

Learn to Play the Game - Play the Game to Learn

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Abstract

Academic libraries have simplified access to academic content by building federated search and discovery tools. This has been welcomed by users. However, it can also instill a false sense of success to a generation whose information seeking behaviour has been conditioned by modern search engines. Users tend to settle on initial results garnered from a few simple searches, and therefore miss valuable content.

There is a need to offer a learning pathway to entry level users that assists them in developing their research attributes of critical thinking and academic enquiry. Current offerings involve online tutorials and how-to guides whose content is a direct translation of what was previously taught in information literacy classes from the past.

An alternative solution is to embed learning in library services through the application of game design. In game design theory a game can evolve as the user's level of competency increases. In this way, a learning pathway is made available to users at their point of need, which gradually improves the quality of their research skills.

This paper will provide an overview of game design, and how games can be developed that relate to principles of application usability. Suggestions will be made on how a games model could be applied to develop critical thinking and academic enquiry skills in learners. Inhibitors to development such as cost and organisational restraints will be discussed.

Introduction

There are countless studies and research papers that discuss the information seeking behaviour of library patrons. They all draw similar conclusions: users want an easy path to finding information. They don't want to think. They just want to find. I am not a librarian and relate to this attitude. It is only now, after working in an academic library for three years, that I see a problem. Finding information is a game with rules. To successfully find information you need to learn how to play the game.

Patrons' lack of appreciation for library information services and their desire for quick and easy answers is well documented: from Sweden (Haglund 2008) to Greece (Saitia 2008), and in business (Atkinson III 1997) to biology (Callinan 2005). This issue is not isolated to any particular demographic and it spans across all generations. Confer (2008) showed even millennials and baby boomers, who are popularly considered "opposite" demographics, demonstrated similar information seeking behaviour, relying heavily on Google and human sources. Both cohorts expressed a desire that library services be more like internet search engines and Amazon.com, and wished there were concierge-type services provided to assist them.

Valentine (1993) and Belliston's (2007) papers remind us that the issue has a long history. This argument is also supported by Atkinson III (1997) where his "study reveals observations that parallel findings of the past thirty years, pointing in the direction of continued user impatience and minimal student effort applied in the execution of search tasks". Impatience and laziness is a human condition which the advent of the internet and Google has simply highlighted.

There was a need to become more like the internet and more like Google (Anderson 2006). Libraries transformed into Library 2.0 in response to the Web 2.0 trend. If this transformation did not happen libraries risked becoming marginalised. Libraries also formed strong allegiances with vendors and in a very short amount of time developed federated search tools for academic content. This was welcomed by users.

The Google generation (Rowlands 2008), which includes all age groups, felt comfortable with the federated search tools offered by libraries. They felt so comfortable that they did not ask for help. The library's federated search tools brought a false sense of success to a generation whose information seeking behaviour had been conditioned by modern search engines, tending to settle on initial results garnered from a few simple searches, and therefore missing valuable content.

Information Literacy

Information literacy classes were conducted long before federated search tools were developed. These classes generally focused on analysing information needs, formulating comprehensive search strategies, identifying reliable information sources, and collating information in a systematic manner.

But users don't care for information literacy. They just want "answers".

Wilder (2005) argued that information literacy made all the wrong assumptions. Librarians assumed that users were overwhelmed by the supply of information and needed to be taught how to deal with the complexity of information retrieval, rather than reduce the complexity. Federated search tools mitigated the complexity but were still a long way from being like Google. Users usually just wanted an easy way to do a quick literary search to provide "answers" for an assignment question.

Web based tutorials faced even more problems than information literacy classes. As stand-alone products they offered de-contextualised information (Sundin 2008), casting doubt over their value. Limberg (2008) argued that the focus should be on meaningful learning goals in teaching and a desire for quality research, rather than focusing on search skills and finding information. Web based tutorials do not offer the appropriate environment for affecting users' perceptions on the need to develop their research attributes of critical thinking and academic enquiry.

