

# Measuring Our Information Literacy Footprint: Assessing Game-Based Learning in Library Instruction

Katelyn Angell and Eamon C. Tewell

## Introduction

Information literacy instruction plays a key role in the educational mission of many academic libraries. To improve the efficacy of their instruction, librarians employ a wide range of strategies and pedagogies for teaching the many dimensions of information access and use. One such method draws upon game-based learning to work towards achieving learning outcomes and increasing student engagement and motivation. Game-based instruction in academic libraries often takes the form of librarians creating their own games, adapting existing games developed by other libraries, or designing class sessions using gaming principles (gamification).

Game-based learning seeks to generate opportunities for students to meaningfully engage with classmates and the instructor, participate in hands-on activities, and learn new information using their preexisting knowledge as a basis. Despite the ongoing popularity of using games in library instruction, few studies have addressed whether playing games in academic library classes may translate into understanding of content or increased engagement. Using two games whose efficacy has been tested by their developers, this research aims to provide insight into whether online games are a preferable method of instruction compared to lecture in terms of student comprehension of selected concepts.

## Literature Review

The literature demonstrates that the use of games for information literacy instruction is increasing in acceptance and popularity, yet in many cases assessment beyond student interest remains unexplored. The scholarly discourse on games as tools to improve learning began with James Paul Gee's 2003 monograph on game-based learning, titled *What Video Games Have to Teach Us About Learning and Literacy*.<sup>1</sup> Gee expounds upon the many ways games facilitate learning through his 36 Video Game Learning Principles, including encouraging exploration and discovery, just-in-time learning, and utilizing active learning methods. Gaming in libraries made a national debut at the 2005 Gaming, Learning and Libraries Symposium, where presenters from various library settings discussed how and why games were being used.<sup>2</sup> Since the mid-2000s a significant amount of literature has been produced on games in library instruction. Though gaming-related topics such as developing video game collections and providing outreach through gaming events appear with regularity, this review will focus on game-based learning for information literacy instruction.

Non-digital games, such as board games and game-show style activities, have been implemented at a number of college and university libraries due to their easy-to-play nature and inherent capacity for en-

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Katelyn Angell is Reference and Instruction Librarian at Long Island University, Brooklyn, e-mail: [katelyn.angell@liu.edu](mailto:katelyn.angell@liu.edu); Eamon C. Tewell is Reference and Instruction Librarian at Long Island University, Brooklyn, e-mail: [eamon.tewell@liu.edu](mailto:eamon.tewell@liu.edu)

agement with other players. Many of these games are developed in order to supplement or enhance library orientation sessions. Marcus and Beck, for example, compared a traditional orientation to one that sent freshmen on a library treasure hunt that required locating a series of clues.<sup>3</sup> A brief post-orientation test found that the treasure hunt received more positive student feedback than the traditional orientation and held increased educational benefits. Thorough reviews of the many types of information literacy games, including non-digital and online games, have been conducted by both Margino and Smale.<sup>4,5</sup> Smale created an internet resource evaluation game titled *Quality Counts*, wherein students search for and evaluate websites.<sup>6</sup> Survey responses indicated that players enjoyed the game and felt that their skill levels increased.

Digital and online games to teach college and university students library skills appeared in the literature at an early juncture with a 1982 report on a computer game requiring students to use the *Reader's Guide to Periodical Literature*.<sup>7</sup> A great deal has changed technologically since this study, but many of the reasons for incorporating digital games into instruction remain the same. While at least one academic library chose to tailor an existing commercial videogame to their needs,<sup>8</sup> the vast majority of libraries using digital games have developed their own. Librarians at James Madison University created two online games with distinct purposes.<sup>9</sup> *Citation Tic-Tac-Toe* asks players to identify the type of a given citation in order to advance in a game of tic-tac-toe, and *Magnetic Keyword* uses virtual refrigerator magnets to help students practice identifying keywords. The authors assessed one game qualitatively and the other quantitatively, and found that in both cases students had increased their skill levels. Armstrong and Georgas developed and assessed an interactive tutorial titled "Doing Research" and discerned a statistically significant difference in student performance using a pre- and posttest questionnaire.<sup>10</sup> Mary Broussard, a prominent researcher in game-based learning in libraries, reviewed 17 online library games and analyzed the traits of successful games.<sup>11</sup> Most recently Broussard makes a case for

games as tools for conducting formative assessment, arguing that both games and in-class assessment of student learning share significant synchronicities.<sup>12</sup>

