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A Portal to Student Learning: What Instruction Librarians can Learn from Video Game Design

Nicholas Schiller

Washington State University Vancouver, Vancouver, Washington, USA

The author may be contacted at: schiller@vancouver.wsu.edu

Schiller is the Library Instruction Coordinator and a reference librarian with the Washington State University Vancouver library.

Abstract

Purpose – The paper presents a methodology for analyzing the pedagogical content of video games and presents the findings of one such analysis.

Design/methodology/approach – The pedagogical analysis presented here consists of three parts - - an introduction to the new media of video games, a method for analyzing video games, and lastly, the results of analyzing the pedagogical content of the video game *Portal.*

Findings – The analysis uncovered significant pedagogical content and useful methodologies used in the design of the video game *Portal.*

Practical implications – The pedagogies and design methods used in the game *Portal* can help librarians engage and educate students of the gaming generation in information literacy tasks.

Originality/value – This paper provides a model for pedagogical analysis of the video game medium and practical techniques taken from an excellent representative of that medium.

Keywords – Instruction, Video Games, Computer Games, Pedagogy, Information Literacy

Paper type – Research Paper

Video Games and Information Literacy

Instruction librarians who wish to teach information literacy to upcoming generations of college students

can benefit from looking at video games. More than just a popular pastime for these students, video games are an emerging media that play a central role in the development of the current generation of college students. This project analyzes the teaching elements of an award winning example of the video game designer's art: the computer game *Portal* from Valve Software. The designers of *Portal* created a learning environment inside their game that does an exemplary job of engaging players in the difficult process of learning new skills and making difficult conceptual leaps. Instruction librarians who can become literate in the new media of video games and examine games like *Portal* will find rich areas for discovery. There is much to learn both about instruction design and about learning environments from studying video games.

An examination of *Portal* will reveal solid pedagogical techniques. Some of these will be very familiar to instruction librarians, while some will offer a new approach to solving instructional problems. Three aspects of the game's instructional design in particular merit closer inspection. *Portal* uses scaffolded instruction and layers lessons in a structure that provides more intervention to players who need it most and then gradually removes the support as players demonstrate a skill level that allows them to stand on their own. The designers of *Portal* also make great use of assessment data in the construction of their game's learning environments. Ideas are put to the test and the reactions of players to the designers' ideas are used to modify the design to be more customized to the players' needs. Finally, the game designers developed a concept they call "gating" to keep players from advancing beyond their skill level and becoming frustrated by situations they are not yet equipped to navigate.

These instruction concepts are interesting and useful for instruction librarians. Because video games are an emerging medium and because our students are likely to be much more fluent in the culture of video games, it is necessary to outline a method for examining games before attempting to draw conclusions about their learning systems. In order to showcase the learning potential of a game like *Portal* it is useful to understand the game from the perspective of a player. In order to provide this perspective, the game *Portal* will be first be described and explained as a player first sees it. Next, a method for analyzing video games will be presented. This method draws both on the unique aspects of the video game media and the particular set of expertise that instruction librarians have developed as they practice their craft. Finally, this method will be applied to the game and the results of this analysis will be discussed. By drawing both on the perspective and skill sets of instruction librarians and on the particular aspects of video games, librarians will be able to achieve a greater degree of literacy with the medium and thus be better equipped to help students who are quite literate in video games increase their information literacy and better reach their academic goals.

The link between video games and library instruction or information literacy isn't necessarily obvious. On

the surface, there is little that connects games with the teaching that takes place in the library and in the classroom. However, the connections exist and are rewarding for those who search for them. The 2007 game *Portal* from Valve Software is an excellent starting point for developing literacy with gaming media. The teaching and learning that takes place in *Portal* are apparent to non-gamers because the game is set in a learning environment (a scientific laboratory) and direct pedagogies are used. To succeed in the game a player must past a series of tests that demonstrate proficiency with the games learning outcomes. Generally, these outcomes are made explicit to the player. Also, the game includes developers' commentary tracks. The developers' commentary take a form very much like the director's commentaries available on DVDs. The commentary tracks allow players to listen to the team responsible for creating *Portal* talk about their work, the design process, and how they came to make some key decisions. Librarians can gain unique insight by listening to the video game's designers talk about, for example, how to make design changes that prevent players from stumbling about the game without understanding key concepts and compromise their ability to learn new skills (Valve Software*, 2007*). The game designers' solutions appear similar to concepts commonly used in library instruction settings. So, in at least some ways, good game designers think like good instruction librarians. This realization leads to the question: "What else are good game designers doing that instruction librarians can learn from?" Answering this question will explain why analyzing video game design can be a productive activity for librarians.

