
Cats and Portals

Video Games, Learning, and Play



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The author builds on arguments he has made elsewhere that good commercial video games foster deep learning and problem solving and that such games in fact promote mastery as a form of play. Here he maintains that some good video games engage players with an important type of play, namely of play as discovery, of play as surmising new possibilities in a given environment. The game *Portal* exemplifies this form of play, a form designed to give players a smart tool that enables them to see these new possibilities and use them in innovative ways. The author concludes with a discussion beyond games of young people using smart tools to become Pro-Ams, that is, amateur experts at something for which they have developed a passion.

Games and Learning

I WANT IN THIS PAPER to talk about video games and play. But let me start with games and learning. In past work, I have argued that good video games are learning engines. Good commercial video games are, for the most part, highly engaging problem-solving spaces. Since video games are often long, difficult, and complex, they must get themselves learned and mastered in effective ways. If they could not be learned and mastered in a motivating fashion, no one would play them, at least not for entertainment.

Good games achieve good learning by building on sound learning principles (Gee 2003, 2007), principles supported by research in the learning sciences (Bransford, Brown, and Cocking 2000; Gee 2007). Game designers do not, of course, necessarily read up on research in the learning sciences. Nonetheless, they have hit on these principles in the competitive race to make successful products that demand mastery of problem solving.

While I have concentrated my work, for the most part, on commercial games, I have also argued that video game technologies hold out great promise, beyond entertainment, for building new learning systems for non-entertainment purposes in and out of school (Gee 2004, 2005, 2007). Many others have also made this same argument as the emerging field of so-called serious games has developed (Hawisher and Selfe 2007; Shaffer et al. 2005; Shaffer 2007; Raessens and Goldstein 2005; Wolf and Perron 2003; Squire 2006).

Of course, not all video games are good in the sense in which I am using the term (i.e., effective learning machines). There are also different types of video games, and learning works differently in different types of games. We can make a distinction between two major types of games: problem games and world games. The distinction, however, is not airtight. Problem games focus on solving a given problem or a single class of problems (e.g., *Tetris*, *Diner Dash*), while world games simulate a wider world within which the player must solve many different sorts of problems (e.g., *Half-Life*, *Rise of Nations*, *Chibi-Robo*).

A game like *Portal*—an innovative and wildly popular game I will discuss in more depth below—melds these two types in a very innovative way. *Portal* is a game developed by Valve (a developer famous for the game *Half-Life* and its sequels). The game was released in a bundle package called *The Orange Box* for PC and Xbox 360 on October 10, 2007, and for PlayStation 3 on December 11, 2007. The game is set in a 3-D world and driven by a minimal but fascinating story. The player has a “portal gun” and can make a blue portal and an orange one. If the player goes through one portal, she comes out the other (your avatar in the game is a female).

The portals obey a law of conservation of momentum, so if the player goes in one fast, she comes out the other one equally fast and can, thus, fly across large spaces if the second portal is, for example, high up. The player must navigate complex environments—sometimes with hazards such as lasers, electrical beams, and toxic waste—with just this tool. (The portal gun can also pick up crates and place them on switches.) For example, you often have to make portals to redirect electric beams so they hit specific targets that operate platforms. In the game, someone appears to be testing both you and your intelligence, and by the end you realize they intend to kill you. As with the classic *Half-Life*, a minimal ending gives you just a glimpse of what is going on.

Portal is a problem game set in an interesting world. You solve one specific class of problems with a specific tool but in a world that simulates a real-world environment, one built to enhance and facilitate just such problem solving

with just such a tool. *Portal* makes clear in a very overt way how the “fun” of a game comes from learning to solve problems and from eventually gaining some degree of mastery over both the problems and the tools that help solve the problems.

A more complex game like *Half-Life 2* involves a wider array of integrated problems and tools. It loses some of the focus and purity of a game like *Portal* but gains a more real-world feel since the real world is itself largely a set of problem-solving spaces, if much more open ended (and consequential) than video games. Neither type of game is better or worse.

Despite its popularity, *Portal* also melds entertainment games and so-called serious games (though gamers would not, perhaps, like to hear this). *Portal* makes a game out of a coherent set of problems largely defined by gravity and other principles from physics. A game can certainly be made out of any problem space, provided the designers are innovative enough.

Some people consider some problem spaces more serious than others, usually when a problem space is connected to some academic or work domain. But the principles of engagement with a game remain the same regardless of the problem space (or spaces) around which the game is made. In that sense, there need be no distinction at a game-design level between entertainment and serious games.

