ENGAGING LEARNING

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Designing e-Learning Simulation Games

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Games? Really?

I N 1982, John Carroll noticed people playing what was probably the first computer adventure game, "Colossal Cave." He observed then what we see now, people hunched over a computer spending hours figuring out how to get further in the game. He compared that observation to people who were giving up on something considerably more valuable to them, learning to use a word processor.

At that time, I had a job creating educational computer games for the Apple II and other, similar, machines. It was my first job out of college, and I'd already been bitten by the computers-and-learning bug badly enough that I'd designed my own major in it (back then, they didn't have such degrees). And, as a professional obligation mind you, I was playing computer games, including the "Colossal Cave" adventure. I was captured by the possibility of embedding important decisions in adventure games and creating learning environments.

And that is really what this book is about, the results of a twenty-plus–year journey from that point, driven by a belief that learning can be fun. My

understanding has been refined through research and trial-by-fire, and also buttressed with evidence. I heard the phrase "hard fun," and realized that is what I mean. It's fun, in the sense that you're engaged, there is a story that you care about, and you have the power to act; it's hard in that it's not trivial— there is sufficient challenge to keep you on your toes. And I most emphatically do *not* want you to infer that I mean the types of games where we put drill and kill, er, drill and practice, into game-based window dressing. I mean something more profound, more important, and more useful. But that is all to come.

To start, my plea is for you to stop doing e-learning the old way. That is, rewriting PowerPoint files and PDFs into online text (whether "gussied up" with graphics, photos, videos, or not) and multiple-choice knowledge tests (whether jazzed up with drag-and-drop or not). Or putting narrated slide presentations up on the Web. Yes, you can do that, and sometimes you have to (because of cost or time pressures). But stop first, and consider the alternatives. Understand that making things interesting can make them more effective, if you know how (and can interfere with learning if you don't), and that there are low roads that give you a lot of benefit for low investment as well as the high road. Then you can make an informed choice.

We are not, *cannot* be, about designing content. A fundamental perspective I want you to take away is that we are designing *experiences*. If nothing else, start thinking not about creating content but about designing learner environments and architecting experiences. It has become clear to me that this is a fundamental point. You have to start thinking about putting the learners into a context where they have to make decisions, understand why those decisions are important, want to make those decisions, and know that there are consequences of those decisions.

If you don't, you're likely to be dooming your audience to ineffective and, really, user-abusive learning. You don't have to make boring e-learning. Yet that is what I see, reliably and repeatedly. And it's not just me, the evidence is pretty consistent: when it comes to online learning, content people are staying away in droves. That has been the message from the analysts, the users, and the marketplace.

Of course, we'd like to develop richly engaging games that address key learning outcomes and are wildly fun, but even if we had the budget, would we know how? Or can we develop engaging learning on the average shoestring budget? I'll argue yes, absolutely, to both (and there are ways to boost that budget).

It is not because the content developers are not trying; it is because the elements of engagement are not understood. And it's not just a matter of putting entertainment and education folks in a room and locking the door. You have to understand the elements of both and find the alignment.

Let me put a stake in the ground here. *It is hard to do good education.* That is why people spend years learning how to do it. Even then, not all do more than follow the prescriptions and keep a finger on the pulse of the industry to improve their practice. *It is also hard to do good entertainment.* For every movie in Hollywood that is a hit, there are four or five that don't succeed. The same is true in the game industry (though I understand the ratios are even worse). *It is doubly hard to do both together.* Coordinating the elements requires a balancing act between the two, which can be well nigh impossible if you don't know how they work together (many assume that education and engagement are irreconcilable). *Yet it is more than doubly worthwhile.*

If you look at the elements that lead to learning, and put them in correspondence with the elements that lead to engagement, you'll see that they can be aligned and become mutually synergistic. By using that framework as guidance, you can systematically design learning that is both more effective and engaging. That is the thesis of this book.

Learning can, and should, be hard fun.

Engaging Experiences

At its best, learning is a wildly enjoyable experience. There are joyous discoveries, satisfied completions, and sudden recognitions. Think of children in that magic time of childhood before school undermines their intrinsic curiosity. All of us have interests about which we learn for no other reward than our own personal satisfaction. Whether it is a team sport such as baseball or an

individual activity like fishing, a hobby such as collecting or crafts, or a personal pursuit such as philosophy or politics, in the pursuit of this informal learning we may be remarkably persistent in the face of adversity. We will learn by reading, by talking with people, perhaps by Web searching, buying books, watching specials, or joining societies.