Research by Young (2001), Whitmire (2003, 2004), and Mansourian (2008) has shown there are points in the search process, when a seeker acknowledges they have "failed". When this acknowledgement occurs depends on the seeker's epistemological beliefs. It is at this point the information seeker will employ a coping mechanism. This is an opportunity to intervene and condition positive coping mechanisms.

A person is only able to learn when they are willing to learn.

The problem is that when users actually do realise they need more than just quick answers, there is no learning pathway which encourages positive coping mechanisms: the development of academic enquiry and critical thinking skills.

Why Games?

Reports show ever increasing sales and growth in the computer game market (Scanlon 2010). These figures indicate it is the biggest entertainment industry in the world. Games are interactive, unlike their passive competition, and therefore must have very intuitive interfaces and usability standards to be successful. Game design is usability theory applied in an industry where failure is not an option, especially considering the million dollar budgets invested into modern computer games' content.

Using games to achieve educational outcomes is nothing new (Ritterfield 2009) and there are many serious games already available (see appendix). These serious games are used by primary educators, corporate organisations, and the military. They are usually developed by independent studios in partnership with the body requiring the serious game/s as a training or educational tool. Generally the research in designing games is based around younger learners, such as the benefits of serious games set in virtual worlds (Wrzesien 2010).

Game Design Theory

Game design theory can inform instructional design (Dickey 2005) and these principles in turn can be applied to information seeking education. Pinelle's (2008) paper covers in detail a heuristic evaluation model used for developing the usability of games. Many of these issues are universal to any interface. The types of problems that are encountered in poor game design include:

- inconsistent response to users' actions
- not allowing enough customisation
- not letting users skip [non-interactive] content
- clumsy input scheme
- not providing enough information on game status
- not providing adequate training and help
- complex command sequences
- difficult to interpret visual representations
- non-timely responses to user actions

Very similar findings are echoed by Desurvire's (2004, 2009). In his papers he suggests the following solutions to the problems:

- Provide immediate feedback for user actions
- The player can easily turn the game on or off, and be able to save the game in various states
- The player experiences the user interface as consistent (in control, colour, typography, and dialogue design) but the game play is varied
- The player should experience the menu as part of the game

- Upon initially turning the game on the player has enough information to get started to play
- Players should be given context sensitive help while playing so that they do not get stuck or have to rely on a manual
- Sounds from the game provide meaningful feedback or stir a particular emotion
- Players do not need to use a manual to play the game
- The interface should be as non-intrusive to the player as possible
- Make the menu layers well-organised and minimalist to the extent the menu options are intuitive
- Get the player involved quickly and easily with tutorials and/or progressive or adjustable difficulty levels
- Art should be recognisable to the player and speak to its function

Library Context

Much can be learned from Pagulayan's (2002) paper User-centered design in games, Rouse's (2005) book Game design: theory and practice, and Schell's (2008) book The Art of Game Design: A Book of Lenses. They cover the key essentials in excellent game design and the ideas can be applied to a library context:

- Some of the most successful games are ones that are very simple. Library services still have a long way to go before the entry barrier to scholarly research is lowered enough that anyone can enjoy searching for academic content. This is not to say the research process is to be "dumbed down" but the searching process needs to be intuitive and simple.
- Games reduce obstacles to fun, rather than obstacles to accomplishment as in productivity applications such as learning objects in tutorials. Nonetheless, the obstacles being removed are the same: confusing layout, misleading button labels, or an inconsistent paradigm. Likewise learning objects in tutorials should be designed like games, to remove obstacles, so users can accomplish their goals.
- In games the goal is defined by the game itself. In productivity applications the goal is defined by the user. Therefore, when designing games, user goals must be clearly defined by the users, not the developers (i.e. librarians and I.T. staff).
- Tutorials in games are generally integrated into the game itself. Having a de-contextualised, stand-alone, cover-everything-in-one-go tutorial, and a make-or-break formative assessment at the end, is to be avoided. It is preferable to set practical mini-tasks with clear goals for the user and offer summative assessment tools that build skills incrementally.
- Pagulayan says it well: "The last thing you want to do is bore your user with a long winded explanation of what they are supposed to do when they [use] your [tool]. It is best to learn in context at a measured pace or users may just quit [altogether]." A game should therefore be integrated into the search tool itself, conditioning the user with positive coping mechanisms in an active-learning context, rather than re-directing them to external learning objects.
- A player is able to regulate the difficulty of a game quite easily. Library search tools tend to have only very limited "difficulty settings". Generally, users can only choose between

