# Information literacy and online reading comprehension in *WoW* and school

Crystle Martin, Gabriella Anton, Amanda Ochsner, Jonathan Elmergreen, Constance Steinkuehler
University of Wisconsin-Madison
Email: crystle.martin@gmail.com, gabby.anton@gmail.com, amanda.ochsner@gmail.com, jonathan.elmergreen@gmail.com, constances@gmail.com

**Abstract:** Massively multiplayer online games and affinity spaces offer a vast array of literacy practices and reciprocal apprenticeship (Gee, 2003; Steinkuehler, 2007; Black & Steinkuehler, 2009; Black, 2008). Many of these literacy and learning practices are well researched (Steinkuehler, 2011), however, the practices of online reading comprehension and information literacy processes are nascent in terms of research. This study was originally designed to compare the online reading comprehension skills used in schools and games; however, this analysis proved to be unfruitful because both tasks were imposed query (Gross, 1995; 1999). This data set does give us an interesting opportunity to compare two coding schemes that both look at how people find and use information.

## Introduction

Literacy learning is a naturally occurring and pervasive part of massively multiplayer online games (MMO) and affinity spaces (Gee, 2003; Steinkuehler, 2007; Black & Steinkuehler, 2009; Black, 2008). Sophisticated practices using science literacy (Steinkuehler & Duncan, 2009) and advanced reading comprehension (Steinkuehler, Compton-Lilly, & King, 2009) have been documented in online discussion forums and fandom texts related to MMOs outside the context of school and other traditional learning spaces. These communities function as participatory cultures (Jenkins, 2006), with community members both producing and consuming information in equal turn. The production and consumption cycles of participants are collaborative and leverage the intellectual resources of the community in a way similar to that described by Levy's (1997) theory of collective intelligence. These communities in and around MMOs also function as communities of practice as described by Lave and Wenger (1991); they offer information to members and use apprenticing to help new members learn the standards and practices valued within the community (Steinkuehler, 2004). The collective intelligence and communities of practice aspects of these communities are seen not only in written documentation of the community of an MMO or affinity space like a wiki, but also in in-game chat. The information needs of the individual seeking information in this setting require both the collective intelligence of the community to give the individual not only an answer but to give the correct answer, as well as be willing to apprentice novices, which is a core value of communities of practice.

## Theoretical Framework

### Online Reading Comprehension

The study of how people read and comprehend online reading materials, online reading comprehension is considered to be a part of literacy studies. Leu, et al., (2001) viewed online reading comprehension through the lens of new literacies, framing it as problem-based inquiry which requires the person implementing online reading comprehension to have new skills, strategies, and dispositions on the Internet. These new skills, strategies, and dispositions allowed the user to create questions that were driven by interests and information needs that occurred while reading. The reader then needs to locate, critically evaluate, synthesize, and design and communicate possible solutions to these questions. Leu and Zawilinski (2007) reaffirmed the list of skills needed for online reading comprehension by determining there were five major functions of online reading comprehension: 1) developing important questions, 2) locating information, 3) critically analyzing information, 4) synthesizing information, 5) communicating information. The functions of online reading comprehension show strong similarities to information literacy; these similarities are explored below.

The differences between studying reading comprehension of print-based media and digital media were laid out by Coiro (2009). First, students needed a new and different skill set to successfully read online. These included creating search terms, sifting through sources, making evaluative choices, synthesizing the chosen sources, and responding through digital communication. The second difference focused on the disposition of the student toward the Internet, with high performing readers

displaying persistence, flexibility, and skepticism. The third difference between digital and print reading was that students often looked for information in a collaborative way on the Internet; they work together in-room, use synchronous online communications methods like gchat, and utilize asynchronous online communications like forums, or collaborative sources like wikis. The fourth difference was that the process of reading should inform the instruction of reading. Coiro found that many struggling students only accessed the top link of a page of search results; often gave up if they could not find information easily; retyped URLs because they were unaware of copy and paste; and typed whole questions into the address bar and added .com at the end. The fifth difference was that the nature of online reading comprehension was constantly changing as digital tools change. The argument being made here is that online reading comprehension is different than traditional reading comprehension. Online reading comprehension requires the ability to read in a format that may not be linear; links within in the text may be explored at any time moving the person away from a straightforward and linear path. Coiro studied participants reading non-fiction and reference materials. The ability to switch to a related subject highlighted by a link is just one of the ways that reading online is a more fluid and complicated, process.

