Video Games as Metaphor for Learning and Curriculum Design

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The key to understanding video games is in looking beyond the fears and negativity, because what is often reported is maligned and non-representative. One should consider one word when thinking of video games:

diversity

Yes, there are games that are suspect in what they allow people to experience in a virtual world, but as in books, video, film, and dinner conversations at family reunions, games offer a wide variety of subject matter and ways of interpreting it. There are games produced by high school students, artists, white extremists, church groups, and the US Army. Games have much to offer in teaching us new ideas in delivering instruction.

Games are very popular among people young and old. When I go to department stores, I often find adults, seniors, teens, and children in the aisles of the video game section. The video game industry has created games that appeal to a wide audience and are designing a variety of play environments to appeal to diverse demographics. Games can become powerful content delivery systems as well as models for instruction.

Video games, what is really going on?

Games do many things well when promoting learning and engagement. One of them is sustaining interest and motivating individuals to continue through challenging learning environments. Gee (2003) lists 36 principles of learning that are built into good video games— ***yes, even in violent video games.***

In his book, Gee makes a case for video games being successful vehicles for instruction and learning. In games, individuals interact with complex dynamic virtual environments where players try on roles as protagonists in what Aarseth (1997) calls multimedia narratives.

In participating in the game, individuals are allowed the opportunity to try on new identities from the game, which in some cases, they can manipulate or design, moving forward in the digital worlds examining and manipulating factors to achieve success in the way the game and game player define it—much as we would like them to engage with their school work and learn the skills that support success in our families and communities.

How video games might contribute to curriculum design

Video games offer opportunity for teachers to begin examining the methods and concepts that game designers use to create environments that are challenging and engaging. Games are designed on challenges and story according to Chris Crawford (2004). And often these games can be broken down into the separate challenges that occur during play, and experienced in different orders, levels of difficulty, and in different contexts so that players acquire skills and knowledge that allow them to advance and gain skills and perhaps mastery of the game. In many ways, the player may experience the game in a number of ways depending upon choices that they make.

Survey Research on Use

There have been two large scale studies looking at games and the new media that validate the importance of looking at video games to inform education. The descriptive figures gathered in these studies make a case for the ubiquitous nature of the games; enough to provide a basis for talking a look at why people like them, and what it is they do well to engage people enough to dedicate resources of time and money into play. Even if we do not use commercial video games in the classroom, it may be prudent to make an effort to understand the phenomena of video game play, the implications of what it means to teachers and students, and how video games have become the media of choice for many people.

1. The Kaiser Family Foundation, **Zero To Six** Electronic Media in the Lives of Infants, Toddlers and Preschoolers.

2. The Pew Charitable Trust Internet and American Life, **Let the Games Begin,** Technology and Entertainment Among College Students.

In the Zero to Six[1] report, it is written that children between the ages of zero and six spend on average two hours and seventeen minutes playing video games. This is a rather striking average when one considers the percentage of kids who spend more than an hour a day playing:

- Playing video games 8%
- Playing computer games 2%
- Total 10%

Considering the age, and the way the descriptive statistics were based on averages across the ages without regard for what would have to be different degrees of use and activity, it seems likely that the older the kids get, the greater the percentage of kids playing, as well as the duration of play.

This excerpt from the last page of the report offers a look at this. According to the report:

> Video game playing is less common among children six and under than most other types of media, accounting for an average of just five minutes a day among all children in this age group. Thirty percent of children ages zero to six have played video games, either on a console or on a hand-held player. By the time they are preschoolers, children are a bit more likely to play video games. In a typical day, about one in every six (16%) four to six-year-olds plays a video game, and those who play average a little over an hour at the controls (1:04). The gender gap in videogames starts young: in a typical day, one in four boys ages four to six plays video games (24%) compared to 8% of girls, and nearly one in ten (9%) boys this age plays every day (compared to 2% of four- to six-year-old girls). (Page 10, Zero to Six.).

