THIS IS A POST-PRINT OF AN ARTICLE THAT APPEARED IN:

Hicks, Alison and Alison Graber. "[Shifting paradigms: Teaching, Learning and Web 2.0](#)"
Reference Services Review 38:4 (2010): 621 -633.

Title: Shifting paradigms: Teaching, Learning and Web 2.0

Autobiographical Note:

- Alison Hicks
- University of Colorado, Boulder
- Alison.hicks@colorado.edu
- University Libraries, 184 UCB, University of Colorado, 1720 Pleasant Street, Boulder, Colorado, 80309
- Alison Hicks is the Romance Language librarian. She has an MA from the University of St Andrews, UK, in French and Spanish and an MSIS from the University of Texas. She researches technology and foreign language librarianship.

- Alison Graber
- University of Colorado, Boulder
- Alison.graber@colorado.edu
- University Libraries, 184 UCB, University of Colorado, 1720 Pleasant Street, Boulder, Colorado, 80309
- Alison Graber is a Social Sciences Reference and Instruction librarian. She is the bibliographer for Education, Anthropology, and Juvenile Literature. She has an Ed.D in Curriculum and Instruction from Northern Arizona University and a MLS from Texas Women's University. Her research focuses on reference and instruction in the social sciences including the information needs of students and faculty in the School of Education.

Abstract:

- Purpose: To re-conceptualize Web 2.0 tools within the intellectual and theoretical frameworks currently driving changes in academic learning communities and to explore the effect of this paradigm shift on academic libraries.

- Approach: The authors explore an intellectually rather than technologically driven definition of Web 2.0 and its potential effect on teaching

and learning in libraries. Reflections are based on paradigm shifts in learning theories implicit in the adoption and implementation of Web 2.0 technologies. The paper also discusses applications of Web 2.0 designed to improve student and faculty engagement in the research process.

- Findings: This article encourages librarians to think beyond the technology and to consider how Web 2.0 can support intellectual teaching and learning objectives in an academic library.
- Practical implications: The paper discusses applications of Web 2.0 designed to improve student and faculty engagement in the research process.
- Value: This paper offers insights into rethinking current conceptions of Web 2.0 based on participation in and collaboration with faculty during a summer institute. It provides a common conceptual framework of teaching and learning theory for librarians to use when implementing Web 2.0 tools and applications.

Keywords: Web 2.0, Information Literacy, Learning theory, Academic Libraries, Scholarship of Teaching and Learning

Classification: Conceptual Paper

Introduction

In this conceptual paper, we suggest that the rapidly changing structure and creation of information necessitates a dynamic technological and philosophical change of direction in how libraries implement new technologies. We propose that libraries expand their concept of Web 2.0 to encompass the greater sociological and pedagogical changes that can be leveraged by Web 2.0 applications (McLoughlin and Lee, 2008). First, the authors explore various definitions of Web 2.0 as well as the evolving perspectives on student learning impacting instruction in higher education. We discuss how the integration of appropriate pedagogies and Web 2.0 tools can help create and support collaborative student and faculty communities. Finally, using concrete examples of projects implemented at the University of Colorado at Boulder, we discuss and reflect upon the impact of this new paradigm of knowledge creation and learning. We conclude that it is only by rejecting the simplistic idea that Web 2.0 is solely a technological phenomenon without pedagogical implications that libraries will be able to embrace, implement, and support the changing paradigms of information, knowledge and pedagogy in the multiple contexts of academic libraries.