The literature demonstrates that librarians have considered it worthwhile to incorporate games for the purposes of library orientations, engagement in standalone sessions, practicing specific library skills, and more. A majority of researchers measured student receptivity to a game instead of whether playing a game may have contributed to student learning. Furthermore, reviewing the literature of games in library instruction presented difficulties in that digital games can have a lifespan as brief as one semester. *Bibliobouts*, one of the most promising research-oriented games in terms of gameplay and adaptability by other institutions, is no longer available due to its four-year grant funding reaching its end.<sup>13</sup> Gaming expectations and technologies change rapidly, and as such it is difficult to determine which games can be used or are available. After a review of the literature the authors were prepared to select the games most appropriate to their setting and instructional goals.

## Methods and Data Collection

The primary objective of this project was to determine if the introduction of games into undergraduate information literacy instruction increased retention of course content. A convenience sample of 86 students enrolled in introductory English classes at a large, metropolitan university served as the study's participants. The participants comprised seven total English classes, each of which visited the library for information literacy instruction (ILI) twice during the semester. The average age was 19 years, with a range from 16 to 40. Fifty-six participants identified as female, while 30 identified as male.

The experimental design selected was nonrandomized control group pretest/posttest, which entailed dividing participants into two groups. One researcher taught three classes in the control condition and the other researcher taught four classes in the experimental condition, basing this division upon their teaching schedule. Forty-three students were in

each group. The treatment in the experimental condition was two educational online games. The first game focused on keyword development and was employed in the first ILI session, while the second game addressed citations and was played in the second ILI session. Students in the control condition did not play any games. Each session was scheduled for one hour and fifteen minutes, and there was typically a gap of two to three weeks between the first and second sessions. In order to streamline instruction techniques the researchers determined that one would teach all four ILI classes in the experimental condition and the other researcher would teach the three classes in the control group.

The lesson plans for the first and second ILI sessions were the same save one difference: students in the experimental group would play a game. Every first session began with the administration of a six-question multiple choice pretest created by the researchers, adapted from Beile's Test of Information Literacy for Education (B-TILED).<sup>14</sup> Students were given five minutes to complete the pretest, and all finished within this time limit. The pretest evaluated participant knowledge of basic keyword development and citing skills. For example, students were asked to identify the journal title in an MLA citation in one question and to choose the best synonyms for the keyword "college students" in another.

Next, all students were given a presentation on strategies for searching the library catalog and a database. Immediately following this instruction, students in the experimental condition played the online game "Doing Research."<sup>15</sup> Created by librarians at the University of Illinois at Chicago, "Doing Research" is an interactive tutorial which presents students with a topic, such as African bird species, and guides them in identifying keywords and synonyms, exploring Boolean operators, and constructing a search string. Students were allocated fifteen minutes to complete the tutorial. The last part of both sessions consisted of a hands-on activity that asked students to select a research topic of interest and locate an article on this topic in an online database. In lieu of playing a game,

students in the control condition were allowed extra time to work on the activity.

A few weeks after the initial ILI session each class returned for their second session. The first part of this session was devoted to a presentation on citing in APA and MLA formats. Following this lecture students in the experimental condition played Citation Tic-Tac-Toe, a free game developed at James Madison University.<sup>16</sup> Citation Tic-Tac-Toe lists a citation and instructs players to determine its proper format in multiple choice fashion. If a player correctly answers a question they are allowed to proceed. Next, all students were given a brief demonstration of ProQuest Databases and then asked to complete a hands-on activity. The activity directed them to locate an article in ProQuest and then cite it in APA and MLA styles. Before the second session ended students were given a posttest, which presented them with the same questions as the pretest ordered differently to discourage memorization. The independent variable in this study was the educational games, while the dependent variable was the measures of achievement on the pretests and posttests.

After all ILI sessions concluded the pretests and posttests were graded and coded. Participants in the experimental condition received a number ranging from 1–43 and participants in the control group were assigned a number ranging from 44–86. Statistical analysis was used to determine if there was a significant difference between scores on the pretests and posttests in both groups. A one-tailed paired t-test was selected, and the data was analyzed using SPSS software.

## Results and Discussion

A paired sample t-test revealed a statistically significant difference between scores on pretests and posttests in the experimental (game) condition, but no significant difference was present in the control (no games) condition (see table 1).