simple search or advanced search. Arguably there should be an even “easier” setting which resembles a “wizard” mode. In this mode the search tool becomes a learning game, prompting the user with natural language for the inputs required to find accurate information. The software could possibly interpret a question from the user, and with some simple clarifying questions, identify the key terms, select sources, and execute the search. Over time the process is learnt by the user and they would eventually set a higher “difficulty setting” of simple search, once they have learned the basic process in “wizard” mode.

- Interfaces in games are adaptive and customisable. If a user authenticates to use a library service then they should be able to customise the service. If a user doesn't like using post-search filters or facets then why should they remain visible? If a user constantly searches by author shouldn't the software detect the behaviour and automatically change the default search field for that user? Why can't a search tool layout be completely customisable by the user, allowing them to decide where to place the search box, results list, and borrower record elements?
- If a user is authenticated then the software can track their behaviour. If the user constantly ignores results beyond the first page, then the search tool could prompt them to check the next page. At this point of need the user could be directed to a learning object like a video or mini-tutorial explaining the benefits of looking beyond the first page.
- Games that “spruce” things up just to make the game look flashy and cool tend to break rules of consistency because the developers get carried away with using all the latest technology available to them. While using high-technology for developing library services is very beneficial, each decision must be made with a clear goal in mind that fulfils an identified need.
- A heads up display (HUD) is a visual layer that is always visible regardless of where a user is in a game. It is consistent and provides vital information every step of the way. For example a user's borrower record, favourite items, personal tag-cloud, and contextualised help could always be visible regardless of where they are in the tool. The HUD should be elegant, easily identifiable, intuitive and customisable.

In figure 1 (below) we see the unobtrusive HUD used in the computer game *Zelda: Wind Waker*. The HUD is actually context sensitive, meaning that the functions of each icon change dynamically depending on the situation. Context sensitive menus and icons reduce clutter and simplify the interface.

The legendary game *Civilization IV* includes a “world-builder” tool, pictured in figure 2 (below). The tool uses little to no text, relying almost entirely on visual icons that speak of their function through graphic art.

Mass Effect pictured in figure 3 (below) allows the player to customise the HUD with their favourite information and functions easily accessible in a layout they choose.

Figure 4 (below) is the search tool used at the University Library at UNSW; which is running on Ex Libris' Primo 3. How could a HUD be implemented to streamline the interface and allow users to customise the search tool's functions?