The term Web 2.0 is generally associated with a specific subset of applications. Facebook, Twitter, and Wikipedia are all commonly identified as representative of the new wave of technology while the Encyclopaedia Britannica and Microsoft Outlook are taken to portray old, outdated information tools. It may be harder to determine a comprehensive definition, but there is an "intuitive recognition" of which sites form the popular conception of Web 2.0 (O'Reilly, 2005). Tim O'Reilly first coined the term Web 2.0 in 2004 as a conference marketing phrase. Since then, Web 2.0 has focused the conversation about the future of the web and has successfully moved from tech-speak to mainstream. Library conferences, journals, websites and library catalogs became "twopointo-ified" (Hicks, 2009) and Library 2.0 was hailed as the modernizer of information services. Yet the backlash against Web 2.0 started as early as 2005. Russell Shaw neatly surmised that Web 2.0 was not as tidy and integrative as had been portrayed, and consisted of "various standards and technologies, some compatible, some not. Some revolutionary, some evolutionary, some impractical. Some are collaborative, others are highly competitive with each other" (Shaw, 2005). In other words, the new technologies were still governed by many of the old rules, including commercial viability and conflicting standards and designs. Libraries had been swift to see the potential of these tools, yet they introduced assessment slowly and a review of the information literacy literature shows little evidence of the impact of these tools on learning (Cohen, 2007; Luo, 2009). In the academic world, Randy Bass and Brett Eynon remonstrated against the urge to jump on board the "unstoppable wave of digital innovation and excitement" (Bass, 2009). They pointed out that ten years ago, educators had been encouraged to adapt to the "new forms of language, communication, and style [that] are shaping emerging generations" by adopting powerpoint and list-servs (Bass, 2009).

Web 2.0, therefore, creates a strange paradox. On the one hand, Facebook, with 100 million users, and other Web 2.0 sites constitute the most popular pages on the web (Washington, 2010). On the other hand, the implementation of Web 2.0 applications has yet to demonstrate an impact on student learning (Luo, 2009). The phrase "creepy tree house" (Stein, 2008) has even been established to describe the way that educators try and connect to a student's personal online space, "Though such systems may be seen as innovative or problem-solving to the institution, they may repulse some users who see them as infringement on the sanctity of their peer groups, or as having the potential for institutional violations of their privacy, liberty, ownership, or creativity". In the face of this reaction, the value of these new technologies are being questioned. However, a deeper exploration of the relationship between technology and pedagogy is needed to truly harness the potential of Web 2.0. Researchers in education, the Scholarship of Teaching and Learning, and library science are beginning to explore the implications and consequences of implementing this technology (Bass 2009, Luo, 2009; McLoughlin and Lee, 2008).

What is Web 2.0?

The internet has revolutionized the concept of information. Ten years ago, finding information was a lengthy, convoluted process. Today, not only do individuals and computers produce thousands of gigabytes of information a minute, but this information is also networked collectively, which further increases the amount of information produced. (Wesch, 2008). A very large proportion of human knowledge can thus be accessed within seconds by anyone and through a variety of devices. And, as information grows and becomes more accessible, the concept of knowledge shifts too. Unlike Web 1.0, which was akin to a source or means of communicating information, Web 2.0 provides a way to create information, and consequently knowledge. We are enveloped in a "cloud of ubiquitous digital information where knowledge is made, not found and authority is continuously negotiated through discussion and participation" (Wesch, 2008). In other words, "knowledge is decentralized, accessible and co-constructed among a broad base of users" (Greenhow, 2009).

Web 2.0 allows us to participate in this cloud, through five main characteristics, Collaboration, Creativity, Conversation, Community and Control (Hicks, 2009). It is a read and write web where "users are as important as the content they upload and share with others" (Cormode, 2008). The participatory and open nature of Web 2.0 gives us the capability to **collaborate** with new knowledge and to create empowering connections and **community** between people. It allows us to **creatively** use and reuse material in novel ways because there is not one centralized power **controlling** the web. Finally, and most importantly, Web 2.0 changes us from passive to active information consumers, allowing our online voice to be part of the **conversation**. The way we produce, store and consume information has changed, and we need Web 2.0 in order to interact with and to direct the future of scholarship.

Viewed from this perspective, Web 2.0 is far more than just a technology. Web 2.0 has a gravitational core of principles and practices that unite sets of disparate websites that demonstrate some of these characteristics. (O'Reilly, 2005). The gravitational core in this diagram is not Wikipedia, or Twitter or Flickr- rather, it is a set of philosophical competencies, of information and knowledge democratization that promote "changes in behaviour and expectation, changes that shifts in technology simply brought within reach of everyone" (Miller, 2006). To quote Ian Davis, "Web 2.0 is an attitude, not a technology" (Davis, 2005).

