

# Connecting the Design of Collaborative Writing Tools with Writers' Practices and Epistemological Beliefs

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## ABSTRACT

In what ways do computational tools and social organization not only shape our practices, but also demand different ways of understanding the world? How does the design of the writing technologies we use affect the nature of the knowledge we produce in collaborative settings? My research examines the tools that mediate knowledge building activities in communities of collaborative authorship. Through a set of iterative studies that will be conducted over the next two years, I intend to answer questions about how the design of a new collaborative technology might transform the practices and beliefs of the people who use it.

## 1. THIS SIMPLY SHOULDN'T WORK

When use of a technology violates expectations in a dramatic fashion, one can be sure there is much to learn from it. Wikipedia ([www.wikipedia.org](http://www.wikipedia.org)) is perhaps the most prolific collaborative writing project ever sustained in an online environment, yet the fact that it works at all is somewhat surprising. It is a collaboratively written encyclopedia that is editable by anyone who has access to a computer with an Internet connection. Authors need not identify themselves in any way. If you know about something, simply click "edit" and add what you know. Spotted something wrong? Click "edit" and take it out. This radically open model of collaboration has raised as many eyebrows as it has questions, yet it seems to be working well.

In order to better understand how Wikipedia works, I collaborated with another graduate student in a study of collaborative practices on the site. Writing an encyclopedia is hard work. It requires commitment, motivation and knowledge. Interviews with established members of the Wikipedia community helped us answer the question, "How do Wikipedians learn to write an encyclopedia?" Through a process of gradual enculturation, newcomers become fluent in the practices of the community [3]. The design of the site plays an important role both by allowing observation of expert practice (past and present) and encouraging bold participation (just click edit!). Wikipedians' contributions are often motivated by perceived visibility and usefulness both for information seekers and for future writers to build upon. Wikipedia is a "natural" online learning community in the tradition of legitimate peripheral participation [6].

The powerful experiences that Wikipedians described in these interviews have generated new questions. How might the design of new wiki authoring tools encourage specific kinds of writing practices? Can we build collaborative technologies that encourage collaborators to adopt particular writing practices? How might our writing tools themselves encourage ways of thinking about authorship and reliability? What role does the design of collaborative technologies play in shaping our epistemological commitments?

## 2. BACKGROUND WORK

To investigate these questions, it is necessary to identify a set of target practices and a social environment in which these practices have meaning and value. I am targeting writing skills that are important in academic writing for high school students: careful citation and critical evaluation of sources. I propose that collaboration using well-designed wiki tools can help change students' writing practices and their beliefs about knowledge. Using specially-designed wiki software, students who participate in my studies will help build *Science Online*, an open-content, wiki-based science encyclopedia.

To begin to understand how wiki technology can best support the target practices of citation and critical source evaluation, I conducted an exploratory pilot study in a freshman-level undergraduate American government course in 2005. Students in the course were asked to write public policy position papers. They collaboratively found, shared and evaluated information resources about public policy issues and then used those resources to write policy position papers that were also shared and critiqued on a class wiki (CoWeb). (Details can be found in [5].) I found that the wiki technology introduced several barriers to collaborating in the desired fashion. Here I will briefly describe how each of these led to specific design directions for the new *Science Online* wiki.

In all, the students generated over 700 pages of content. One of the results of this information sprawl was duplicated effort when it came to entering citation information for resources. Evaluations of those resources were seldom aggregated in the same place, so little discussion developed. Worse, citations in students' papers were not linked to these comments, so there was no catalyst for reflection on the quality of these sources while writing. To address these problems, I am creating a set of new wiki tools that extend an existing wiki platform, MediaWiki.

MediaWiki already standardizes the relationship between content and discussion of that content. I am designing a set of citation tools that will also allow writers to easily save, share, discuss and cite information sources. Usually, the procedure for adding citations to articles in wikis involves manual formatting and synchronization between in-text citations and the bibliography. Automating parts of these tasks reduces mundane aspects of citation. In addition, each cited resource has a discrete page for evaluation and discussion, connected to all the articles that refer to it. In this way, works cited themselves become anchors for discussion in the new system.

The second major problem that I identified was that the teacher had difficulty assessing student work. The kind of radical collaboration supported by wiki does not harmonize with the dominant culture of individual assessment in schools. In order to

build a sustainable wiki environment for classrooms, I need to create tools that help teachers assess based on individuals' contributions to a collaboratively built artifact. I am currently conducting interviews with teachers who use wikis nationwide to help inform the design of a suite of teacher tools that will allow instructors to visualize student participation in a long-running, collaborative wiki project.

### 3. THE PROPOSAL

In October 2005, I proposed nearly three years of work, including a year-long longitudinal study to be conducted in a high school science class to examine the impact of participating in *Science Online* on students' writing practices and epistemological beliefs. Over the course of the 2006-2007 school year, I will closely follow the experiences of a group of students in an AP environmental science class who will use the *Science Online* site throughout the year. I have included a sample of my research questions:

*Q1. How does collaborative writing for publication influence students' writing practices? In particular, (how) does the authoring environment affect students' critical use of information sources in academic writing?*

Log-file analysis, retrospective verbal reports [4], and pre-and post-assessments will be used to investigate these hypotheses. Log files will allow me to examine students' actual compositions for evidence of critical sourcing. Naturally, the artifacts themselves cannot reveal process or context of the writing activity. By examining students' editing history together with participants during interviews, I will reconstruct the writing process as much as possible (As modeled in [8]). Pre- and post-assessments using document-based questions will allow me to establish changes in writing practices.

*Q2. To what extent do participants in Science Online come to regard themselves as potential critics and creators rather than consumers of scientific knowledge?*

Although writers are not often preoccupied with epistemology, the character of the activity system that supports publication is connected with writers' perceptions of reliability and truth [2]. In pre- and post- interviews with students, I intend to explore their ideas about what scientific knowledge is and how it comes to be. Because the interviewing process is open-ended and can be guided by the participant [9], it is ideal for investigating personal matters like epistemology and role perception.

### 4. A WORD ON METHODOLOGY

The belief that *context matters* has become axiomatic among researchers of computer-supported collaborative work. Many contextual approaches to researching collaborative computing have emerged to accommodate increasingly influential situated theories of human activity (e.g. [6, 10]). This commitment to understanding technological and social phenomena as complex systems has complicated the use of traditional methods and bred an interest in contextual methods of inquiry (see [7]). When new tools are developed with the goal of changing users' practices, it makes sense to examine these tools in the context of use and to

reflexively use such evaluation as an opportunity to improve the tool itself.

In the past decade, design-based research has drawn a great deal of attention from researchers of computer-supported collaborative learning (See [1]). Unlike many other methods of contextual inquiry, design-based research works from the assumption that the goal of design is *changing* users' practices, which makes it particularly well-suited for my purposes. It involves iterative studies in complex, messy research environments. In addition to allowing investigators to answer research questions, design-based research is expected to yield theoretical contributions, and generate useful guidelines for designing new technologies. I expect that my dissertation work will not only provide a theoretically-grounded description of changing practices in a community of collaborative authorship, it will also yield guidelines for the design of technologies that support collaborative writing activities in schools and elsewhere.

### 5. ACKNOWLEDGEMENTS

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