Fig. 1 – HUD layout of *Zelda: Wind Waker*

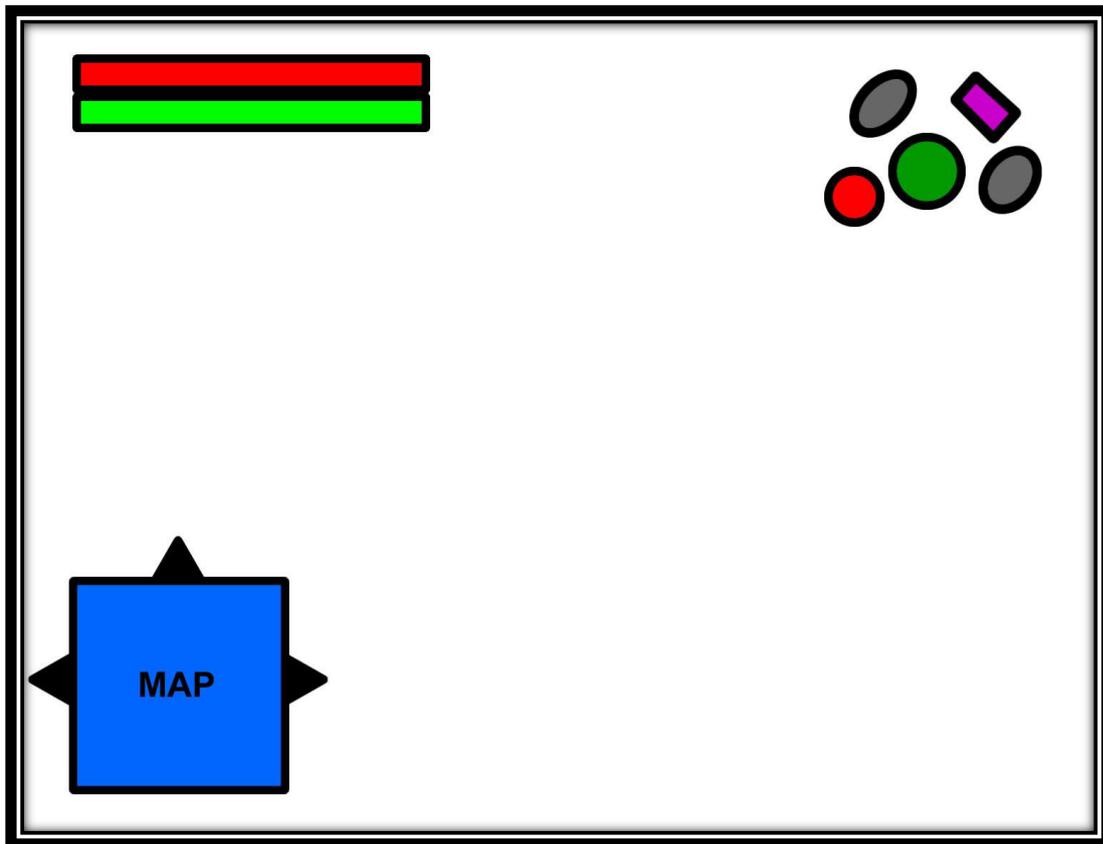


Fig. 2 – HUD layout of *Civilization IV World Builder Tool*