For some, the technology is not even half as exciting as the sociological and philosophical change. Miller states that on the one hand, Web 2.0 should be considered more as evolutionary because it builds upon traditional web standards of browsers and html standards. Where Web 2.0 is revolutionary, he continues, is where it challenges

"outdated attitudes towards the rights of the user, customer choice and empowerment." (Miller, 2005). Claire Gunnels argues that the epistemological shift is similar to the effects of the introduction of Diderot and d'Alembert's Encyclopédie and the subsequent dissemination of knowledge during the Enlightenment (Gunnels, 2007). For Michael Wesch, the cultural anthropologist, "The technology is secondary. This is a social revolution, not a technological one" (Wesch, 2009).

There is, of course, a technological aspect to Web 2.0. Cormode and Krishnamurthy suggest that on a basic level there are three recognizable shifts involved from the old web to the new web. The differences are "technological (scripting and presentation technologies used to render the site and allow user interaction); structural (purpose and layout of the site); and sociological (notions of friends and groups)" (Cormode, 2008). It is the combination of these three shifts that permit us to fundamentally change how we interact with the web. Yet we remain transfixed with the idea that Web 2.0 is solely a technology. Web 2.0 is Facebook rather than Facebook is Web 2.0. By our constant focusing on the more visible technological and structural changes of Web 2.0, the sociological change and the exciting potential of the collaborative, participative web is lost in the distracting web noise.

Therefore, on closer examination, the effects of Web 2.0 are wide reaching. It connects us to the new information realities. It allows us to make sense of the thousands of gigabytes of information that are produced every day, making information relevant and meaningful in a world where the dynamics of knowledge have changed. However, by considering Web 2.0 as a state of mind, rather than just a technology, it is evident that Web 2.0 has many more possibilities. It is only by advancing beyond the technolust that has characterized our early interactions that we can examine the real changes and potentials that these new technologies have engendered.

Web 2.0 and Higher Education: Changing Approaches to Learning and Teaching

The implementation of Web 2.0 technologies in academic contexts raises questions about the mismatch of the existing traditional learning paradigm with the new pedagogies inherent in Web 2.0 tools (McLoughlin, 2009). Until recently, higher education embraced a teaching model based on traditional conceptions of learning. This traditional learning paradigm focused on how the environment, which included teachers' actions, led to the desired response in students consisting of observable changes of behavior that were maintained over time. (Shuell, 1986). For example, a well structured lecture led to students "learning" the material as demonstrated by the correct responses in an exam. Internal variables unique to the learner such as prior knowledge, engagement, and motivation were not part of this traditional learning model and learning. Cognitive psychologists, however, began to question this learning model in the 1960's and 1970's,

shifting their focus from the environment and the products of learning to the processes of learning. Learning became "active, constructive, cumulative, and goal oriented" (Shuell, 1986). Learning was no longer just an observable change in behavior. Learning models now included a series of complex internal processes involving "invisible" changes in cognition and meaning that resulted in observable behaviors. Students' prior knowledge, motivation, and meta-cognition became the focus as control of learning shifted from the instructor to a shared process involving both the instructor and student. In addition learning was not seen as an individual act but a process that is socially situated in learning communities that engage in conversation and collaborative work.

Nonetheless, although learning is now acknowledged as a complex cognitive process, traditional learning models still provide the framework for much instructional and web design in higher education classrooms and libraries. Just as the phrase Web 2.0 is often overused and misinterpreted, "there continue to be gaps between the espoused and enacted pedagogies of teachers" (McLoughlin, 2008). Often, traditional instructor centered pedagogies are simply directly replicated in an online format, thus perpetuating outdated models of teaching and learning and failing to adapt to new beliefs and attitudes. For instance, designing the perfect web site without paying attention to usability studies that provide information on how the user constructs knowledge from the website is relying on a traditional model of learning. Even the terminology we use to describe learning opportunities, such as "exposing" students to ideas and "repackaging" content using new technologies assumes a passive learning relationship where knowledge can just be transferred or transmitted to another individual.

