# Can Educational Be Fun?

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**Abstract**
Most attempts at making software both educational and fun end up being neither. Fun is often treated like a sugar coating to be added to an educational core. Which makes about as much sense as chocolate-dipped broccoli. The problem is that too many game designers are using long-outmoded models of what it means to be "educational." This paper reviews some useful ideas from contemporary educational theory, providing concrete advice for making games both fun and educational.

**Beyond Sugar Coating**
When I'm not doing research on how to design better educational software, I review it for *Wired*. Companies are always sending me things to review—the stuff piles up in my office. Most of the time, I don't even open the packages. It's all pretty much the same old junk: drill and practice.

Consider Math Blaster (Davidson): in the original version, kids answer repetitive arithmetic problems, one after another. Each problem correctly answered earns you a bullet. When you've answered enough questions, you get a break to play a quick shooting game. Is this really your idea of fun? The assumption behind the design of this sort of software is that learning is unpleasant, but we're going to sugar-coat it. Math stinks, but there are cool space ships on the screen for decoration, and if you're done you can do something more fun: shoot things. The problem of course is that it's not really fun, and kids eventually see through that sugar coating. What is particularly upsetting from a parent or teacher's perspective is the fact that kids tend to internalize the implicit message that math isn't actually interesting. Ever wonder how kids come to decide that learning is awful? This is how.

It doesn't have to be that way. Learning isn't an unpleasant core that you need to hide in a chocolate coating. Learning can be fun in itself. A useful exercise is to think back to a moment when you were inspired by a new idea—when it really seemed magical. Now think about how you could share that passion, that inspiration with a child. You want not just for the child to learn the dumb math stuff because the game was fun to play, but for the child to decide that the math (or other subject matter) is in itself really cool.

**From Theory to Practice**

Math Blaster is an example of "drill and practice" software. Drill and practice is rooted in the cognitive theory of "behaviorism." Researcher B.F. Skinner learned that if you carefully apply positive and negative reinforcement in a repetitive fashion, you can get rats to perform complex tasks like remember their way out of a maze (Skinner 1968). (See Table 1, Row A.) Applying this concept of stimulus and reinforcement to children, you get drill and practice learning. Which basically amounts to treating children like rats. To try to make the whole process less unpleasant, designers add pretty graphics and breaks to play more fun games, which have nothing to do with the content that kids are supposed to be learning.

Part of the problem with this approach is that the learning is out of context. In Math Blaster, you're not adding 2 somethings to 5 somethings, you're just adding 2 and 5. The math is more meaningful to kids when it's adding for example 2 new band members to 5 original band members to discover that you now need 7 microphones on stage. Another Davidson title, Math for the Real World, uses the theme of a rock band to put the learning in context. Your rock band goes on tour, and along the way you have to answer math problems about things like how much wood you need to frame the tour poster, or how much the band is going to spend when they stop in a diner for lunch. It's still basically drill and practice, but the drill and practice is in a more meaningful context (see Table 1, Row B).

| | Theory of Learning | Type of Educational Software | Examples |
|---|---|---|---|
| A. | Behaviorism | Drill and practice | ♦ Math Blaster (Davidson) |
| B. | Behaviorism + context of learning | Contextualized drill and practice | ♦ Blue's Birthday Adventure (Humongous)<br>♦ Logical Journey of the Zoombinis (Broderbund)<br>♦ Math for the Real World (Davidson) |
| C. | Constructivism | Creative puzzle solving | ♦ The Incredible Machine (Sierra)<br>♦ My Make Believe Castle (LCSI) |
| D. | Constructionism | Construction kits | ♦ Hollywood (Theatrix)<br>♦ Kid Pix (Broderbund)<br>♦ LEGO Mindstorms<br>♦ Sim Tunes (Maxis) |
| E. | Social nature of learning | Electronic Learning Communities | ♦ MOOSE Crossing<br>♦ Mamamedia<br>♦ Disney Online |

Table 1: From Theory to Practice

Most drill and practice learning is based on an "instructionist" model of learning, which asserts that learning is about knowing facts. In this model, teachers (or teaching software) tell facts to students, and students repeat them back. Knowledge is information, and information is transmitted from teacher to student. Research by the Swiss psychologist Jean Piaget argues instead that the learner doesn't just passively receive information, but instead actively constructs meaning. Knowledge is more than information, and can't just be "transmitted" to students. People learn better when actively engaged with the subject matter. Piaget's theory of called "constructivism" (Piaget 1929). (See Table 1, Row C).

