Building the Games Students Want to Play: BiblioBouts Project Interim Report #2

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Abstract

The University of Michigan's School of Information and its partner, the Center for History and New Media at George Mason University, are undertaking the 3-year BiblioBouts Project (October 1, 2008 to September 30, 2011) to support the design, development, testing, and evaluation of a computer game to teach incoming undergraduate students information literacy skills and concepts. This second interim report describes the project team's 5-month progress achieving 2 of the project's 4 objectives, designing the *BiblioBouts* game and engaging in evaluation activities. It also enumerates major tasks that will occupy the team for the next 6 months. Appendixes A and B describe the game's design and include pedagogical goals and how the game scores players.

CONTENTS

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Project Objectives

The BiblioBouts Project has the following four objectives:

1.   Design and develop a game that teaches students information literacy skills and concepts while they do their assigned coursework.

2.   Evaluate the game to determine its effectiveness for teaching information literacy skills and concepts.

3.   Expand our list of premises for the design of information literacy games to give direction to future designers.

4.   Develop a model of best practices for the design, development, and deployment of information literacy games so that institutions that want to pursue game development can streamline their efforts.

During the last 5 months of the project (May to September 2009), the BiblioBouts Project team has completed the first iteration of objective #1, game design and development, and made considerable progress on the first iteration of objective #2, game evaluation.

Project Design

Table 1 enumerates the 12 design steps of the BiblioBouts Project. It includes the people responsible for and the expected dates of the work effort. Design steps are the organizing principle for this second interim report.

Table 1. 12 Design Steps of the BiblioBouts Project

Step	Date	Responsibility
1. Design and develop BiblioBouts	fall 2008, winter, spring, & summer 2009	Project team
2. Learn about the research needs of incoming students	winter & spring 2009	Principal Investigator (PI), Co-PIs, student assistants; instructors at participating institutions
3. Conduct baseline study #1	spring & summer 2009	PI, Co-PIs, student assistants
4. Test BiblioBouts	fall 2009 & winter 2010	Project team; library liaisons, students, and instructors at participating institutions

5. Conduct baseline study #2	fall 2009 & winter 2010	PI, Co-PIs, student assistants, library liaisons at participating institutions
6. Evaluate game play	fall 2009, winter & spring 2010	PI, Co-PIs, student assistants, instructors and students at participating institutions
7. Analyze evaluation data and report findings	spring & summer 2010	PI, Co-PIs, student assistants
8. Make design and development improvements to BiblioBouts	winter 2010, spring, & summer 2010	Project team
9. Test BiblioBouts	winter 2011	Project team; library liaisons, students, and instructors at participating institutions
10. Evaluate game play	spring & summer 2011	PI, Co-PIs, student assistants; library liaisons, students and instructors at participating institutions
11. Analyze evaluation data and report findings	spring & summer 2011	PI, Co-PIs, student assistants
12. Support widespread distribution and adoption of BiblioBouts	summer & fall 2011	Project team

Step 1. Design and Develop BiblioBouts

Staffing the BiblioBouts Project Team

BiblioBouts Project Team staffing remained stable throughout the period. In summer, new doctoral student Christopher Leeder assumed the project's Graduate Student Research Assistantship position and has been occupied with evaluation activities. The team's concern about the complexity of registration and authorization procedures resulted in the hiring and training of graduate student assistant Andrew Calvetti to serve as an end-user support specialist.

Starting October 1, 2009, the BiblioBouts Project team has these members:

- PI: Professor Karen Markey
- Co-PI: Associate Professor Soo Young Rieh
- Co-PI: Associate Professor Victor Rosenberg
- Project Consultant: Fritz Swanson
- Lead Programmer-architect: Greg Peters
- Programmer and Interface Designer: Brian Jennings
- Graduate Student Research Assistant: Christopher Leeder

- Doctoral Student Assistant: Beth St. Jean
- Graduate Student Assistant: Andrew Calvetti

Designing and Developing BiblioBouts

Game design work began in December 2008 with discussion at weekly meetings. Driving the team's efforts was the design and pedagogical goals statement drafted by Project Consultant Fritz Swanson that cites overall game goals, goals for BiblioBouts' mini-games suite, and scoring goals. Team members claimed design tasks that were best suited to their expertise and game-design experience, worked through problems, and presented solutions at weekly meetings. Game design and development was accomplished in incremental stages. Programmer Brian Jennings took the lead on designing mini-game interfaces and functionality. After programming one or more mini-game interfaces, he demonstrated them at the next meeting, and all assembled agreed to changes with regard to layout, graphic design, functionality, internal consistency, etc. After several iterations, mini-game interfaces were finalized and turned over to Lead Programmer-architect Greg Peters who connected them to game functionality and databases that he had developed behind the scenes. Final touches were added by PI Karen Markey, Consultant Swanson, and GSRA Chris Leeder who reviewed instructions, layout, explanatory text, text styles, button names, etc., and suggested changes that would ensure internal consistency and understandability.

This incremental approach to game design and development characterized the project team's design and development of BiblioBouts. One-by-one, the team completed all mini-games except for the Best Bibliography bout in time for the BiblioBouts Meeting in Ann Arbor on August 4–6, 2009 of the project's library liaisons (see Step 4 below).

Since September 1, all 5 mini-games (Donor, Closer, Rating & Tagging, Sorter, and Best Bibliography) have moved into alpha release. See Appendix A for a description of the BiblioBouts mini-games suite that includes pedagogical goals and scoring summaries. Based on Consultant Swanson's original design and pedagogical goals statement, the description in Appendix A has been a moving target, subject to change, scrutiny, and fine-tuning throughout the design and development period.