Shifting technology and a growing interest in learning activity paralleled and intersected with many of the developments in constructivist learning theory. The evolution of Web 2.0 is one example of a shift that created many opportunities for constructivist learning. Increased accessibility to information and subsequent changes in the use and creation of knowledge have changed the way we communicate and interact. With Web 2.0, the emphasis is on "participating, doing and experiencing rather than knowing what or where" (McLoughlin, 2008), a constructivist approach. In the Visible Knowledge Project (VKP), a project focused on the Scholarship of Teaching and Learning (SOTL), Randy Bass and Brett Eynon investigated the impact of the implementation of new technologies on learning by systematically studying the results of innovative academic teaching projects. Their goal was twofold. Firstly, they wanted to assess the use of new Web 2.0 technologies in teaching. Secondly, however, they were interested in looking beyond the technology and seeing how these new tools could affect and measure the teaching and learning process. They were specifically interested in capturing visible evidence of the learning process, and, in particular what they termed "invisible learning".

Bass (2009) used his VKP findings to show how social media enabled three major components of learning: adaptive learning, embodied learning, and socially situated learning. The adaptive component of learning provides opportunities for students to apply skills and knowledge in flexible and creative ways. Are learners able to transfer new skills and understandings to different contexts and situations? This also acknowledges the difference in approach by novices and experts, making the knowledge and processes used by experts visible to students. Embodied components of learning include aspects beyond cognition. Students bring affective and motivational elements that influence the learning process. Embodied components of learning accept and build upon the prior knowledge that students bring to any learning experience. Finally, this model acknowledges that learning is socially situated and collaborative happening within learning communities. Instructional design needs to incorporate different social structures that enable student conversations with peers as well as helping them to communicate and connect with specific audiences. Providing opportunities for students to work in collaborative groups during information literacy instruction sessions creates time for peer to peer conversations about research and information sources. Students can share prior experiences and knowledge with the small group as well as the whole class, providing a window into their current understanding of the research process.

The importance of social interaction and context are key. Greenhow (2009) proposes broadening a conception of classrooms "which posit learning as located in contexts and relationships rather than merely in the minds of individuals, sociocultural and sociohistorical theories are based on the assumption that learning derives from participation in joint activities, is inextricably tied to social practices, and is mediated by artifacts over time." This leads to the development of learning ecologies that acknowledge that learners create and participate in multiple learning contexts and that "overall, learning can manifest itself across settings, and informal or formal crossing of boundaries might enhance learning." (Greenhow, 2009). This has implications for academic libraries, which need to expand the conception of learning and instruction beyond information literacy sessions. Every interaction with library staff, OPAC, and website is part of our user's learning ecology. As we implement new services and technologies we need to consider how this impacts what users learn about accessing and evaluating library information sources.

Scholars in higher education have been questioning the traditional learning paradigm since the 1990s. (Boyer, 1990). Bass, (1995) in a reflective article on his own teaching wrote, "It takes a deliberate act to look at teaching from the perspective of learning." Faculty were beginning to examine their teaching and, subsequently, student learning to create a research agenda focused on learning and teaching in higher education. The term Scholarship of Teaching and Learning (SOTL) arose in the late 1990's from the work by the Carnegie Academy for the Scholarship of Teaching and Learning. (CASTL) Based on

Charles Boyer's work, it suggested a reevaluation and refocusing of faculty research. Boyer proposed an acceptance of faculty research agendas focused on an examination of the learning and teaching in faculty classrooms (Boyer, 1990). The gradual acceptance of by faculty and administrators engaged in SOTL research created a shift in learning paradigms, moving faculty from traditional teaching models to cognitive constructivist models that focus on student learning and understanding. Much of the SOTL work is supported by teaching excellence programs at individual universities. The activities of the Faculty Teaching Excellence Program (FTEP) at University of Colorado at Boulder (CU-B) focus on student engagement and learning. One of FTEP's greatest achievements has been to facilitate a change in the teaching/learning paradigm at the CU-B from traditional behaviorist models focused on teaching to constructivist paradigms that acknowledge the invisible aspects of learning, such as engagement, affective elements, prior knowledge and metacognition (Bass 2009). Library faculty have participated in FTEP faculty development workshops and institutes over the years; both authors participated in separate summer institutes in 2008 and 2009 entitled Web 2.0: Increasing Student Engagement and Creating Learning Communities Using Web 2.0 Tools. Participation by library faculty in university-wide faculty development institutes is seen as a way to engage faculty in discussions related to integrating information literacy in the curriculum (Fister, 2009; Fonesta and Viator, 2009).