James Paul Gee provides another observation about video game design and solid pedagogy. Since video games need to teach their players how to play in order to sell copies, market forces come into play and motivate game designers to pay attention to their instructional design.

> If a game, for whatever reason, has good principles of learning built into its design—that is, if it facilitates learning in good ways—then it gets played and can sell a lot of copies, if it is otherwise good as well. Other games can build on these principles and, perhaps, do them one step better. If a game has poor learning principles built into its design, then it won't get learned or played and won't sell well. Its designers will seek work elsewhere. In the end, the video games represent a process, thanks to what Marx called the "creativity of capitalism," that leads to better and better designs for good learning and indeed good learning of hard and challenging things. (Gee, 2003)

This provides another reason to turn a critical eye to video games and their relationship to pedagogy. Game designers assume many of the same instructional challenges that instruction librarians face, and work with similar audiences. They also have competitive market pressures that work to drive innovation in the field and cull techniques that are less successful. Because of these pressures, video game development may be a productive

environment for driving innovation in pedagogical techniques.

A third justification for academic professionals to invest time and attention in the study of video games can be found in Gerald Graff's *Clueless in Academe*. Graff highlights the difficulty faced by those who are not acculturated to the academy in understanding the contexts of academic conversations. Problems discussed by faculty do not seem to be real problems, and students have difficulty engaging when the rules of the game are not explicit. A key missing piece is "intellectual socialization" (Graff, 2003). If educators can make links between an activity that students are socialized in (such as games) and the requirements of scholarly communication, it is likely that they will see more success in engaging students in the "game" that is the academy. The fact that students have learned how to succeed and understand games, a context situated outside of normal life, can help them develop situated learning in the context of the academy, if librarians and educators can show them the links.

Given these potential values of the study of video games, it is important to isolate the specific parts of games that are of use to educators and identify how a methodology for learning from them can be developed. This investigation will discuss potential analytical methods and examine the results of such an analysis on a particular video game: Valve Software's *Portal.*

Portal

Portal is a video game from Valve Software for Windows computers and the Xbox 360 and PlayStation 3 video game consoles. It is a puzzle game in which the player guides a character through a series of tests and uses problem-solving and additional skills taught by the game to navigate the various test-chambers that house the puzzles. In the language of video game industry, Portal is a cross between the first-person shooter (fps) genre and the puzzle genre. That is, Portal is a game that shows the player the world through a first-person perspective and the main challenge is solving puzzles. As players guide their characters through the game, the game screen shows what the character "sees" through their "eyes". The player controls the action using mouse and keyboard or the Xbox controller using standard control conventions for the first-person shooter genre of games.

Plate I, Screenshot from Valve Software's *Portal*

Set in a mysterious laboratory, *Portal* puts the player in the role of a test-subject for laboratory experiments. The game's action takes place in a laboratory that tests the player's ability to solve puzzles using portals. Portals are linked gateways that allow the player to move between points that are physically isolated from each other and unreachable using the normal laws of physics. The player navigates a series of test chambers, each of which forms a level, or discrete unit, of the game. A computerized voice speaking over the lab's intercom system provides instructions for each successive test chamber. Solving puzzles allows the player to advance through the game rather like a lab rat navigating a maze to find a piece of cheese. As the game progresses, players have the opportunity to learn more of the background context for the laboratory, tests, and the voice. However, the keys to understanding the pedagogies used by the game developers are concentrated in the training levels found in the first half of the game.

At the center of all of the tests and of the game itself are portals. Unlike other games in the FPS genre, *Portal*'s players do not use firearms or weapons. Instead of bullets they use the "Aperture Science Hand-Held Portal Device" or portal gun. With this device players can "shoot" holes or portals in walls and pass through them.

The illustration below shows the basic gameplay mechanic. Using the portal gun, a player can place portals on walls or other surfaces and travel between them.

