (2007). Cognitive and Affective Benefits of an Animated Pedagogical Agent:  
Considering Contextual Relevance and Aesthetics. *Journal of Educational Computing  
Research*, 36(4), 373-377.

Cognitive and Affective Benefits of an Animated Pedagogical Agent:  
Considering Contextual Relevance and Aesthetics

Choi and Clark (2006) argue that learning is attributed to the instructional method rather than the specific medium used to deliver instruction (i.e. the pedagogical agent). Additionally, they consider pedagogical agents as unnecessarily expensive tools, whose instructional affordances can be replicated by less expensive options. In this response to Choi and Clark (2006), I argue that pedagogical agents are not a new iteration of the media debate because the anthropomorphous features and social affordances of pedagogical agents elicit psychological responses from learners that other media cannot educe. As such, when considering the implementation of pedagogical agents, researchers need to consider the agent's (a) contextual relevance, and (b) aesthetic properties. It is important to note that none of these factors influence the instructional method used to deliver instruction via a pedagogical agent.

*Contextual Relevance*

Contextual relevance is an overlooked design feature not only in the study conducted by Choi and Clark (2006), but in a number of other investigations as well. For example, sorcerers have been employed to teach economics (Craig, Cholson, & Driscoll, 2002) and cartoon-like characters have been depicted as physics experts (Mayer, Dow, & Mayer, 2003). Choi and Clark employ a Genie that intends to teach English as a second language.

Contextual relevance can be defined as the conformity of an agent's visual characteristics to the content area under which the agent purports to function. Norman (1997) has argued that user expectations regarding agent abilities are derived from agents' visual appearance. Even though anthropomorphous features may elicit irrational expectations from users regarding agent abilities, agent representations may bring forth expectations that are in line with an agent's

appearance. For instance, an anthropomorphous agent who looks like a scientist may be perceived to be more competent in science-related disciplines such as chemical engineering or nuclear physics, than art-related disciplines such as music or graphic design.

This result follows logically from the *media equation* which states that individuals treat media as if they were human, responding to media in inherently social ways (Reeves and Nass, 1996). Since individuals stereotype and categorize other individuals, the media equation holds that individuals will stereotype pedagogical agents. Such a categorization becomes important when considering the content area under which pedagogical agents purport to function. In other words, pedagogical agents whose visual appearance conforms to the content area under investigation become contextually relevant. If their visual appearance does not conform to the content area under investigation, pedagogical agents become contextually irrelevant. Contextual relevance is important because it may influence learners' attention and perceptions and degree of agent relevance, seriousness, and authenticity.

Choi and Clark (2006) have used Microsoft's Genie as a pedagogical agent and electronic arrows as an alternative medium to deliver instruction to learners about the English language. In the face of the argument presented above, this choice is problematic. First, the Genie is contextually irrelevant. The agent's visual representation conflicts with the content area under investigation and fails to present the agent in an authentic context. How are learners supposed to pay attention to an agent that encompasses the role of an instructor but looks as if it was derived from a fairy tale? Second, one would expect that, even prior to seeing Genie, learners have associated negative stereotypes to Genie, much like they have associated negative stereotypes to other Microsoft agents (e.g. "Clippy the paperclip"). For example, all undergraduate students who participated in a study conducted by Xiao, Catrambone, and Stasko (2003) were familiar

with Clippy and had negative preconceptions regarding its performance and use. The failure of Microsoft agents to assist users in the use of Microsoft Office is well documented (Whitworth, 2005), and we would expect that the categorization of incompetence would transfer to similar agents (i.e. Genie) and to domains other than Microsoft Office. For example, previous research has shown that “Clippy the paperclip” was considered to be annoying, impolite, and disruptive of a user’s workflow (Whitworth, 2005; Xiao, Catrambone, and Stasko, 2003). If learners consider the Genie to be incompetent, it is logical to assume that they will not pay attention to it while completing the task. Even if learners did pay attention to Genie, to what extent would they consider the information delivered by Genie to be credible? After all, the information is delivered from an incompetent source. Finally, Choi and Clark’s alternative medium (the electronic arrow) lacks an anthropomorphic representation. As such, it cannot be stereotyped and its contextual relevance or irrelevance cannot be evaluated. Additionally, there is no reason to expect that participants will consider the arrows to be incompetent or non-credible.

### *Aesthetic Properties*

Choi and Clark (2006) disregard the aesthetic properties of pedagogical agents and the impact that well-designed, pleasing, and elegant agent representations may have on learning outcomes. The authors are not alone in their lack of concern for aesthetically pleasing educational software. Even though Moreno, Mayer, Spires, and Lester (2001), and more recently Gulz and Haake (2006), called on the research community to investigate the role of agents’ visuo-aesthetic presence in multimedia learning environments, researchers have demonstrated a lack of interest in this topic. To date, other than the theoretical propositions put forth by Gulz and Haake (2006), there exists no other examination of the impact of agents’ aesthetic properties on educational outcomes. Equally important, the existing literature expresses only passing interest

on the aesthetic properties of educational software (Lavie and Tractinsky, 2004; Miller, Veletsianos, and Hooper 2006; Parrish, 2005) even though previous research has shown that aesthetically pleasing objects positively influence metacognition, and perceptions of ease of use (Norman, 2004; Tractinsky, Katz, and Ikar, 2000).