So, as time goes on, it is more likely they will play, and play more. With this in mind, we might make a case for games as an important area of inquiry to understand the students we will deal with in the future; because as these children get older, the prevalence of video games will become an important source of media for teachers to understand.

College Students

In **Let the Games Begin,** the prevalence of video game play among college students is clearly apparent. What is most interesting is that the bias against video games, and the common misconceptions and stereotypes are often not a fair representation. One thing is clear; video games are very popular amongst college students

While the last few years have seen tremendous growth in gaming, for one segment of the population, college students, gaming is virtually a commonplace. Computer, video and online games are woven into the fabric of everyday life for college students. And, they are more of a social/socializing activity than most suspected.

- All of those surveyed reported to have played a video, computer or online game at one time or another. Seventy percent (70%) of college students reported playing video, computer or online games at least once in a while. Some 65% of college students reported being regular or occasional game players. Students cited gaming as a way to spend more time with friends. One out of every five (20%) gaming students felt moderately or strongly that gaming helped them make new friends as well as improve existing friendships.

- Gaming also appears to play a surrogate role for some gamers when friends are unavailable. Nearly two-thirds (60%) of students surveyed agreed that gaming, either moderately or strongly, helped them spend time when friends were not available.

- Two-thirds of respondents (65%) said gaming has little to no influence in taking away time they might spend with friends and family.

- Students integrate gaming into their day, taking time between classes to play a game, play a game while visiting with friends or instant messaging, or play games as a brief distraction from writing papers or doing other work.

- Gaming is integrated into leisure time and placed alongside other entertainment forms in their residence, and that it forms part of a larger multitasking setting in which college students play games, listen to music and interact with others in the room.

- Most college student gamers seem to associate positive feelings with gaming, such as “pleasant” (36%), “exciting”(34%), and “challenging” (45%). Fewer students reported feeling frustrated (12%), bored (11%), or stressed (6%) by gaming.

- Close to half (48%) of college student gamers agreed that gaming keeps them from studying “some” or “a lot.” In addition, about one in ten (9%) admitted that their main motivation for playing games was to avoid studying.

- College student gamers’ reported hours studying per week match up closely with those reported by college students in general, with about two-thirds (62%) reporting that they study for classes no more than 7 hours per week, and 15% reported studying 12 or more hours per week.

- One third (32%) of students surveyed admitted playing games that were not part of the instructional activities during classes.

In looking at the summarized accounts of these two studies, it seems evident that there may be great opportunity in tapping into these socio-cultural groups to find out what these games do well in capturing the attention of young people, as well as engaging them in complex tasks that often involve interdependency and dynamic decision making. . . and what if games became part of the curriculum? Perhaps games in class would make for a more engaged student body ~ at the very least, perhaps instructors may benefit from knowing more about this cultural practice and the opportunity of thinking about and experiencing what many students invest time and resources into.

Games as metaphor

Perhaps having educators look at video games as an opportunity to examine how game designers create environments that are challenging and engaging, what people like about them, and how the design principles in video games might be useful in thinking about student learning.

Games are designed to help players develop new skills and tactics that can be layered and manipulated to evolve strategies to create the player's desired outcome. Once a player develops a skill and uses it tactically, in many cases the game is designed to make the player change their strategy and use the skills and tactics in novel ways so that pire trial and error is not enough to win. These evolving challenges put the players in positions where, if they want to beat the game, they must develop novel approaches to old problems in matching skill sets in new combinatorial and permutative sets, thus players begin to create novel combinations and reductions from the game's skill sets, unique tactics, and layered strategies are acquired through the experience of applying their problem solving skills to changing events and twists in the story.

What may be helpful in making sense of these complex interactions is to think of a game as a story that has many challenges with many solutions linked together to form the narrative:

> a game is composed of challenges or conflicts with purposeful opponents where "the player is pitting themselves against some problem," (Crawford 2003, page 7).

Further, he says that these challenges and conflicts are then linked into a cohesive story of choices and reflection on how meaning was made.