The gradual change in learning paradigms in higher education can also be illustrated through the evolution of FTEP summer institutes at CU-B. Summer institutes, directed by Mary Ann Shea and Michael Lightner, have provided a reflective space for faculty to think about student learning and technology since 1998. Interestingly, the first FTEP summer institute to focus on Web 2.0 applications was the 2007 Summer Institute for New Media Pedagogy, Scholarship, and Learning Technologies. Tellingly, though, it was canceled due to inadequate enrollment. In 2008, FTEP invited Randy Bass, Executive Director of the Center for New Designs in Learning and Scholarship (CNDLS), Georgetown University, to facilitate the workshop. Subsequently, the 2008 institute, which attracted 25 participants, introduced a wide variety of Web 2.0 tools to faculty. The following year, and based on faculty feedback from the previous summer, the institute introduced fewer Web 2.0 tools (blogs, RSS and video) as the focus shifted to instructional design based on constructivist learning theories. The changing content of the workshop mirrored the approach that faculty were encouraged to take with Web 2.0 in the classroom by focusing on facilitating student understanding of fewer core concepts rather than covering large amounts of material (Grant and Wiggins, 2005). The institute-modeled constructivist learning approaches provide multiple opportunities for diverse faculty to create new knowledge through reflection and dialogue related to student engagement and learning. Another major focus of the 2009 institute was the creation and support of intellectual learning communities, aligned with how students learn and create content in a Web 2.0 world. Faculty grappled with the implications for instructional

design, control of learning, student engagement, and appropriate assessment techniques that reflected a learner centered approach.

If Web 2.0 creates a different learning and information reality then reflective and collaborative dialogue and research in higher education is needed to explore how we design instruction and web tools based on a different model of knowledge creation and learning. Articles about Web 2.0 tools and its application can be found throughout higher education in both academic classroom and library contexts (Cohen, 2007; Maness, 2006; Luo, 2010; Williams, J. & Chinn, S.J. 2009). However, Web 2.0 tools and applications such as blogs, wikis, and use of social networking sites are often implemented in higher education based on the argument that students, as digital natives, use these tools in their everyday life. Web 2.0, however, has larger implications that go beyond specific tools and applications. The accessibility of these tools that encourage creativity, knowledge creation, conversation, and collaboration has created a student population with very different expectations about the control of their learning process and knowledge creation.

It is essential that pedagogy conform to these different approaches to teaching and learning in order to take advantage of the potential of digital media and Web 2.0 applications. On the one hand, changing information realities mean that pedagogy needs to adapt to the new idea that knowledge is a "collective agreement" that "may combine facts with other dimensions of human experience, such as opinions, values and spiritual beliefs" (Dede, 2008). On the other hand, changing student realities means that pedagogy needs to adjust to student web habits to maintain the wide variety of contexts in which students accomplish formal, informal and non formal learning. Therefore it is important to consider the philosophical and sociological changes as well as the technological changes engendered by constructivist learning theory and Web 2.0 in order to rethink and create an effective pedagogy as well as a virtual library presence that embraces this new paradigm of learning and collaboration.

Web 2.0 and Libraries

Libraries have been eager adopters of Web 2.0 technologies; from next generation catalogs to using blogs in the workplace to outreach via Facebook. However, busy librarians often implement these technologies without the time to reflect on learning objectives, assessment, or a literature search providing information on patrons' perceptions and actual use of these technologies. Curiosity about how faculty peers were thinking about and implementing Web 2.0 applications led to the authors' participation in the FTEP summer institutes. However, using the institute to think about the theoretical construct of Web 2.0, as represented through collaboration, community, creativity, conversation and control proved to be key for reflecting on and restructuring many

instruction, liaison activities and other projects in the libraries. Conversations started at the summer institute were continued with other librarians at the University Libraries. By creating our own learning community, librarians increased their knowledge of the theoretical foundations of web 2.0 and changing pedagogies. Subsequently, growing self-confidence allowed us to re-situate new and existing Web 2.0 tools within this modern paradigm with the aim of improving student engagement in the research process. Naturally, the process was not straightforward. The unique context of libraries, where activities are limited by time and period of interaction meant that librarians had to be particularly innovative to make academic Web 2.0 work within these limitations. Furthermore, many activities had to be curtailed due to other difficulties, such as the current economic climate. Nonetheless, the Libraries has since implemented, re-purposed or planned several new Web 2.0 based initiatives.

