Developing Web 2.0 Tools for Support of Historical Inquiry in Social Studies

Glen Bull
Thomas Hammond
Bill Ferster

ABSTRACT. Web 2.0 tools offer new possibilities for teaching and learning. PrimaryAccess is a Web 2.0 tool designed for K-12 history education. PrimaryAccess shares many of the characteristics of other Web 2.0 applications, but its educational focus makes it different from generic Web applications. Our work developing and researching PrimaryAccess has helped identify the tensions and opportunities for integrating Web 2.0 tools into K–12 instruction. Web 2.0 tool development and use are best explored in a disciplinary context. Mishra and Koehler’s construct of Technological Pedagogical Content Knowledge (TPACK) provides a useful framework for this research and development process.

KEYWORDS. Web 2.0, social studies, TPACK

Mrs. Carlson’s students are creating Civil War documentaries using the same techniques that Ken Burns developed for his pioneering films.
on the same subject. The students’ documentaries are shorter—only 2 or 3 minutes in length. However, they draw on the same primary source documents—archival photographs, maps, illustrations, manuscripts, and other artifacts contemporary with the era.

The previous day, teams of students sorted through sets of online archival documents and wrote out arguments in favor of secession. Each team adopted one of several perspectives: states’ rights, economic self-interest, cultural preservation, and similar views. Today, they will view movies produced by another classroom, that argue the opposite point that the Union must be preserved. Mrs. Carlson explains that the students are to watch carefully and critique the perspective presented—is the argument based on the Constitution, northern economic interests, or morality? Tomorrow, the teams will select a contrasting video and create a unified documentary that draws upon the two movies to explain the escalating tensions that led to the Civil War.

This vignette describes a teaching strategy that is familiar to many social studies educators. Students work with primary sources and adopt a perspective on a historical event. They then work through stages of production, resulting in a final product that describes the event and multiple perspectives surrounding it. This sequence of actions could have taken place at any time since the advent of the New Social Studies in the 1960s (Nelson, 1992).

The technology used in the lesson, however, highlights a recent shift in what K–12 students and teachers are able to do. One aspect of the activity draws upon a mature technology: digital primary sources. Since the inception of the World Wide Web, historical institutions, such as the Library of Congress and the Smithsonian Museum, have been digitizing millions of historical artifacts—including maps, documents, photographs, and artwork—and making them available on the Internet (McMichael, Rosenzweig, & O’Malley, 1996). Over the ensuing decade, many social studies teachers have integrated these primary sources into their classroom instruction (Friedman, 2004; Hicks, Doolittle, & Lee, 2004).

While the presence of digital primary sources in the activity is familiar, what the students did with these resources is new. They created an online movie. The application used by Mrs. Carlson and her students is PrimaryAccess (http://www.primaryaccess.org), a Web-based tool designed for social studies instruction (Ferster, Hammond, & Bull, 2006). Using PrimaryAccess, students can assemble a montage of archival images, compose a script, and record a voice-over narration. The only software required is a Web browser.
PrimaryAccess is an example of a Web 2.0 technology. The term Web 2.0 encompasses both a series of technological innovations and ways of thinking about collaboration and user participation in the technological environment created by these innovations. Technology publisher Tim O’Reilly coined the term in 2004 to describe an inflection point in the evolution of activities taking place on the Internet. A concept map that he published the following year illustrated some of the outcomes and capabilities that collectively became known by the term, Web 2.0 (O’Reilly, 2005). The first and most important was that it became possible to develop lightweight applications that used the Web as a platform. Consequently, small teams of one or two individuals could develop applications used within a Web browser without the necessity of downloading and installing software.

The decrease in barriers to development and distribution of applications that lived on the Web meant that many more applications could be created, triggering an explosion in creativity. It also meant that new business models could be explored, resulting in the availability of many of these applications at no charge to the user. The decreased cost and increased accessibility lowered the barriers to authorship. This triggered a secondary effect, leading to production of media of all kinds by users. The rise of user-generated content was reflected in text formats (Blogger), photo sharing (Flickr), audio sharing (podcasts), and video sharing (YouTube).

Proliferation of user-generated media led to a tertiary effect, a culture of sharing and remixing. Because the media produced were visible and available on the Web, it became common to appropriate elements of other media and remix them to form a new work. Thus, bloggers commonly linked to and quoted from one another’s works and were facilitated by tools such as trackbacks. Sampling and remixing had been an element of audio culture even before the Web, and the increased ease with which this could be done facilitated the trend. Still images and video were similarly remixed and embedded in other works.

The proliferation of content contributed by users proved to have value. Content had always been the primary asset of media companies and publishers. Books, articles, and films had previously been acquired through contracts with users. In the Web 2.0 environment, users contributed content in return for use of applications and storage space.