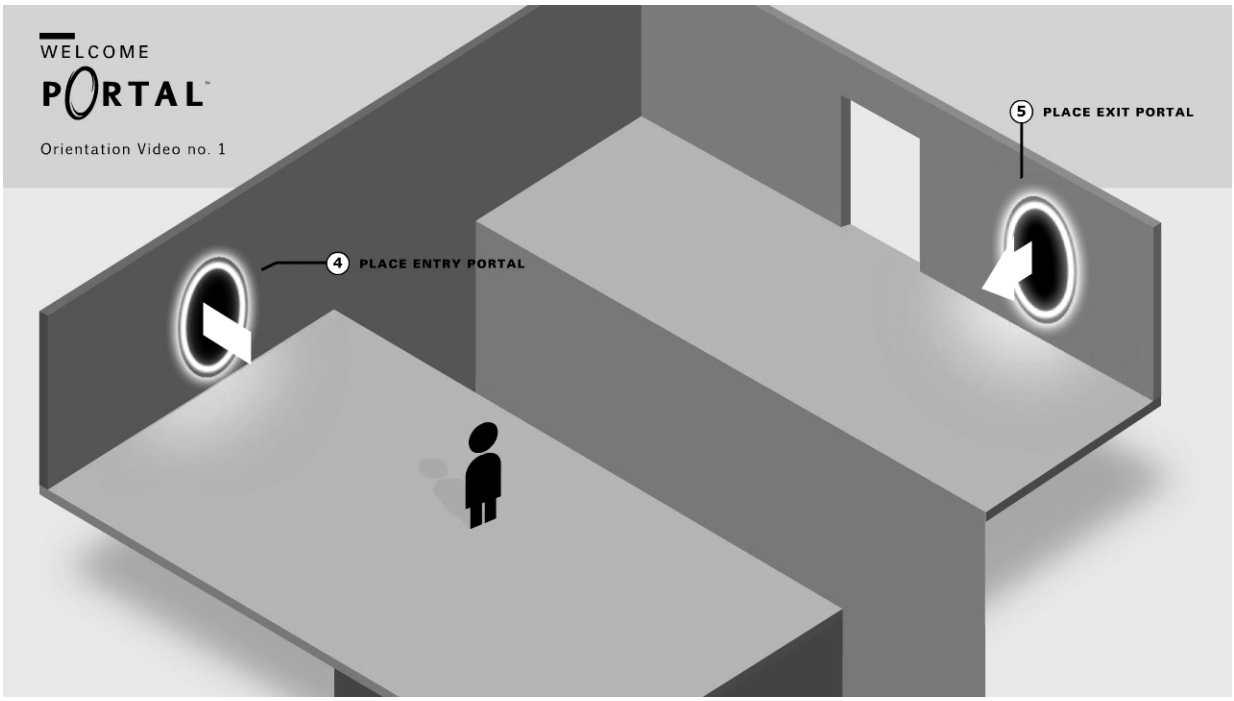

Plate II. Screenshot from Valve Software's *Portal* trailer video

The player in the image wishes to exit through the door near the top of the image, however, the gap in the floor prevents this. Using portals, the player can solve the puzzle by entering through one portal and exiting the other, thus bypassing the barrier. This is the essence of the game. Players use the portal gun to make doors in solid walls or floors and navigate mazes that would otherwise be impossible to solve. Discovering creative ways to use the unique properties of portals is required to solve the puzzles. Developing and building the skills necessary is difficult, since the laws of physics and of three-dimensional space are applied (and violated) in unfamiliar ways. In many ways, the genius of *Portal* is in successfully teaching players to make a complex cognitive leap and develop a series of new skills and ways of approaching otherwise familiar problems. A close look at how the game designers teach their players to "think with portals," enjoy themselves, and persist through failure provides myriad benefits for instruction librarians.

How to Read a Video Game

Librarians and education professionals are not the target audience for video games. At least, librarians and educators are not the target audiences of video game marketing campaigns. This can present barriers for librarians who might otherwise use games media as a resource. Sensational news reports of violence and sexual

content in video games might also turn educators away from the media as a whole and especially from considering games as a source for sound pedagogical techniques. To circumvent these barriers, librarians and educators might consider using the analytic tools they apply to other media and simply ignore the context or setting of the video game. A suggested approach for analyzing video games is to use the techniques developed by Mortimer Adler and Charles Van Doren's in their classic *How to Read a Book.* While Adler and Van Doren are clearly writing about written media, their techniques and advice can be applied to other media forms to great effect. Using the *How to Read a Book* technique for analytical reading, gamers should first play through a game just to experience and enjoy it. Then, following Adler and Van Doren's advice for readers, try to express what the whole game is about in a single statement or brief paragraph (Adler & Van Doren, 1972). Be a player and experience the game from that perspective. Have fun! Next, after becoming immersed in the setting, gameplay mechanics and enjoying the game, return to the tutorial or training levels and actively observe what is happening pedagogically. Look outside of the game-world for the teaching and learning that is going on. Adler and Van Doren suggest outlining the structure of a book's chapters and breaking them down into their component arguments and assertions (Adler & Van Doren, 1972). This is also useful for analyzing video games. On the first play-through a player can get a sense for the unity of the game and on the second playing a player can break the game down and analyze its parts. The second, analytical, playing also frees the player to separate the experience of the game from the analysis and helps keep the player from being overwhelmed and missing both the fun and the insight the game has to offer.