Many puzzle-oriented programs are good examples of this more active model of learning. Two particularly good examples are The Incredible Machine (Sierra) and My Make Believe Castle (LCSI). Both games provide intriguing sets of parts that can be used either to solve the given puzzle, or just for free play. In My Make Believe Castle, children as young as four years old can figure out that they need to have the dragon jump on the teeter-totter to throw the watermelon at the target. Alternatively, they can use the environment in a free-form way, deciding that it's fun to watch the dragon grow large, do a pirouette, slip on a banana peel, and then shrink small again. In the process, children develop their imaginations, problem solving skills, and critical thinking skills. In both My Make Believe Castle and The Incredible Machine, there are many ways to solve any given problem. The environment is playful and open-ended. This is more engaging than a regimented puzzle with only one possible solution.

One of Piaget's students, Seymour Papert, later argued that if Piaget is right about the nature of thinking, it should follow that people learn particularly well while creating things. Learning by doing, learning through design and construction activities, is better than learning by being told. He called this extension of Piaget's ideas "constructionism" (Papert 1980; Papert 1991). In this tradition, people design construction kits. (See Table 1, Row D). Papert himself was co-inventor of the Logo computer language, advocating that children should learn by writing computer programs. However, perhaps the most famous constructionist learning tool is Craig Hickman's Kid Pix (published by Broderbund). A personal favorite of mine is Toshio Iwai's Sim Tunes (published by Maxis). In Sim Tunes, you paint a picture, which becomes a piece of music. Each pixel on the screen is a note. You place four insects on the picture, each of which is a different musical instrument. As the bugs crawl, the music plays. Construction kits are particularly good for promoting creativity, and encouraging self-motivated learning. Underlying this approach to learning is the idea that people learn better when they are having fun, and are doing something they really care about.

Finally, researchers working in the tradition of Lev Vygotsky (Vygotsky 1978) pay special attention to the social context of learning—the ways in which people motivate and support one another's learning experiences. Computer networks have the potential to create "electronic learning communities," places where participants support one another's learning experiences. This is a particularly powerful approach when combined with constructionism. Children on Mamamedia (http://www.mamamedia.com), Disney Online (http://www.disney.com) and my own MOOSE Crossing (http://www.cc.gatech.edu/~asb/moose-crossing/) learn through design and construction activities with the support of other members of the community. On MOOSE Crossing, kids build a virtual world together, and in the process improve their reading, creative writing, and computer programming. Members of the community provide role models, project models, technical support, emotional support, and an appreciative audience for completed work (Bruckman 1998).

**Five Useful Concepts**

When most people think back to the early years of their formal education, "fun" is not the first word that comes to mind. In fact, "fun" is still a subject of some controversy in educational circles. Conservative critics like Neil Postman argue that we are in danger of "amusing ourselves to death." Learning shouldn't be fun—we should teach children discipline and hard work, and not pander to their whims (Postman 1985). Others disagree, arguing that people who are having fun learn better. They learn especially well when they want to learn—when they develop a sincere interest in the subject at hand. Results from this second tradition of educational research can be of practical value to educational game designers.

To summarize:

1. Make the learning inherently fun—don't sugar-coat an unpleasant educational core.
2. Put learning in context.
3. Open-ended tasks are more engaging and promote creativity.
4. Learning by making things is one useful approach that is both fun and educational.
5. Whenever possible, provide social support for learning.

**Bibliography**

Bruckman, A. (1998). "Community Support for Constructionist Learning." *Computer Supported Cooperative Work* **7**: 47-86.

Papert, S. (1980). *Mindstorms: Children, Computers, and Powerful Ideas*. New York, Basic Books.

Papert, S. (1991). "Situating Constructionism." *Constructionism* Eds. I. Harel and S. Papert. Norwood, NJ, Ablex Publishing. 518.

Piaget, J. (1929). *The Child's Conception of the World.* New York, Harcourt, Brace and Company.

Postman, N. (1985). *Amusing Ourselves to Death, Public Discourse in the Age of Show Business*. New York, Viking.

Skinner, B. F. (1968). *The Technology of Teaching*. New York, Appleton-Century-Crofts.

Vygotsky, L. (1978). *Mind in Society*. Cambridge, MA, Harvard University Press.