The overall effect can be summarized as follows:
1. Web as a Platform
   Lower barriers to development of Web-based applications led to
2. User-Contributed Content
   proliferation of user-contributed content resulting in
3. Sharing and Remixing
   a culture of sharing and remixing,
4. Economic and Educational Value
   producing value for developers.

Web 2.0 tools allow applications to be developed more quickly and economically than before. At the same time, the cost of online disk storage has dropped dramatically. Further, the content generated by users creates economic value for Web 2.0 developers. The rise of YouTube illustrates all four trends. Three friends working at PayPal conceived the idea and registered the site in 2005. By January 2006, less than a year after the site was registered, users were watching 25 million videos per day. Google acquired YouTube in November 2006 as a result of the value of content contributed by users (Cloud, 2006). The economic value of user-contributed content has fueled advances in Web 2.0 development tools, which in turn benefits developers working on nonprofit educational initiatives such as PrimaryAccess.

WEB 2.0 CHARACTERISTICS OF PRIMARYACCESS

PrimaryAccess illustrates several key characteristics of the kinds of instructional systems that can be designed in a Web 2.0 environment. It is designed specifically to facilitate historical inquiry in social studies classes.

1. Web as a Platform
   Because it is now possible to develop lightweight applications that use the Web as a platform, small teams with complementary expertise can work together to produce server-side programs. PrimaryAccess, like many other Web 2.0 tools, was produced by a small team of developers. It uses content already available on the Web, such as images in online archives. Users can incorporate these images into a digital documentary using only a Web browser.
2. User-Contributed Content
   PrimaryAccess provides tools that allow teachers to annotate images and create lesson plans based on primary source documents.
Resources created by one teacher can be freely shared with other educators. Similarly, student-created documentaries that a teacher judges to be exemplary can then be published on the Web and shared with other classes.

3. **Sharing and Remixing**

Sharing and remixing are some of the most important attributes of the Web 2.0 culture. In PrimaryAccess, annotated images and resources developed for one lesson can be shared and remixed by students to tell a story from different perspectives.

4. **Economic and Educational Value**

In a Web 2.0 environment, software gets better as more people use it as a result of user sharing, contributions, and remixing. In the case of commercial ventures, these contributions generate economic value. In the case of nonprofit initiatives such as PrimaryAccess, the sum of contributions by users—teachers and students—is of educational value.

In addition to these core characteristics of Web 2.0 technologies, PrimaryAccess also reflects two other patterns typical of Web 2.0 applications.

**Software Above the Level of a Single Device**

In a prior era, PrimaryAccess might have been constructed as a desktop application installed individually on each computer. In the Web 2.0 era, the pieces of the application and the resources accessed can be distributed across several different servers. In this instance, the PrimaryAccess Web application includes an audio-processing application on one server, a database on a second server, and the user-interface on a third server.

**On-Going Enhancements**

Because Web 2.0 tools run on server-side programs, they can be easily updated, allowing new features to be readily added. The developers of the first Web-based application, Viaweb, were able to incorporate enhancements more rapidly than developers of conventional applications (Graham, 2004). The cost of distribution of new versions essentially becomes zero. Based on feedback from collaborative partners and users, PrimaryAccess has been updated and improved many times since its inception.
APPLICATION OF WEB 2.0 TECHNOLOGIES TO SCHOOL PRACTICE

As the foregoing illustrates, the emergence of Web 2.0 offers opportunities for new ways of thinking about teaching and learning in schools. The Pew Internet and American Life Project tracks changes in society and culture over time. The transition to what has been termed a participatory culture as a result of Web 2.0 applications has affected many sectors of life, including commerce, journalism, entertainment, and social life (Jenkins, 2006). It also has affected the ways in which students interact and complete work outside of school. For example, students now use the Internet to acquire information for assignments more often than they physically go to the library (Jones & Madden, 2002).

In contrast, the effect of emerging technologies on practice within schools and universities has been less pronounced. Wensch, a professor of cultural anthropology, is conducting a series of studies of Web 2.0 practice in his digital ethnography class at Kansas State University. Students in his class used Web technologies to collaborate on a survey used as the basis for a report titled A Vision of Students Today. Their findings were presented in the form of a video posted on YouTube (http://mediatedcultures.net/ksudigg/index.php?paged=2).

This exercise similarly illustrates several characteristics of a Web 2.0 environment. Freely available Web-based tools were used to collaborate, acquire data, remix and reinterpret data, and report the results in a media-rich format. Further, by sharing the results on the Web, the class was able to establish a dialog with a larger group that extended beyond the classroom. Professor Wensch commented that the conclusion he hoped might be drawn from the video was, “What are we doing to change how we are teaching?” in response to the changes that are occurring throughout society. In a blog statement, he clarifies that he is referring not only to changes involving technology, but also changes in teaching practice that may not use any technology at all (http://mediatedcultures.net/ksudigg/?p=121).