It is also highly useful to apply one's own preferred instructional design methodologies to break down how a game is teaching its players. Whatever methods are used to design an information literacy instruction session, the action from the training levels of the game can be put into that model. For example, many librarians are familiar with the Outcomes Assessment model taught by Deb Gilchrist and the ACRL Immersion faculty (Griffin, 2007). To employ this model, ask the following five questions of the video game designers:

> What does the game want the player to be able to do? (This is the *outcome.*)
> What does the player need to know in order to do that well? (This is the *curriculum.*)
> What activity facilitates the learning? (This is the *pedagogy.*)
> How will the player demonstrate the learning? (This is the *assessment.*)
> How will the game know if the player has done this well? (This is the *criteria.*)
> (Gilchrist, 1999)

An early sample from *Portal* serves as an example of this technique in action. In this example the player is faced

with a simple puzzle. S/he is placed in a room with a large floor button, a door, and box. When the player stands on the floor button her or his weight depresses the button and opens the door. However, as soon as the player walks toward the door to leave the room, the button is no longer depressed and the door closes. The player must discover that placing the box on the button will hold the door open and allow their egress. Breaking this down using the instruction design model above looks something like this:

What does the game want the player to be able to do?
The desired outcome is that the player can operate the button-box mechanic and pass through button controlled doors.

What does the player need to know in order to do that well?
The player needs to know that the floor button will open a door as long as it is weighted. The player needs to know that boxes are heavy enough to keep the button pressed. The player also needs to know the appropriate game controls to pick up the box and drop it on the floor button.

What activity facilitates the learning?
The learning activity is the test, operating the floor button with the box and exiting the room.

How will the player demonstrate the learning?
The player will demonstrate that she has mastered the required skills by successfully operating the button-box mechanism and leaving the room through the door.

How will the game know the player has done this well?
For most players, this is a pass/fail test. However, in advanced versions of the game, the elapsed time taken to solve the puzzle can be used as evaluation criteria.

Using a formal tool for analysis can be very helpful for both seeing beyond the cartoonish or childish settings that appear to characterize or define many games and revealing the pedagogical methodologies employed by the game designers. Using the tools in use for instruction design can help librarians bridge the gap between librarian and game designer and help illuminate game scenarios as learning scenarios and game problems as common problems shared by educators of many sorts. Not all games will reward this kind of analysis, but as James Paul Gee notes: "good video games incorporate good learning principles and have a great deal to teach us about learning in and out of schools, whether or not a video game is part of that learning." (Gee, 2007) Choosing a game that will reward formal analysis can present a challenge to those unfamiliar with games

and their literature. It may be advisable to choose a game already highlighted by a trusted authority such as Gee or one that is referenced in library literature or blogs for a first attempt at game analysis.

Analysis of Portal

Analyzing *Portal* reveals several areas of interest for instruction librarians. First, the instruction in *Portal* is very intentionally structured into discrete learning activities or blocks of instruction. Comprehensive learning goals are scaffolded and layered into a series of lessons. Early in the game players receive a great deal of support in learning specific skills. Each lesson is independent and self-sufficient yet successful completion of each consecutive lesson requires using or modifying skills presented in previous lessons. As players progress through *Portal* support is gradually taken away giving players freedom to make more choices and practice their skills.

Second, *Portal's* designers gathered a staggering amount of assessment data while designing and editing their product. Many times in education, the push for assessment is external. Accreditation bodies, funding sources, and legislatures are requiring schools and universities to measure the success of their instruction. *Portal* reveals practical reasons for assessing our work. Inside libraries, there is a movement to encourage integrating assessment into our instruction design. The ACRL Immersion program is notable for their leadership in educating librarians about assessment. Valve's game *Portal* is an example of a creative company relying heavily on assessment for no reason other than they believe it is the best way to increase the quality of their product. Valve Software's focus on assessment is worth paying close attention to because it offers techniques and justifications not found in externally motivated assessment efforts.

Finally, *Portal* is worth looking at because it relies heavily on a learning technique largely missing in contemporary search interfaces: trial and error. A generation of students have grown up playing games have spent thousands of hours learning to perform complex tasks by trial and error (Beck & Wade, 2006). Google and federated search products both on the web and in subscription database products have marketed themselves based in part on how easy they are to use. Ease of use often means that searches do not reveal failure, every search returns *something.* Viewed from a certain perspective, search tools that are designed to produce results that seem useful from flawed searches are denying these students the opportunity to learn from one of their favorite instructional methods: trial and error. There is much that is innovative and worth studying in Google's interface design and in meta-search products. However, it is fascinating to see how Valve's designers use failure to teach, make extensive use of failure as an instructional technique, and rely on it as a source of player motivation.

