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Your Library Instruction is in Another Castle: Developing Information Literacy Based Video Games at Carnegie Mellon University

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Introduction

Being part of an institution possessing a world-renowned computer science school and a reputation for developing innovative new technologies, the University Libraries at Carnegie Mellon were motivated to explore a new method of information literacy instruction. This method was to be the creation of a web-based video game. Through a $50,000 grant from the Buhl Foundation, awarded in the Spring of 2006, the University Libraries began developing a series of "web-based instructional modules." [1] The University Libraries soon formed a representative group of three librarians, self-dubbed the Library Arcade (LA) Committee, to help define how to best transmute the goals of traditional "information literacy" instruction into a video game format. The committee began this process by investigating the past and current trends in video game culture.

Gaming and Culture

Over the past 50 years, video gaming has grown exponentially due to technological innovations and found a broad audience. Gaming technology was greeted by those ready for entertainment that would not only challenge their problem-solving skills and hand/eye coordination, but keep them coming back for more. Arcades provided a social space for a shared activity, with gaming as its center. As computer games became more complex, and the quality of the graphics improved, they were able to encompass detailed narrative stories with

unforgettable characters.

Gaming culture shifted from the arcades into the home as console systems became accessible by a larger portion of the population. Just as previous generations vied for playground sports supremacy, many children spent vast amounts of time challenging each other at their favorite video game. Opportunities for players to experience gaming in an online environment increased with the advancement of internet technologies. These developments allowed game manufacturers to spread their titles via the Web and for players to interact in new virtual worlds across global networks. The current appeal of massive multiplayer online role-playing game's (MMORPG's), and the inclusion of online connectivity as a standard feature on next-generation game consoles, give evidence to the social role that gaming has adopted. Many gamers develop complex social networks and utilize information literacy related skills when playing these all-immersive games.

The use of computer games in libraries is a fairly new concept and a librarian having an influence on their creation is equally as novel. Games are a large portion of the popular culture and libraries recognize them as an attractive method to engage young adults in library activities. Gaming can provide avenues for exploration and experimentation through which players pursue goals and take risks without the fear of permanent failure. Gaming environments allow students to try playing a game multiple times, and in doing so alleviate the pressure of getting it exactly right the first time.

We also know from observation and professional literature that our undergraduate students are digital natives and, for the most, part grew up playing video games. Having an

audience that is familiar with modern gaming opens any library game to the risk of falling victim to the "lame-factor", which plagues most educational gaming initiatives. Designing an engaging library instruction session is challenging in itself, but creating a video game that attempts to translate the information literacy goals of the library, evokes an immediate "lameness." The LA Committee knew that if we were to make successful use of these facts, we would need to enlist the expertise of those beyond the library realm.

Advantage of Having the ETC

The work that goes into producing a modern online game is extremely diverse. Various talents and experts are often utilized including: artists, producers, writers, programmers, animators, etc. Game design, a complex discipline in its own right, was not an expertise that members of the LA Committee inherently possessed. However, we were fortunate to have access to the experience and services of the Entertainment Technology Center (ETC) at Carnegie Mellon. The ETC awards a Masters of Entertainment Technology degree, which combines an understanding of the arts and technology through which the graduates are able to create the next-generation of digital entertainment. The ETC curriculum is experiential and project-based, rather than course-based, and "students devote most of their energy (and do most of their learning) as members of interdisciplinary teams completing projects in lieu of taking traditional classes." [2] These semester-long projects are typically overseen by an ETC faculty advisor. The Five ETC students, who would become the iLit team, possessed varied backgrounds: computer science, electronics and communication, fine art, psychology and journalism. By working together, the two groups were able to produce design documents for an interactive, web-based information literacy computer game, which resulted in the completion of two playable stand-alone modules.

Without the ETC, the majority of activities involved in the creation of these games - design, programming, user testing and maintenance - would not have been possible to accomplish in-house (within University Libraries) alongside the existing duties and responsibilities of the LA Committee members.

As students would be directly involved with the game's production, the project time line was based upon an academic calendar. Initially, considerable time was spent brainstorming with the ETC faculty member who would oversee the project, to coordinate student involvement and address any additional programming or outsourcing needs. The deliverable product was to be completed in about a year's time, and ultimately be uploaded to the University Library web servers.

Where Do You Press Start?