As Wensch observed, employing Web 2.0 tools in a classroom setting is different from working in this context outside school (i.e., in a business or social setting). One obvious difference is that specific instructional objectives are associated with school use. K–12 social studies instruction is a constrained environment (Cornbleth, 2002); students studying U.S. history of the 1920s and 1930s may or may not be interested in the Harlem Renaissance, John Steinbeck, and F. Scott Fitzgerald, but they must learn this material to meet standards and pass high-stakes examinations. This
places bounds on the creative choices; these expectations do not exist for Web 2.0 social media developed outside of school.

Another difference may be less obvious—participation inequality. A frequent pattern in Web-based communities is that a small group of frequent contributors account for the majority of contributions. Participation inequality reflects the fact that 90% of the members of a large-scale Internet community are consumers, 9% contribute occasionally, and 1% contribute frequently (Nielsen, 2006).

In a classroom, of course, it is desirable for all students to contribute equally. In the instance of PrimaryAccess, the goal is for every student to successfully create a digital movie related to the instructional objective. Hence, one design goal for PrimaryAccess is to reduce the overhead or friction that serves as an impediment to construction of digital documentaries.

A final barrier to developing useful classroom strategies for Web 2.0 tools is a persistent issue from earlier periods of development in educational technology: the use of generic technologies to address content. The academic culture, traditions, and pedagogical goals in each content area are different; using the same technology (e.g., instructional films) the same way (to present content) across all content areas may not be appropriate.

Instead, effective use of technology in curricular instruction requires consideration of technology, pedagogy, and content (Thompson & Mishra, 2007). Examination of the fit between technologies and the demands of specific content areas may suggest different purposes for different disciplines. Effective use of digital video, for example, may differ across different content areas, as suggested in Table 1. Because the instructional objectives differ across disciplines, the teaching strategies for effective use of digital video may also be specific for each discipline (Bull et al., 2007). Because Web 2.0 is a flexible development environment, designers may be able to shape the tools to the specific demands of content instruction and

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K–12 curricular environments. The flexibility of Web 2.0 development and use may allow for more productive integration of technology into content instruction than has previously been observed (Dynarski et al., 2007).

**DESIGNING A WEB 2.0 APPLICATION FOR SOCIAL STUDIES**

Chris Anderson, editor of *Wired Magazine*, identified another characteristic of the Web 2.0 environment that he termed the *long tail* (Anderson, 2006). Given a sufficient online population, even niche audiences will find a following. In other words, it is no longer necessary to solely focus on the lowest common denominator to reach the greatest number of people from the start.

In that spirit, PrimaryAccess was developed to address the needs of social studies classes in a school environment. Primary source documents are at the heart of historical inquiry by scholars. Consequently, the application was designed around a database of links to primary source documents in online archives.

The first task was to work out the environment for the core functionality required to create a digital documentary. A media browser provides access to an archive of annotated links to primary source documents. A drag-and-drop interface allows students to mix photographs, maps, and documents with their script in an online story editor. A media mixer allows students to edit and narrate their videos. An embeddable media player allows these digital movies to be shared and remixed online.

There are two significant instructional affordances that were designed specifically to facilitate historical inquiry.

1. **Links to Annotated Primary Source Documents**
   The media browser provides annotated links to online primary source documents. As teachers identify and annotate primary source documents in specific eras, these resources become available to other teachers. Teachers have the capability to select the exact resources that will be made available to students for a given project, allowing them to align resources with historical objectives.

2. **An Integrated Script Editor**
   In contrast to other digital video editors, the script editor in PrimaryAccess is incorporated into the application itself. This allows students to create a historical narrative and place an image beside
each paragraph to form a digital documentary. The application is constructed so that the student must write before creating a movie.

Dual coding theory (Paivio, 1986; Sadoski & Paivio, 2000) suggests that a verbal and a visual system coexist in the mind and are used to interactively process information perceived through the senses. This theory predicts positive effects from instructional formats that combine visual and textual input in appropriate ways. The concept of multiple literacies also predicts an interactive effect when the two literacies are combined (e.g., Hobbs, 2006). Creation of a tool in which students explicitly link written work with visual material in the process of developing a digital documentary provides the opportunity to assess these theories and their effect on both short-term and long-term recall and understanding.

In addition to the design choices made for instructional purposes, PrimaryAccess also addresses an important constraint for K–12 curricular materials: copyright. Copyright is frequently an issue when sharing and remixing take place. Although guidelines exist (Langran, Bull, & Langran, 2005), the extent of fair use in educational settings has not yet been clearly defined. To address the issue of copyright, in PrimaryAccess, primary source documents are accessed through links to digital archives at other locations. When a student constructs a digital documentary, it does not have a physical reality until the “Play” button is pressed. At that point, the PrimaryAccess engine assembles the resources across the Web and combines them. The digital movie that results does not have a physical existence before that point or after—it is just a series of discrete parts that are combined and exist only when the “Play” button is pressed. This approach allows the copyright holder to retain control, removing access to the resource if they choose. However, this design characteristic increases the importance of working with collaborative partners whose holdings will remain stable.