> What is the fundamental component common to both story and interactivity? Answer: choice. Aristotle placed choice at the core of the story; choice reveals character. And choice lies at the heart of interactivity; a user makes a choice with a keyboard and a mouse, and the computer responds to that choice.
>
> (Crawford 2003, pg. 165).

Play, like trial and error and planning, is a creative process where the player co-creates meaning to navigate towards a game ending scenario based on goals, consequence, and outcome. Video game play seems to be a form of critical literacy where individuals are involved in a narrative where they investigate a problem, fantasy, or scenario without life or resource threatening outcomes.

Perhaps what might be helpful in thinking about games and classroom learning is the way games can be broken down into the separate challenges, and the player can approach them at different levels of difficulty, and in different contexts. In this way, players can acquire skills and knowledge that allow them to advance and gain skills and perhaps mastery of the game while they are playing.

Deconstruction and guided reflection for developing understanding

One of the ways that games can help teachers is in the conceptualization of curricular design. In games, there is a modularity that resembles what Roschelle & Kaput (1999) call component architecture. Zhao, Y., Mishra, P. & Ferdig, R. E. (in print) expanded this view and proposed that educational software in particular, be modular in design because it allows the developers and users more flexibility in use.

Functionally, modularity allows developers and users to mix and match components to achieve different goals. This has multiple consequences for software developers and users.

1. Each component works independently of the others allowing each component to be an "expert" in one specific area. Given the complexity of software today it is difficult for any single developer to produce an excellent all-purpose piece of software. It allows programmers to build on their strengths and produce a single component that functions well (a master of one) rather than something that performs in an average manner on many tasks (jack of all).

2. It allows for combinatorial creativity on the part of the user/developer. Given a wide variety of components, the user/developer can mix and match pieces that are relevant to their task at hand and construct a piece of software that performs a variety of tasks seamlessly.

3. The component architecture also allows for expansion and modification of the software with changing needs. For instance an instructional web site that just had text and images can be very easily adapted to include animations and video. Contrast this to a situation where one uses a single piece of large instructional software constructed without taking advantage of the component architecture. Adding another media to the mix would require rewriting the entire software from scratch.

4. Having a component architecture allows for easier trouble shooting. In a component based world, a malfunction can be caused by two things–malfunction in a single component or malfunction in the manner in which different components talk to each other. In either case, identifying and rectifying the problem is easy–something that would be extremely hard in the previous ways of developing software. One does not have to go back and attempt to parse through the entire code. The solution is usually replacing a malfunctioning module rather than revamping the entire software.

If you replace the word software in the text that was just cited with the words: lesson plans, curriculum, or learning objects, you would begin to see where a curriculum based upon component architecture might be powerful in offering choice to students and instructors.

Operationalizing skills and knowledge can help educators and learners by having coherent, unified, and developed curriculum plans. The idea is that we teach what we say we are teaching, and help develop the skills that we value as a society in our learners.

So how do video games offer insight?

Consider that games are often complex and dynamic stories that link tasks that are skill and strategy dependent, and allow the flexibility of co-creation of the narrative based upon the player's ability to choose variables for problem solving based upon their analysis of the problem and predictions about how to solve it.

What if we could embed mandated learning objectives and skill sets into larger curriculum tasks as well defined learning objects like games do with skill sets and narrative? This might go along way in helping teachers define and offer embedded outcomes, which seem in large part what states are asking teachers to do in the form of curriculum mandates; these often based upon operationalized skills and functions based on what society and policy makers value, and cognitive and social research.

Deconstructing games into their learning objects

A learning object, according to Wiley (2000) is any digital resource that can be used and reused to support learning. He goes on further to say

> Supporting the notion of small, reusable chunks of instructional media, Reigeluth and Nelson (1997) suggest that when teachers first gain access to instructional materials, they often break the materials down into their constituent parts. They then reassemble these parts in ways that support their individual instructional goals.

