

# What Video Games Have to Teach Us About Learning and Literacy

JAMES PAUL GEE  
University of Wisconsin-Madison

---

Good computer and video games like *System Shock 2*, *Deus Ex*, *Pikmin*, *Rise of Nations*, *Neverwinter Nights*, and *Xenosaga: Episode 1* are learning machines. They get themselves learned and learned well, so that they get played long and hard by a great many people. This is how they and their designers survive and perpetuate themselves. If a game cannot be learned and even mastered at a certain level, it won't get played by enough people, and the company that makes it will go broke. Good learning in games is a capitalist-driven Darwinian process of selection of the fittest. Of course, game designers could have solved their learning problems by making games shorter and easier, by dumbing them down, so to speak. But most gamers don't want short and easy games. Thus, designers face and largely solve an intriguing educational dilemma, one also faced by schools and workplaces: how to get people, often young people, to learn and master something that is long and challenging—and enjoy it, to boot.

Categories and Subject Descriptors: K.3.2 [Computers and Education]: Computer and Information Science Education

General Terms: Experimentation, Human Factors

Additional Key Words and Phrases: Video games, education, learning, literacy

---

In my book, *What Video Games Have to Teach Us About Learning and Literacy* (New York: Palgrave/Macmillan, 2003);

[http://www.amazon.com/exec/obidos/ASIN/1403961697/qid=1062706188/sr=21/ref=sr\\_2\\_1/002-5282466-9651248](http://www.amazon.com/exec/obidos/ASIN/1403961697/qid=1062706188/sr=21/ref=sr_2_1/002-5282466-9651248), I argue that schools, workplaces, families, and academic researchers have a lot to learn about learning from good computer and video games. Such games incorporate a whole set of fundamentally sound learning principles, principles that can be used in other settings, for example in teaching science in schools. In fact, the learning principles that good games incorporate are all strongly supported by contemporary research in cognitive science—the science that studies human thinking and learning through laboratory research, studies of the brain, and research at actual learning sites like classrooms and workplaces [e.g., see Bruer 1993; Clark 1997; Cognition and Technology Group at Vanderbilt 1997; Lave 1996; New London Group 1996; Lave and Wenger 1991].

Beyond using the learning principles that good games incorporate, I also argue that schools, workplaces, and families can use games and game technologies to enhance learning. Further, I believe that use of games and game technologies for learning content in schools and skills in workplaces will become pervasive. Many parents, by getting their sometimes quite young children to play games while actively thinking about the game's connections to other games, media, texts, and the world are already doing so. In field studies we are conducting at the University of Wisconsin, we have watched seven-year-olds play *Age of Mythology*, read about mythology inside and outside the game on web sites, borrow

---

Author's address: University of Wisconsin-Madison, 225 N. Mills St. Madison, WI 53706 WI. Email: [jgee@education.wisc.edu](mailto:jgee@education.wisc.edu)

Permission to make digital or hard copies of part or all of this work for personal or classroom is granted without fee provided that copies are not made or distributed for profit or direct commercial advantage and that copies show this notice on the first page or initial screen of display along with full citation. Copyright for components of this work

owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, to republish, to post on servers, to distribute to lists, or to use any component of this work in other works requires prior specific permission and/or a fee. Permission may be requested from Publications Dept., ACM, Inc., 1515 Broadway, New York, NY 10036, USA, fax: +1-212-869-0481, or [permissions@acm.org](mailto:permissions@acm.org).  
 © 2003 ACM 1544-3574/03/1000-BOOK01 \$5.00

books on mythology from the library, and draw pictures and write stories connected to the game and other mythological themes. They think about the connections between *Age of Mythology* and *Age of Empires*, between mythological figures and popular culture superheroes, and the connections of all of them to history and society. This is education at its best, and it is happening at home, outside of school.

Let me give a few examples of the good learning principles that are incorporated in good games (36 principles are discussed in my book). Good games give information “on demand” and “just in time,” not out of the contexts of actual use or apart from people’s purposes and goals, something that happens too often in schools. *System Shock 2*, for instance, spreads, throughout the game, the sort of information typically found in a manual. As they move through the initial levels of the game, players can request just the right information (by pressing on a little green kiosk) and make use of it or see it applied soon after having read it. People are quite poor at understanding and remembering information they have received out of context or too long before they can make use of it [Barsalou 1999; Brown et al. 1989; Glenberg and Robertson 1999]. Good games never do this to players, but find ways to put information inside the worlds the players move through, and make clear the meaning of such information and how it applies to that world.

Good games operate at the outer and growing edge of a player’s competence, remaining challenging, but do-able, while schools often operate at the lowest common denominator [diSessa 2000]. Since games are often challenging, but do-able, they are often also pleasantly frustrating, which is a very motivating state for human beings. To achieve this, good games allow players to customize the game to their own levels of ability and styles of learning. For instance, *Rise of Nations* lets players tweak almost every element in the game, and offers skills tests as well, to ensure that nearly everyone can find the outer edge of their competence. Furthermore, players can continually adjust the game as their competence grows.

Games allow players to be producers and not just consumers. Along with the designer, the player’s actions co-create the game world. As players make choices about what to build in *Rise of Nations*, what skills and missions to choose in *The Elder Scrolls: Morrowind*, or what moral decisions to make in *Star Wars: Knights of the Old Republic* players are as much designers of the game as the original innovators. Furthermore, players can use software that comes with the game to build new scenarios, maps, or episodes (for example, a scenario in *Age of Mythology* or a skateboard park in *Tony Hawk*). Too often, students in schools consume, but do not produce, knowledge, and rarely get to help design the curriculum [Brown 1994].

