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Towards a Creative Social Web for Learners and Teachers

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### Abstract

This article examines the potential strengths and weaknesses of Web 2.0 in supporting student collaborative creativity in light of sociocultural conditions of knowledge creation. Weaknesses and challenges are identified related to the embedded and dispersed representation of community knowledge, weak commitment and support to sustained progress, judging contributions based on popularity instead of advancement, and the conflict between the chaotic emergent Web and rigidly organized schooling. Discussion is extended to the use of the Web for supporting teacher learning and innovation. Research questions are identified calling for design-based research to advance both pedagogy and technology design.

Keywords: Web 2.0, Collaborative creativity, Teacher learning, Design-based research

### Towards a Creative Social Web for Learners and Teachers

The manuscript by Greenhow, Robelia, and Hughes (2009), titled “*Web 2.0 and Classroom Research: What Path should we Take Now?*,” presents a timely and insightful review of Web 2.0 in light of learning and education in the 21st century contexts. The authors delineated the affordances of Web 2.0 and identified research questions related to three themes: learner participation and creativity, learner online identity formation, and transformation of educational scholarship. The present article focuses on two issues that have been left unaddressed: the potential weaknesses and challenges of Web 2.0 environments in supporting knowledge creation and the use of the Web for supporting teacher learning and innovation. Integral to my discussion is a design science perspective that focuses on identifying challenges, envisioning new possibilities, and testing improved learning environments and interventions, with formative research findings fed back into further cycles of innovative design (Bereiter, 2002a; Collins, 1992). This interventionist design-based approach complements the research agenda set up by Greenhow et al. (2009) whose primary focus was on what students do and how they learn in “natural” Web 2.0 environments. Design-based research further puts educational researchers and practitioners in a proactive position to produce rational change in learning environments instead of only responding to waves of technological change from outside education.

#### *Web 2.0 for Collaborative Creativity: Strengths and Challenges*

This section focuses on examining the strengths and challenges of Web 2.0 in light of the recent research on creativity, which has substantially deepened our understanding of knowledge creation as a social practice. Creativity and knowledge creation is (a) a

social and collaborative process that involves complex, often unpredictable social interactions (Brown & Duguid, 2000; Csikszentmihalyi, 1999; Sawyer, 2007); (b) a sustained, incremental process instead of a sudden flash of new insight (Sawyer, 2005); and (c) a knowledge-intensive practice that is enabled by long-term knowledge accumulation instead of being squashed by knowledge and experience (Weisberg, 1999). This new perspective enlightens a number of sociocultural conditions essential to sustained, collaborative knowledge creation. I elaborate below several of the conditions and use them as a lens to look into the strengths and weaknesses/challenges of Web 2.0 technologies.

*(a) Working with community knowledge.* Creative knowledge work generates and improves knowledge as a social product. It focuses on advancing community knowledge that has an out-in-the-world existence (e.g., ideas in books) representing the state-of-the-art of a community, instead of only personal notions and opinions (Bereiter, 2002b). Creative knowledge work in a field thus requires assimilating and building on the community's knowledge and related knowledge practices and engaging in sustained idea advancement that brings about valuable novelty to a domain (Csikszentmihalyi, 1999). To ease knowledge assimilation and innovation, ideas in a public knowledge domain need to have permanent and accurate representation that is easily available and accessible. According to Csikszentmihalyi (1999), "The more accessible the information, the wider range of individuals who can participate in creative processes" (p. 318). Sustained creativity can be further advanced through cross-fertilization (Sternberg, 2003) of different domains and cultures that leverages contact of diverse ideas.

The Web—including its 1.0 generation—supports creative inquiry through

evolving a rich information repository (Windschitl, 1998) that provides objectified, easily accessible representation of knowledge from multiple fields and communities. The current Web further provides a range of features that supports collaborative creation, sharing, linking, and remixing of multimedia content among the users (Greenhow et al., 2009). A specific weakness, however, is the embedded and dispersed representation of community knowledge adopted by many Web 2.0 environments. For example, social networking, as the term implies, focuses on social interaction among users, through posting to a friend's Wall in Facebook or chatting among avatars in Second Life. Knowledge is communicated and shared through the user interaction and dialogue; the dialogue records may be made instantly accessible to a broader network of users. But the knowledge and ideas communicated through the online posting, commenting, and chatting are not treated as explicit objects in their own right that can be indexed, searched, referenced, re-organized, and integrated into higher-level synthetic structures. There is a lack of explicit, coherent knowledge spaces and representation tools for indexing, tracing, monitoring, integrating, and advancing ideas emerged from temporally and spatially distributed interactions in different socio-technological environments (e.g., Wall, forum discussion, chatting).