Re-conceptualizing the library as a place is one area that has changed significantly at the University of Colorado. In one project, the library is actively encouraging faculty and students to use and adapt library and database widgets, or the short pieces of code that directly embed library resources in a blog or web page. By deconstructing library tools and allowing them to be embedded outright into the curriculum, librarians are ceding control and enabling the production of a personalized community space. Class web pages become subject hubs and form a dynamic learning community that helps students become immersed and grounded within their subject, thereby directly contributing to academic learning objectives. By providing quick access to the scholarly literature, widgets also help connect the course to authentic conversations on the Web.

The formation of a usability task force is another area where CU Librarians are collaboratively working with patron conceptions, work-flows and library habits. The first project of that group was to look at the design of Subject Guides, web pages that librarians create to help students navigate the library thematically. By working with a broad section of the library's user base, the group is looking at patron understanding and terminology related to the research process within discipline specific learning communities to design web pages rather than solely relying on librarian jargon and conceptions. Finally, another project that the Libraries is exploring is the concept of catalog tagging, where users add tags to the records in the library catalog to personalize library research (Rolla, 2009). Tagging introduces social scholarship, or the mechanism to adapt academic practices to the Web 2.0 world. This allows students to make connections between resources, becoming part of the academic conversation and fostering "online communities organized round the library" (Rolla, 2009).

A major set of changes involved the restructuring of instruction classes to include more student centered lesson plans in order facilitate a deeper understanding of information literacy instead of skill based knowledge. One key feature was the introduction of short

activities using Web 2.0 technologies to target core information literacy concepts. One core concept was understanding the need to generate multiple ways of representing and describing ideas through the use of keywords. We identified Sporcle, a timed online quizzing software as a way to strengthen student comprehension of keyword formulation. Working in teams, students brainstorm and enter relevant keywords for a given topic. On conclusion of the quiz, the class compares student generated responses with librarian generated responses. This allows students to explore the difference between their novice use of terms and the librarians' expert use of keywords and descriptors. By giving up control of the teaching, and allowing collaborative participation, this Web 2.0 tool allows student understanding to develop through group conversations rather than lecture. Instead, the instructor helps scaffold the change in student understanding from novice to expert. Furthermore, the team or peer structure of the activity provides accountability and buy in, not only by providing equal opportunities for participation, but by ensuring that students learn from each other rather than scoring off each other. Plans for the future include making class video tutorials using Jing, a screencasting software to encourage students to portray a sense of voice and audience by representing knowledge for others and as part of the peer to peer learning and classroom structure.

Librarians have also collaborated with faculty members to develop and embed information literacy activities their curriculum, particularly activities that would be hard to achieve in a short instruction session. The Instruction Coordinator introduced a tagging activity to writing instructors as a way to present the difference between natural and formal database language. (Also see Maggio, 2009) Firstly, this is another example of giving up the control and deconstructing library instruction in order to work with faculty in a collaborative and integrated process. By engaging students in learning activities outside of the library classroom, faculty and librarians are creating an intellectual community. Secondly, the tagging activity enables students to participate actively in the creation of their own knowledge, while illustrating the importance of metadata. The tagging schema that students created could be expanded throughout the course, which would help deepen understanding and reintegrate student knowledge because the class worked with concepts and ideas recursively. Finally, by looking at Web 2.0 as a theoretical construct, it is possible for librarians to embrace the key ideas and concepts without including technology. The Instruction Coordinator also recently piloted an information literacy lesson plan based on experiential learning activities. Working in collaborative groups, students created their own methods of evaluating and using information resources, before sharing their discoveries with the class. Students were encouraged to problem solve creatively by engaging in intensive, open ended small group collaboration. As a consequence, the instruction session was driven by the student dialog as librarians gave up control of the learning moment. (Sinkinson, 2010)