Scaffolding & Layering

In *Portal,* the game is learning. In order to succeed the player must learn enough to pass a series of tests. Using skills learned in the game, navigating puzzles using portals between points is the core game-play mechanic. In order to make this process engaging and fun, *Portal* organizes the puzzles into a very intentionally focused series. In early chambers, the designers provide a lot of support for players. The puzzles are designed so that there is only one possible solution and that solution requires use of the skill being taught. This simplicity helps highlight the learning objectives, but as players gain skill and confidence, the environment grows more complex and players face puzzles with multiple possible solutions (Valve Software, 2007). This design model closely mirrors the instructional technique known as scaffolding. Scaffolding is a technique where new learners are provided with support by partner with a higher skill level who slowly withdraws external support as the learner gains competence. The ERIC Thesaurus defines it as:

> Temporary support or assistance, provided by a teacher, peer, parent, or computer, that permits a learner to perform a complex task or process that he or she would be unable to do alone -- the technique builds knowledge/skills until learners can stand on their own, similar to scaffolding on a building (Educational Resources Information Center, 2008).

Portal uses scaffolding to gradually introduce new players to the game and make the process of gaining the necessary skills and concepts more gentle. Scaffolding allows *Portal* to not be overly difficult at the beginning levels so as not to overwhelm unskilled players. *Portal's* scaffolds and layers also allow the game to develop and reach levels of complexity and difficulty that keep skilled players engaged and challenged. At the beginning of the game, while the player is still new to the *Portal* environment, the game designers slowly introduce game-play concepts and allow them to become familiar with them before progressing. For example, in the first stages, the player walks through portals created by the game to experience how they work. After learning what portals are, the player is given a portal gun that allows them to open portals that link only to portals created by the computer. After players become comfortable with creating portals, they are allowed to acquire a portal gun that creates both linked sides of a portal. As the player successfully navigates the test-chambers and becomes more proficient at using portals to solve puzzles the scaffoldings fall away and players are given more freedom, more choices, and less help. As the scaffolding falls away, the nature of the puzzles change from tests that require the player to demonstrate acquisition of a particular skills into more complex and free-form puzzles that require the players to combine skills and techniques in new and creative ways. This incremental approach is very effective in building new skills, reinforcing skills already acquired, and keeping the player engaged in the game by providing a level of

challenge that increases as the players' skill increases.

One of the more important scaffolds used in *Portal* is providing a task that places skill acquisition and practice into a context that is engaging. Without the structure of the test chambers, learning the skills needed to develop proficiency with the portal gun would probably seem onerous or boring. However, without the skill acquisition lessons and practice, using a fully functional portal gun in a difficult puzzle would completely overwhelm most players. By providing external context for simple puzzles, such as the button-box mechanic described above, the game designers give their players motivation and reason for going through the repetitive and often difficult task of skill and concept acquisition and reinforcement. Players who have developed advanced skills with the portal gun may be motivated to discover advanced new techniques out of a desire to improve their skills or accomplish known tasks more efficiently, but players who are still unfamiliar with the game mechanic benefit from being given external context and rewards for developing the first levels of skills.

Portal also scaffolds the player by removing anything from the early test-chambers that might distract the player from the skill or concept they are attempting to acquire or understand. For example, the button-box mechanic described above is presented in an extremely simple manner the first time a player encounters it in the game. The player is placed in a room that is empty other than a floor button, a weighted box, and a door. There is very little to distract a player from seeing that weight on the button opens the door. In addition, there is a visual cue, a line of the floor that connects the button with the door. By removing all distractions, this scaffolding makes is possible for a new player to quickly acquire the skill needed with limited trial and error. In more advanced test-chambers the button-box mechanic is used without the scaffold of a simplified environment. Since the player has acquired the requisite understanding of the concept, they will be able to open doors. In future puzzles players will encounter doors that require multiple buttons to open, multiple doors in the same room, and alternate methods of opening door. However, the line connecting button with door is maintained, providing a visual clue to remind the player of the button's function. Once a player understands how move through the puzzles, they no longer need a simplified environment to focus their attention on the core game-play mechanics. They can be freed to make creative choices and attempt alternate solutions, but new players benefit from having individual skills and concepts identified and demonstrated without distraction.