However, this isn't what most people think of when they think of learning, particularly when it is codified as education or training. You're likely to get somewhat different responses: "I haven't time"; "Let me just read a book"; or "Not more school!" Drop-out rates for online learning have been listed as high as 80 percent. A renowned business school theorist suggests that what motivates people to take training is fear of being unable to perform, rather than any intrinsic value.

If you think that learning has to be "read this and take the test," then you haven't been paying attention to what's known about how we learn. The evidence is that learning is more effective if it attracts the attention and interest of the learner, is obviously relevant, requires action on the part of the learner, and is contextualized so that the learner understands how and when to apply it. In short, we need to address the emotional side of the learning as well as the knowledge side.

What we want is learning that engages the learner, but what we have is learning that bores or confuses the learner. Here, *engagement* is the word used to describe the situation when learners are captured, heart and mind, in learning—or to use formal terms, are cognitively and affectively connected to the learning experience. The best learning experiences generally available are either high-fidelity simulations or interactive sessions with skilled facilitators. However, most learning experiences involve heavy use of text, too many knowledge-test assessments, and facilitators who might care but are not so skilled as is needed.

Let me be clear, I'm not talking about game shows or gussied-up drill and practice. I am not advocating putting lipstick on the pig of fact-based learning. Instead, I am talking about the type of learning environment where you have a challenging goal set in a believable theme, and you must struggle to

achieve the goal. We should be creating a learning environment where we transform our learning objectives to important behaviors, where contexts are meaningful to the learner, and where the decisions are consequential. These are the learning experiences that will make a difference, and they are what we should be shooting for.

Let me also acknowledge that I do not believe that these engaging learning experiences will (or should be expected to), by themselves, lead to learning. I advocate discussion around the experience, and connecting learner actions to the underlying concept. As yet, computers are not quite capable of supporting such dialogue. Self-directed learners may be capable of facilitating their own reflection, but it's not the way to bet (though I believe strongly that meta-learning, or learning to learn, is a key leverage point for the future). So although such environments are not sufficient, they are necessary; we need engaging experiences to motivate learners to attend to the content, give them rich practice opportunities, and provide fodder for discussion and refinement of their understanding.

Why Engagement?

Why should learning be hard fun? Surely, learners should buckle down and do what they need to do to acquire the necessary skills. Perhaps in an ideal world learners would be motivated and self-directed. We know, however, that having the pull of a challenging learning experience is still an advantage.

As long as engagement doesn't hurt, it's a positive. It doesn't have to help; as long as it doesn't interfere it can be argued to be valuable (of course, if the cost isn't too high). For instance, the Masie Center found that 70 percent of survey respondents would be *very* interested in a learning process that has computer games. I'll bet most folks developing learning would be thrilled to have 70 percent of their audience heading into the learning experience very interested.

People intuitively think that learning through games ought to be better, but is there any evidence? Although I won't be academic throughout (though

there will be times), let me briefly review some findings. Work on cognitive science, education, anthropology, and practical experience guide the view that engagement enhances learning (when done right).

Some cognitive research either directly demonstrates or indirectly suggests the value of adding engagement to learning. Mark Lepper of Stanford University has investigated motivation in learning and in a key experiment showed that adding story enhancements to mathematics instruction improved outcomes (Lepper & Cordova, 1992). We can also use some inferences from the work of Phil Johnson-Laird of the Psychology Unit in Cambridge, who found that complex decisions are made more tractable by the addition of concrete context (e.g., Johnson-Laird, Legrenzi, & Legrenzi, 1972), which is part of the engagement process. Jean Lave at the University of California at Berkeley (1988) cites work on Brazilian street kids who can't seem to be taught mathematics, yet are actually quite good at doing calculation in the monetary tasks they perform to survive (showing motivational effects on learning).