Good games confront players in the initial game levels with problems that are specifically designed to allow players to form good generalizations about what will work well later when they face more complex problems. Often, in fact, the initial levels of a game are in actuality hidden tutorials. Work in cognitive science has shown that people need to be presented with problems in a fruitful order, getting initial problems that set up good generalizations for later problems. If they are confronted too early with problems that are too complex, they often come up with creative solutions, but ones that turn out, in the end,

not to be very helpful for working on other problems later on [Elman 1993]. Good games don't do this, but order problems in helpful ways.

At the same time, games create "a cycle of expertise" [Bereiter and Scardamalia 1989].

At the outset, the game repeatedly confronts players with a similar type of problem, for example, enemies like the head crabs in *Half-Life*, until players achieve a routinized, taken-for-granted mastery of certain skills. Then the game confronts players with a new problem, for instance, a new type of enemy or a boss, which forces the players to rethink their now taken-for-granted mastery and to integrate their old skills with new ones. Then these new sorts of problems are practiced until a new higher-order routinized, taken-for-granted mastery occurs. This cycle is repeated throughout the game. In many a game, the last boss requires a last re-opening of one's taken-for-granted tool kit. This cycle is the basis for producing expertise in any area. Good games are models for the production of expertise.

Motivation is the most important factor that drives learning. When motivation dies, learning dies and playing stops. Cognitive science has had a hard time defining motivation, though one definition is a learner's willingness to make an extended commitment to engage in a new area of learning [diSessa 2000]. Since good games are highly motivating to a great many people, we can learn from them how motivation is created and sustained.

In computer and video games, players engage in "action at a distance," much like remotely manipulating a robot, but in a far more fine-grained fashion. Cognitive research suggests that such fine-grained action at a distance actually causes humans to feel as if their bodies and minds have stretched into a new space [Clark 2003], a highly motivating state. Books and movies, for all their virtues, cannot do this. The more a player can manipulate a game character and make decisions that impact on the character, the more the player invests in the character and the game at a deep level. This investment appears to be the deepest foundation of a player's motivation in sticking with and eventually mastering a game.

In a sense, all learning involves "playing a character." In a science classroom, learning works best if students think, act, and value like scientists. Games can show us how to get people to invest in new identities or roles, which can, in turn, become powerful motivators for new and deep learning in classrooms and workplaces.

Finally, we can state that when players play in massive multiplayer games, they often collaborate in teams, each using a different, but overlapping, set of skills, and share knowledge, skills, and values with others both inside the game and on various Internet sites. In the process, they create distributed and dispersed knowledge within a community in ways that would please any contemporary high-tech, cross-functional-team-centered workplace [Wenger et al. 2002]. In this respect, games may be better sites for preparing workers for modern workplaces than traditional schools. However, in the end, the real importance of good computer and video games is that they allow people to re-create themselves in new worlds and achieve recreation and deep learning at one and the same time.

## REFERENCES

- BARSALOU, L. W. 1999. Language comprehension: Archival memory or preparation for situated action. *Discourse Process*. 28 (1999), 61–80.
- BEREITER, C. AND SCARDAMALIA, M. 1993. *Surpassing Ourselves: An Inquiry into the Nature and Implications of Expertise*. Open Court, Chicago.
- BROWN, A.L. 1994. The advancement of learning. *Educational Res.* 23 (1994), 4–12.
- BROWN, A. L., COLLINS, A., AND DUGUID 1989. Situated cognition and the culture of learning. *Educational Res.* 18 (1989), 32–42.
- BRUER, J. T. 1993. *Schools for Thought: A Science of Learning in the Classroom*. MIT Press, Cambridge, MA.

- CLARK, A. 1997. *Being There: Putting Brain, Body, and World Together Again*. MIT Press, Cambridge, MA.
- CLARK, A. 2003. *Natural-Born Cyborgs: Why Minds and Technologies Are Made to Merge*. Oxford University Press, Oxford, UK.
- COGNITION AND TECHNOLOGY GROUP AT VANDERBILT. 1997. *The Jasper Project: Lessons in Curriculum, Instruction, Assessment, and Professional Development*. Erlbaum, Mahwah, NJ.
- DISSA, A. A. 2000. *Changing Minds*. MIT Press, Cambridge, MA.
- ELMAN, J. 1991. *Incremental learning, or the importance of starting small*. Tech. Rep. 9101, Center for Research in Language, Univ. of California at San Diego.
- GLENBERG, A. M. AND ROBERTSON, D. A. 1999. Indexical understanding of instructions. *Discourse Process*, 28 (1999), 1-26.
- LAVE, J. 1996. Teaching, as learning, in practice. *Mind, Culture, and Activity* 3 (1996), 149-164.
- LAVE, J. AND WENGER, E. 1991. *Situated Learning: Legitimate Peripheral Participation*. Cambridge University Press, Cambridge, UK.
- NEW LONDON GROUP. 1996. A pedagogy of multiliteracies: Designing social futures. *Harvard Educational Rev.* 66 (1996), 60-92.
- PELLIGRINO, J. W., CHUDOWSKY, N., AND GLASER, R. 2001. *Knowing What Students Know: The Science and Design of Educational Assessment*. National Academy Press, Washington, DC.
- WENGER, E., MCDERMOTT, R., AND SNYDER, W. M. 2002. *Cultivating Communities of Practice*. Harvard Business School Press, Cambridge, MA.