Before the LA Committee was established, the University Libraries had a specific concept in mind for a prototype. Engineering, specifically sustainable engineering, was initially considered a game theme that would fit well within Carnegie Mellon's interdisciplinary environment. Creating a centralized repository to hold resources on sustainable engineering was appealing; with the game serving as a modern "pathfinder*."* This concept raised concerns about copyright authorization and maintaining the timeliness, accuracy and relevancy of the data for future users. If a repository starts to grow, and at a later time other students have access to the repository, would the students be motivated to play the game if what they needed was already gathered? Since our goal was to improve undergraduate research skills using a video game interface, and not to build a large-scale set of data that might quickly become hard to manage, we

focused on creating something that would aid in sharpening the skills of an individual. Although it was decided not to have data collection integrated into the playing of the game itself, having it as an addendum to the end product was left on the table. The LA Committee revisited one of the original grant proposal goals as a guide, "Developing, testing, evaluating, and refining educational modules that will be lively and attractive, as well as intellectually sound." [3] Thus, at the start of the fall 2006 semester, the project was still somewhat of a 'blank slate' when the aforementioned ETC iLit team joined the development process. As the client, the LA Committee needed to provide answers to several questions: What is our motivation? What would motivate students to play or interact with whatever was to be our final product?

The Playability Challenge

We quickly realized that some of our original plans were not going to be workable within the constraints of the game design environment. The experts at the ETC explained that if we started out with very specific ideas, directed at too narrow of an audience or for only one course, then the game would not be adaptable to different subject modules. Decentralizing the focus away from 'sustainable engineering' – i.e. opening the game up to other subject disciplines – would better position us in creating a game that would be broader in its playability. Another clarification we made was to redefine our target audience from "upper level undergraduate" to "higher education student". The "what do we want?" phase soon flowed into an active "how do we do this?" phase with the start of the spring term, 2007. Every few weeks the iLit team met face-to-face with the LA Committee. Initially a shared document manager was set-up; however, in-person meetings presented the best opportunity to brainstorm. The students started to address

the problems of the playability involved in designing of game by acknowledging the following questions, commonly posed before beginning the design of any game: How will we fake the real world? How will the game be scored? Will the act of collecting data be rewarded? How much time should it take to play the game? How can skills be gained, but at the player's own pace? The teams then decided to develop several mini-games that would be placed within the context of a single narrative storyline.

Would Finding it on Google Count?

In order to clarify what the University Libraries wanted to accomplish with an educational game, a review of the Association of College and Research Libraries' (ACRL) Information Literacy Competency Standards for Higher Education was conducted. With the overarching aim of imparting life-long learning skills to our students, the committee was united by the belief that the sources where the player might find information within the game should include, but not be limited to subscription databases. Other relevant "sources" of information could include their colleagues, professors, a website or a printed encyclopedia. Through this reflection came the discussion point of, "Is the way or means by which students seek information as important as the information itself?" Do we penalize them in the game setting if they were to use, for example, Google to find information?

Information Literacy: Standards, Accreditation, Assessment & Measurable Objectives

The LA Committee wanted the final product, eventually named 'Library Arcade', to be a convenient venue for incorporating an information literacy assessment tool. With accrediting

agencies such as Middle States focusing more on assessment in their evaluations, the Library

Arcade could become an increasingly useful asset. Measurable learning outcomes on which to

base in-game assessments would need to be outlined. The LA Committee began using the

learning objectives from the ACRL Information Literacy Competency Standards for Higher

Education.[4] These standards served to focus both the librarians' efforts on providing content

for the game as well as deepen the iLit team's understanding of information literacy as an

educational goal. As the two groups met and hammered out the structure of the games, we

decided to focus on one ACRL information literacy standard per mini-game. It was crucial that

the learning outcomes were identified before any assessment was built into the game design,

otherwise the team could run the risk of getting off track in the game's design and/or ultimately

creating a game with un-measurable outcomes. The games' learning outcomes breakdown like

this:

**Mini-Game 1: Learning how information is organized and categorized using the Library
of Congress Classification System**

ACRL Standard # 2.3.b

Standard 2.3. The information literate student retrieves information online or in person using a

variety of methods.

Outcomes Include:

(b) Uses various classification schemes and other systems (e.g., call number systems or indexes)

to locate information resources within the library or to identify specific sites for physical exploration

Mini-Game 2: Discerning the relevancy of information

ACRL Standard # 1.2.c,d:

Standard 1.2. The information literate student identifies a variety of types and formats of potential sources for information. Outcomes Include:

(c) Identifies the value and differences of potential resources in a variety of formats (e.g., multimedia, database, website, data set, audio/visual, book)

(d) Identifies the purpose and audience of potential resources (e.g., popular vs. scholarly, current vs. historical)