Games and Play

Though people have been kind enough not to mention it, one thing has been unfortunately missing in my work on games: the fact that video games are a form of play. I have certainly not treated video games as work or even as something serious, but I have stressed learning without mentioning play (though I have talked about pleasure, see Gee 2005). But video games are play and they recruit learning in the service of play as much or more than they recruit play in the service of learning.

Of course, a massive amount has been written on play, and a number of people have applied this work to video games (see Juul 2005; Malaby 2007; Salen and Zimmerman 2004). There has been, for example, much written about the “magic circle.” This concept comes from Johan Huizinga (1950/1938), who argued that play is free and voluntary and not connected to any material interest. For Huizinga, play takes place within its own boundaries of space and time

and draws players into a separate world, a world set apart from ordinary life (the “magic circle”), though it is still created and sustained by players in the real world.

Although many scholars have adopted Huizinga’s view in their work on games and learning, some have grown critical of his argument as they come to consider video games more widely useful for educational and other “serious” purposes. However, such criticism begs the point whether such serious uses of games are still play. I personally don’t care much about the magic circle idea, but I do care about the issue of what we lose—and whether we lose play itself—when we turn video games into serious games.

A good deal of work has gone into developing a general theory of play or of games (see, for example, Juul 2005). I do not think that all things we call play—or all things we call games—match any one set of criteria, nor fall under any one definition, nor fit inside one general and unitary theory. Here I follow Wittgenstein (1958/1933) and take these terms to name “family resemblance” concepts. There are different “clusters” of play and games that relate to other clusters in different and variable ways, just as members of the same extended family resemble each other in different and variable ways.

So I want to discuss just one aspect of play, admitting there are many others, some of which fit video games and some of which do not. The aspect of play in which I am interested is connected to discovery. To make clear what I mean, consider cats. To the everyday observer, at least, it appears that when cats play, they go around and explore and probe the world. All of sudden—and you can readily see it when it happens—they discover something that intrigues and surprises them. They have seen something new, even in an old place. They seem aware of new possibilities—and sometimes they can use these new possibilities to their advantage. Little children seem to do the same thing. So, sometimes, do some scientists.

When cats are wandering the house exploring and probing, they may well have goals. They are not, I think, just moving around randomly. But as they push and pull on things and the world talks back to them, their goals apparently change. They seem open, from the outset, to new possibilities. They appear, to me at least, to be looking for and open to discoveries.

I am, then, going to use the term discovery in just this simple, basic sense. I will deepen the term a bit below, but not much. I don’t think it needs much deepening. I will also later add another type of cat play to the mix.

Portal

I want to use the game *Portal* to develop a particular perspective on games, learning, and play, play in the sense of discovery that I have just delineated via cats. Let's start with the following remark from a Valve website advertising the game:

The game is designed to change the way players approach, manipulate, and surmise the possibilities in a given environment . . . (The Orange Box 2007)

How does *Portal* “change the way players approach, manipulate, and surmise the possibilities in a given environment”? (And doesn't this sound a bit like cats at play?) *Portal* gives the player a new tool—the portal gun—to probe and explore the virtual world in new and specific ways that can lead to discoveries. Players discover things that intrigue and surprise them. They see something new. They are aware of new possibilities. And they use these new possibilities to their advantage in different ways in order to play the game and win.

It just so happens that a number of these discoveries are, in fact, discoveries about physics, though physics as “content” in no way defines the game. Rather, it is physics as possibilities for action that defines game play in *Portal*.

This sense of play and discovery in *Portal* is not irrelevant to how knowledge is built in the real world. There is a world out there: the real world. People who want to produce knowledge—academic or otherwise—often find the real world too complex to take on all at once, so they use tools that operate on the real world to solve certain specific types of problems. The tools they use cause them to look at the world in a certain way, sometimes in a new way. They learn to look at the world in terms of the tools they have and what those tools are good for. These tools are, as Valve would have it, designed to change the way players approach, manipulate, and surmise the possibilities in a given environment.

Knowledge tools—microscopes, models, geometry, a pair of birding binoculars—cause us to foreground and pay attention to certain aspects of the world and to background other aspects. In that sense, knowledge tools always create virtual worlds. The real world is reduced to those aspects of it that our tools can leverage for powerful problem solving of a certain sort.

The very agile front paws of cats and their keen sense of smell, as well as their other marvelous tools, no doubt cause them to probe the world in certain ways and to see the world in certain ways. When I say see the world in certain ways, I mean to surmise the possibilities in their environment—what can be done and what can be made to happen—in certain ways. Humans can create or be given tools that change the way they approach, manipulate, and surmise the possibilities in a given environment.