Finally, the most unexpected outcome of the FTEP summer institute was discovering that by working closely with faculty at the week long institute, we were able to use it as a joint space to explore and develop a common vision of learning. Librarians often struggle to build relationships with faculty but we found this workshop helped both groups learn about our unique contexts and made us reconsider the way we approach and work with faculty. Through learning about how to create student learning communities, we created our own learning communities, with faculty as well as fellow librarians. This helped us to align our goals with faculty goals from the beginning of our liaison projects as well as developing a common vocabulary and a shared pedagogical viewpoint. Consequently, the workshop helped build increased in depth collaboration in our liaison departments as well as giving us the chance to work with previously silent groups on campus. The Romance Language Librarian has since been able to work with the Department of Spanish and Portuguese to implement a Spanish language immersion information literacy program as part of the 3000 level curriculum, as well as creating and embedding relevant web tools in various classes (Hicks, 2010). Information literacy now forms a direct part of the Spanish learning community goals, and it is collaboratively designed and taught by the librarian, faculty and teaching assistants.

In addition, participating in the summer institute provided time to reflect on how available Web 2.0 tools could facilitate research within academic learning communities. The Education librarian was asked to present about Refworks, a citation management system, as part of the summer institute. The presentation, entitled, "Refworks: Mapping and Creating Scholarly Conversations," focused on how a web-based citation management application can enable scholarly conversations through sharing of bibliographic information and notes. The following semester a research group in Education contacted the Education Librarian about issues with the development of a shared bibliography. The research group adopted RefWorks as a tool to create and dialogue about an evolving bibliography supporting this research group. This use of a Web 2.0 tool provided support for collaboration and creation within the research process.

Conclusion

In conclusion, Web 2.0 tools can lead to a powerful paradigm shift. Beyond the obvious technological changes, Web 2.0 causes us to reconsider the creation and development of information and knowledge based on the five Cs of participation: Community, Collaboration, Creativity, Conversation and Control. In order to fully appreciate the potential of Web 2.0 tools, we need to look beyond the technolust and the focus on technology to start to engage more with the implicit sociological changes. In that respect, Web 2.0 technologies and tools have to be viewed more as strategies that embody certain philosophical and theoretical ideas about how people interact and learn. Higher education

needs to adapt to the new realities that inform key areas of their work. Information realities and student realities have changed considerably and it is important that the shifts the technology brings are fully understood.

At the University of Colorado at Boulder, work has only just begun on integrating Web 2.0 tools and the Libraries are constantly trying to improve and expand access to the new constructs of knowledge and information. Increased communication of our learning objectives is one area that needs refinement as was shown by the reception of the Libraries' new Learning Commons on campus. Although some faculty were very receptive to the idea of a Learning Commons, others feared that the library was being turned into a coffee shop or an undergraduate circus. This experience showed the pitfalls of implementing Web 2.0 concepts without full comprehension of the theory or constructs behind the changes.

Another key area that needs improvement is assessment and inquiry. Randy Bass opines that "changes in your teaching practice, especially with new media technologies, are a particularly critical time to find ways to weave classroom inquiry into your teaching" (Bass, 2009b). Therefore, although the assessment of our projects was beyond the scope of this paper, it is represented in many of the papers that we cite. It is particularly important that the Libraries looks at project learning goals to consider what we want to know about the impact of the changes we have made during and after each project as a way to evaluate the effectiveness of our programs.

Libraries as a physical and a virtual space are an integral part of larger learning communities, from formal learning communities such as universities and schools to informal learning communities based on research groups, departments and patrons. Integration of Web 2.0 tools has to proceed alongside a re-examination of the library's role in different learning communities, which are undergoing a dramatic shift in how they create knowledge and use information. Web 2.0 technologies, however, can provide the tools to create stronger connections between libraries and the learning communities that they serve. A new collaborative model of interaction has the possibility to ensure that libraries become key rather than peripheral players in academic learning communities.

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