Well, I’m going to try to get this into 12 minutes. There has been a big interest over the past 5 or 6 years in video games and the potential they have to create a new paradigm of learning, which, if you don’t play video games, is kind of surprising. So, what I want to do first is give what you find is the learning paradigm in modern-day video games. If you’ve never played one, modern-day video games have a very interesting problem that is very similar to the core problem of school. They’re long, they’re hard, they’re complex, and they take up to 100 hours to play. Companies can’t sell dumbed-down games, players won’t take them. So here’s an industry that has to try to get somebody to pay to do something that’s long, hard, and difficult. Therefore, they can’t have failures in learning, because if they do, they go broke. And we face the same issue in our schools: how do we get someone to learn something that is long, hard, and difficult, and stay at it? Now, I want to just show you some learning principles that go with the games. People can be addicted to learning outside school. They actually enjoy it. Something happens in school to hide this fact.

First thing, video games start with a strong identity. They know you’re going to have to learn it step-by-step, and so, as people in social learning theory know, if you want people to learn a bunch of stuff and do it, not just talk about it, you have to start with an identity that shows them what they’re going to be and what values they’re going to hold, and what this is going to mean. So, video games start with that. For example, in *Thief*, you start with the identity of a thief, in *God of War* you are a God, a very highly motivating identity, and in *Full Spectrum Warrior* you are a soldier. In David Shaffer’s game at the University of Wisconsin on urban planning, you start as an urban planner. It doesn’t matter what it is, you just have to show people what are the values, what are the tools, and why in the hell are we doing this?

Second, you have to lower the consequences of failure, because if the price of failure is too high, people won’t explore, they won’t take risks. And if you’re in a very complicated domain, you can’t teach everything with words, you have to have people discover something, and they’re not going to discover it if the price of failure keeps punishing them for taking those risks. Video games lower the price of failure because you can return to your last save of the game when you fail, and so should be the schools.

The other thing video games do is put performance before competence. They don’t say, ‘you have to be competent’ when you’re doing start. ‘You have to read a 500-page textbook, and then you can do some science.’ What they do in a game like *Full Spectrum Warrior*, they ensure that the soldiers you control (give order to) are very intelligent agents. And so you have to coordinate them, and they’re very smart, and you’re very stupid. And so you can’t fail totally, because they aren’t going to look bad. Eventually, by performing and with some of their knowledge, you discover some of the stuff, and there’s also a lot of guidance, and you get smarter and smarter, and the
competence comes through performance. Of course that’s how we learn our first language, no one says, ‘Janie, don’t talk until you know English.’

Game designers know that you must leave decisions and choices to players. If you leave no choices to them, their motivation just dies. Game designers even have good ways to give the illusion that you had a choice. Choice is fundamental to a sense of agency.

Video game designers also know that people are no good if you just put them into an open-ended inquiry space with no guidance, because they’re too creative, they’re too smart, they work on problems and get the most creative answers, but these answers may never work again. They may not be fruitful paths for later problems. You have to order problems so that the first problems people see send them down fruitful paths so that they develop good hypotheses for later, when they’re working on harder problems. There has to be design to the immersion experience—in games, this is just good level design. There’s nobody that would put the last level first in a game, although many progressive pedagogies do, when they ask you to solve hard problems with no tools for thought, and for example to discover the laws of the pendulum with no geometry. That was a problem too hard even for Galileo, who used geometry to solve it.

Games are built with a cycle of challenge, consolidation, and new challenge—the cycle of expertise. You give someone a challenge, something that’s hard to do, and you make them practice it until they could do it in their sleep, and then you put them in a new challenge where it doesn’t work. They have to open the black box, think about their old expertise in a new way, then routinize some new stuff only to face a new challenge again eventually, and, thus, they keep going up the skill tree. This cycle is why many games have a boss at the end of a level. By the end of a level, you’ve routinized your skills, but faced with the boss, they now don’t work anymore; now you have to add something new. This is how expertise is formed in any area.

The most motivating point in a game is when the game play feels at the outer edge of your competence, but still within it—game play feels challenging but doable. This has sometimes been called the state of “flow”. It takes a great amount of effort to design a game that will continue to hit this level for different players. It has to be designed for different styles of play, and allow the player to customize it. Good games cycle though a set of three stages: first, players are a bit anxious because things are hard; then they still feel challenged, but know they can do it (“flow”); and then they achieve mastery or control when they have practiced enough for things to be easier. The cycle starts anew on each level.

Games encourage players to think about systems and relationships, not just facts. So if you play a strategy game, like Civilization, you have to worry about hundreds of variables at once. And the only way to do that is to see them as some sort of system relating each other. If you’re going to have someone manipulate hundreds of facts, it doesn’t do any good to make them concentrate on each fact individually; you have to see patterns. In fact, pattern recognition systems are the core principles in game play.
Games handle verbal information in good ways. Games never give you a textbook and say, ‘read 500 pages of it before you can do anything.’ Games read manuals after they have played a while, not before. Games give you words, but within a minute or so, you’re going to apply them. In a *System Shock 2*, for instance, you see some words on a kiosk about what you’re going to do in the next room and then you go do it, and if you don’t understand, you can go back and look at the words. Or, in a game like *Civilization*, you can demand an entire encyclopedia, but you ask for it when you can use it.