My point about tools—that, like the portal gun, they change the way people approach, manipulate, and surmise the possibilities in a given environment—could be exemplified with many examples from science, especially as new technological tools change how we look at and act on the world to gain new knowledge. The point, in that sense, seems obvious. But, then, for some people science is work not play (though, in my experience, many scientists and scholars would deny this). So let me tell a different story, one about a girl at play.

A working-class girl who was unhappy with school joined a club that tried to help young women become “tech savvy” (Hayes forthcoming 2008). She loved to play *The Sims*, the best selling video game in history. In *The Sims*, the player builds and sustains houses and buildings, families, and whole neighborhoods and communities.

She wanted badly to turn real clothes into virtual clothes for her Sims (her virtual humans) in *The Sims*. The people running the club told her that they thought this could be accomplished using Adobe Photoshop, but they didn’t know how to do it themselves. She found a version of Photoshop and spent many hours learning how to turn the photos she took of clothes she liked into virtual clothes. The process was technical and complex, and she had to master concepts like texture, layering, mesh, hue, perspective, and design. She made (and redesigned) clothes for her Sims and for months worked to perfect the process.

Eventually, she gave the virtual clothes she designed away to her friends, who also played and loved *The Sims* and who came to admire greatly her skill and taste. She then discovered that she could upload her virtual clothes for strangers and soon had over 400 people using and praising her clothes. Her status and her self-respect continued to grow as she made clothes, first, for her local friends and, then, for her global audience.

There are people who say that *The Sims* is not a game, because it has no win state. They call it a sandbox or even—a phrase I dislike—a dollhouse. However, clearly *The Sims* gave this young woman a set of tools with which to see new

possibilities for action. One of the possibilities she saw was the idea of turning real-world clothes into virtual clothes. Then she got a new tool, Adobe Photoshop, which allowed her to approach, manipulate, and surmise the possibilities in a new environment. The real world and the virtual world mixed, matched, and melded.

One of the new possibilities she surmised was this: when asked what she had learned from her experience, what it made her think about her future, she said she had decided that she would like to go on in life and “work with computers,” though, perhaps ironically, not on clothing design. She said that she had discovered that computers could make you feel “powerful.” She had surmised new possibilities in computers and in life and had done so from play, not from school.

Pro-Ams: Moving from Play to Work

The experience of this young woman could be a leitmotif of our age. At the same time as schools engage in test prep, skill-and-drill, and the basics, we live in the age of “Pro-Ams” (Anderson 2006; Leadbeater and Miller 2004; Toffler and Toffler 2006). Pro-Ams are people who have, as amateurs, become experts at whatever they have developed a passion for. Many of these are young people who use the Internet, communication media, digital tools, and membership in often virtual, sometimes real, communities of practice to develop technical expertise in a plethora of different areas such as digital video, video games, digital storytelling, machinima, fan fiction, history and civilization simulations, music, graphic art, political commentary, robotics, anime, fashion design (e.g., for Sims in *The Sims*), and nearly every other endeavor the human mind can imagine.

These Pro-Ams have passion and go deep rather than wide. In fact, it seems that developing such a passion is a *sine qua non* of deep learning that leads to expertise. At the same time, they are often adept at pooling their skills and knowledge with other Pro-Ams to bring off bigger tasks or to solve larger problems. These are people who don’t know what everyone else knows, only how to engage with other Pro-Ams to put knowledge to work to fulfill their intellectual and social passions.

The young woman is fast on her way to being a Pro-Am. She has not yet sold her clothes, only given them away. She has become a classic example of

what the Tofflers (Toffler and Toffler 2006) call a “prosumer,” a consumer who produces and transforms, not just passively consumes, for off-market status and as part of a community of like-minded experts. As the Tofflers point out, such prosumer activity often affects markets when people like this young woman eventually sell their goods or services. In fact, the Tofflers believe such activity, though unmeasured by economists, plays a big role in the global economy and will play a yet bigger role in the future.

Is this young woman learning something serious? What she is learning is not a school subject or defined by an academic label or the name of an academic discipline. Nonetheless, it seems serious to me. Of course, she finds what she is doing engaging because she has a passion for it and the word “serious” probably does not come to her mind. What she does is certainly not trivial and is much more deeply relevant to both her future and the global world than much of what she does (or ignores) in school.