Library instruction classrooms are often the setting for similar kinds of scaffolding. Karen Bordonaro and Gillian Richardson's recently wrote of "a multi-step process of integrating library instruction into an undergraduate education class." They address several layers of scaffolding in the classroom including scaffolding between students and peers, faculty, and librarians as well as between librarians and faculty (2004). Adapting the

techniques used in *Portal* for library instruction seems straightforward. Following *Portal's* example, librarians can offer classes or students information literacy instruction that presents concepts individually and in isolation rather than approaching with a "whole cloth" approach. The individual concepts can then be layered to promote complex skill development. The *Portal* approach resembles instruction in which a librarian demonstrates keyword searching, allows the students to see how this works and provides helpful intervention in the search process. Then the lesson can expand the searches to build in controlled vocabulary searching. Next, after having the students demonstrate they can use controlled vocabulary, the librarian can introduce other metadata fields and the concept that metadata changes from database to database, allowing the students to explore various databases and see how information is organized. The final assignment and assessment would include using multiple databases and multiple access points to retrieve information. Scaffolding is not a new concept for library instruction, but the effective use of it in *Portal* makes a strong case that video games are sophisticated teaching media that employ sound pedagogies.

Assessment

Playing *Portal* and analyzing the pedagogies and methods employed reveals the extensive use of scaffolding and layering in *Portal*. The role of assessment, another key methodology employed by the Valve software development team, is not obvious to players of the game. It was, however, a key in the development and success of *Portal.* Assessment is a core part of Valve's corporate culture. In the video game industry, assessment is referred to as playtesting. As a new concept or feature is written into a game, the designers observe test audiences playing the game to see if the new feature leads to the intended outcomes. This method of testing and observation assesses the design of the game, but not the player's performance in the game. In many educational contexts familiar to librarians, assessment refers to the evaluation of student performance. While video games as a genre tend to keep score and assess player performance to a high degree, *Portal's* assessment of the game design is a more useful and interesting area to explore, especially for librarians. Given that a large portion of library instruction sessions take place as guest lectures in courses taught by other faculty members and that librarians are not universally called upon to assign grades, evaluating the success of our instruction design and delivery is a more pertinent aspect of assessment. In support of this, we have an excellent example to observe and learn from in *Portal* and the Valve Software approach to design. The *Portal* developers relied heavily on assessment data to guide their design decisions. Eric Wolpaw, a member of the *Portal* design team, said in an interview:

> Valve's, for lack of a better term, corporate culture is "Playtest, playtest, playtest." *Portal* was being playtested in the first week. But when you're working on some sort of creative project, your natural inclination is to not want to show anyone until it's in a state that you think you can be proud of.
>
> But at Valve, we're putting you out there, and you're going to fall, fail, fail. You'll have little successes and little failures, and until you get used to the process, it's a little bit scary and painful. But it's really worth it. (Scheffield, 2007)

In the developer commentaries, the developers repeatedly mention playtesting as the source of many of their teaching devices. It is their primary device for measuring the effectiveness of design concepts. In an early example, a developer mentions that they noticed that players were charging through a particular level without pausing to notice an important visual clue they needed to solve a later puzzle. Based on that observation, they added a mandatory pause and audible cues to direct player attention to the desired target (Valve Software, 2007). Another developer commented: "unnecessary objects scattered all over the place distracted players to the point where it actually interfered with the portal training process." (Valve Software, 2007). This led the designers to choose a stark, simple, and uncluttered setting in which their desired learning goals stood out. With this adjustment made, they observed that players had more success identifying the goals of various puzzles and also developing the skills needed to solve them. In later parts of the game, after the players have been successfully trained, backgrounds became more complex and busy. Still another observation from playtesting revealed that "Overwhelmed players tend not to digest new information." This led to the developers layering their training over a series of smaller lessons with fewer learner objectives per lesson (Valve Software, 2007).

Unfortunately, many aspects of Valve Software's approach to playtesting and assessment may not be compatible with the way academic libraries are currently organized. Our students do not always do their research so that librarians can observe. Additionally, librarians usually don't have access to students in the same way that Valve has access to playtesters. Furthermore, librarians also tend not to have budgets that allow them to pay students to playtest their designs or the ability to watch students go through our lesson plans time and again until they can be perfected. Still, there are many aspects of the Valve approach to assessment and observation that librarians can employ. Even if librarians cannot have students navigate their lessons before they are presented in a class session, they can spend their time in hands-on class sessions and on the reference desk observing how students interact with our library web interfaces and constantly ask "are our design schema leading to the desired outcomes?" Librarians can use the assessment tools they do have access to (focus groups, observation, space

studies, web page analytics, etc.) to focus their attention on how their students are using the interfaces they have designed and modify their design when the intended outcomes are not reached. Librarians can also adopt some of Valve's findings if they believe that their students are likely to behave in similar ways to their playtesters. For example, knowing that Valve found that the introduction of too many concepts at once interfered with concept retention, can we find ways to simplify our subject guides and pathfinders for first year students? Are there ways we can layer our information literacy instruction efforts so that students have a clear path to learning that is not cluttered with too much noise? The experience of a new student attempting to navigate a library catalog or an academic database may be similar to a player being thrust into the end of a game like *Portal* without the benefit of the scaffolded and layered training levels to teach them the basic research mechanics in an environment designed for maximum comprehension and retention. Instruction librarians who have the task of helping new students become fluent in the language and culture of the academy may have a lot to learn from game designers who have spent a lot of time and energy researching how to design learning environments so that learning objectives have the highest chance of being met.