I don’t really have enough time for my next principle and it is the one closest to my heart as a linguist. People do not know what language means when all they get is language. They know what language means when they can associate words with images, actions, dialogue, and experiences, not just other words. It’s why in school very often even good students can’t do anything with their knowledge—all they have is words and definitions. They may know the definition of ‘work’ in physics, but they don’t recognize how the concept functions in application to real problems in the world, because they don’t have experiences, images, actions, and dialogue to associate with the word “work” in physics. All they have is words and other symbols they can write down on paper. If games just gave you words for words, they would go broke. What they do, of course, and this is their biggest power, they allow you to take any word you want, any symbol you want, and attach it to images, actions, experiences, and dialogue. This creates the ability to do what you know, and not just talk about it on tests.

Games make learning affective; they tie it to emotion. Gamers are solving problems all the time as the play, but the world they are in and the character they are playing—as well as the choices they are making—make them care emotionally about what they are doing. They are caught up in their mind, emotion, and body. Research shows that when people attach an emotional charge to their learning, they learn more deeply and store what they have learned in ways that are more integrated with their other knowledge.

Games give you a second body. And that fact is important. Research in cognitive science has shown that people feel their sense of bodily control and command extends as far into space only over the region in which they have fine-grained control—which for most of us is very close to our body. For blind people, this sense of control extends as far as the end of their cane. If someone is watering a plant far away via the internet with a web cam, she feels as if her body extended all the way to that far away place, thanks to the way the technology has “tricked” her into feeling fine-grained control at quite a distance. Video games allow players to control in a fine-grained and precise way a surrogate body in a virtual world. Players feel as if part of their body went into the virtual world. Learning becomes embodied (and affective) in a significant way. This allows players to experience in an embodied way worlds they could never actually enter in the real world.

Games reward a very different kind of intelligence. When I was in school, baby-boomers were taught that you were intelligent if you moved as fast and efficiently to your goal as possible. If you do that in a video game, you get to do it for about 11 seconds before you
die. Video games require you to explore thoroughly and think laterally, not just linearly, rethinking your goals from time to time. Now which form of thinking would you like in a high-risk world? Which one would have advised for thinking about Iraq? Rethinking goals in world full of risky systems is an essential thing; exploring all options before you move, and not just thinking linearly, is essential too. I myself think that in a risky world these are important ways of thinking. So the old idea that you are smarter than me because your algebra proof is two lines shorter and you learned something two weeks quicker than me is a dangerous thing. We don’t need those people anymore.

Games realize you make people smart by giving them smart tools. In a game like SWAT 4, each of the policemen to whom you give orders—your squad mates—has already a tremendous amount of stored knowledge (thanks to AI) on how to move, how to get into formations, and how to protect each other. They are not just extended bodies for the player, they smart tools that store and model knowledge. We want to give kids smart tools like this in urban planning and other important areas.

Now, since I don’t have time for this, I just want to state that one of the other things these games do—that people find obnoxious in the real world, but fun in a game—is that many modern-day games make players join and operate within cross-functional teams. Such teams are core to many modern workplaces. On such teams, each member must have deep expertise, different from other team members (their “functions”). But they also must have general knowledge of other team members’ functions so that they can integrate with them and even replace members when they are missing (crossing functions). You have to understand your skill at a very deep level, but then see the big picture to integrate your skill with other people’s skills. In World of Warcraft, people often play on teams of five members and each one has to have expertise and integrate with others in cross-functional team. If you are a priest you must be an expert at healing skills, but you must know how the skills of other players work (e.g., warriors or mages), so that you can heal each at the right time and place. Five person teams often band with other such teams to make yet larger groups. In large groups there are a myriad of coordination, planning, and leadership skills that must be displayed. So much so, that there’s an article by John Seely Brown and Doug Thomas called, “You play World of Warcraft? You’re hired.” So here a game company is selling people something they often can’t stand at work—due to the pressure—yet they are playing every day on a cross-functional team, with just as much pressure connected to it.