### Information Literacy

Traditional information literacy theories and standards are designed to describe the practices of information literacy in formal learning environments like K-12 or college (AASL, 1998; ACRL, 2000). Many traditional models are unable to account for some of the most basic practices in online affinity spaces, such as *World of Warcraft* (*WoW*). These spaces have little in common with traditional resource-heavy spaces. The traditional models focus on formal educational settings using institutionally created information resources utilized by a single person on a solitary journey, with the output of their search usually ending in a paper. The online affinity space is collaborative and the resources vary from institutionally created (resources published by the game companies) to a variety of user-created resources such as leveling guides, guild websites, and wikis. Because so many of the resources are user-created, the nature of the resources is constantly shifting, with the information they present constantly in flux. Thus, we need a more contemporary framework for information literacy skills that can better account for the collaborative nature of communities like those found in the information constellation around *WoW*.

Information literacy is more than just a skill set. It requires reasoning and critical thinking skills for determining which sources and information best fill the need at hand. It requires both ICT (Information, Communications, and Technology) skills and critical thinking because it encompasses both. Using examples culled from eight months of online ethnographic data (Steinkuehler & King, 2009), Martin and Steinkuehler (2010) have examined the information literacy practices that arise in the in-game chat of *WoW*. The information literacy practices observed in analysis take the form of five patterns. These patterns were identified and described in Martin and Steinkuehler (2010) as “call and response”, “call and refer”, “call and avalanche”, “simultaneous not sequential”, and “fluid”. These new patterns utilize the existing descriptions of the process of information literacy but crucially illustrate the actual actions and practices of people in natural information seeking spaces.

## Methods

This study was designed to replicate and build on a study conducted by Coiro and Dobler (2007). Their original study followed 11 successful 6$^{th}$ grade readers of mixed gender as they completed two tasks of online reading comprehension. The first task required participants to use a website about tigers to find information and determine answers for a set of seven comprehension questions. The second activity was structured similarly except that the students were able to use the website Yahoolagains!. During both activities the participants were asked to think aloud about their process. From the data collected, Coiro and Dobler coded the transcribed think-alouds to determine the practices that readers with a high reading ability in traditional reading settings use in online reading situations. We conducted a modified version of the study. The study took place in part of an afterschool lab for adolescent males, 13-18 years old and mostly from rural areas, conducted at University of Wisconsin-Madison. The lab ran for two years with a pilot in 2008 that had 9 participants and the full lab running in 2009 with a total of 22 participants. Most participants were considered chronically disengaged with school and were identified as struggling readers. The lab met face-to-face once per month and regularly online in *WoW*. A modified version of the original Coiro and Dobler study was conducted during a Saturday face-to-face meeting. The main modification to the study was that a reading in the form of a wiki pertaining to *WoW* was substituted for the Yahoolagains! portion of the original study. One activity, referred to as “Tigers” for our research, used the Save the Tiger Fund

website; this is the same website that Coiro and Dobler used in their original study, which at the time was called 5 Tigers: The Tiger Information Center. The second activity, which we refer to as "Murlocs", used the Murloc WoWWiki.com page. WoWWiki.com is a wiki similar to Wikipedia, but dedicated entirely to articles about *WoW*. This site was used in conjunction with the website Save the Murlocs.

Both activities, Tigers and Murlocs, included worksheets that asked seven comprehension questions: five content questions and two inferential questions. The participants were asked about their levels of prior knowledge and interest in the topic before each activity, and about their enjoyment of and success with the activity after they had completed it. These activities required the participants to use the designated websites to answer the questions while thinking aloud to explain their actions and decision-making. The think-alouds were videotaped, transcribed.

## Analysis & Results

The data analyzed in this study was a combination of the results from the worksheets from the Tigers and Murlocs activity as well as analysis of the think-alouds. The think-alouds were analyzed using two a priori coding schemes, Coiro and Dobler's (2007) coding scheme and Information Literacy.