BiblioBouts Interfaces

Interface development uses a combination of HTML, PHP and JavaScript. HTML is used to set up the underlying framework for individual interfaces and create core objects such as tables, paragraph text, anchor links and the overall layout of an individual interface. CSS is then used to style and to simplify making stylistic changes to interfaces. CSS classes make interfaces more uniform and intuitive to use.

When playing BiblioBouts, players interact directly with these interfaces:

- Login: Displays a brief game-objectives description and invites the player to log in.
- Home: Displays important information about the game such as leader board, mini-game timetable, game news, and the player's total score and bout-by-bout scoring breakdown. Features a navigation menu offering game instructions, Zotero information (i.e., Zotero instructions, tutorial link, and synchronization settings),

user profile, and logoff.

- Donor: Describes this bout and reports the number of donations made by the player, the average of the entire group, and the most active player. Links to Zotero where most Donor activity takes place.

- Closer: Describes this bout. Highlights in white and yellow the player's donations that are and are not ready for closing, respectively; gives the player functionality to close the former and links to Zotero where the player can add citations or full-texts to close the latter.

- Rating & Tagging: Describes this bout. Collects the player's relevance and credibility ratings, and keyword, format, and audience-level tags.

- Sorter: Describes this bout. Gives the player drag-and-drop functionality so they can sort up to 5 closed donations at a time into folders named for the specific subtopics or aspects of the broad-based topic in play.

- Best Bibliography: Describes this bout. Gives the player functionality to: (1) search donations, (2) review a selected donation's citation, full-text, ratings, and tags, and (4) choose up to 10 donations for their Best Bibliography.

BiblioBouts features many more interfaces for these functions: (1) registration: 4 separate but related interfaces for a 4-step process, (2) game administration: 11 separate interfaces for game administrators for a wide range of tasks such as setting up a game, editing previously-set game dates, adding and deleting game players, creating and editing home-page news items, creating subtopics for the Sorter bout, and creating research questions for the Best Bibliography bout, (3) student self-review: 8 separate interfaces that give a scoring breakdown, brief players on their bout-playing performance, and compare their game-play performance to the bout's top player and to the group as a whole, (4) instructions: 5 separate instructions interfaces that are comprehensive about game play or focus on a specific aspect of the game such as registering with Zotero or setting up a BiblioBouts account, and (5) situational interfaces: 7 separate interfaces needed for special game-play situations such as accepting an invitation to play BiblioBouts, editing one's profile, reissuing a BiblioBouts password, and printing one's Best Bibliography at the end of the game.

Of the dozen interfaces that were designed but never used in BiblioBouts, two-thirds of them were for the Policing and Rating Revisited bouts that were eliminated from the game on the advice of SVSU faculty who felt their elimination would streamline BiblioBouts (see Step 2). Other interfaces were not used because of their complexity or the adoption of alternative solutions.

The BiblioBouts Game-System

Game-system development uses a combination of PHP and JavaScript code, MySQL, and customizing and maintaining an Apache HTTP server. MySQL is used to store all of the game data, from the specifications for a given game, to the profile information for each player, to all of the data used for game/player evaluation. PHP is the language of choice to manipulate the data from the MySQL databases in order to present intelligible playing interfaces to the end user. JavaScript is used in a number of capacities, but primarily to

enhance the game play experience with dynamic interfaces and on-the-fly access to information from the Apache server.

The Donor mini-game connects with an individual player's Zotero account using the Zotero API. This lets Donor determine what documents the player has added to Zotero for potential use in game play. The Closer bout also uses this connection to allow players to choose their best documents (capped at 6) for submission to BiblioBouts for consideration by the other game players.

For all mini-games except Donor, we have incorporated a number of JavaScript and AJAX techniques to streamline player interaction with the system. The resulting experience is more like a stand-alone desktop application than a series of web pages despite running in the Firefox browser.

Having finished game-play development, the BiblioBouts project team added the scoring model to the game. Scoring included tests to determine how well balanced the model is. Programming for scoring was accomplished with the intent of making it as easy as possible to update the scoring mechanisms. This allowed the BiblioBouts project team to test a variety of different point values for the different behaviors within game play.

Doctoral Student Assistant Beth St. Jean designed BiblioBouts' scoring algorithm so that game players who donate citations and full-texts that other players rate highly and choose for their Best Bibliographies *and* play all mini-games at medium- to high levels will win the game or place at or near the top of the BiblioBouts leader board. Appendix A summarizes scoring on a bout-by-bout basis. Appendix B details BiblioBouts scoring.

The BiblioBouts project team has implemented the first round of game maintenance tools which allow those with the proper level of access to create and manage games. These tools allow the game manager to set and change the start and end dates for individual mini-games, add and remove players from the game, set the general topic and specific subtopics for investigation, and set the research questions that the players ultimately address with their document selections in the Best Bibliography mini-game.

Implementing a first round of game evaluation tools marked the team's final development effort. These tools enable game administrators to determine how actively individual game players are playing the game and compares individuals to the group as a whole. Also, the game collects game-play data for each closed document such as relevance ratings, credibility ratings, tags, etc. The game exports these data to Excel spreadsheets for subsequent data analysis by project team members.

The BiblioBouts Project team has had to deal with several challenges during development. Using Zotero as the primary document gathering tool has led to delays. This is primarily due to the status of the Zotero API as a beta release. This means that we are attempting to code to a moving target. In particular, we lost one week of development time when the Zotero developers scrapped their existing authentication system (a username/password mechanism) in favor of an authentication key system. This required the BiblioBouts Project team to adapt its account creation and registration system to reflect changes to Zotero.