When people interact with others, there is overwhelming evidence that interpretations of appearance and observable physical cues profoundly affect both beliefs and behaviors (Dion, Berscheid, and Walster, 1972; McArthur, 1982; Kalick, 1988). For instance, prior research has shown that teachers give higher scores to attractive students than otherwise (Ritts, Patterson, and Tubbs, 1992). The evidence highlighting the importance of aesthetics and beauty on human-human interactions implies that aesthetics and beauty may be a vital but overlooked aspect of human-agent interactions. The natural question to ask is: Do aesthetics and beauty influence human-agent interactions and consequently human beliefs and behaviors regarding learning and teaching? Evidence from social psychology and human computer interaction suggests that deliberate attempts to improve the aesthetic properties of pedagogical agents may influence learner perceptions and learning outcomes, but to date this suggestion has not been examined.

### Implications

The two issues I have raised above appear to be important in the design and development of pedagogical agents, but are often overlooked. Choi and Clark (2006) argue that pedagogical agent researchers and designers should (a) re-evaluate the benefits of pedagogical agents in relation to their costs and (b) consider less expensive tools that provide the same instructional affordances. In essence, Choi and Clark believe that pedagogical agents are the “latest iteration” of the media debate (p. 442). In this paper I have taken the stance that learners perceive

pedagogical agents in a humanlike and social manner and, as such, designers need to consider the agents' contextual relevance and aesthetic properties.

It is only through collaboration and discourse on such issues that we, as a research community, will come to conclusions regarding the design and development of pedagogical agents. Even though I have expressed my concerns about the study conducted by Choi and Clark (2006), it is vital to note that their investigation is important because it lends itself well to being replicated with the issues I have identified above.

#### References

- Choi, S., and Clark, R.E. (2006). Cognitive and affective benefits of an animated pedagogical agent for learning English as a second language. *Journal of Educational Computing Research*, 34(4), 441-466.
- Craig, S. D., Cholson, B., and Driscoll, D. M. (2002). Animated Pedagogical Agents in multimedia educational environments: Effects of agent properties, picture features and redundancy. *Journal of Educational Psychology*, 94(2), 428-434.
- Dion, K., Berscheid, E., and Walster, E. (1972). What is beautiful is good. *Journal of Personality and Social Psychology*, 24(3), 285-290.
- Gulz, A., and Haake, M. (2006). Design of animated pedagogical agents - A look at their look. *International Journal of Human-Computer Studies*, 64(4), 322-339.
- Kalick, S.M. (1988). Physical attractiveness as a status cue. *Journal of Experimental Social Psychology*, 24, 469-489.
- Lavie, T., & Tractinsky, N. (2004). Assessing dimensions of perceived visual aesthetics of web sites. *International Journal of Human-Computer Studies*, 60(3), 269-298.

- Mayer, R. E., Dow, G. T., and Mayer, S. (2003). Multimedia learning in an interactive self-explaining environment: What works in the design of agent-based microworlds? *Journal of Educational Psychology*, 95(4), 806-813.
- McArthur, L. Z. (1982). Judging a book by its cover: A cognitive analysis of the relationship between physical appearance and stereotyping. In A. H. Hastorf and A. M. Isen (Eds.), *Cognitive social psychology* (pp. 149-211). New York: Elsevier.
- Miller, C., Veletsianos, G., and Hooper, S. (2006). Demystifying aesthetics: An exploration of emotional design. In Proceedings of the 2006 *Computers and Advanced Technology in Education (CATE)* conference, October 4-6, 2006, Lima, Peru.
- Moreno, R., Mayer, R. E., Spires, H., and Lester, J. (2001). The case for social agency in computer-based teaching: Do students learn more deeply when they interact with animated pedagogical agents? *Cognition and Instruction*, 19, 177-213.
- Norman, D. (2004). *Emotional design: Why we love (or hate) everyday things*. New York: Basic Books.
- Norman, D. (1997). How might people interact with agents. In J. M. Bradshaw (Ed.), *Software agents* (pp. 49-56). Menlo Park, CA: MIT Press.
- Parrish, P. (2005). Embracing the aesthetics of instructional design, *Educational Technology*, 45(2), 16-24.
- Reeves, B., and Nass, C. I. (1996). *The media equation: How people treat computers, television, and new media as real people and places*. New York: Cambridge University Press.
- Ritts, V., Patterson, M.L., and Tubbs, M.E. (1992). Expectations, Impressions, and Judgments of Physically Attractive Students: A Review. *Review of Educational Research*, 62(4), 413-426.

Tractinsky, N., Katz, A., and Ikar, D. (2000). What is beautiful is usable. *Interacting with Computers*, 13, 127-145.

Whitworth, B. (2005). Polite Computing. *Behaviour & Information Technology*, 24(5), 353-363.

Xiao, J., Catrambone, R., Stasko, J. (2003). Be quiet? Evaluating proactive and reactive user interface assistants. In Proceedings of *INTERACT 2003*, Zurich, Switzerland, pp. 383–390.