We have come full circle; play has become serious, affecting futures, work, and the global economy—serious, indeed. And this reminds me of another aspect of cats at play. Cats use play to practice and perfect skills they will use for “real” if they have to hunt and defend themselves and their territories. The young woman is playing at what are, in fact, twenty-first-century identities and skills. School work, for the most part, today leads to no such thing for most young people.

Play as Practicing for Reality

It is a striking feature of popular culture today that when people play, they engage in activities similar to those they engage in at school and at work, though they don’t like these latter activities as much. For example, in massive multi-player games, such as the very popular *World of Warcraft*, often a group of five people will party together to hunt and quest. The group will almost always be composed of players with very different game characters. For example, such a group (or party) might be composed of a Hunter, Warrior, Druid, Mage, and Priest. Each of these types of characters has quite different skills and plays the game in a different way.

Each group member (player) hones his or her special skills and learns to integrate these skills as a team member within the group. Each team member must also share some common knowledge about the game and game play with all

the other members of the group—including some understanding of the specialist skills of other player types—in order to integrate successfully. So each member of the group must have specialist knowledge (intensive knowledge) and general common knowledge (extensive knowledge), including knowledge of the other members' functions.

Often, within the game, team members hold each other to a very high standard of both specialized skills and the ability to understand the various specializations of others and to integrate with the team (Steinkuehler 2006). Often, too, these five-person teams partner with other such teams to form larger groups within which each team must coordinate.

In the workplace, this kind of group is sometimes called a “cross-functional team” (Parke 2003). Such teams are common in modern high-tech “new capitalist” workplaces, as well as in contemporary forms of social activism (Beck 1999; Gee 2004; Gee, Hull, and Lankshear 1996). People specialize, but integrate and share, organized around a primary affiliation to their common goals. At work these teams can be demanding and highly stressful. In *World of Warcraft* players find such teams demanding, as well—at least when they are playing as members of guilds requiring high standards for game play—but they call what they are doing play. (Guilds are associations of players that help people find other players to group with and sometimes set certain goals.)

More interesting for our purposes here, play also mimics school or work in the way many young people today encounter complex specialist language and demanding problem solving as they engage in popular culture activities (Gee 2003, 2004, 2007; Jenkins et al. 2006). In video games like *Civilization* or card games like *Yu-Gi-Oh!*—and many other such activities—young people confront language as complicated as any they see in school, and they often must engage as well in complex, strategic, systems thinking and problem solving.

It's interesting that the complex language young people see in popular culture can—when it occurs in school—be a real barrier to success in the classroom (Gee 2004). In fact, in a well-known phenomenon called “the fourth-grade slump” (*American Educator* 2003; Chall, Jacobs, and Baldwin 1990; Chall and Jacobs 2003; Hirsch 2003), children—often, but not always, less privileged children—pass early reading tests but cannot read well enough to learn content in school. Content—for example, math, science, and social studies—begins to play a major role in learning around fourth grade. From that point forward, content is more and more frequently couched in complex academic language rather than everyday language. On the other hand, children, rich and poor,

appear to cope well with complex language when it is embedded in a popular culture practice for which they have a passion.

For example, consider the technical and logical language in the following definition written on an Internet board discussing *Yu-Gi-Oh!*, a card game played via video games or face-to-face and depicted on websites and in books, movies, and television shows. I have watched children as young as seven play *Yu-Gi-Oh!*. The site is meant to answer questions players have about the game:

Amplify (Onslaught) - Amplify X means “When this creature card is summoned, reveal X creatures of the summoned creature’s creature type(s). If you do, put X times N +1/+1 counters on that creature (X = Amplify X. N = Number of revealed creatures).” (Pojo.com)

Or consider the text below, which appears on a *Yu-Gi-Oh!* card that I borrowed from a seven year old:

Armed Ninja

Card-Type: Effect Monster

Attribute: Earth | **Level:** 1

Type: Warrior

ATK: 300 | **DEF:** 300

Description: FLIP: Destroys 1 Magic Card on the field. If this card’s target is face-down, flip it face-up. If the card is a Magic Card, it is destroyed. If not, it is returned to its face-down position. The flipped card is not activated.

Rarity: Rare

The “description” is really a rule. It states what moves in the game the card allows. This text contains three straight conditional clauses (the “if” clauses). Note how complex the meaning is: First, if the target is face down, flip it over. Now check to see if it is a magic card. If it is, destroy it. If it isn’t, return it to its face-down position. Finally, you are told that even though you flipped over your opponent’s card, which in some circumstances would activate its powers, in this case the card’s powers are not activated. This is “logic talk,” a matter, really, of multiple, related either-or-if-then propositions. It is the type of explicit specialist language children will see often in school in the later grades.