The team also had to change its original assumptions about game play for the Closer game. Our original model required a minimum number of closed documents from each

player to be presented to the other players for evaluation. The game rewarded players for any documents submitted above and beyond the minimum. Testing BiblioBouts, we realized that failing to cap a maximum number of closed items would place a counter-productive burden on players during mini-games requiring document evaluation (i.e., Rating & Tagging and Sorter mini-games). Minus the cap, we estimated that players could be required to evaluate a minimum of 70 documents in the Rating & Tagging mini-game. To solve the problem, we placed a cap on the maximum number of documents players submitted to the Closer mini-game. This required changes to the interface but, ultimately, it resulted in a more playable game.

Step 2: Learn About the Research Needs of Incoming Students

To learn about the research needs of incoming students, the BiblioBouts Project team planned to interview faculty and students at the institution where the game would first be played. The latter proved to be too difficult due to a number of factors that were detailed in the team's first interim report. The team targeted the former, drafting a data collection plan and open-ended questions to determine the expectations that faculty have for the papers and bibliographies that students write and whether faculty anticipate improvements in student performance as a result of playing BiblioBouts.

The PI submitted a data collection plan and an open-ended interview questionnaire to the U-M's Institutional Review Board (IRB) in early February 2009 and received an exempt rating that allowed the BiblioBouts Project team to start data collection.

PI Markey and GSRA Leeder visited Saginaw Valley State University (SVSU) in July to conduct personal interviews with faculty. They conducted baseline interviews with 2 SVSU faculty members who planned to test the game in their English (ENGL) 111 classes in fall 2009.

Following interviews, BiblioBouts Project team members briefed these same faculty on playing BiblioBouts. They described a BiblioBouts that featured 7 bouts and took 7 weeks at the very least to play from start to finish. SVSU faculty briefed the BiblioBouts Project team on ENGL 111 course objectives and desired outcomes. All assembled including library liaisons speculated on how the game might be integrated into ENGL 111. Both game and the course syllabus were complex and proved difficult to merge together. Faculty convinced BiblioBouts Project team members that 2 bouts, Policing, in which game players conduct a preliminary check of fellow game players' donations for "side-of-the-barn" relevance and for the presence of citations and matching full-texts, and Rating Revisited, in which players rate donations a second time based on sortings into particular subtopics, were redundant and unnecessary. Both bouts were stricken from the game which resulted in a streamlined game that could be played in 4 to 5 weeks.

Despite game streamlining, ENGL 111 faculty were concerned about the large scope of the BiblioBouts Project. They withdrew their participation in the project and suggested that the BiblioBouts Project team recruit faculty who teach advanced English courses that include a specific research component.

SVSU library liaisons Averill Packard and Anita Dey briefed SVSU Professor Geoffrey V. Carter about BiblioBouts, and he volunteered his fall English (ENGL) 212 course as

the BiblioBouts debut site and took part in a baseline interview. (See Step 4 for details on deploying BiblioBouts in ENGL 212.)

Step 3. Conduct Baseline Study #1

The short lead time for deploying BiblioBouts in Professor Carter's ENGL 212 course precluded the collection of student papers from an earlier class that had not played BiblioBouts. However, PI Markey conducted a phone interview with Professor Carter, asking him baseline-study questions.

Planning for subsequent game play in winter 2010, the BiblioBouts Project team has been proactive in its correspondence with library liaisons about recruiting faculty well in advance so we can collect and analyze graded papers from classes before students play the game (baseline study) and from classes where students play the game (test study).

The PI has turned over her extensive literature review of published research papers on rating the bibliographic entries in student papers to GSRA Leeder. He is taking the lead on analyzing the published literature to determine the characteristics of student papers that should figure into the analysis. He will also take into consideration the answers faculty give to baseline-study questions about the bibliographies. He will develop a quantitative assessment tool for evaluating the quality of a student bibliography and test the proposed tool to assess its usefulness.

Comparing student papers in baseline- and test-studies will enable the BiblioBouts Project team to answer 2 of the project's 10 research questions:

1.   Is gaming an effective approach for teaching incoming undergraduate students information literacy skills?

2.   What do game players learn?

Step 4. Test BiblioBouts

Developing Data Collection Instruments

The PI developed these data collection instruments for the project's many data collection approaches:

•   Pre-game questionnaire: Completed by all students prior to game play, this web-administered questionnaire asks students to rate their perceptions about their ability to perform library research.

•   Game diary forms: Completed by student volunteers during game play, this web-administered questionnaire asks students to tell us what BiblioBouts mini-games they played, what went right, and what went wrong.

•   Post-game questionnaire: Completed by all students after game play, this web-administered questionnaire asks students about their perceptions about their ability to perform library research, about their experiences playing particular mini-games, and for their suggestions for improving the game.

•   Post-game focus group interview questions: Interviewers ask student volunteers about their motivation playing BiblioBouts, what they learned from game play, improvements to BiblioBouts, and whether they want to learn about library

research and academic topics generally by playing games.

- Post-game personal interviews with faculty: After faculty grade student projects, interviewers ask faculty what impact game play had on students, what they think students learned from game play, and how we could improve game deployment in subsequent classes.

- Follow-up personal interviews: Four to six months after game play, interviewers ask student volunteers to reflect on the impact BiblioBouts had on them, specifically, using its library-research model in subsequent research, feeling more confident about conducting such research, whether and why they feel differently about playing BiblioBouts.