This description of learning objects agrees with what a friend of mine at a game development company says about game design. Evidently game designers construct situations to teach and train players the skills and knowledge they will need for future situations through a variety of means:

- developing layered strategies to resolve difficult or new situations,
- learning revolving around memorization of specific game details or notable points of interest/ information displayed throughout the game.

From these situations, the player becomes engaged in a larger narrative, and is scaffolded into the creation of a larger narrative by connecting the experiences and making meaning.

By looking at the way individuals engage with problems in video games, we may gain insight and practice into the way an individual interacts in developing problem solving skills and means for how they inform their literacy practices.

According to Greg Costikyan, games have as their common thread:

- decision making,
- managing resources in pursuit of a goal;

And he says,

> that's true whether we're talking about Chess or Seventh Guest, Mario Brothers or Vampire, Roulette or Magic: The Gathering. It's a universal; it's what defines a game, Costikyan (1994).

With this said, looking at video games is still a difficult task, many people, across many different fields have studied games. I feel that games can provide an opening for researchers to look at pedagogy, critical literacy, as well as the cultures of practice that allow learners to engage in inquiry, try on new identities, and take chances knowing that they have the ability to fail and try again—learning at each step of the game. Games support trial and error, it is the nature of a game for the player to say, ***play you again***

We should begin to look at games as being similar to experimentation and curriculum: ***if the rules and context are well designed, behaviors will manifest, hypotheses can be tested and observed, and predictions about human learning can be validated.***

The key seems to be sustaining active engagement so that the experiment evolves with the participants. Experimental research, curriculum design, and game design are all based on assumptions about learning. The latter, game design has not been given much thought considering its prevalence in the lives of young people. Specifically, I believe there are several ways that games can be very useful in education:

- Games are effective in delivering content and keeping students engaged. Teachers can benefit from understanding the way games create problem scenarios where students develop skills to develop expertise.

- Games are a new form of media. Students are interested in the new media and have shown through interest and expenditure of resources that this is something important. Teachers can tap into interest in popular culture to relate and create connections to our cultural heritage and what might be considered important declarative information in our society's history.

- Games themselves and cultural artifacts that can be analyzed and evaluated for the design elements that expose the author/producer's beliefs about the world.

- Games provide good opportunities for identity development and examination of taking on different roles.

- Games are a new narrative, and games can be used effectively for developing literacy practices.

I believe the key elements that should be looked at are:

- how we make meaning

- use of prior knowledge

- motivation based upon social networks

- identity

- trial and error

- reflection integration

- and the ways in which video games are designed to promote learning to engage and scaffold players to overcome complex problems.

If you look at the game, Alice, by EA Games, you will find an interactive interpretation of Lewis Carroll's story of Alice's Adventures in Wonderland. You begin the story moving through a much darker version of the story. Rather than waking up under a tree, Alice is mad and in an asylum. This interpretation was likely made based on the conversation in the story with the Caterpillar who smoked the hookah on the mushroom; where Alice had her sanity questioned. The key to the game is accepting a different interpretation of the story, and looking at how make sense of it and how the player must make sense of a different Wonderland.

Beyond a comparative reading experience from the original text, an instructor might begin to think about how the game is created and how there are choices built into segments between short animations where the player/reader is led through the narrative to each new challenge.

In this game, the Cheshire Cat leads the player through series of encounters where skills are learned and the story is exposed after each challenge is met. It makes itself visible as the guide through Wonderland, giving hints and nebulous comments about where she might be going and what she might do after each challenge is met.

If we break down the interaction we have:

Alice as a computer generated persona representing the player, known as an avatar, moves through a virtual environment based upon the virtual environment, the player's goals, and their manipulation of the mouse and keyboard to pass challenges—like directing the player through a maze—and then short clips of animation to tell the story: what we have are tasks that are linked by a narrative. This direct application of skills in the service of developing a narrative might be useful in considering ways to construct curriculum.

In essence, the curriculum elements can be considered as declarative/factual, procedural, and contextual structures from which learners can experience directly, and then reflect upon and make meaning with guided instruction.