Consider another *Yu-Gi-Oh* card from the seven-year-old's deck:

Cyber Raider

Card-Type: Effect Monster

Attribute: Dark | **Level:** 4

Type: Machine

ATK: 1400 | **DEF:** 1000

Description: When this card is Normal Summoned, Flip Summoned, or Special Summoned successfully, select and activate 1 of the following effects: Select 1 equipped Equip Spell Card and destroy it. Select 1 equipped Equip Spell Card and equip it to this card.

Rarity: Common

This card has the following technical words (some are compound words) on it: “effect monster,” “dark,” “machine type,” “normal summoned,” “flip summoned,” “special summoned,” “successfully,” “select,” “activate,” “effects,” “equipped,” “Equip Spell Card,” “destroy,” “rarity,” and “common.” These all have special meanings within the game rules. While they have specialized uses within the game, their uses even there relate to their more common meanings in other activities and areas.

As I said above, I have watched seven-year-old children play *Yu-Gi-Oh* with great expertise. They must read each of the cards. They endlessly debate the powers of each card by constant contrast and comparison with other cards when they are trading them. They discuss and argue over the rules and, in doing so, use lots of specialist vocabulary, syntactic structures, and discourse features. They can go to websites to learn more or to settle their disputes. If and when they do so, here is the sort of thing they will see: “The effect of ‘8-Claws Scorpion’ is a Trigger Effect that is applied if the condition is correct on activation”(Yu-Gi-Oh! Wikia)—note: “effect,” “applied,” “condition,” “activation,” and the conditional “if” clause.

However, all this complex language—connected to the *Yu-Gi-Oh!* cards, books, video games, movies, and television shows, as well as to argument and dialogue while playing—is part of play. In popular culture, games like *Yu-Gi-Oh!* or video games are for most young people forms of play involving not just the game proper but also reading, writing, drawing, arguing, and dialoguing as well, on the Internet and off it in the real world. Here young people—in regard to language, literacy, and complex problem solving, not to mention collaboration—

practice in play very real skills crucial for success in school and the world. Ironically, today, often they are doing no such thing at work in our schools.

This discussion about language brings us to an important distinction between entertainment games and “serious,” school-like learning. A game such as *Portal* does not demand that the player come to an explicit understanding of the principles and concepts behind the solutions to its problems (e.g., the physics of the conservation of momentum). It does not demand that players can articulate their understandings. Rather, players gain tacit understandings that they can apply to new levels in the game. So, of course, transfer is built into the game: later levels demand transfer of knowledge developed at earlier levels, knowledge that must also be put together with new learning at the later level.

A non-entertainment learning space would usually want to create and enhance explicit learning and the ability to articulate one’s knowledge, hopefully without losing tacit knowledge and actual problem-solving ability. However, we have just seen that such explicit understandings and the ability to articulate one’s knowledge are not foreign to commercial entertainment video games and other popular culture play practices. Such explicit understandings are often created and enhanced through web sites and communities connected to games, as well as through strategy guides of various types. For example, below is a section from a Wikipedia entry on *Portal* replete with explicit language articulating concepts a player picks up tacitly in the game:

The portals create a visual and physical connection between two different locations in 3D space. Portal ends are restricted to planar surfaces, but if the portal ends are on nonparallel planes, bizarre twists in geometry and gravity can occur as the player character is immediately reoriented to be upright with respect to gravity after leaving a portal end. An important aspect of the game’s physics is “momentum redirection.” Objects retain the magnitude of their momentum as they pass through the portals but in a direction relative to the surface the exit portal is on. This allows the player character to launch objects, or even herself, over great distances, both vertically and horizontally, a maneuver referred to as “flinging” by Valve. (Wikipedia 2007)

In this passage, the reader is linked through the phrases “3D space” and “momentum” to Wikipedia entries that deal with the physics of these concepts in much technical detail.

Interactions around such explicit and technical language are common when gamers discuss games on boards, devote websites to them, or write technical strategy guides (“FAQs”). It is all part of play. At the same time, though, mastery of complex “academic-like” language is at the heart of school success—or, unfortunately, school failure for many young people (Gee 2004; Schleppegrell 2001, 2004).

Words and Symbols as Knowledge Tools

I am by training a linguist, and so I care about language. Language is for me a tool through which I surmise possibilities in new environments, for example, in learning environments. In fact, it was, in part, discovering new possibilities for the role of language and literacy in video games while I was playing them that got me interested in games and learning.