The PI submitted these data collection instruments, a revised baseline study questionnaire, and a description of data collection procedures to the U-M's Institutional Review Board (IRB) in early July 2009 and received an exempt rating that allows the BiblioBouts Project team to collect data for all aspects of the project.

Planning for BiblioBouts Deployment in Undergraduate Courses

The BiblioBouts Project team finished all BiblioBouts game development except for the Best Bibliography mini-game in time for the project's 2-day Ann Arbor meeting on August 4 to 6, 2009. This meeting brought together library liaisons from participating institutions Chicago State University (Gabrielle Toth), Saginaw Valley State University (Averill Packard and Anita Dey), Troy University-Montgomery Campus (Alyssa Martin), and University of Baltimore (Catherine Johnson) with the BiblioBouts Project team. At the meeting, the BiblioBouts Project team wanted library liaisons to:

- Become experts at registering for game play and completing system-authorization procedures. Registration and authorization are complicated processes because game-play requires several disparate computers to work together for the purposes of creating, changing, and moving files between systems. Because library liaisons will eventually help students register and complete system-authorization procedures, they must become trouble-shooters, adept at determining which system is experiencing problems when registration and/or system-authorization fails.

- Become experts at playing BiblioBouts, a suite of mini-games featuring personal collection building, shared collection evaluation, and bibliography creation, so that they can show students how to play the game and answer their questions.

- Plan ahead on BiblioBouts implementation at their institutions. Library liaisons and the BiblioBouts Project team worked together to solve various issues that may be unique or common to each institution, e.g., technical infrastructure, technical expertise of student game players, recruiting participating faculty.

- Shoulder some of the data-collection burden. The BiblioBouts Project team cannot travel to all participating libraries to conduct interviews, thus, the team must rely on library liaisons to help out. We reviewed the project's several data collection methods, discussed how to conduct personal and focus group interviews, and practiced conducting focus group interviews.

Appendix C contains the Schedule of Events for the 2-day meeting.

Deploying BiblioBouts in Undergraduate Courses

In August 2009, SVSU Professor Geoffrey V. Carter volunteered his ENGL 212 course as BiblioBouts' debut site. PI Markey and Professor Carter corresponded via email and phone about integrating BiblioBouts into his course. PI Markey and GSRA Leeder visited Professor Carter at SVSU to demonstrate BiblioBouts game play and plan how BiblioBouts would be integrated into ENGL 212. All involved—the BiblioBouts Project team, Professor Carter, and library liaisons—huddled at various times to solve difficult problems:

- How to ease students through the game's complicated registration procedures and authorization procedures that are a result of connecting several disparate computer systems together.
- How to divert students from Google and the web to library databases.
- How students could save their personal collections of retrieved citations and full-texts on machines in university computer labs that wipe hard disks after they sign off.

Professor Carter integrated BiblioBouts into his ENGL 212 course syllabus. Students are graded a total of 800 points for 9 assignments. One of the 9 assignments is BiblioBouts participation for which students receive a maximum of 75 points. Students can draw on the bibliography that is the direct result of BiblioBouts game play to complete a 50-point writing assignment on electracy and digital writing. They can also use the bibliography for the ideas, concepts, and viewpoints that drive their media authoring projects (150 points maximum).

SVSU library liaisons Packard and Dey made presentations to ENGL 212 students at the first 2 class sessions. They demonstrated relevant databases for finding information on the "Electracy and Digital Writing" topic chosen for class projects, showed students how to use Zotero, and how to save retrieved citations and full-texts to USB drives. To spur students' research activity, Professor Carter gave students assignments connected with finding information on the chosen "Electracy and Digital Writing" topic so that they would start building their personal collections of citations and full-texts and saving them in Zotero. GRSA Leeder created 3 Flash-based instructional videos students can watch while registering and setting up: (1) registering with Zotero (http://bibliobouts.org/documentation/registering.html), (2) setting up a BiblioBouts account (http://bibliobouts.org/documentation/setting_up_bb.html), and (3) setting up a Zotero collection (http://bibliobouts.org/documentation/setting_up_zotero.html).

BiblioBouts Project staff members and library liaisons returned to Professor Carter's ENGL 212 class on October 14, 2009 to register students on Zotero, register students on BiblioBouts, and activate WebDAV (a set of HTTP extensions that allows students to create, change, and move citations and digital full-texts from their personal computers to Zotero, and from Zotero to BiblioBouts). Upon completion of this necessary technical business, students can play BiblioBouts, starting with the Donor bout, in which they populate their personal library on the topic in play with the citations and full-texts they find on the web and in library databases. The game features an email address (info@bibliobouts.org) to which students can send email messages bearing questions or requests for technical support. The team's user-support specialist replies to students'

messages within 24 hours so that they can continue playing the game. Game play continues in ENGL 212 up to the Thanksgiving break. After Thanksgiving, BiblioBouts Project team members return to SVSU to conduct focus group interviews with student volunteers.

The BiblioBouts Project team has been in constant contact with library liaisons with regard to recruiting faculty and their courses for evaluating BiblioBouts in winter 2010. The team would like to evaluate the game in courses from several different disciplines, stand-alone bibliographic instruction courses, and purely academic courses so that they can determine the type of support that each requires.

Project Dissemination Activities

The BiblioBouts Project web site debuted in January 2009 at http://bibliobouts.si.umich.edu. Team members monitor the web and professional publications to add to the site's "Games bibliography" pages (http://bibliobouts.si.umich.edu/GamesBibliography.html). They keep its "BiblioBouts Progress to Date" page up-to-date adding new entries every month or every other month that tell exactly what tasks occupy the project team and participating libraries (http://bibliobouts.si.umich.edu/BiblioBoutsProgress.html). A feature article about BiblioBouts was published in the October 2009 issue of SI's alumni magazine and follow-up publicity with the University of Michigan News Service is in the planning stages.