Gating

One of the key teaching tools that grew out of Valve's assessment / play-testing program is a concept referred to as gating. In a previously cited example, play-testing revealed that often players would rush through a section without pausing to notice an important clue. The solution to this problem was to introduce a mandatory pause in the action. These pauses are referred to as gates. In more advanced applications of the concept, gates are used to prevent players from advancing until certain conditions are met. Use of these gates help the designers pace the action of the game, but consequently they also move the focus away from learner-centered instruction to a more traditional authority structure where the instructor (or game designer) is in control of the learning experience.

In general, gates as metaphors have fallen out of favor in academic librarianship. While librarians once may have been considered the gatekeepers to knowledge, our understanding of our role has shifted to the point where gates are commonly viewed barriers to the flow of information to users. Libraries now strive to be gateways, rather than gatekeepers. (Dougherty, 1992) In *Portal* however, gates were employed to great effect and their success is confirmed in their playtesting data.

Each gameplay concept in Portal is very deliberately introduced and trained so that once players reach this spot they know what a portal is and roughly how it works. Early versions of the game let players stumble through the beginning without really understanding what was going on, which compromised teaching new

concepts. The puzzle you just finished was designed so that stumbling around will almost always lead to a dead end. Completing the puzzle requires walking through a minimum of five portals in a specific order. This kind of gating, in which a solid understand of key gameplay concepts is required for success, helps standardize the learning curve of the game tremendously(Valve Software, 2007).

Seen this way, gates and gating appear to be re-envisioned requirements for advancement, similar to passing grades in basic courses being required for entry into advanced courses, or diagnostic examinations being required for entry into or graduation from degree programs. However, gates do seem to be out of favor in library instruction today. Keyword relevance searching popularized by Google's search engine makes every search appear to be successful. As keyword searching becomes the norm and federated searching makes it possible to search many separate databases and indexes with keywords, it is likely that students will stumble through the beginning without really understanding what is going on and librarians may find that this does compromise the teaching of new concepts. Keyword relevance searching and federated searched have much to offer searchers and libraries, and it would be foolish to dismiss them based on this observation. However, there are many reasons to consider using what Valve refers to as a gate or a mandatory pause in the action to drive home key information literacy concepts that students will need as the demands on them grow increasingly rigorous. In video games the term "button mashing" refers to randomly pressing keys until a puzzle or level in a game is solved. Button mashing becomes a problem when players are able to bypass key learning sections of the game. The *Portal* designers would rework levels if playtesters discovered ways to circumvent certain puzzles (Valve Software, 2007), unless the circumvention technique demonstrated mastery of the game mechanics. Instruction librarians might consider the wisdom of adopting similar tactics - - at least for novice researchers.

Another reason to consider adding gates to our search interfaces and training materials is that the newest generation of college students known as Generation Y, the media generation, the gamer generation, etc. strongly prefer trial and error and a learning mechanism. John Beck and Mitchell Wade of Harvard Business School identify this as a key aspect of working with members of the gaming generation in the workplace.

> For them, trial and error is not only a legitimate tool; it’s their standard. Manuals *are* ignored. "Training missions" are just structured trial and error. The way you learn to use grenades in Metal Gear Solid or to build a stable nation-state in Civilization is by doing it. Players like it this way. After all, training missions could be mandatory, with a strong dose of reading and lecture,

> perhaps like your company's training programs. But reviewers and players would hate that. (Your employees don't mind at all—right?) (Beck & Wade, 2006)

In describing the work habits of the gamer generation, Marc Prensky notes that when this generation attempts to learn, “they'll just play with the software, hitting every key if necessary, until they figure it out. If they can't, they assume the problem is with the software, not with them.” He attributes this preference for trial and error learning to childhoods spent with video games (Prensky, 1998). Gates can provide a structure and a balance to a purely learner-driven structure. If our students prefer to learn by exploring the environment, it might help to think of gates as environmental feedback that correct poor searching decisions.

After all, learning with trial and error relies heavily on receiving feedback. If failed searches do not advertise themselves as failures, students with low levels of information literacy may have difficulty understanding that what they tried did not work, let alone understanding why what they tried did not work or coming up with more successful alternatives. Competency theory teaches that searchers with low skill levels are less able than their more skilled fellows to accurately diagnose their degree of competency. Melissa Gross uses competency theory to describe the effects of low-level skills on information-seeking behavior thusly:

> Low levels of information-seeking skills may do the following: keep people from recognizing the need for information; keep them from recognizing the value of libraries and reference services (traditional or digital) to their needs; render them unable to assess services, programs, and systems accurately when they do access them; and impede their ability to make good relevance judgments and to recognize the information they need when they see it (Gross, 2005).