We also see significant evidence in learning theory. The anchored instruction approach of John Bransford and his colleagues at Vanderbilt (Cognition and Technology Group, 1990) has had success in teaching a variety of core curricula such as mathematics through rich media and story. Jeroen Van Merriënboer's (1997) work on teaching complex skills suggests that we need full practice in simulated environments. Roger Schank's work on goal-based scenarios indicates the need for a goal and an exploratory environment to drive learning (Schank & Cleary, 1995). The entire focus of Howard Barrows's problem-based learning (Barrows, 1986), and case studies such as Harvard Business School's pedagogy, is to help make the learning more concrete and meaningful.

There's more pragmatic evidence as well. The military has a significant investment in rich simulations as training tools. Institutes continue to be founded to investigate games and training or learning. The Massachusetts Institute of Technology has one of the newest, and the University of Southern California has one as well. A surfeit of new books also talk about the need for games or simulations as learning environments: Marc Prensky, Clark Aldrich, James Gee, the list goes on. By the way, I'll differentiate between

games and simulations (and approximations thereto) later on, but briefly, *simulations* rely on underlying models, not prescribed branches, and *games* are simulations with the aesthetic tuned to create an optimal level of engagement.

Finally, as Donald Norman's book *Emotional Design* points out, the effect of the experience adds to our ability to think and perform. As we begin to explore how emotional experience affects our cognition, the picture increasingly shows that the aesthetics matter. If this is indeed the case, we need to exploit this opportunity to our advantage. We can design learning experiences that have positive effect and have reasons to believe that is more effective for learning.

Games for learning are not just a guilty pleasure! The evidence is clear that rich environments and story lines are more engaging and more effective. But the real reason to investigate this comes from the second half of that claim. We need more effective learning. Why?

The Learning-Doing Continuum

Our goal is not to help people learn. That's a tactic. If we said people need to learn *X* and then made sure that happened, we wouldn't be doing our job. In organizations, the direction is no longer to hypothesize needs but to justify the cost. And the industry has moved beyond return-on-investment arguments. It's not about showing that improvement happens as an outcome of the training. Or even counting the dollar benefits of the outcomes. Instead, the goal now for training is to target and improve the key performance indicators of the organization. This trend is currently also reflected in the metrics associated with schools, though I hope that schools will soon move to a more realistic way of assessment that targets what learners actually can do (for example, portfolios of work) and not just what they know.

No, the goal is clear: we must help people *do*. And that, at the end of the day, is the strongest argument for focusing on engagement in learning, because learning designed to incorporate engagement is more effective.

So why is our learning so dry? A widely cited Forrester report (Hogg, 2002) found that 75 percent of e-learners do not finish their courses. This is

not because the courses are engaging learning experiences. We're following the prescriptions of instructional design, which we know is empirically based to ensure learning outcomes. What is new are the results of cognitive research (mentioned above) that suggest extensions to our learning design. This research begins to give us ideas of what we need in an environment. What hasn't been presented to date is a reliable way to get there.

A learning environment has to be designed properly to incorporate engagement that integrates with effectiveness. The problem is figuring out how to do it, particularly under real-world constraints, and seeing whether there are intermediate steps that can give us leverage when we simply can't justify the development of a full game engine. Just putting educational people and entertainment people in the same room isn't going to do it, because they don't have a shared vocabulary or any understanding of how their work aligns and synergizes. That there have been more failures than successes is not a surprise. Yet if we do understand both sides, we can make them work together to accomplish this goal of better learning experience *and* better learning.

Is this approach appropriate for all learning objectives? Yes and no. If your learning objectives are about knowledge—for example, does someone know x or y—you don't need to create engaging scenarios (though you can ramp up the engagement with quiz show–type trappings). However, I believe we mistakenly think that knowledge alone will solve our problem, when usually we need that knowledge to be actionable—and then we do need an engaged approach. Sometimes you will want to have lower-level knowledge automated, so that you're equipped to take on more complex decisions, but I believe in putting the decisions first to motivate learners to recognize why they need the more-rote practice. Then you can make that more enjoyable, too, but the focus has to be on the ability to *do*. And that requires focus on creating a learning experience.