Readers who want to play a demonstration BiblioBouts game can do so at http://www.bibliobouts.org. When BiblioBouts prompts you for a username and password, enter the following:

username: demo@bibliobouts.org

password: demo

Experience all but the Donor bout through the demonstration game. Because the demonstration game was designed for classroom demonstrations, it is a one-person game. Multiple simultaneous sign-ons may result in unpredictable game behaviors.

Future Plans (October 2009 to March 2010)

With most design and development work behind us, the BiblioBouts Project team will focus on game deployment, testing, and evaluation activities during the period October 2009 to March 2010. Important subtasks connected with the 4 steps that will occupy the BiblioBouts Project team for the next 6 months are:

Step 1. Design and Develop BiblioBouts

- Based on the project team's pretest of BiblioBouts, log desired changes to BiblioBouts that cannot be implemented in the game before game play begins in fall 2009.
- Based on the evaluation of BiblioBouts at SVSU, log desired changes to BiblioBouts.
- Scrutinize the log of desired changes, choosing only the most important and/or minor ones to make in the BiblioBouts version that debuts in partner institution

10

courses in winter and spring semesters 2010.

- Implement selected changes in the BiblioBouts version that debuts in partner institution courses in winter and spring semesters 2010.
- Update BiblioBouts as needed to conform with switch from Zotero beta-system 2.0 to the Zotero production-system 2.0.
- Pretest the BiblioBouts version that debuts in partner institution courses in winter and spring semesters 2010 to make sure selected changes and updates do not result in bugs, inconsistencies, sign-on problems, etc.

Step 3. Conduct Baseline Study #1

- Complete the literature review of published research that rates the bibliographic entries in student papers.
- Select, define, and operationalize rating criteria.
- Collect the papers that students from partner institutions write before students play BiblioBouts in winter and spring semester 2010.
- Apply the rating criteria to student papers and analyze results.
- Conduct baseline-study personal interviews with faculty whose classes play the game in winter and spring semester 2010.

Step 4. Test BiblioBouts

- Engage library liaisons in recruiting faculty at participating institutions.
- Work with recruited faculty as needed to integrate BiblioBouts game play into their course syllabus, graded assignments, and projects.
- Deploy BiblioBouts game play in selected undergraduate courses in winter and spring semester 2010.

Step 6. Evaluate Game Play

- Require student game players to complete pre- and post-game surveys.
- Recruit student volunteers to keep game-play diaries and participate in focus group interviews.
- Conduct follow-up interviews with faculty after they grade student papers.
- Recruit student volunteers to participate in follow-up interviews.

Appendix A

BiblioBouts Design, Goals, and Scoring Summary

Introduction

The structure of the game is to posit an idealized research task targeted toward a theoretical research paper. The flow of the game moves from a broad-based topic that casts a wide net for collecting a comprehensive subset of available resources on that topic. Students assess the large resource collection they have built together in terms of its quality, content and audience. When students sort resources into smaller subcategories, they should get a sense of the topic's breadth and depth and how certain collection pieces excel in one or the other. The students finally propose specific research questions based on the collection. They choose one such question, and the final game is for each student to build a theoretical bibliography targeted at best answering that question.

BiblioBouts' primary goal is to give students practice and experience with the research process from start to finish. To achieve this goal, students gain valuable experience navigating the many digital library resources available to them in a university setting. Because they will be exposed to different resource formats such as web sites, journal articles from abstracting & indexing (A&I) databases, books via library catalogs, research reports and datasets from institutional repositories, students may come to expect different kinds of materials from them in terms of format, audience level, discipline, depth, formality, etc. We also want students to be able to intelligently assess the resources they retrieve from the digital repositories they search, especially for the web where quality is so varied.

To play the game, students do research as a set of tasks that are discrete from other learning tasks and are even discrete from each other. We want students to be able to distinguish the different tasks in research and to come to appreciate how they fit together. As much as possible, we want the students to get a sense of research as an independent activity, and maybe appreciate research as an aesthetic experience on its own.

Donor Bout

GAME GOAL: Build a collection with breadth and depth on the broad-based topic.

PEDAGOGICAL GOAL: Help students to see collection building as a discrete task. Focus on the fun of resource discovery and resource navigation. Help students to evaluate what they find for basic relevance to the broad-based topic (does this retrieval give me enough to work with?, is there another way of looking at this topic?, after I search the web, where do I look?) Some students will quickly collect a lot of citations from popular sources, other students will collect a few esoteric resources slowly, and other students will be lazy or confused. We want to reward both the fast/broad and the slow/quality strategies. We want to encourage the fast to recognize the benefits of the slow and vice versa. We want to help the lazy or confused to see the two different paths of success.

WHAT HAPPENS IN ZOTERO AND/OR BIBLIOBOUTS: Before Donor begins, librarians instruct students in online searching so that they know where to look after exhausting Wikipedia, Google, and the web. They also need to cover how Zotero

functions so students know how to add citations to Zotero, download PDFs, correct citations, etc. Students use available digital repositories to find citations that address the broad-based topic. They add them to a Zotero folder named for the chosen broad-based topic. BiblioBouts monitors students' donations to Zotero to compute game players' scores and list them on the leader board.

SCORING SUMMARY: For each item that the player donates up to the quota, s/he gets a base score. The player gets bonus points for every donation over the quota. The player gets extra bonus points if s/he is the first player to donate a particular item.