The current social networking spaces support a community of practice approach to knowledge, which sees knowledge as integral to participation in cultural practices and distributed in the social relations and activities (Wenger, 1998). The primary focus of the community of practice model is on enculturation into existing cultural practices and sharing of practices, with little attention paid to creative changes in the practices and deliberate, systematic innovations that are paramount to knowledge-creating

organizations of today (Bereiter, 2002b; Paavola & Hakkarainen, 2005). Intentional knowledge creation additionally requires collaboratively developing knowledge and ideas as explicit objects in their own right that take on a history of evolution in a public knowledge space (Bereiter, 2002b; Csikszentmihalyi, 1999; Popper, 1972). New ideas and knowledge that emerged from distributed interactions are selectively incorporated into a knowledge base that is shared and continually advanced (Sawyer, 2007). To support knowledge creation, the *social* networking spaces thus need to evolve into networks of people and ideas in which ideas are treated as real and as visible as people, with people interacting and co-evolving with the knowledge objects. Among Web 2.0 environments, social bibliography sites such as CiteULike and Delicious support co-development of shared references—explicit knowledge objects—along with user-created indexing tags; although these sites have been designed for scholars with little educational concern (see also Greenhow et al., 2009). Wikis represent a knowledge-intensive environment in which ideas are represented as explicit, interconnected objects—wikipages that can be collaboratively edited. However, the Wiki approach, as well as social bibliography, is strong at supporting knowledge sharing but relatively vague and weak at *advancing* community knowledge, as elaborated below.

*(b) Agency and practices for progressive advancement of community knowledge.*

Creativity requires a commitment to sustained progress and is best recognized through significant moves to advance the state-of-the-art knowledge of a community (Bereiter, 2002b). In Sternberg's (2003) term, creativity is a decision—an investment—to make creative contributions that lead to progress in a field, ranging from contributions that preserve and refine a paradigm to those that move the field in a new direction. To make

sustained progress, creative knowledge workers engage in progressive problem solving (Bereiter & Scardamalia, 1993), extended deepening inquiry (Paavola & Hakkarainen, 2005), and expansive learning (Engeström, 2008): they intentionally identify deeper challenges as old problems are addressed; and collectively formulate higher-level goals emergent from complex idea interactions (Sawyer, 2007; Valsiner & Veer, 2000).

Web 2.0 technologies encourage artistic expression and sharing of personal feeling and ideas through a wide range of digital media (Greenhow et al., 2009; Jenkins, 2006). The democratization and decentralization of knowledge enabled by the participatory Web may foster habits of mind that are conducive to creative contributions: open-mindedness to change and new ideas, enjoyment of dialogue and collaboration, self-efficacy in creative work, sensible risk-taking, and so forth (Florida, 2002; Sawyer, 2005; Sternberg, 2003). These habits of mind lie between the two research themes separately identified by Greenhow et al. (2009): creativity and online identity formation, pointing to research opportunities to investigate the impact of Web 2.0-infused practices on the formation of creative identity and life style.

Although embracing participatory sharing, Web 2.0-based practices are generally weak in the commitment to sustained progress of ideas, which represents a much deeper commitment than displaying and sharing knowledge. Knowledge sharing and displaying focuses on producing and sharing media objects (e.g., webpages, movies); sustained advancement of ideas requires creating and continually improving knowledge objects in forms of ideas, theories, designs, work plans, and so forth (Scardamalia & Bereiter, 1999). Many Web 2.0 environments can identify potential connections between media objects based on titles, tags, and user information (e.g., users who like this book also