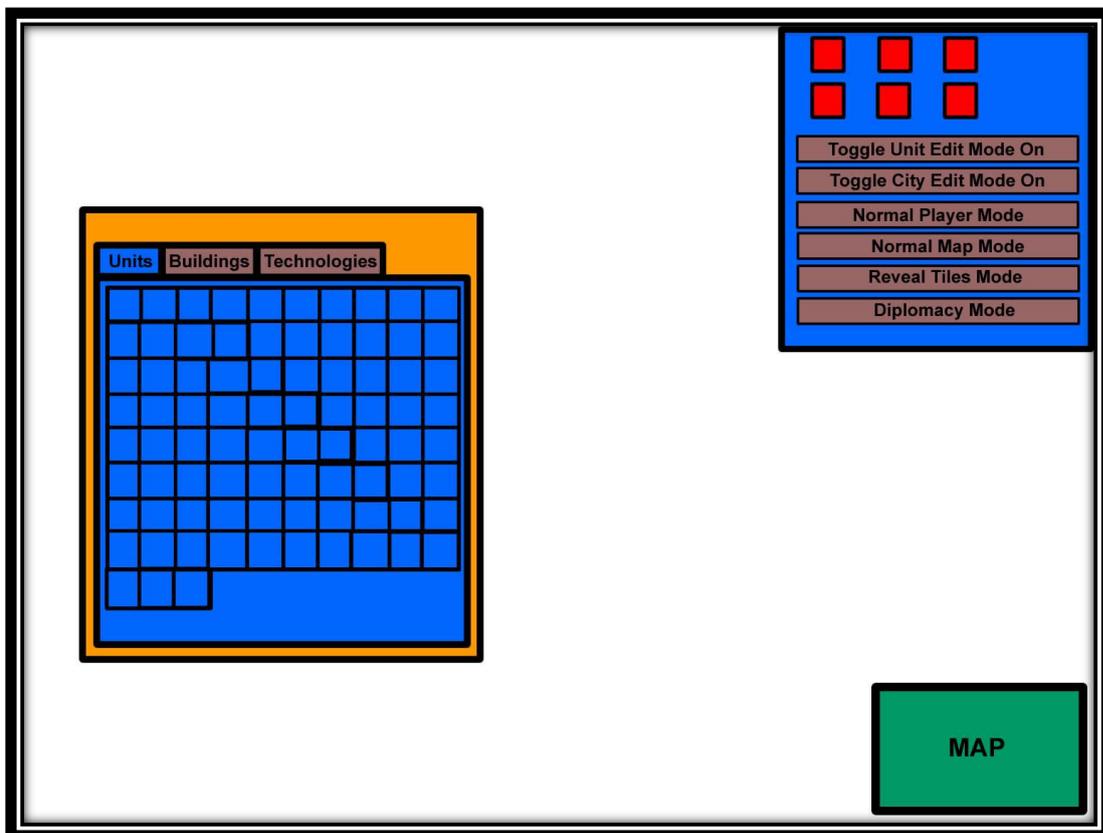


Fig. 3 – Customised HUD layout of *Mass Effect* video game

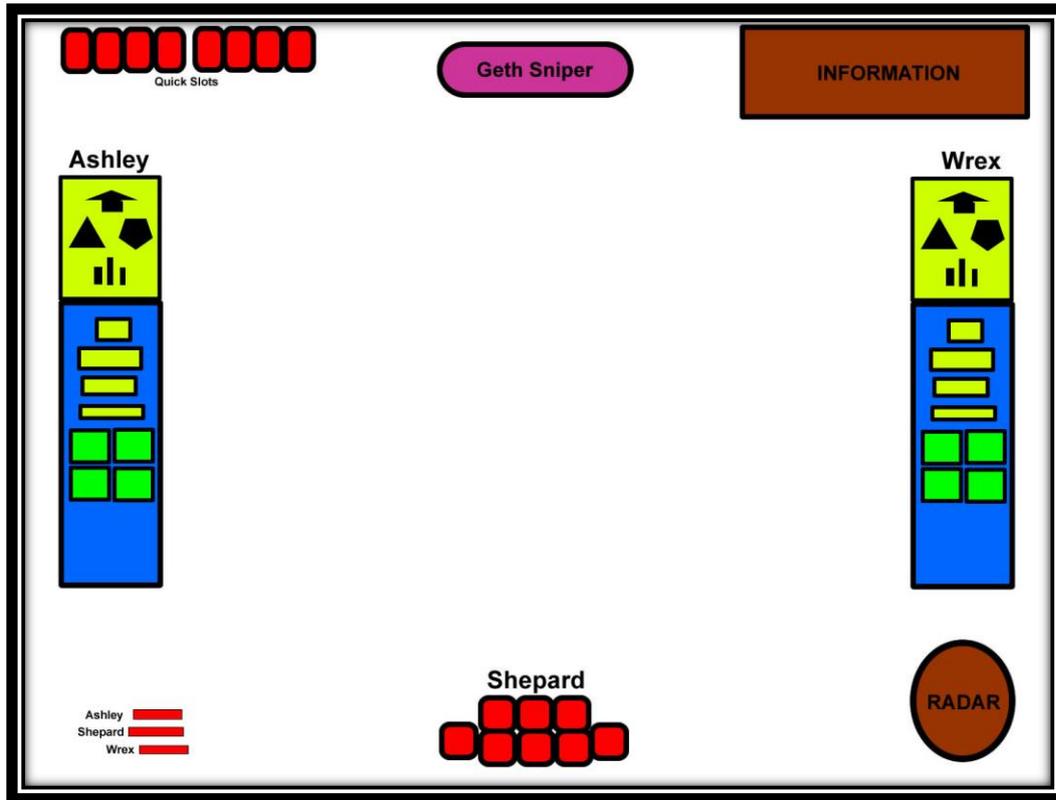
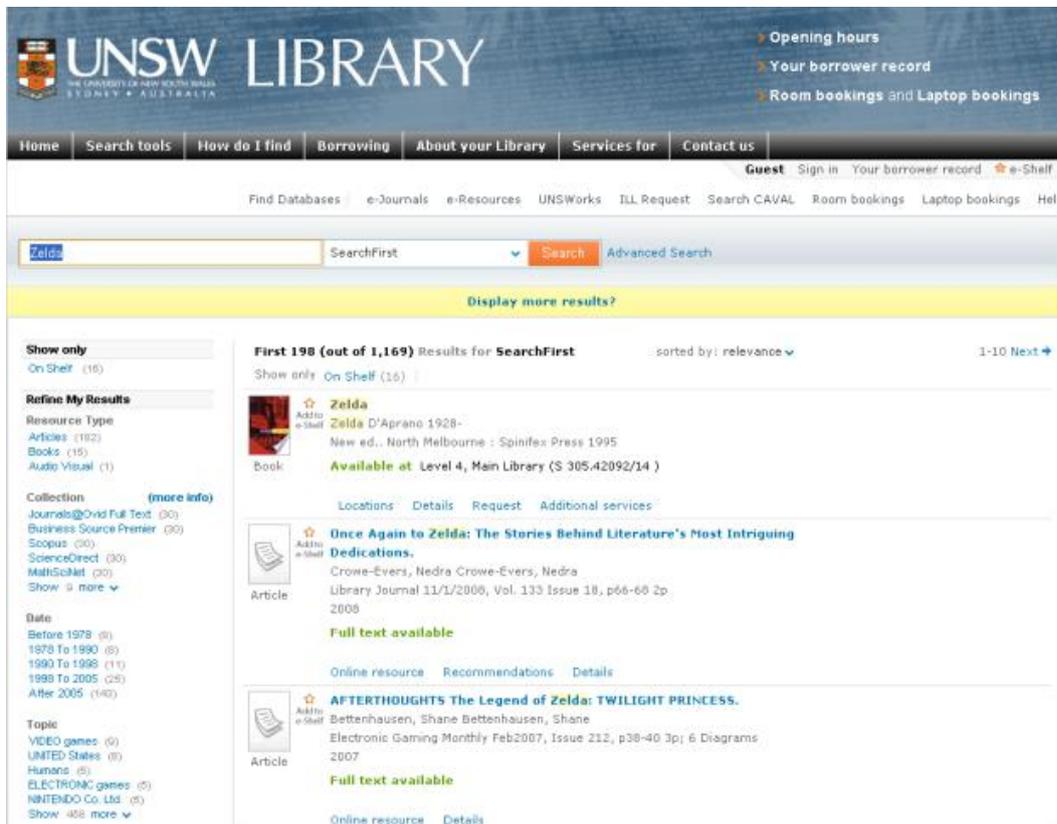