Closer Bout

GAME GOAL: Choose the best 6 citations on the topic in play, complete with full-texts, and submit them to BiblioBouts.

PEDAGOGICAL GOAL: Help students to see beyond the mindless, Pac-Man fun of resource navigation, discovery, and retrieval. A resource without a digital full-text or the wrong full-text is worthless. Increase students' understanding of and experience with the essential elements of bibliographic citations. Evaluate one's personal collection of citations and full-text readings making quality assessments that will affect one's success in the game.

WHAT HAPPENS IN ZOTERO AND/OR BIBLIOBOUTS: Make sure one's best donations have both digital citations and full-texts, check and complete the citations that Zotero fails to make automatically. Submit one's best citations and full-texts to BiblioBouts for other players' evaluation and scrutiny in subsequent bouts.

SCORING SUMMARY: For each item that a player closes, s/he gets a base score. The closing player gets bonus points throughout the game when other players rate his or her donations highly and when other players add his or her donations to their Best Bibliography.

Rating & Tagging Bout

GAME GOAL: Evaluate the potential of donated resources to address the broad-based idea or topic.

PEDAGOGICAL GOAL: Get first-hand experience with the characteristics of resources that are indicators of their quality, their relevance to the broad-based topic in play, and their usefulness to potential audiences.

WHAT HAPPENS IN BIBLIOBOUTS: BiblioBouts randomly chooses a resource donated by competing players, displays it to the player, and asks the player to identify this resource's audience and the discipline it addresses, rate its relevance and credibility, and assign keywords that describe its contents.

SCORING SUMMARY: For each item that the player rates and tags up to the quota, s/he gets a base score. The player gets bonus points for every rating and tagging over the quota. The player gets extra bonus points if s/he adds an explanation of his or her ratings, and if other players match his or her rating and tagging choices.

Sorter Bout

GAME GOAL: Sort donated resources into specific aspects, subsets, features, subdivisions, or facets of the original idea that this collection can answer.

PEDAGOGICAL GOAL: Students need to rethink their original broad-based topic in light of the collection at hand. What aspects, subsets, features, subdivisions, or facets of the original idea do individual resources address? What resources span several of these?

WHAT HAPPENS IN BIBLIOBOUTS: Before starting this bout, the instructor and/or players scan all the resources in the collection and identify the subtopics or aspects of the original broad-based topic that these resources address. The game administrator instructs BiblioBouts to display as many separate folders as there are subtopics and aspects. BiblioBouts randomly chooses a resource donated by competing players, displays it to the player, and asks the player to sort the resource into the folder that best describes its overall contents.

SCORING SUMMARY: For each item that the player sorts up to the quota, s/he gets a base score. The player gets bonus points for every sorting over the quota. The player gets extra bonus points if other players match his or her sorting choices.

Best Bibliography Bout

GAME GOAL: Select the best resources to answer a specific research question.

PEDAGOGICAL GOAL: Give students experience and practice specifying a research question and choosing the best resources to use to answer it in the form of a bibliography.

WHAT HAPPENS IN BIBLIOBOUTS: This is the final bout. Before starting this bout, the instructor and/or players scan all the resources in the collection and identify research questions that these resources can answer. The game administrator profiles BiblioBouts to display these research questions, and players choose one during the Best Bibliography bout. Then they select the best items from a list bearing their original donations and competing players' donations to build their best bibliography of 10 resources that addresses their chosen research question.

SCORING SUMMARY: The game scores like a hand of poker or similar card game—high cards win. The "cards" are the resources for which the students determined the value in the Rating & Tagging bout. For each item that a player adds to his or her bibliography, the player gets a base score. The player gets bonus points for how well each item's taggings (discipline and audience) match the selected research question and how favorably the item's ratings (relevance and credibility) compare to the average ratings across all items donated and closed. The player gets extra bonus points if other players choose the same item for the Best Bibliographies they submit on the same research question.

Appendix B

BiblioBouts Scoring Details

Donor Bout

The Donor Bout plays a very crucial role in the final score. Players can only close items that they donated during the allotted time for this Bout and the quality of each of their donations will be assessed later in bouts that follow the Closer bout, i.e., Rating & Tagging, Sorter, and Best Bibliography bouts). For each item that a player donates up to the quota, s/he receives 100 points; thereafter, players receive 200 points for each donation. A final bonus (a weight of 1.5) will be applied to the player's donor score for each unique donated item, that is, if the player is the first person to donate a particular item.

Example: Ted donated a second item. He was the first player to submit this particular item. Ted's Donor Score for this 2nd item donated: 100 * 1.5 = 150 points.

Closer Bout

During the Closer Bout, players can increase their Donor Score by making sure that their citations are complete and by attaching the matching full-text for each donation. Players get to keep their Donor Score for unclosed items. The Closer bout is capped at a set number of items to keep under control the minimum number of items players must rate, tag, and sort in subsequent bouts. Thus, players cannot close items beyond the capped number.

The Closer Score for a closed item *replaces* its Donor Score. Additionally, the Closer score is adjusted throughout BiblioBouts to take into account what happens to each donation in later bouts. During the Rating half of the Rating & Tagging bout, each successfully closed item is adjusted upward based upon the extent to which it exceeds the average relevance and credibility ratings for all items donated and an additional bonus of 100 points is applied if the majority of the players vote that the original donating player has attached the correct full-text.