Analysis of the worksheets rendered the information in Table 1. While prior knowledge for the Tigers and Murlocs activities had a mean of less than three, which on a five-point scale is less than 50%, both mean comprehension scores were over 70%. Thus, although prior knowledge was low, participants were still able to find correct information with reasonable success.

| **Reading Tasks** | **Response** | |
|---|---|---|
| | Mean | Range |
| Prior knowledge about tigers [a] | 2.2* | 1-3.5 |
| Interest in Tigers [a] | 2.63* | 1-4 |
| Enjoy Tigers task [a] | 2.6* | 1-3 |
| Success at Tigers task [a] | 3.267* | 1-5 |
| Comprehension questions answered correctly [b] | 4.967* | 1.25-7 |
| Prior knowledge about Murlocs [a] | 2.5* | 1-4 |
| Interest in Murlocs task [a] | 2.63* | 1-5 |
| Enjoy Murlocs task [a] | 2.99** | 1-4 |
| Success at Murlocs task [a] | 3.89** | 1-5 |
| Comprehension questions answered correctly [b] | 5.183* | 3-7 |
| *N=15 **N=14<br>[a] Participants chose rank on a scale of 1-5, with 5 being the highest<br>[b] Total correct out of 7 questions; participants many not have completed all questions | | |

***Table 1*: Screenshot of WoWWiki Murlocs Website.**

Average scores across all measures were slightly higher for the games-related reading, but not high enough to be statistically significant. In Table 2, a sample of the participants' most recent grade in English is compared to their success on the worksheets. Participants' strategies for finding information and comprehending online texts were of central interest to our design.

| Participants* | Grade Level | Grade in English | Tigers Score | Murlocs Score |
|---|---|---|---|---|
| Jamie | 11 | A | 71% | 86% |
| Wes | 12 | A | 100% | 100% |
| Nicholas | 11 | B | 86% | 71% |
| Neil | 8 | F | 57% | 71% |
| Alex | 7 | B | 89% | 86% |
| Patrick | 9 | B | 71% | 86% |
| Jay | 7 | C | 71% | 46% |
| Jesse | 10 | A | 79% | 86% |

| | | | | |
|---|---|---|---|---|
| Derrick | 9 | D | 18% | 61% |
| Noel | 10 | A | 79% | 86% |
| Brandon | 11 | C | 71% | 75% |
| Todd | 8 | A | 86% | 100% |
| Christian | 7 | A | 79% | 57% |
| Zach | 7 | B | 71% | 57% |
| Connor | 12 | C | 43% | 43% |
| *Pseudonyms have been applied for this paper | | | | |

***Table 2*: Comparison of participants' last grade in English to succeed on worksheets.**

## Online Reading Comprehension

A coding scheme, similar to Coiro and Dobler (2007) (see Figure 1), was structurally altered from the original scheme in two ways: (1) a code to track when participants were critiquing the activity, and (2) a code to track mouse movement. The code for Prior Knowledge Search Engines was removed due to the fact that the study had been modified to exclude search engine activity.

| Coiro Dobler Coding Scheme | |
|---|---|
| **Category** | **Definition/examples** |
| **Inferential Questions** | |
| Inferential prediction (IP) | Makes, confirms, or adjusts a substantiated guess about what will come next, usually prior on clicking a particular link |
| Inferential prediction informed by literal matching (IP - LM) | Uses the words in the search question and seeks similar words within the hypertext to inform prediction about where information might be found |
| Inferential prediction informed by structural cues (IP-SC) | Makes connections between the way the website is organized and the type of information needed to inform prediction of where information might be |
| context cues by context cues (IP-CC) | Makes use of the descriptions, icons, graphics, and headings to inform prediction about where information might be found |
| Inferential prediction informed by anticipations across multiple levels(IP- ML) | Makes use of understanding that information may be "hidden" beneath several layers of links on a website to inform prediction about where information might be found |
| **Prior Knowledge** | |
| Prior Knowledge of the topic (PK-T) | Relies on domain specific knowledge and key vocabulary to inform reading choices |
| Prior knowledge of informational text structures (PK-ITS) | Uses knowledge about the ways informational text is organized on a website (e.g. titles, headings, description, captions) to inform reading choices |
| Prior knowledge of informational websites (PK-IW) | Uses ability to recognize and negotiate hyperlinks, navigational icons, interactive multimedia, and browser toolbars to inform reading choices |
| Prior knowledge of search engines (PK-SE) | Draws from experiences with the processes of browsing, selecting appropriate search engines, formulating keyword searches, negotiating subject hierarchies, and evaluating annotated search results to inform reading choices |
| Prior knowledge of website structure (PK-WS) | Uses ability to recognize the general structure of specific websites to inform reading choices |
| **Self-regulation** | |
| Self-regulation: Plan (SR-PL) | Thinks about multiple choices, sets a purpose, and prepares a plan of action that addresses questions such as: What do I need to find out? Where should I begin? Where do I want to go? What do I need to do first? |
| Self-regulation: Predict (SR-PR) | Makes, confirms, or adjusts a substantiated guess about what will come next, usually prior to clicking on a particular link |
| Self-regulation: Monitor (SR-MN) | Having selected a link with an anticipated result, the reader monitors the choice that has been made |
| Self-regulation: Evaluate (SR-ER) | Actively evaluates the relevance of a particular reading choice while considering: Does this choice bring me closer or further away from my goal? Is this a likely and appropriate place for the information I need? Should I move to a deeper level, select a related topic, revert back to an earlier location, or start all over again? |
| **Actions** | |
| Physical reading action: Keyword (PRA-K) | Employs physical reading actions using a mouse or keyboard to navigate Internet text - types in keyword or phrase; types in website address |
| Physical reading action: Click (PRA-C) | Employs physical reading actions using a mouse or keyboard to navigate Internet text - clicks search button; clicks back button; clicks hyperlink |
| Phsysical reading action: Mousing (PRA-M) | Employs physical reading actions using a mouse or keyboard to navigate Internet text - moves mouse over text, across the screen, or under text |
| Physical reading action: Scroll (PRA-Sl) | Employs physical reading actions using a mouse or keyboard to navigate Internet text - scrolls up, down, or across the page |
| Answer | States the answer to a given question |
| Writing | Writes notes or answers |