There is a hierarchy of knowledge, as Tony O'Driscoll (2003) has pointed out. As you enter a new domain, at the base or bottom position of expertise the knowledge is fairly well agreed upon. As you move up to greater expertise, you get to areas where understanding is still being negotiated and the learning is more through communication and collaboration. The approach

here works better when there is agreement about the right approach, although you could allow such an environment to have an ambiguous ending as long as you can create a vehicle for dialogue afterward. However, as I reiterate later, engaged learning is not designed to be a total learning solution but an important component of practice. Reflection is still best left to mechanisms outside the game environment (ideally, with mentors and peers). However, I argue that the environments I'm talking about, the experiences I'm suggesting we can and should design, are the right sort of practice environments for most behaviors and learning goals when we know what we want to achieve.

The Payoff

Why should we do this? Although we don't yet have the data to support quantitative justification, we can cite several qualitative reasons. First and foremost is that our learning will be more effective. This approach, done properly, leads to greater retention over time and transfer to appropriate situations. Second, it increases the likelihood of learners' continuing to the end and achieving the desired outcomes. If they like it, they will play. Third, it will increase learner morale. Who wouldn't be happier with a learning experience that sticks and creates an engaging experience?

Let's walk through a situation. You've got an organizational change that is critical to the success of the company, say a shift to a customer focus (why is that a *new* concept?). You approach it the traditional way: the CEO addresses the troops about the importance. PowerPoint slides are created to deliver the details to departments companywide. These slides are rewritten into Web-based content, with some multiple-choice questions tacked on. The employees are sent an e-mail pointing them to the URL for the course and told that it's important. They dutifully start, are bored stiff, are distracted by an important job issue, and never go back. If their manager even bothers to check, they successfully argue that it was a case of finishing the course or closing the Acme deal (substitute other appropriate departmental crisis). The change doesn't take hold, the company continues doing business as usual, and eventually another imperative business change is announced.

Now consider an alternative. The content is re-imagined as a game, where the player starts in a customer-facing role. It's not heavily produced, it's done with some dialogue and some stock photos, but it's heavily designed, with lots of thought about how people will go wrong, what the consequences should be, and how to ensure that the difficulty starts low but gradually increases. The players get to make choices about how to behave, but the choices aren't obvious. They fail but get just enough of a hint to think they know what they need to do next. And they fail again. Yet the story is believable enough, interesting enough, and the outcomes linked closely enough to the business that they "get" why it's important to succeed at this. They struggle through, going to portals to download relevant documents, until they succeed. They now know the need. They talk about the game with their colleagues, and employee interest in it spreads word-of-mouth. And more important, the learning sticks and the organization slowly takes on the desired characteristics and moves ahead in a strategic direction.

This isn't fantasy; it can happen. It's a different way of learning, and one we need. And just in case it sounds overwhelming, there are baby steps along the way. You can tap into the power of learning like this fairly simply, but if it's really important or you have a large audience, you can use the effectiveness of the approach to justify the more major investment. Again, however, you don't get this by just putting game designers and instructional designers into a room together. You need to understand how to align and exploit the two sides, but there is alignment, and it can be leveraged.

Road Map

And that, in a nutshell, is the premise of this book: that there is a synergistic alignment of engagement and learning effectiveness that we can exploit and systematically implement to improve our learning solutions. The trick is to design our learning in a new way, a way that puts learners into the position of making decisions that make the content meaningful and are aligned with how they need to apply the knowledge. My claim is that there is not a learn-

ing objective for which we cannot design a game (but I reserve the right to raise the objective to a meaningful level).

The concomitant focus of this book is how to redesign learning into compelling and effective learning experiences. Note that the book is not about how to produce these designs. There are many ways to do it, and the inherent trade-offs between choosing to use a fixed branching solution or a flexible rule-based engine are related to the context of implementation and not upon the design. I believe the hard task is coming up with the design; once that's done, there are a variety of ways to get it built. In fact, as a reviewer suggested, you absolutely have to have the design nailed down before you think about how to produce it, as the design will influence your choice of implementation tools. (It's too easy to let the tool dictate the design, and that way lies educational ineffectiveness.) Further, considerable savings in production can be sustained from spending the energy in design up front. Challenging questions can engage learners such that high production values are not required to maintain interest (although, of course, they can add to the experience if aligned to the learning, and ideally are also included).