This puts instruction librarians in a bind. Instruction librarians want to provide students with search interfaces that they prefer and with the ubiquity of Google and the growing popularity of federated searching, this appears to mean providing keyword searching. However, for new students and students with the least developed information literacy skills, these keyword interfaces that make every search strategy look successful may be denying these students the very feedback required for them to modify their searching behavior or seek help with their research. They want to learn by exploring the environment, but if every part of the environment appears identical to the untrained eye, what exactly can they learn by exploring? The key question appears to be: "how can we help our students recognize when their search strategies are insufficient for the task at hand?" The answer may well be found in Valve Software's concept of gating.

If looking forward to new technologies such as video games seems a narrow thread on which to hang the

concept of embracing error as part of the learning process, one need only look back to the Socratic method to see that encouraging students to identify and recognize their own mistakes is part of a solid and powerful instructional technique (Schiller, 2008). Failure or error does not have to be considered something to be avoided. It is a powerful motivating force and feedback mechanism that many students use and the newest generation of college students seem to rely on particularly (Beck & Wade, 2006). By using gates to make it clear to students that something else is required for a successful search, we can provide students what they really want: clear feedback that makes trial and error a productive learning technique.

If we accept that many members of the current generation of students prefer to learn using trial and error, what should be done with search interfaces that go to great lengths to remove all hints of error and failure from the research process? One potential answer is to follow Valve's lead and design assignments and instruction tools that require complex answers that random keyword searching or "button mashing" cannot answer. Encouraging obvious failures is suggested, as they are a shorter path to learning new skills. Failure need not be a negative experience, especially if the students are led to recognize the errors on their own. Librarians can look back to the Socratic Method for ideas on how to help students identify errors in their work (Schiller, 2008). If we are confident that students really do need to develop more advanced searching skills than simple keyword searching, we should be able to assist them by assigning tasks that will end in failure unless they adapt their practice to fit the situation. After all, the games they choose to play use these kinds of challenges to teach new skills and the students appear to enjoy the learning process.

Conclusion

Video games are a rich environment for instruction librarians and educators to explore for solutions to problems we face creating information literate students. They are a new media, and literacy in this new media can only help educators tasked to instruct a generation steeped in the culture of video games. They are also a fertile field for creative minds attempting to solve similar problems to the ones faced in the library; it would be a shame to dismiss these creative solutions based on a summary dismissal of video games as either irrelevant to the academy or as simple toys. However, in order to reap the rewards of this creative source, librarians will need to develop gaming literacy.

The key to developing gaming literacy is to apply the methods and techniques developed to analyze other media to video games, keeping in mind the unique aspects, such as interactivity, that separate games from more traditional media. Librarians who can learn to play games as a gamer and analyze games as teaching professionals will be well equipped to glean the most useful insights from games. These insights can help

librarians understand how best to educate a generation of students who have had their approaches to handling information influenced by gaming media to a degree foreign to generations who developed their information literacy before video games evolved into a mature media format.

This approach is not limited to just video games. Edward Tufte, in his introduction to *Envisioning Information* notes: "To envision information—and what bright and splendid visions can result—is to work at the intersection of image, word, number, art." As librarians seek to create truly information literate students, there is much to learn from others who encode information in learning systems. Similarly, there is much to learn about those who envision information as they decode these systems. The flexibility to apply what we know of information and learning to new and emerging media appears to be a skill that is only increasing in value.

The value of this kind of synthesis is confirmed when a quality video game such as Valve's *Portal* is investigated with a critical eye. The way instruction is scaffolded and concepts are layered provides evidence that a highly nuanced pedagogical approach is at work in a medium that many have dismissed as childish or immature. Looking further, at the design techniques used to create *Portal*, a commitment to assessment and user-centered design can be seen - - something that many librarians aspire to in their own practice. Finally, when the concept of gating is examined, some of the library world's entrenched concepts are revealed in a new light and exposed to challenges. Video games have all of this to teach librarians and more. In order to learn what they have to teach librarians need to become literate in what is clearly a new, but maturing, media. Gaming literacy can be a great asset to student learning, if librarians approach video games with an open mind and a critical eye.

For those wishing to analyze the game *Portal* for themselves, Valve has made the first eleven levels, including the key instructional phases of the game, available for a free download for Windows computer systems. The download is available from the following url: http://steampowered.com/v/index.php?area=app&AppId=410. A list of system requirements may be found at the same location.

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