Fig 4. University of NSW Library search tool; running on Ex Libris' Primo 3.



Discussion

Clear goals need to be set by users as to what they expect from library services. Focus groups should be organised with users and librarians. Both parties can raise their concerns regarding the simplification of access to information and the need to improve academic enquiry and research skills. These goals will inform the game design process.

Library services would then be developed using the game design process that is used by the most successful game developers in the world. The process is no secret and there are many books and published works that describe in great detail how this process is carried out. If the goals are clearly set by the users, in consultation with librarians, then the testing phase will be smooth and very productive.

The biggest hurdles in development are usually organisational constraints and budget, but more specifically, the cost required in customising vendor systems, the cost required in developing new software, and the lack of technical expertise within the institution. One of the solutions is partnership and team work.

Some vendors have opened up their system architecture, allowing deep customisation of the services, but vendors make changes to their software which has a knock-on effect to any customisation implemented by the customer. This knock-on effect requires customers to be constantly updating and maintaining their customisations. In many cases, this is untenable for the libraries involved since it depletes the customer's operational budget in supporting the workforce required to respond to the constant changes. Vendors need to provide a stable development layer, with legacy compatibility, so customers can develop new functionality with ease of mind. Customers need to engage their vendors when they draft their contracts and include the expectation for a stable development layer, with legacy compatibility, as a key clause. This will allow games to be developed as extensions to vendor systems, therefore embedding the learning process as part of the user experience.