Question:

So what would happen if the facts, skills, and contexts were embedded in an activity which is co-created based upon criteria agreed upon before starting?

Answer:

It is likely you would have a greater degree of success in helping students reach the intended instructional outcomes.

By designing curriculum and instruction as linked learning objects into coherent challenges as video games are designed, teachers can begin thinking about developing skill sets, strategies, and knowledge acquisition tools that students can integrate and manipulate in ways that are the most advantageous to them, and thus encourage them to focus on their strengths and develop more proficiency in their weaknesses by allowing them the opportunity to make meaning of the components of learning into a self-constructed architecture based upon process and reflection.

With this in mind, my work would begin approaching ways that teachers may think about design elements for creating larger narratives in learning along with specific learning tasks which have been deemed important by the state, district, or their own understanding.

In essence, I began to see ways to answer many questions in an open architecture design with testable hypotheses. Good curriculum is methodical, structured and thought-through with room to wiggle, as well as transparent for the learner, so that they have a clear idea as to the outcomes and the methods of how to get to the finish, and more importantly to them, how they will be evaluated when they finish.

I learned good curriculum is like a laboratory experiment; and both are designed based upon assumptions about learning—just like video games. In the end, the data is as good as the design.

So why video games?

I have been conducting some informal interviews in the big gaming centers in the malls here in Minneapolis. The arcades seem to be making a comeback. But rather than people just pressing buttons to smash asteroids and jump barrels with monkeys like I used to do, people are given opportunity to engage in complex and dynamic simulations as games. It is phenomenal the degree of complexity these simulations offer.

After walking around an arcade for a while, I started talking with a man playing a horse racing game. I was amazed at the knowledge I acquired in the process of watching and listening. He taught me a lot about horse racing and training in the course of 30 minutes. I am sure he spent a small fortune and a lot of time to learn these things—I guess I was lucky he was interested in sharing with me. The degree of background that could be acquired was impressive. And the content was optional: you could let the machine offer you advice, you could learn from others, or you could go ahead with trial and error—the expensive way!

Through this game, he was being put in a position where an expert in horse racing had created a complex and dynamic scenario, where many interdependent variables could be chosen by the player to create a variety of outcomes. The multiple combinations and sequences of matching different skill sets created many different outcomes: in the case of the horse racing game, the growth and training of a race horse—the way it is chosen for characteristics, the way it is run, how it is fed, and how it is raced and rewarded has outcomes for future races. It is a never ending story as long as the player has quarters.

Thus the player can apply prior knowledge and acquire new strategies through playing against the computer AI and other players. This opportunity for trial and error, observation, manipulation of variables, and mentorship where life, limb, and social status are not in jeopardy allows for players to learn with creative engagement and risk taking.

Through this video game, strategy generation and knowledge accumulation is created and allowed an opportunity for application in a quantifiable outcome that allows for many attempts for mastery. It seems to me that these interactive simulations masquerading as video games are what Dewey would envision for active learning.

There are strong foundations for offering experiences like these in the classroom (Papert 1991). Computational modeling, simulations, and role playing are powerful tools in testing hypotheses in science as well as expressing narratives. And these are tools that are implicit in many of the complex games many people enjoy playing.

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[1] Methodology of Study Zero to Six

According to the methods section of the **ZERO TO SIX** report, the figures presented were based on the results of a nationally representative, random-digit dial telephone survey of 1,065parents of children ages six months to six years old, conducted from April 11 to June 9, 2003. The survey was designed and analyzed by staff at the Kaiser Family Foundation, the University of Texas and Princeton Survey Research (PSR). The interviews were conducted in English and Spanish by Princeton Data Source, LLC.

The margin of sampling error for the complete set of weighted data is ±3%. The total sample design effect for this survey is 1.06. As many as ten attempts were made to contact every sampled telephone number. Calls were staggered over times of day and days of the week. In each eligible household, interviewers asked to speak with the parent who spends the most time with the target child. In households where neither parent spends more time with the child, one was chosen at random for interviewing. The response rate for this survey was 40 percent.