During the Tagging half of the Rating & Tagging bout, each item closed is weighted according to the type of resource that has been donated (as judged by other players), with resources that are more challenging to find and retrieve being weighted more heavily [**Article-like weight=2.5** (Chapter in a Book/Conference Article, Paper, or Talk/Journal or Magazine Article weight=4; Encyclopedia Article weight =2.5; Newspaper Article weight =1.8); **Book-like=2.5** (Book/Dissertation or Thesis weight =3; Reference Book weight =2.5); **Communication-like weight =1.0** (Blog/Email Message/Forum/Letter weight =1); **Media-like=1.5 weight** (Image or Photograph/Map/Movie/Music=1.5 weight); **Web-like=1.5 weight** (Educational Website/Government Website=2 weight; Commercial Website/Personal Website/Wiki=1 weight)]. Lastly, resulting scores for each item are multiplied by the number of players who select that item for inclusion in their Best Bibliography.

Example: Ted successfully closes his second donation. During Rating & Tagging, this item beats the average relevance rating by 0.2 and the average credibility rating by 0.6

and the majority of the players vote that his attachment is the correct full-text for the citation he provided. During the Tagging Bout, the majority of players indicate that this donation is a reference book. 8 players (including Ted) select this item when building their Best Bibliography.

Ted's total score for his 5th donation at the end of the bout: [150 * 2 * (1 + 0.2) * (1 + 0.6) + 100] * 2.5 * (8 + 1) = 15,210 points.

Rating Half of the Rating & Tagging Bout

For each item a player rates up to the quota, s/he receives 100 points. Thereafter, each item a player rates earns 200 points. Rating an item consists of indicating whether the attached full-text matches the citation and then providing 6 credibility and relevance judgments. If a player's decision on whether the attached full-text is correct matches with what the majority of other players have said so far, the player receives an attachment bonus of 50 points. For each of the 6 required judgments that the player provides a comment explaining the reasoning behind one's rating, the player is awarded an additional bonus of 10 points. The score for each item (including the attachment bonus and the comment bonuses) are weighted to reflect how well an individual player's judgments agree with the average of the judgments of other players.

Example: Ted rates a second item. He indicates that the attached full-text matches the citation, as did the majority of the other players who have rated the item to date. He provides comments on 5 of the 6 judgments required by the Rating Bout. His 6 ratings differ from the average ratings, respectively, by 0.0%, 3.2%, 4.5%, 6.7%, 2.1%, and 9.2%.

Ted's Rating Score for this item: [100 + 50 + (5 * 10)] * [1 / (average (0%, 3.2%, 4.5%, 6.7%, 2.1%, 9.2%)] = 4,669 points

Tagging Half of the Rating & Tagging Bout

For each item a player tags up to the quota, s/he receives 50 points. Thereafter, each item players tag earns them 100 points. Tagging an item consists of indicating the Branch of Knowledge and/or Discipline with which an item is most closely associated, selecting keywords to best represent the item, indicating the audience level for which an item seems most appropriate, and indicating the type of donation (i.e., Article-like, Book-like, Communication-like, Media-like, or Web-like, and more specific categories within each of these higher-level categories).

A player's Tagging Score is weighted according to how well s/he matches the tags (Topic, Keywords, Audience, and Donation Type) selected by his or her opponents. If the player selects only a Branch of Knowledge (but no discipline), s/he receives 50 points times the number of other players that selected this particular Branch of Knowledge. If the player selects a specific discipline, s/he receives 100 points times the number of players that selected this particular discipline.

A player's keywords are similarly weighted based both on how well they match other players' keywords (Exact Match=5 or Phrase Normalized=4) and on how many other players selected the same keywords.

Regarding a player's selection of audience, s/he receives 200 points times the number of players that selected the same audience.

Regarding a player's selection of donation type, s/he receives 200 points times the number of players that selected the same type. If the player's choice of donation type is a higher-level category (i.e., Article-like, Book-like, Communication-like, Media-like, or Web-like), the player receives 50 points times the number of other players that selected this same donation type. If the player's choice of donation type is a more specific category (e.g., Encyclopedia Article, Reference Book, Blog, Educational Website), the player receives 100 points times the number of other players that selected this same donation type.

Example: Ted tags a third item. He selects a discipline that 10 other players also select. He enters 3 keywords – 1 was an exact match with 3 other players and 2 were a phrase normalized match with 5 other players. His selection for audience matches that of 8 other players. Also, his selection for donation type (Reference Book) matches that of 6 other players.

Ted's Tagging Score for this item: $50 + (100 * 10) + (5 * 3) + (2 * 4 * 5) + (200 * 8) + (100 * 6) = 3,305$ points.

Sorter Bout

For each item a player sorts up to the quota, s/he receives 1,000 points. Thereafter, each item the player sorts earns 1,500 points. These scores are adjusted based on the number of players who agree with an individual player's sorting judgment. If this player's judgment matches that of other players, s/he is awarded more points.

Example: Ted sorted a third item. He selected a subtopic that 37% of the other players also selected.

Ted's Sorter Score for this item: $1,000 * (1 + 0.37) = 1,370$ points

Best Bibliography Bout

The player selects a research question and submits his or her best 10 items. The player automatically receives 5,000 points for each of these 10 items. These points are then adjusted upwards based on how well the topic and audience of these items match the topic and audience of the player's chosen research question and on how well the player's submitted items fared versus the average across all items in terms of relevance and credibility ratings. If a submitted item has only a Branch of Knowledge specified (but no discipline), the player receives a base score of 100 points if that Branch of Knowledge is the most applicable to the player's chosen research question. If the item has a specific discipline identified, the player receives a base score of 200 points if that discipline matches his/her chosen research question. This score is further modified by a multiplier of 1 plus the fraction of players selecting this Branch of Knowledge or specific Discipline. The player receives points according to how closely this item matches the audience level specified for this research question. S/he receives 200 points plus 200 points times the fraction of players who selected the specific audience level. Scores for each of the items the player selects for his or her Best Bibliography are then further adjusted upward based on the extent to which they exceed the average of all items in

terms of relevance judgments and credibility judgments. Additionally, each of the player's entries are then weighted by the percent of players selecting the same research question as this player who decided to include that same entry in their Best Bibliography.