LESSONS AND REFINEMENTS FROM THE FIELD

The design stage is the beginning of the development process. Once tools or models for instruction are used in the field, user feedback, bug reports, feature requests, and moments of insight will trigger new rounds of development and refinement. PrimaryAccess, like other Web 2.0 tools, has incorporated numerous enhancements since its initial deployment. This process is ongoing. The application, in effect, serves as a laboratory for exploring ways to effectively support historical inquiry in a Web environment.
One universal observation from field work with teachers is that student creation of digital documentaries can take more instructional time than more traditional activities. The recording of the voice-over narration can be particularly time-consuming. We have observed that any use of collaborative media in the classroom will inevitably require more classroom time than instruction that does not involve technology. The justification for this use must rest on the belief that students will gain a deeper, more lasting understanding of the content than if otherwise employed with sufficient skill. One set of quasi-experiments suggests that student authorship of digital documentaries may improve students’ long-term retention of historical content knowledge (Hammond, 2007).

Another insight from pilot research process was the significance of teacher feedback. Because students’ work resides on the Web, the teachers were able to observe students’ work at the end of each session and provide comments linked to the draft script (Hammond, 2007). In pilot studies, some teachers proved to be more skilled in doing this than others. There were differences in both the frequency and quality of comments. Some teachers provided more frequent and more specific comments than others. These comments correlated with students producing more well-developed and accurate documentaries. We speculate that specific comments will prove to be more effective than generic comments (such as “Good job. Keep up the good work!”) in facilitating development of digital movies that support historical inquiry.

Finally, the growth of images, activities, and movies assembled through PrimaryAccess has demonstrated the power of user-contributed content. At the time of this writing, more than 12,000 images have been cataloged in PrimaryAccess. Teachers have created more than 2,000 activities, and teachers and students have created more than 10,000 movies. This process of creation has been made possible through the concept of shared benefit. An image cataloged by one person is available to all; an activity created by one teacher can be modified and reused by another.

In response to these observations, a series of features has been added to PrimaryAccess. The audio-recording features were expanded to include editing capabilities. Teachers and students were also provided with a mechanism to skip recording entirely and merely link to an external audio source. The text comments were supplemented with audio comments, allowing a teacher to provide feedback via audio or for students to make a “director’s cut” of their movie, talking over their previous narration. The timeline feature was expanded, and an outlining feature is currently being developed. A feedback and commentary feature is under development. A requested
feature that will be incorporated in the future is the ability to stitch together multiple movies into a single sequence, creating a playlist of digital documentaries.

**SUMMARY**

The emergence of Web 2.0 presents a challenge and an opportunity for education. Our work with PrimaryAccess has allowed us to explore issues relevant to Web 2.0 environments in a K–12 curricular context by focusing on one content area, history. PrimaryAccess shares many of the characteristics of other Web 2.0 applications, but its educational focus makes it different from generic Web applications in three important respects.

First, PrimaryAccess was designed for K–12 instructional use. While some Web 2.0 technologies have been adapted for instructional environments (e.g., 21 Classes provides a structure for classroom blogging), many are either not appropriate for young learners (YouTube.com) or not appropriate for the K–12 curriculum (Wikipedia).

Second, PrimaryAccess was developed for a specific academic discipline, history. While other Web-based video editors have emerged (JumpCut), they do not include features specifically designed for history education, such as timelines, contextual information, and an outlining feature. PrimaryAccess allows students to engage in historical inquiry through the process of creating documentary videos, and it also makes it possible for students to access, adapt, and remix primary source documents.

Finally, PrimaryAccess is not designed as a stand-alone learning experience. The classroom teacher remains central to students’ documentary creation process by designing activities and providing formative feedback throughout. Accordingly, the teacher can fully use his or her technological, pedagogical, and content knowledge while guiding students through the digital documentary process. PrimaryAccess can help scaffold students’ efforts as they create, share, and remix interesting and compelling media while facilitating historical inquiry.

Web 2.0 technologies enable new models of teaching and learning. This can include innovations, such as PrimaryAccess, that are intended to move education beyond a content-transmission model and encourage development of deep conceptual understandings. Effective uses of these applications require skill and pedagogical expertise on the part of the teacher. Consequently, the role of the teacher remains central in this process, which
may be the most important design lesson to consider in designing Web 2.0 instructional environments for K–12 schools.

REFERENCES