To get there, I briefly review learning (for those coming from the engagement side) and engagement (for those coming from the learning side). In both cases, I want a shared foundation. From there, I demonstrate the alignment and use it to take a first pass at enhancing traditional instructional design. I then proceed from that, through a series of incremental improvements, to the structure of full games. I place this developed framework in the context of a usable design process, derived from familiar design processes and with indications of how existing processes can be amended rather than replaced. In the process, I cover some practical hints and tips (really, lessons learned). I also point to some of the future directions I see coming, before wrapping up.

Engaged learning is doable. I saw the connection between computers and learning in college when I got a job maintaining the computer records of the office managing the math and science tutoring I'd been doing. As mentioned earlier, I saw the link between computer games and learning when my first job out of college was designing and programming educational computer

games. I spent a large part of my graduate student career looking at every form of what makes experiences effective for learning. I looked at instructional design, developmental psychology, cognitive learning, and behavioral learning. I even looked at *machine* learning! As part of my research then and subsequently, I also examined the elements that contribute to an engaging experience, across drama, fiction, experiential psychology, interface design, and, of course, computer games. I discovered an alignment that is teachable, systematic, and effective. And I've had a chance to hone my theorizing through practice.

The road ahead is straight, but it has some steep spots. To truly understand and apply this approach, you have to understand learning and engagement reasonably deeply. Therefore, Chapters Two and Three, and their integration, Chapter Four, are somewhat theoretical. And from time to time in other places I similarly take some time to develop a framework (for example, Chapter Six). As a consequence, although this book primarily addresses e-learning, the principles are applicable more broadly to the category of experience design, interaction design, and other recent buzzwords. Similarly, I hope the audience can include instructional designers, programmers, game designers, trainers, interaction designers, and so forth.

Chapter Two reviews traditional instructional design, enhances it with cognitive results, and derives a model that reflects where many learning models are converging. Some elements are extracted that highlight effective learning. In principle those who understand learning can skip this chapter, but I request that you at least review the convergent model so we start with some common terminology.

Chapter Three does a similar review of elements of engagement, ultimately extracting elements that characterize an engaging experience. This chapter could be skipped by those with experience in game design, though again I request at least reviewing the synthesis, at least to share vocabulary.

Chapter Four is the key to the approach, where the elements of engagement and learning are aligned. It points to some principles to guide effective outcomes. This is where we discover, and elaborate, the key synergy.

Chapter Five is a practical chapter of models that can be used. The chapter reviews several levels for applying the principles to learning goals. This discussion starts with very small modifications to existing approaches, and culminates in a full engine-driven game.

Chapter Six is a how-to chapter that walks you through the background of design. It then derives a systematic process that starts with gathering objectives, and works through the details of nailing down a design that is both engaging and effective. You could start here, even with the section that is the synergy of the game and learning design processes, if you really need to get something done, but I hope you will be intrigued enough to go back and "get" the underpinning framework. I don't think you will be equipped to wrestle with the nuances that will arise if you don't understand the principles.

Chapter Seven is another practical chapter that goes over a laundry list of pragmatic issues to consider and lessons learned. I toss in a number of thoughts and ideas here that address the reality of doing what I'm talking about, which don't necessarily arise from the theory.

Chapter Eight is a forward-looking chapter that talks about some trends that are emerging and some possible new directions. Here's where we see what the future of engaged learning might be.

Chapter Nine sums up where we've been and gives us direction in moving forward.

A case study is used to help convey the principles in Chapter Four, and one each is used to demonstrate the different levels of application. These case studies are illustrated in some cases with screenshots, but idiosyncratically. This has to do with the difficulty in obtaining permission to use the relevant images. People were happy in principle to provide them, but when it came time for official signatures, in several cases legalities and permissions resulted in protracted negotiations. As there is a timetable to produce a book, some of the permissions had to be abandoned. However, I've tried to include some representations that convey, if not the final product, some of the development process.

YOU'LL ALSO FIND SOME SIDE COMMENTS LOOKING LIKE THIS

I care passionately about helping people improve their ability to solve the problems they face, and learning new skills is the key. There is more good content that needs to be developed than I can handle, so I want more people to have the skills to do this. Even small improvements will help create the groundswell of interest and examples we need to fundamentally change not only the vast majority of what is seen out there, but the way we think about learning design.

Hence, this book. Please, read, use, design better learning, and make us all happier and better off! *Learning can, and should, be hard fun.*