like...); but the media objects are almost never connected and indexed in a way that shows how they progress over one another to address increasingly deeper issues or contradict with one another calling for further examination and conceptual rising above. Conversations around the media objects through online chatting and commenting are mostly oriented towards opinion sharing (e.g., like or dislike a video). Guzdial and Turns (2000) observed earlier that discussion in online forums tended to be too brief, short-threaded, disconnected to achieve significant progress; there is no indicator that this situation has been improved with online commenting and chatting in social networking and media sharing spaces. Wiki sites such as Wikipedia explicitly encourage collaborative creation and improvement of knowledge entries, and thus seem to place more emphasis on progress. Nevertheless, the pursuit of Wikipedia is to create an online encyclopedia that presents and summarizes the-state-of-the-art knowledge in different fields with high accuracy and credential (Giles, 2005), not so much as to *advance* it. Revisions of Wikipedia articles focus on improving the representation and organization of knowledge and expanding the scope of topics in reflection of new knowledge originally presented in other sources (e.g., journals, research reports). The quality of the articles, like traditional encyclopedia entries, is established through their proper scope, format, uniqueness, authority, accuracy, currency, and accessibility (Crawford, 2001), not how an article has contributed to advancement of knowledge. Learning the “Wiki way” of knowledge work and discourse is thus likely to help students develop capabilities for knowledge representation, organization, sharing, and updating; sustained knowledge creation additionally requires high-level agency and practices for extended, progressive inquiry and incremental advancement of ideas.

(c) *Peer review of creative contribution.* Two important questions arise that are associated with the social process of knowledge creation: Who is entitled to judge individual contributions? What criteria are used to judge the contributions? With a small number of gatekeepers who have the right to add memes to a domain, there emerges a centralized field that is impervious to change (Csikszentmihalyi, 1999). Greenhow et al. (2009) commented that “*Validity* of knowledge in Web 2.0 environments is established through peer-review within an engaged community” (p. x). Judgment of contributions has thus been largely decentralized. Meanwhile, it is important to be aware that “both too little and too much freedom for the field are inimical to creativity... Criteria that are too liberal for accepting novelty may end up debasing the domain” (Csikszentmihalyi, 1999, p. 325). Whether the criteria for quality review in Web 2.0 environments are too liberal might be debatable (Keen, 2007); but it is clear that the criteria used to judge contributions in many Web 2.0 environments are misaligned with the goal of knowledge advancement. Online postings are often judged based on popularity—for example, the number of hits or the extent to which users like a posting—instead of progress made. Gaining popularity is paramount to media celebrities and politicians and can be also rewarding to creative knowledge workers; but it is never the primary pursuit of knowledge advancement, and thus not the primary criteria of evaluation. When opposing views are presented, a knowledge community needs to examine critically and evaluate the alternative views in light of the underpinning reasons and values. The process is not to vote for the most favorite, but to determine which view has the greater explanatory power or how the views complement each other in formulating a higher-level idea complex (see also, Etelapelto & Lahti, 2008).

(d) *Dynamic collaboration, improvisational innovation.* Creativity emerges from complex idea contacts and unpredictable social interactions (Sawyer, 2007). Accordingly, knowledge organizations need to develop an organic, flat structure that encourages a high degree of adaptability and emergent collaboration (Gloor, 2006; Williams & Yang, 1999). Internet-based technological tools, such as computer-mediated communication, social networking, and shared accumulation and indexing of bibliographic resources, have substantially leveraged social mobility, adaptability, and interactivity, supporting the development of loosely coupled virtual communities for emergent creative collaboration. A challenge associated with educational use of the Web—not necessarily a weakness—is that this open, emergent, chaotic nature of online interaction often conflicts with the rigidly organized social structure of formal education that involves standardized goals and curricula, officially generated and fully packed schedules, age-based grouping, classroom-based organization, and stressful examination. To make online collaboration workable and manageable in education, a widely adopted strategy focuses on the use of collaboration scripts, which provide instructions regarding what activities should be carried out, following what steps, who should collaborate with whom, using what tools, and so forth. But with this scripted approach arises the risk of making online collaboration too structured and formalized, squashing or even stalling creativity (Dillenbourg, 2002; Zhang, Scardamalia, Reeve, & Messina, 2009; see also, Cohen, 1994; Sawyer, 2007).