***Figure 1*: ORC Coding Scheme.**

Analysis of the coded transcripts (see Figure 2) revealed that the practices used by the participants for school and games websites are strikingly similar. An example of the practices demonstrated in the think-alouds would be a turn of talk like that of Wes, who said, "There is a thing at the top that uh…WoWWiki usually had sound clips and it's pretty, it's something like this. [clicks on a link and plays the sound file]." This demonstrates Wes's familiarity with WoWWiki as an informational website, which demonstrates his prior knowledge of informational websites. Similar examples can be found in the school examples.

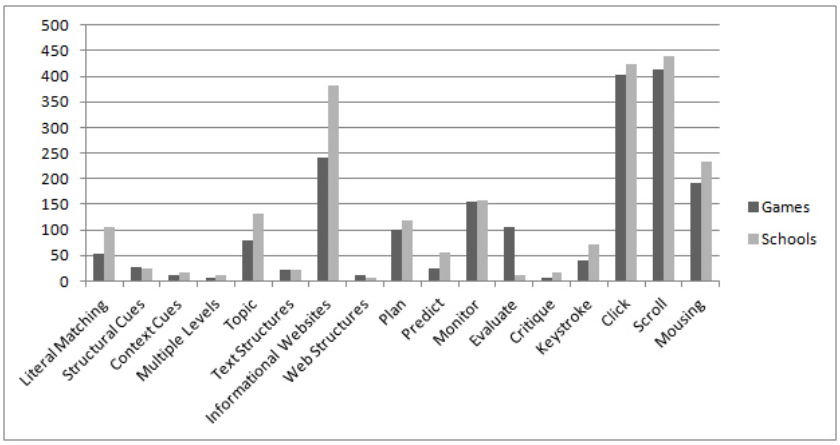


***Figure 2*: Graph of Online Reading Comprehension code occurrences for data set.**

## Information Literacy

An a priori coding scheme for information literacy (Martin, in progress), expanded the five-step process of information literacy (AASL, 1998; ACRL, 2000), was applied to the data (see Figure 3). More variability was added to original five factors in order to look at the minutia of information seeking, such as breaking information seeking into two subcategories of recognizing information need and determining the extent of information need.

| Information Literacy Coding Scheme | |
|---|---|
| **Code** | **Definition** |
| Recognize Information Need | To recognize needed information for a particular problem |
| Identify Information Needed | To identity information and resources that are necessary to fulfill the information need |
| Construct Strategy | To construct a strategy in order to locate and access needed information to fulfill the information need |
| Determine Extent of Information Need | To determine the extent of information needed to fulfill the information need |
| Disseminate Information | To disseminate information to others who have an information need or as a way of sharing results of the information literacy process |
| Organize Information | To organize retrieved resources and information for later use |
| Evaluate Information and Source | To evaluate information both for its applicability to fulfill the information need and the reliability of the source itself |
| Access Needed Information | To access needed information |
| Construct New Concepts | To apply prior and new information to construct new concepts or understanding |
| Use Information | To use information to fulfill the information need |

***Figure 3*: Information Literacy coding scheme.**

Preliminary analysis of the coded transcripts reinforced our findings that the information seeking practices within both game and school based texts are similar (see Figure 4). Further analysis can examine the correlations between codes and the participants' success in the activity.