Example: The third item in Ted's Best Bibliography has a discipline that matches the discipline of his chosen research question and an audience that matches the audience associated with his chosen research question. This item's relevance rating exceeds the average rating of all items by 2.4%. This item's credibility rating is lower than the average rating of all items. This item was included in 75% of the Best Bibliographies that focused on this particular research question.

Ted's Best Bibliography Score for this item: $[5000 + 200 + 400] * (1 + .024) * 1 * 1.75 = 10{,}035$ points

Appendix C

AUGUST 4-6 BIBLIOBOUTS MEETING IN ANN ARBOR
School of Information, Ehrlicher Room, 411 West Hall
Schedule of Events

DAY	TIME	EVENT
TUES. 2009/8/4	7 pm	Meet in Microtel Lobby for ride to dinner at the Blue Tractor, 207 East Washington Street, 734–222–4095. Discussion topic: Introductions and project progress to date (game design and development, formulation and approval of data collection instruments, recruiting faculty)
WED. 2009/8/5	8:30 am	Meet in Microtel lobby for ride to School of Information, 1085 South University Avenue, 734–764–9376
	9 am	Update on project progress and timeline (Karen Markey) Review of BiblioBouts and its 5 mini-games. Request: Add your mug to the project participants page Project progress: Where we are now, where we should be, and where we are headed in fall 2009 and winter 2010. Expected changes to the original timeline.
	9:20 am	Recruiting teaching faculty for the BiblioBouts Project (Karen) Starting early to avoid problems later. Candidate classes: English 111 or more advanced courses? Sparking faculty interest, then getting buy-in from deans, directors, and program chairs. Librarians demo the game. How to incorporate the game into classes: First 4 to 5 weeks or all semester synchronized with a research-writing assignment. For the baseline study: Personal interviews of faculty and collecting papers from classes before the game.
	9:40 am	Learning how to use Zotero (Chris Leeder) Demonstration of Zotero focusing on Zotero features that figure into BiblioBouts: Setting up an account, passwords, finding citations, taking snapshots, finding full-texts, linking full-texts.
WED.	10:30	Break
	10:45	Playing BiblioBouts (Chris) Demonstrating BiblioBouts game set-up (for a faculty

		member): Setting up a game for a group (or class), setting up the timeline for BiblioBouts' sequence of mini-games
		Demonstrating BiblioBouts game set-up (for a player): Setting up a BiblioBouts account, setting passwords especially vis-a-vis Zotero, turning on WebDav.
		Demonstrating BiblioBouts game play: Starting with *Donor* and *Closer* mini-games. Show interfaces for remaining mini-games: *Tagging & Rating, Sorter, Best Bibliography*.
WED.	12	Lunch (at Pizza House: pizza, burgers, chipati, or salads)
		Project team members Brian Jennings, Greg Peters, Vic Rosenberg, Beth St. Jean, and Fritz Swanson will join us. (Soo Young Rieh is on vacation.)
		Discussion topic: Game design and development specifics (Learn the contributions of Greg, Brian, Fritz, and Beth on BiblioBouts design and development and ask them your specific questions)
	1:30 with break at 2:45 (or 3 pm with break at 4:15)	Your Assistance vis-a-vis BiblioBouts (Karen)
		Test the game now to familiarize yourself with game play. Invite your librarian colleagues to play.
		Required in-game assistance: Editing news page, helping instructors identify broad topics, troubleshooting, e.g., creating Zotero and BiblioBouts accounts, setting passwords, playing the game, helping instructors and students refine BiblioBouts collection into subtopics and aspects (prior to *Sorter*), helping instructors and students formulate research questions (prior to *Best Bibliography*)
		Required pre-game instruction: Zotero, searching the web and library-licensed databases, and, possibly, demonstrating BiblioBouts' *Donor* and *Closer* games to classes.
		The need for game instructions and tutorial (Averill's experience with the latter).
		Revisiting recruiting faculty instructors.
	4 or 5:30 pm	Adjourn (Discover Ann Arbor: U-M campus or downtown)
	7:15 pm	Meet in Microtel Lobby for ride to dinner at the group's choice
		Discussion topic: Debriefing on the game-registration business (how can we streamline this process for first-time players?)
THURS. 2009/8/6	before 8:30 am	Check out of Microtel
	8:30 am	Meet in Microtel lobby for ride to School of Information,

		1085 South University Avenue, 734–764–9376, or follow me to campus
	9 am with break at 10:30	Evaluation Discussion (Karen)
		Evaluation overview: Answering the 10 research questions, evaluation methods, and sequencing.
		Personal interviews with (1) faculty (pre-game baseline study), (2) faculty (post-game debriefing), (3) 4-month follow-up interviews with students. Training, role playing, and testing audio recorders.
		Focus group interviews with students. Training, role playing, and testing audio recorders. (See Karen's book chapter on conducting focus groups.)
THURS.	11:30	New business
		Including meeting at ALA Midwinter in Boston.
	12 pm	Adjourn (lunch on your own or join BiblioBouts Project team members Karen and Chris)