In coming up with learning outcomes for each mini-game the team discussed outcomes on a spectrum very similar to Bloom's Taxonomy [5]. For example, with mini-game 1, our most basic outcome was, "[the information literate student will] recognize that the books are arranged on the shelf in a logical order." The official, measurable learning outcome 2.3.b was chosen because mini-game 1 deals with the Library of Congress Classification System and the student's ability to apply what he/she learns about the LCC through the game play of arranging books on a shelf. Even though nearly all libraries discourage patrons from re-shelving books, the student should come away from this game with a better understanding of exactly how the books on the

shelf are arranged. As another example, mini-game 2's most basic outcome was "[the information literate student will] recognize that there are a variety of information sources," while the more measurable outcome is 1.2.d, the identification of a resource's purpose and audience. Each mini-game was to have primary measurable learning outcomes in addition to underlying informal outcomes.

Performance measurements varied by mini-game. For example, the completion of the three levels in mini-game 1 is the only satisfactory performance indicator for this game. Mini-game 2, however, would use points to determine the player's level of performance. The scoring rubric for mini-game 2 is still in development. The overall performance measurement for the entire game is not yet complete, but will likely combine the player's performance on each game and apply it to a scale devised by the librarians. This could ultimately make the games playable on "easy, medium, or hard" levels to facilitate implementation in K-20 environments. With an attainable set of goals, the teams began to put concept to screen.

Librarians Collaborate with Students

As the semester got underway, the LA Committee communicated regularly with the iLit team to provide them with advice and direction. We expressed how we wanted something decidedly different from a typical library instruction module, i.e., a product that would not be "tutorial" in nature. Before the iLit team was sent off to work on 'story' ideas, we agreed to some basics. The product would make use of Adobe Flash technology; the games would be short, make use of a single player, feature more images than text, would be re-playable, interactive and (of course) entertaining. The LA Committee also wanted to assure the iLit team that the artistic

creation of the product was in their hands. We did not want have a negative influence on their creativity, but hoped to provide constructive feedback when asked.

Storyboard Emerges

The iLit team presented their preliminary story ideas, concept art, and the basic game mechanics to the LA Committee in February 2007. The game's story featured the character of a typical college student named 'Max'. We discussed the possibility of allowing players to choose between several main character avatars, but this feature would have increased the amount of programming that was possible during the time allotted. Having received an "F" on a paper, 'Max' is presented with the opportunity to go back in time in order to improve his research methods with the help of a "Father Time" character. Each mini-game would progress Max through the storyline and highlight different research skills. Themes for the individual games were labeled: Classification Concepts, Appropriate Finding Tools, Evaluation of Resources Sources, Information Ethics/Plagiarism, Brainstorming for a Research Paper, and Assessment.   Ideally, the goal would be that they could be played independently of each other.

The iLit team expected to outsource most of the programming needs for the deliverable product. Although much of the design had already been outlined, time constraints prevented finishing all six mini-games at once. The teams then focused on the first two games in the story. Game 1 would focus on Classification Concepts, while Game 2 would address Appropriate Finding Tools.

Baffled by Game 1

The LA Committee was disappointed that the first mini-game was set in a virtual library and involved putting books in order.   We reasserted our desire to the iLit team that the games forgo "library themes" and that simply knowing how to shelve a book was not important to information literacy. Instead of dismissing the work that iLit team had already started, we gave suggestions to direct the learning goal away from putting numbers in order and more towards an understanding of classifications and an introduction to subject headings. We thought that the story would still work if Max could somehow learn how to use the online catalog to begin searching for information on his subject. We debated the use of a timer, but were finally swayed by the argument that timing a player is common to most games. Furthermore, the iLit team needed a way to score a player's progress through the levels.

We had to agree with the mindset that we should not worry too much about players failing because they will eventually "get it" - this is the appeal of playing a game. During development, feedback was solicited by some informal testing, and the LA Committee continued to suggest ways to edit the look and feel of the mini-games and help with the wording, especially on the "Hint" pop-ups.

Creating Questions for Game 2

Mini-game 2 was designed to depict the physical space of a library. Again, we expressed disappointment with the choice of setting, as we had emphasized to the iLit team that libraries provide a wealth of information electronically; suggesting that students do not necessarily need to physically visit the library to use its resources. The iLit team reassured us by describing the plans for mini-game 3 to be set in a virtual "campus" setting, complete with a dorm room, a professor's office, a classroom, as well as a library. However, once these

additional variables were added, the amount of time to fully design and implement mini-game 3 far exceeded the allotted project time line. With that realization, the teams set out to create the content for mini-game 2.