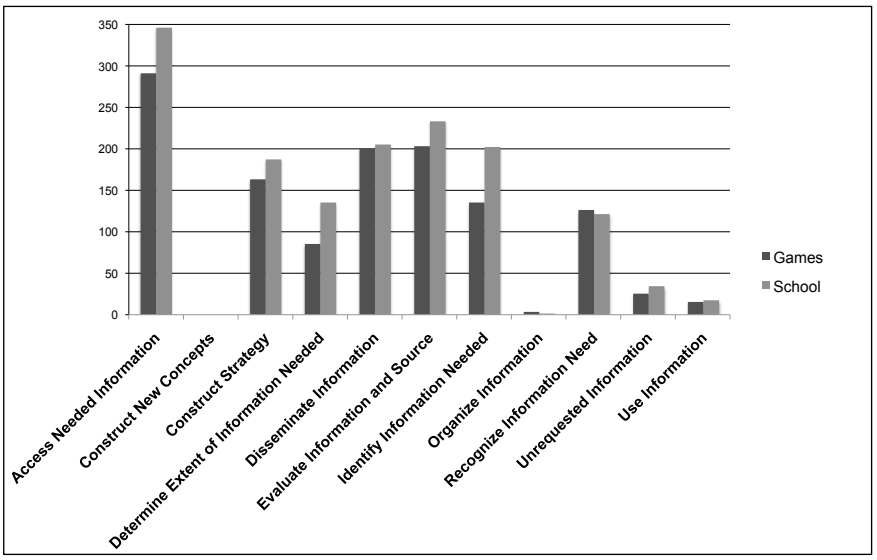


***Figure 4*: Graph of Information Literacy code occurrences.**

## Conclusions & Discussion

This study offers a look at the comparison between how people find different types of information from online resources and the types of online reading comprehension skills and information literacy practices that they employ, both for a more traditional informational, school-like topic such as tigers, and a more contemporary, games-related informational topic like murlocs in the *WoW* universe. One explanation for the similar approaches between school and leisure contexts could be that the tasks we have given them were essentially imposed queries. An imposed query is a question given to someone else to transact or resolve (Gross, 1995; 1999), as opposed to a self-generated query in which the information seeker has recognized an information need and has created the question they are seeking an answer for themselves. A major issue with imposed queries is that the person asking does not have context for the question; even if the context is explained to the person, it is not the same as having developed the need and then generating the question autonomously. Therefore, imposed information seeking is externally motivated and the questions are appointed or assigned (Gross, 1998). Self-generated information seeking is spawned by interest, the recognition of a need for information, and then the development of a question to fulfill the information need.

The imposed query prevented us from allowing the participants to make determinations about whether a site was credible and a sensible choice for the assigned questions. Instead, the text was selected for them, much like textbooks are selected by school boards and states rather than the students themselves. The constraints that this activity put on the natural information literacy processes of the participants was made apparent through their critique and push back on the rules that were designated for them. For example, one participant when asked to find answers to the questions on the worksheet told the interviewer, “That’s what Google’s for. Not this website.” Another said, “I'm tempted to almost just search on wowwiki ‘oracles.’ Can I do that? (clicks back space and then scrolls down) Or is that not allowed?” this was in regards to a question that many participants had trouble finding, partly due to the wording of the question. A third said, “Am I allowed to just go on Google and search for a sample of Murloc?” These three examples illustrate how the activity affects the participants’ natural online reading comprehension patterns, namely the approach they would use if they were looking for information on their own.

The critique given by the participants underlines how imposed query affects the online reading comprehension habits of an individual. Limiting the resources that are available to a person solving pre-structured problems changes the way they approach the problem, limiting their problem-solving abilities and online reading comprehension practices, just as seen in the imposed query research mentioned previously (Gross, 1995, 1998, 1999). Steinkuehler (2011) observed a similar phenomena in a study where she asked her participants to read texts that were at their grade level. In the first run of the study, participants performed nearly identically on a reading task with both a games and school-based text. In the second run of the study, participants selected their own game text, resulting

in marked improvement over their "school designated" reading level. The study demonstrates that students are able to read at a much higher reading level when choice and interest come in to play.