To develop serious games libraries may need to employ the services of educational designers, human-computer interface designers, programmers, I.T. support staff, liaisons officers, project managers, graphics designers, audio engineers, and script writers. The staff required depends on the scope and ambition of the project. While this may seem daunting it is worthwhile reaching out to the experts in the institution to form allegiances and partnerships. There is a possibility that the development of the game/s could be a post-graduate project for computer science majors?

There are companies who specialise in the game development process and may be interested in exploring a new market. If libraries have definite goals developed from focus groups these companies may be willing to partner with libraries since there is an opportunity to exploit an under-developed educational market. A quick search turns up some companies which may be worth pursuing: *Behavioristics*, *Catalyst Group*, *Blueprint Usability*, and *Axance*. Alternatively an academic library could engage the school of human computer interaction (or similar), in their institution, and work on the development in partnership. Surry (2005) argues that it is important that resources, infrastructure, people, policies, learning, evaluation, and support are harmonised for real progress to be made in developing innovative e-learning solutions.

The 2010 Horizon Report mentions near term developments having a focus on mobile computing and open content, with simple augmented reality only a couple of years away. Recently there has been some foray into the benefits of mobile gaming with older demographics (Goh 2010) which has shown to encourage content sharing. The community aspect of games is another element which could be explored to nurture knowledge sharing and peer-support in research. Game design can also be applied to “pure” games, not just computer games. Maybe a board game or card game can be developed in conjunction with online learning that will supplement the user’s learning experience? Maybe this can provide alternate, cost-effective ways to engage users with games that do not require large developmental overheads?

Maybe Information Literacy needs a new identity, so it may be reborn in the context of game design theory: Research Conditioning. Research Conditioning implies that we are subtly altering users’ research behaviour without them being aware. Unlike a direct educational approach (i.e. tutorials and classes), Research Conditioning empowers the user to learn incrementally, in a student centred environment.

Conclusion

Games can be developed which are embedded as part of vendor search tools or as stand-alone products. These games can provide a student centred learning environment. Users will learn the skills of academic enquiry and critical thinking incrementally, in-context of their work process. This method will alter their coping mechanisms at points of intervention when they are usually more receptive to learning.

Game design theory is a philosophy whose ideology is to remove barriers to a goal. Libraries can apply game design to their systems to make them easier to use. Libraries can apply game design to create stand-alone games. Libraries can collaborate with other faculties and companies to develop games and extensions to vendor systems. This will be welcomed by users. This will empower users by assisting their learning process. If we consider academia to be a game with rules, then users can learn to play the game by playing the game to learn.

Appendix: Serious Games

Library games could simulate the “perfect” research process as part of the search tool interface, or as a supplementary “mission based” game which would require the player to use various tools like search and bibliography management. Libraries could develop puzzle games that assist users in recognising citation and Dewey numbers. Below are examples of various teaching games which may provide inspiration.

CyberCIEGE - <http://en.wikipedia.org/wiki/CyberCIEGE> - [September 2010] - Computer network security sim game developed by the Naval Postgraduate School. Players protect assets while enabling "users" to achieve their goals.

Darfur is Dying - http://en.wikipedia.org/wiki/Darfur_is_Dying - [September 2010] - An online game by mtvU that simulates life in a Darfur refugee camp.

DARWARS Ambush! - http://en.wikipedia.org/wiki/DARWARS#DARWARS_Ambush.21 - [September 2010] - Developed as part of DARPA's DARWARS project, designed to create low-cost experiential training systems.

FloodSim - <http://en.wikipedia.org/wiki/FloodSim> - [September 2010] - A flood prevention simulation/strategy game designed to inform the people of the United Kingdom about the dangers of flooding as well as to help gather public opinion on the problem that flooding presents to the UK. The player takes control of the UK's flood policies for three years and attempts to protect the people and the economy of the United Kingdom from damage due to floods.