The LA committee was asked to script the questions and answers for mini-game 2. Since a minimum of 60 research questions were needed, we appealed to our colleague liaison librarians, who command a variety of subject specialties, to help generate questions. Their assistance was greatly appreciated and many of the submissions were based on actual questions received at our reference desks.

The flow for the game mechanics was to depict Max visiting other students in the library and helping them with their research. For Example, when Max receives the question "Do video games make kids violent?" these choices are presented: PsycINFO database, the American Psychological Association (APA) website, a Time magazine article, or a monograph titled, *Game Producer's Handbook*. Points are assigned depending on what he chooses. The resources are evaluated in terms of "best," "good," "not that useful," and "not useful at all." Comparing "best" versus "good" seemed especially difficult to measure since the questions could not be too long in length, and, of course, one source might be better than the other depending on the need and circumstance involved in the research. As the semester was rapidly ending in April 2007, mini-game 2 was completed without explanation to the player about why the resource they may have chosen was not considered the "best." Expanding on the "hint" function would be a desired feature to an updated mini-game 2. The hint would encourage the player to "think again" about the resource that was picked by posing a hint like, "If you picked a reference book, maybe it is not relevant because it has information on many topics and just a little information on your

topic?" Keeping in mind that the games learning objective deals with the awareness of a variety of sources, these hints could also be perceived as supplemental to the already instructive game play. Since the iLit team finished their semester's project, with a few of its members graduating, future work on the game would need additional funding and new team members. After some additional programming was completed by ETC, we were ready to share the games with the Carnegie Mellon community.

Making the Arcade Our Own

The final versions of the games were reviewed by the committee in mid-June of 2007. Those present shared their thoughts on the application and execution of each game. The committee added another member to act as an expert analyst on video gaming and to market the games to the student community. One question that arose in marketing the games, was how best to name the game. Within the originally envisioned unified game experience, each mini-game would be a stage, not necessarily requiring a name. Now that the tasks comprised individual games, finding appropriate names became more pertinent. It was agreed that leaving library jargon out of the naming would be a main goal. It was thought that students would shy away from even trying a game if the name featured "Information Literacy" or "Library" or "Classification." To this end, the members of the assembled committee brainstormed a series of related terms and concepts for each game.

For the game in which the player re-shelves books in Library of Congress Classification order, the concepts hovered around such things as shelving, order, arrangement, and classify. The final concept was "Within Range," which directly refers to the library term "call number

range," but manages to remain similar to other more popular gaming titles. The title also encompassed the actions the player would take as they attempted to find the proper location for their title by scanning the surrounding numbers in a search-like manner. The logo was designed to mimic the rows of books found in the game. Title letters were designed to be slightly off center horizontally, to provide a sense of movement.

The item retrieval game was more complex in nature and consequently created some challenges in finding an appropriate title. With the many actions found within this game, the concepts discussed ranged from finding, deciding, evaluating and locating. In the end, the final title was decided to be "I'll Get It!" This not only represents the actions of the protagonist, as he eagerly retrieves items for the library patrons, but a reference to the abilities gained by the player. By exercising their ability to evaluate resources and choose question-specific item types, the players will begin recognizing the role of evaluation as it relates to information literacy. The graphic design of this logo incorporates the main protagonist and shows him performing the actions in the game.

Going Live

To present the games to our audience, the committee decided that a page hosted on our library web site would be created (http://www.library.cmu.edu/Libraries/etc/index.html). This page would serve as not only an entry portal to the games themselves, but as a secondary information source for users to find out more about the concepts of information literacy and how other libraries are approaching gaming. Initial design concept was to use the title logos in rectangular button forms to act as a clickable button link. This design proved to be adequate, but

not overly engaging. To that end, two early arcade-era arcade boxes were created to display not only the title logo panel, but also a screen capture of the game in play. This design featured a large Nintendo-styled "Play" button on the face of the arcade box. Users were instructed to hit play, but in the event that this instruction was not clearly understood, the entire image was made to be the clickable link. The original page layout placed these game boxes side-by-side underneath a short introduction to the library arcade project.

The page also featured a short explanation of the parties involved in the making of the game. Below this text, several links highlighting other academic gaming initiatives were featured. In the final right portion of the page a feedback section was featured. The means of feedback were through a group email link and a general survey (see addendum). This survey featured questions inquiring as to the users gaming experience, reaction to our games, and direct input for future modifications. During the initial release of the games, no public marketing was created. Being that this was the unfinished version of the library arcade, the power of viral marketing was thought to be sufficient in spreading the word of the games. In short, the committee hoped that the audiences reached through social networking channels would be more akin to offering opinions based on other gaming experiences and possibly from both a library-centric standpoint and as an external video gamer's view. The page did not initially contain any instructions as to how to play the games or what skills they were designed to strengthen. The thoughts behind this decision were envisioned through the exploratory nature of many modern games.   It was believed that users would become curious as to what they could click and how they would interact with the virtual environment.