Although students in both the experimental and control groups received higher scores in the second class sessions than in the first, students who played

**TABLE 1**  
**Output for Paired Samples t-Test**

Pair	Condition	Mean	Std. Dev.	Std. Error Mean	t	df	Sig. (1-tailed)
Pair 1	Pre No Games- Post No Games	-2.326	30.138	4.596	-.506	42	.308
Pair 2	Pre Games- Post Games	-10.488	22.508	3.432	-3.056	42	.002

games showed the greatest improvements. Specifically, students in the control condition improved two percentage points on average, while those in the experimental condition increased their test scores by roughly ten points.

This data supports the overturning of the null hypothesis, which predicted that any difference between test scores in the experimental and control conditions would lack statistical significance. However, statistical analysis showed clear support of the experimental hypothesis, which surmised that students taught with games would perform better on a research skills test than students unexposed to any treatment. These results indicate that the fledgling trend of integrating game-based learning into ILI pedagogies deserves to be further explored in both theory and practice.

While not exhaustive, the current study furnishes empirical evidence that games hold promising possibilities to improve student learning comprehension of critical components of information literacy. The encouraging results of this project justify an expansion of educational games into active learning pedagogies within the ILI classroom. Additionally, this data provides a solid argument for enlarging amounts of both employee time and money spent on developing online games with academic research themes.

Within this project there are a couple limits worth exploring. To begin with, at the beginning of the study the researchers decided to streamline instruction loads by designating one researcher to teach all experimental classes and the other researcher to teach all control classes. In the future, the researchers would alter the initial procedure and instead each teach both types of classes. The goal of this adjustment would

be to maximize the potential of the games to impact learning and to downplay possible confounding influences of individualized instruction approaches of the two researchers.

A second limit pertains to the temporal gap between the first and second instruction sessions. The passage of time between administration of the pretests and posttests could have caused an extraneous time-related variable in both conditions. After the first ILI session students did not revisit the library for their second session for two to three weeks. In between these sessions students could possibly have advanced their research skills apart from the ILI session. For example, a student could have consulted with a reference librarian and learned new citing or keyword development skills from this interaction. Consequently, it is plausible that an unknown percentage of study participants received higher grades on the posttests than the pretests not because of the study's treatment (games), but rather because they bettered their ILI skills in other settings during the break between the two sessions.

The promising results of this study warrant future research investigating similar phenomena. One idea would be to incorporate qualitative as well as quantitative methods into the research framework. For example, in addition to completing a multiple choice pretest/posttest participants could be presented with open-ended questions testing their ILI skill sets. Additionally, only two areas of ILI were explored in this study: keyword development and citing. Additional research could measure comprehension of other important ILI components, such as identifying appropriate information retrieval systems or source evalu-

ation. It would also be valuable to map the threshold concepts of the forthcoming ACRL Framework for Information Literacy for Higher Education onto the methodology utilized in the present study. Lastly, assessing the effects of information literacy games when played alone versus in groups would be another intriguing method for structuring related studies, and would contribute valuable research to the area of game-based learning within the academic library classroom.

## Conclusion

The results of this study suggest that, when implemented in information literacy instruction sessions, brief online games addressing two common research processes—identifying keywords and synonyms and categorizing citation types—can be successfully utilized to improve student comprehension of these skills. The instruction containing games was compared with instruction with additional lecture, the latter being a type of teaching that can be considered “traditional” information literacy instruction. These games represent a modest change to the content of the instructors’ ILI sessions, and as such might easily be adopted by other librarians interested in using participatory game-driven methods to encourage engagement with information literacy practices. The successful use of games will vary according to student backgrounds, desired learning outcomes, and other classroom factors, but in the appropriate circumstances game-based learning may have the potential to enhance student learning in regards to instructional content.

An additional advantage to game-based learning, noted by several researchers but outside of this study’s scope, is the contribution of gameplay to affective elements that contribute to learning, such as student enjoyment of the session and intrinsic motivation. The authors have found anecdotally in their experiences as instructors that engagement and motivation can be greatly improved when games are part of student learning experiences. It is the authors’ hope that this study will encourage additional research on game-based learning and other popular teaching methods

to ensure that our practices as information literacy instructors are grounded in effective pedagogy, and in turn, instruction that places learners first and foremost.

## Notes

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