With the issue of imposed query creating similar results with the game and school activities and eliciting similar strategies in the coding schemes, we find that continuing analysis is needed. The analysis for this data set will continue using a finer grained analysis. This will look qualitatively at exactly what each participant did when they were successful in finding an answer and when they were unsuccessful in finding an answer. We will also look at the differences in practice that both the online reading comprehension and the information literacy schemes illustrate to create a comprehensive picture of seeking information in an imposed query context.

## References


Black, R.W. (2008). Covergence and divergence: Online fanfiction communities and literacy pedagogy. In Z. Bekerman, N. Burbules, H. Giroux, & D. Silberman-Keller (Eds.), *Mirror Images: Popular Culture and Education.* New York: Peter Lang.

Black, R.W. & Steinkuehler, C.A. (2009). Literacy in virtual worlds. In L. Christenbury, R. Bomer, & P. Smagorinsky (Eds.), *Handbook of adolescent literacy research* pp. 271-286). New York: Guilford Press.

Coiro, J. (2009). Rethinking online reading assessment. *Educational Leadership, 66*, 59-64.

Coiro, J., & Dobler, E. (2007). Exploring the online reading comprehension strategies used by sixth-grade skilled readers to search for and locate information on the Internet. *Reading Research Quarterly, 42*(2), 214-257.

Gee, J. (2003). *What videogames have to teach us about learning and literacy.* New York: Palgrave Macmillan.

Jenkins, H. (2006). *Fans, bloggers, and gamers: Exploring participatory culture*. New York: New York University Press.

Gross, M. (1995). The imposed theory. *Reference & User Services Quarterly, 35*(2), 236-43.

Gross, M. (1998). The imposed query: Implications for library service evaluation. *Reference & User Services Quarterly, 37*(3). 290-299.

Gross, M. (1999). Imposed versus self-generated questions. *Reference & User Services Quarterly, 39*(1), 53-61.

Lave, J. & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation.* Cambridge: Cambridge University Press.

Leu, D. J., Coiro, J., Castek, J., Hartman, D. K., Henry, L. A., & Reinking, D (2001). Research on instruction and assessment in the new literacies of online reading comprehension. In C. C. Block, S. Parris, & P. Afflerbach (Eds.), *Comprehension instruction: Research-based best practices* (pp. 321-346). New York: Guilford Press.

Leu, D. J. & Zawilinski, L. (2007). The new literacies of online reading comprehension. *Reading Online, 43*(1), 1-8.

Levy, P. (1997). *Collective intelligence: Mankind's emerging world in cyberspace.* Cambridge, Mass.: Perseus.

Martin, C. (in progress). A framework for information literacy in the 21st Century. Manuscript in preparation.

Steinkuehler, C. (2011). The mismeasure of boys: Reading and online videogames. *WCER Working Paper*. Retrieved from http://www.wcer.wisc.edu/publications/workingpapers/Working_Paper_No_2011_03.pdf

Steinkuehler, C. A. (2004). Learning in massively multiplayer online games. In Y. B. Kafai, W. A. Sandoval, N. Enyedy, A. S. Nixon, & F. Herrera (Eds.), *Proceedings of the Sixth International Conference of Learning Sciences* (pp. 521-528). Mahwah, NJ: Erlbaum.

Steinkuehler, C. (2007). Massively multiplayer online games as a constellation of literacy practices. *E-Learning and Digital Media, 4*(3), 297-318

Steinkuehler, C., Compton-Lilly, C. & King, E. (2009). Literacy practice & reading performance in the context of MMO games. To be presented at the Annual Meeting of the American Educational Research Association (AERA), Denver CO, April 30-May 4.

Steinkuehler, C. & Duncan, S. (2009). Informal scientific reasoning in online virtual worlds. *Journal of Science Education & Technology.* DOI: 10.1007/s10956-008-9120-8.

## Acknowledgments

This work was made possible by a grant from the MacArthur Foundation (Constance Steinkuehler, PI), although the views expressed herein are those of the authors and do not necessarily represent the funding agency's.