So that’s just a few things about video games. What I’m suggesting, is not that we should rush and put video games in schools, but that we should rush and put the learning principles found in good games into school. I ask you just to think as an exercise, what if we taught science that way? Whether we did it with a game or not, wouldn’t we get better results? So if we know all this in the learning sciences, why do we have to wait for the video game industry to show policymakers that this might be something we can do? Let me close, though. To me, this [referring to a slide] is a revolutionary picture. I predict this picture will be in a museum someday, when we finish this revolution in learning. It’s a Sony Playstation 2 controller, but it is not labeled by the keys by which you play the game, but, rather, it is labeled by the keys you use to make a game. This is
form one of the Tony Hawk skateboard games, and like most modern games today, these games come with the software by which they were made; if you don’t like it, you can remake it from the ground up. In Tony Hawk games, you can create every board, every skater, every trick, and every rule-system over again. Instead of playing the game you can make it; it’s called ‘modding’ (= modifying games). Many kids today believe firmly that they are better designers than those who design this stuff for a living, and prove it everyday with this type of controller. They’re modding their games, and the day is going to come when they mod their science curriculum. Thank you.”

That was phenomenal. Would someone like to start the discussion?

The gamers seem to have it all together. Did they do this by accident?

No, I was asked that once when I wrote my first book and got invited to a video game developers conference (GDC) to talk, and I gave the talk in front of the very people whose games I had discussed in the book, and it was a very scary thing, they could have all stood up and said look, ‘bullshit.’ When someone in the audience asked me if designers knew the principles I had discussed and where they had learned about them if they did, a famous game designer in the audience answered for me. He readily acknowledged that he knew and used some of these principles. The ones he had not thought about overtly, he acknowledged were in his games. He said he had read some work on learning, but mostly had discovered the principles as part and parcel of making good games. Good game designers have to think about learning because they’ve got this very long complex thing and people must learn to play it and even master it. To me, good game designers are applied learning theorists.

So much of this work is confined to learning domains or critical thinking. But I was hoping you could give some thought as to how these learning principles could be applied to developing the underlying cognitive processes that allow one to learn, such as memory, attention, working memory.

Games do this already, for example they can improve spatial skills, they can improve working memory if designed right. My colleague Constance Steinkuehler has convincingly shown that in the forums of World of Warcraft there are more contributions with critical thinking that meet the science standards, for example, than in most spaces you would see in school. When players mod a game like World of Warcraft—for example in making a damage meter and giving it to other players—they have to engage in model-based thinking and talk about models. I think that’s a very fruitful area for games, and we want to make games that engage players with this sort of thinking, but in areas like urban planning, engineering, journalism, ecological activism, civic participation, and so forth. But I think that is one of games’ big areas of promise, because they can create an active community in which to argue with each other.

Let me add, there is just a vast population of people with cognitive impairment.
There is a big interest in using games for this purpose. There is some evidence that in worlds like Second Life, with the proper conditions set up, kids with ADHD LD kids, as well as some autistic kids, can do well. The research is just beginning, but it’s a very fruitful area.

Let me say one thing about what basic skills are. Memory, attention, and perception are certain basic skills, but there are many, many others. And I think problem solving, reasoning, and multi-tasking, a variety of others which psychologists have not sufficiently studied...they’ve often wanted to study things that are easy to study. And quick perception experiments and memory are among them. So when you talk about what is mental skills, I think there’s a lot of them that are not being explored right now, and we should put as much attention on those.

The most likely pathway for which we can start getting into some of these principles is the standard pedagogy that everyone goes through.....(inaudible)

How many of you remember the dot com and Western Governors University and so on? A lot of the things that were big before the dot com bubble burst are still out these and they are going to get applied various ways. I’m also predicting that ‘no child left behind’ will be a railroad wreck and will have to find some alternatives to it. What we’re missing is the performance measures that really get at integrated skill and the kind of constructive decision-making and so on, that someone gives you to read about looking at the games research. And so it’s finding prototypes and building those out so that they are on-hand and ready to go. Put those together with the internet as a backbone, to allow for rapid and huge data flows. University of Toledo and University of Alaska last semester had an English class jointly through the portfolio product that I’d been working with, and looking at. And as you get examples of that, and then document that it has some impact, both on long-term retention and performance, I think we’ll get there.

We all know that the history of technology in schools has never really worked out right. There are pessimistic folks about that, who feel that fundamental changes haven’t really worked out, except in pockets. But for the first time in history, public schools have a form of competition they’ve never really had, because most of the stuff we’re talking about could be delivered on-demand 24/7 by other institutions and schools. The vast majority of the paradigms of learning we’re talking about that are innovative, are not going on in your standard school. It’s going on after school, at community centers, and in the schools that are taking risks. They’re on the margin, and they’re not going off of schools, they’re going off of businesses. So a very new landscape. The did purposely, because they felt that going into these marginal spaces, putting new paradigms in, we can prove they work. We’ll put pressure on the schools to have to eventually change the assembly line of paradigms we have.

There are some psychologists that are actually taking these learning environments and doing experiments in them in K-12, and of course in college, one of the things that many of us learned is hard, because of the cultures. Never run a study between mid-March and
mid-April in Tennessee, when all the Tennessee tests are. You can’t go in there then, but you can go in there after then or right before, but we find that more and more of us doing these experiments within the systems may eventually have some scope. It may. But it’s hard research to do.