The above analyses elaborate the potentials of Web 2.0 in supporting collaborative knowledge creation, along with the associated weaknesses and challenges: embedded representation of community knowledge, weak commitment and support to progress and

advancement, judging contributions based on popularity instead of advancement, and the conflict between the chaotic emergent Web and rigidly organized schooling. Web 2.0 has made significant progress in developing a social Web for participatory social networking and knowledge sharing, with promises for supporting knowledge creation. It needs to address the above challenges to evolve into a more creative social Web that works for educational innovation. Addressing these challenges requires technological augmentation such as re-designing knowledge representation, discourse spaces, and peer reviews; more profoundly, it depends on the evolution of a creative culture online and offline, with a considerable proportion of the users (“the crowd”) embracing creative ethos and practices in their focal areas of interest in which they have at least some level of expertise.

Identifying the above challenges implies a positive account for the digital disconnect between students and their schools identified by Levin, Arafeh, Lenhart, and Rainie (2002) and highlighted in Greenhow et al. (2009). Instead of simply blaming teachers of their slow response to Web 2.0 and other new technologies, researchers need to understand the ways in which the technology innovations mismatch with the culture of schooling. Although the current Web is socially dynamic, information rich, and personally engaging, the chaotic online interaction and dispersed knowledge representation in Web 2.0 spaces are inclined to worry educators who traditionally emphasize student predictable behavior and accountable academic achievement. Understanding this mismatch helps to inform adaptation and improvement to be made to school practices as well as technology design.

Recognizing both the potential strengths and weaknesses/challenges of Web 2.0 helps educators to develop wise educational applications and further guides design-based

research to develop increasingly productive technological tools and pedagogical designs for supporting creative knowledge practices. Expanding on the need of design-based research briefly noted in Greenhow et al. (2009), researchers need to investigate: (a) Reflective and integrated representation of community knowledge: What technological features can help to represent, connect, integrate, and trace ideas emerged from spatially and temporally distributed interaction in social networking sites and 3-D virtual environments? How should boundaries be transcended between different discourse spaces and inquiry environments (e.g., Wikis, forums, chatting) so that knowledge can be integrated, accumulated, and built on over time? How should student agency be fostered in developing and monitoring shared knowledge spaces (Zhang & Chan, 2008)? (b) Progressive inquiry: What pedagogical processes and technological support (e.g., discourse markers) are needed to nurture progressive questioning, deepening discourse, and sustained knowledge advancement? (c) Progress-focused review and feedback: How should progress-focused peer review of online postings be designed along with feedback tools such as semantic visualization of inquiry threads unfolding through online discourse (Teplovs & Scardamalia, 2007; Zhang, Scardamalia, Lamon, Messina, & Reeve, 2007) and automated analysis of online discourse and contribution (Erkens & Janssen, 2008)? (d) Social and cognitive scaffolding of emergent collaboration and collectively evolved inquiry: What changes are needed for schools to embrace improvisation and adaptability in support of collaborative creativity (Sawyer, 2005)? What social and cognitive scaffolding can be used to nurture a creative community of learners who are able to make intuitive, productive decisions about what to do and with whom to collaborate in creative endeavors? How should flexibly adaptable online knowledge spaces and collaboration

tools be designed to support productive improvisation (Zhang et al., 2009)? What online and offline support can help address the challenge of high cognitive load in complex collaboration and inquiry environments (Dillenbourg & Betrancourt, 2006; Kirschner, Sweller, & Clark, 2006)? What impact will Web 2.0-infused practices have on the transformation of educational organizational culture?

Contributing to addressing these questions, several design-based research studies have been evolving. For example, Dede, Nelson, Ketelhut, Clarke, and Bowman (2004) developed a multi-user virtual environment for science inquiry called “River City.” Students engage in open-ended, collaborative inquiry supported by individualized guidance, expert modeling and coaching, computer-based agents and lab notebook, and a data-tracking system that profiles students’ progress. Slotta and Peters (2008) tested a blended model that embeds scaffolded inquiry in a wiki-supported environment to foster community knowledge building among secondary students. Focusing on evolving dynamic collaboration structures for knowledge building, Zhang et al. (2009) presented a three-year design experiment, which demonstrates the possibility and educational benefits of engaging young students (9 to 10 years old) in flexible, opportunistic collaboration compared to fixed small-group structures, supported by a collaborative knowledge space. Collectively, these design-based studies showcase how researchers can collaborate with teachers to produce significant advances in pedagogy as well as technology, enabling sustained cycles of innovation in education.