Foldit - <http://en.wikipedia.org/wiki/Foldit> - [September 2010] - Protein folding, puzzle game where results can be used in real science.

Food Force - http://en.wikipedia.org/wiki/Food_Force - [September 2010] - Humanitarian video game. The UN's World Food Programme designed this virtual world of food airdrops over crisis zones and trucks struggling up difficult roads under rebel threat with emergency food supplies.

Genomics Digital Lab - http://en.wikipedia.org/wiki/Genomics_Digital_Lab - [September 2010] - A series of interactive science games where users learn about the importance of plants and their contribution to energy and the environment.

Global Conflict: Palestine http://en.wikipedia.org/wiki/Global_Conflict:_Palestine - [September 2010] - A 3D-adventure/RPG-game. You are given the role of a reporter in Jerusalem, and have to write articles for your paper.

Harpoon - [http://en.wikipedia.org/wiki/Harpoon_\(computer_game\)](http://en.wikipedia.org/wiki/Harpoon_(computer_game)) - [September 2010] - Entertainment version was "dual use" from 1989 forward. Professional version Harpoon 3 Professional created in 2002 with help from Australian Defense Department, updated in 2006.

Microsoft Flight Simulator - http://en.wikipedia.org/wiki/Microsoft_Flight_Simulator - [September 2010] - Developed as a comprehensive simulation of civil aviation. Notably one of the few flight simulation games that does not concentrate on simulation of aerial warfare.

NanoMission - <http://en.wikipedia.org/wiki/NanoMission> - [September 2010] - A series created for the non-profit group Cientifica in order to teach about nanomedicine, nanotechnology and associated concepts through a series of action games.

Peacemaker - [http://en.wikipedia.org/wiki/PeaceMaker_\(game\)](http://en.wikipedia.org/wiki/PeaceMaker_(game)) - [September 2010] - A commercial game simulation of the Israeli-Palestinian conflict designed to promote "dialog and understanding among Israelis, Palestinians and interested people around the world".

Quest Atlantis - <http://atlantis.crlt.indiana.edu/> - [September 2010] - Quest Atlantis is an international learning and teaching project that uses a 3D multi-user environment to immerse children, ages 9-15, in educational tasks. QA combines strategies used in the commercial gaming environment with lessons from educational research on learning and motivation. It allows users to travel to virtual places to perform educational activities (known as Quests), talk with other users and mentors, and build virtual personae.

Re-Mission - <http://en.wikipedia.org/wiki/Re-Mission> - [September 2010] - 3-D Shooter to help improve the lives of young persons living with cancer.

Ship Simulator - http://en.wikipedia.org/wiki/Ship_Simulator - [September 2010] - A simulator which simulates maneuvering various ships in different environments, although without the effects of wind and current.

Simport - <http://en.wikipedia.org/wiki/Simport> - [September 2010] - A simulation game in which players learn about the intricacies involved in construction large infrastructural projects, like a major sea port.

Steel Beasts Professional - http://en.wikipedia.org/wiki/Steel_Beasts - [September 2010] - Tank simulator, developed by eSim Games, and used by several armies around the world.

Tactical Language & Culture Training System -

http://en.wikipedia.org/wiki/Tactical_Language_%26_Culture_Training_System - [September 2010] - Computer-based learning system that lets people quickly acquire functional knowledge of foreign languages and cultures. Current titles include Iraqi Arabic, Pashto and French.

VBS1 & VBS2 - <http://en.wikipedia.org/wiki/VBS1> <http://en.wikipedia.org/wiki/VBS2> - [September 2010] - Training tool for the British Military and the USMC and other military forces around the world. Developed by BIA, and based on the game engine used in Operation Flashpoint and Armed Assault.

X-Plane - [http://en.wikipedia.org/wiki/X-Plane_\(simulator\)](http://en.wikipedia.org/wiki/X-Plane_(simulator)) - [September 2010] - A comprehensive civil aviation simulator. An FAA approved version exists which enables low cost flight training.

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