Words are themselves tools. They are tools for training vision, just like the portal gun. But they often require other sorts of tools to prepare a space or niche—a sort of landing zone—for them in the world first, and then they come to serve as higher-order tools. Above I said that when cats explore and probe the world, they often discover new possibilities for action that they then take advantage of for their own purposes (e.g., learning to open doors and then eventually open the cabinet that holds their food). For us humans, when we learn to attach words to new possibilities, we can then use these possibilities in a higher-order way for our own advantages and purposes.

Let me return to the young woman turning real-world clothes into virtual clothes for her Sims. Her activities with Photoshop foregrounded certain features of the real world as important to her productive goals. These features—things like different degrees of hue or mesh or texture—require names for human actors to use them; they need words attached to them just as computer files need names to open or save them. Her activities created niches for words to attach to.

With words attached, she can extend, discuss, and eventually come to be able to explicate her knowledge. She can ask questions, make claims, and interact with other emerging and accomplished experts (on *The Sims* sites, for instance). The words become themselves tools for foregrounding and leveraging aspects of the real world, as well as aspects of an explicit knowledge-building process. The words become, in collaboration with other sorts of tools, themselves tools for building and transforming both clothes and knowledge.

So we see that play with tools like Photoshop (or tools in science) opens up niches to which words can be attached. Sometimes these words are technical terms, sometimes they are everyday words. But in both cases they are technically “technical” because they are explicitly attached to an emerging expert practice (often a Pro-Am practice today) and take on their specific meanings (whatever other meanings they may have elsewhere) here and now in terms of this expert practice. As we become expert at a practice we all speak jargon, but only outsiders consider it jargon, not insiders. We hate other people’s jargon, but not our own. As we have seen, in popular culture today, play is full of jargon. Such jargon—like the language of *Yu-Gi-Oh!*—is a language of play. It is part and parcel of what it means to know the rules of the game.

Playing *Portal* opens up all sorts of niches for words. For example, after trying to figure out how to fly through the air at the right speed and angle to get to hard-to-get-to ledges, the player certainly has prepared a niche for a term like “conservation of momentum” or even “a direction relative to the surface the exit portal is on.” I don’t know a shorter word for this latter phrase. And it is not uncommon that we attach phrases and not just words to niches. And, of course, these niches are related to words and niches in physics in an interesting way.

Games like *Portal*—and other related technologies—can do something else fascinating, something that is sometimes harder to do in the real world. They can create niches for words (that is, foreground properties in a world) that are nonexistent in the real world. They can offer us tools that train vision for a wider set of “realities” (possible realities) than are actually present in the real world. They are, then, in that sense, about “possible worlds” (much like modal logic—see Lewis 1986). After all, we could make lots of different portal games, each set in a world with different physics, different from each other and different from the real world.

The young woman can make clothes that have never existed in the real world for creatures (fantasy Sims) that have never existed there either, and she can do this by transforming real clothes and in the act see new possibilities in both the real and virtual worlds. Now we are talking about possibilities in the sense of possible worlds, possibilities on a big and a wide scale.

We can then turn to the real world and see which subset of this wider set of possible worlds the real world represents. This is an important knowledge-building property. We can come to see that theories often predict sets of possible worlds, which are narrowed down to the real world by empirical data. But

these possible worlds also sometimes illuminate paths to new technologies, new hypotheses to test, and discoveries about new and unexpected properties of the real world. They are a key part of innovation and creativity. Words don't care whether they attach to niches in the real world, virtual worlds, or just imaginary worlds.

One of the promising things about games, simulations, and virtual worlds is that they allow us to create tools for foregrounding aspects of possible worlds (modeled usually on the real world in some sense) that can become niches for words. These words can then lead to debate about possibilities, innovation, transformation, and change. We can ask: why not (or can we) actually make a new niche in the real world for this word to inhabit?

But now I have strayed too far from play, perhaps. It sounds like I am getting close to school and to work. Children, unlike cats, have to go to school, I suppose. But we live in a global world full of complex systems, risks, and dangers—many due to our own adult, serious but simplistic, linear thinking that is so often unaware of alternative realities (Klein 2007). In my view, we dare not lose what I mean here by play—the sense of discovery and the ability to surmise new possibilities in new worlds. But we lose this too often as children move from home and community to school. Our children, in our global world, more than ever, need lots and lots of good portal guns. Today they get them, for the most part, to enhance their play. And for that we can be thankful.

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