#### *Teacher Learning, Collaboration, and Innovation*

This section highlights how teachers are using and can possibly use the Web for professional development, collaboration, and innovation, an important topic that has been

left out by Greenhow et al. (2009). Sustained innovation and deep reform in education requires the development of innovative teacher communities. Characterizing such communities are teachers' continual learning, deliberate investigation and reflection, collaboration and sharing in practice, and collegial dialogues and friendly critics (Fogleman, Fishman, & Krajcik, 2006; Hargreaves, 1999; Wilson & Berne, 1999). The Web, especially the current participatory Web, demonstrates immense potentials to support online professional communities where teachers can access professional resources, share practices and reflections, and engage in collaborative dialogues. For example, TeacherTube, an online community for educators to share instructional videos, now has approximately 220,000 regular users and more than 54,000 videos (<http://www.teachertube.com>). In Second Life, the International Society for Technology in Education (ISTE) hosts a group for K-12 educators with more than 4,000 members, which has weekly networking socials, speakers' series, and other activities. As a more teacher-directed group in Second Life, Virtual Pioneers represents an international network of Grades 7 to 12 history/social studies teachers looking for new ways to learn and teach. Ever since the Web 1.0-dominated era, several research studies have evolved to investigate social and technological infrastructures for supporting online teacher learning communities using a Web 2.0 participatory model. Among them, Guzdial, Rick, and Kehoe (2001) developed the CoWeb—an open authoring space where any user can edit any existing page or create new pages—to support teacher collaboration and inventiveness as well as student inquiry. Researchers at Stanford Research Institute (SRI) developed a multi-user virtual environment called Tapped In<sup>®</sup> (<http://tappedin.org/>), with a large number of educators and educational organizations involved. Teachers engage in

productive professional discourse in virtual rooms using a variety of communication tools such as speaking, whispering, paging, transcript recorders, document sharing, whiteboards, and so forth (Schlager, Fusco, & Schank, 2002). Specially focusing on inquiry-based learning, Barab, MaKinster, Moore, and Cunningham (2001) developed the Inquiry Learning Forum (<http://ilf.crlt.indiana.edu>) that supports a community of mathematics and science teachers. The teachers interact online; share inquiry-based lesson plans, resources, and classroom videos; and engage in professional reflection and dialogue. A comprehensive review on this topic is beyond the capacity of this article; the above examples suggest the importance of including Web 2.0-enhanced teacher learning and innovation as a critical item on our research agenda.

Future research in this regard needs to investigate: (a) how to develop sustainable and scalable community computing and social infrastructures to support online teacher communities (Barab et al., 2001; Farooq, Schank, Harris, Fusco, & Schlager, 2007); (b) the ways in which the online teacher learning environments can be integrated with professional development initiatives organized by educational agencies and school boards to contribute to systematic education reform (Schlager et al., 2002); (c) conducive sociocultural contexts and technological support to evolve teacher communities that not only share practices but continually go beyond best practices, committed to progressive problem solving, pedagogical knowledge building, and sustained advancement of their profession (Chan, van Aalst, & Law, 2008; Zhang, Hong, Teo, Scardamalia, & Morley, 2008). Focusing on the last question, a Wiki-based environment has been evolving at the University at Albany, titled the Knowledge Network for Innovations in Learning and Teaching (KNILT) (<http://tccl.rit.albany.edu/knilt>). Although still in its infant phase, the

growth of this environment suggests the promisingness of engaging educators as co-innovators to understand new possibilities in pedagogy, assessment, and technology, co-evolve a professional knowledge base, and develop classroom designs to actualize their new educational visions.

### *Conclusions*

Through examining Web 2.0 in light of the latest research on creativity and knowledge creation, this article elaborates the strengths of Web 2.0 in supporting collaborative creativity as synthesized by Greenhow et al., and further reveals its weaknesses and challenges such as embedded and dispersed knowledge representation and weak commitment and support to progress. Additionally, this article highlights the need to investigate the use of the Web for supporting teacher learning and innovation. Research questions are identified related to student collaborative creativity and teacher learning and innovation, calling for design-based research to produce sustained improvement in both pedagogy and technology. Web 2.0 as a loosely defined concept represents a complex variety of technologies that are in rapid development. Thus, any claim about its strengths or weaknesses may turn out to be too simplistic to generalize. The sociocultural conditions of collaborative creativity elaborated in this article provide a lens for viewing into the creative potential of specific technological tools, so as to inform critical analysis, productive design and application, and advancement.

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