The Library Arcade web page was unveiled on September 18, 2007. A link to the arcade page was placed on the Carnegie Mellon University Libraries front web page and an announcement was sent to all library personnel via internal email lists. The ETC announced the live version of the games on their web site shortly thereafter. The games were featured on a blog, *The Extensible Librarian* (http://johnfudrow.wordpress.com) and soon other library bloggers began to share the Library Arcade with their audiences. Over the next few weeks, comments on the games could be found on a range of websites: library related blogs, online video game sites and a web discussion forum and bboard.

Player Reactions

A large portion of the initial players seemed unsure of how each game functioned. Their comments and questions framed the evaluation of what type of descriptions should accompany the games at their entry points. Based on the number of comments requesting guidance, the LA Committee decided to draft a set of short instructions for each game. Not wanting to walk the player through the entire experience, the instructions both outline the concept of the games and the basic interactions with which the user can engage the games. To facilitate the display of the instructions on the web page, a design incorporating images of library catalog cards was created. Placed beside a scaled down version of the video game boxes, the catalog cards display the title, description, and a fictional library call number for each game. The page was updated to feature a longer introduction, encouraging users to leave feedback for ways to add to the game experience.

The various reactions to the game intrigued the committee members and provided fuel for

the planning of future revisions. Though many of the comments focused on the game being set in a library, others focused on the applicability of the games to their own experiences. "Within Range" was described as well crafted but somewhat unclear as to what information was to be taken away from the completion of the tasks. We received several comments from school librarians wanting to use a modified Dewey Decimal version of Within Range" to train their students and staff. As can be seen in other collected comments, many players began to reflect on how they used libraries as well as the profession of librarianship. Because many players immediately recognized the adaptation of the popular Web game "Diner Dash," it was decided that "I'll Get It" should become the lead game for any future marketing campaigns. After further refinement, both games are set to be released in a final version.

From This Point On

The Library Arcade project is being developed as freeware so that anyone can download the mini-games and customize the content to fit users' skill levels or interest, whether their audiences are K-12 students, college students, or adult learners. We believe that the final product could be easily incorporated into any subject course. Many universities have a required library/computer skills course for incoming freshman that would be well suited to feature the games. At Carnegie Mellon, twenty percent of the incoming freshmen matriculate from Pennsylvania and fifty-one percent come from the Middle States of Delaware, the District of Columbia, Maryland, New Jersey, New York, Ohio, Pennsylvania, and West Virginia.[6] Carnegie Mellon University Libraries has a vested interest in starting and maintaining information literacy outreach with local K-12 institutions. By supporting such initiatives, the University increases its chances of enrolling applicants equipped with information literacy skills.

We feel that the project was successful though it was not without the difficulties found in producing any type of digital project. Having more than one semester to collaborate with the same student team, would have allowed more time to apply the revisions suggested by user testing and survey responses. Alternately, we realized that a better understanding of the client/developer relationship could have allowed the clear communication of our project vision. With this in mind, the desire to not make these games a library simulation may have been realized sooner in development. Overall, Carnegie Mellon University Libraries benefited from a product that will provide the greater community with a unique vehicle in which to challenge their information literacy skills.

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Library Arcade Survey Responses

1. Which game did you play?

		Response Percent	Response Count
Within Range		6.6%	9
ILL Get It		19.0%	26
Both		**74.5%**	102
		answered question	137
		skipped question	1

2. How fun was this game?

		Response Percent	Response Count
Totally Lame		11.8%	16
Kinda boring		8.1%	11
Neutral		14.0%	19
Fun		**59.6%**	81
Hysterically Fun		6.6%	9
		answered question	136
		skipped question	2

3. Are you a self-described gamer?

		Response Percent	Response Count
yes		30.1%	41
no		**69.9%**	95
		answered question	136
		skipped question	2

4. How often do you play online games?		Response Percent	Response Count
Never		28.9%	39
Occasionally 1-5 times per month		46.7%	63
Frequently 1-5 times per week		15.6%	21
Everyday		8.9%	12
	answered question		135
	skipped question		3

5. Would you play this game again?		Response Percent	Response Count
yes		71.6%	96
no		28.4%	38
	answered question		134
	skipped question		4

6. How should the Carnegie Mellon University Community be made aware of this game?

What did you like about it, and where do you see it "fit" at Carnegie Mellon?

Response Count

87

answered question 87

skipped question 51