

Directions in Web 2.0 Research

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Abstract

There are several important research questions that need to be addressed about Web 2.0 technologies and students' use of these technologies. First, should Bloom's taxonomy be revised for this digital age and the new ways that students can meet the learning objectives? Second, does using Web 2.0 help students learn and, if so, how can we structure curriculum to maximize both learning and transference to post-collegiate life? And finally, how can we as scholars use the Web 2.0 technologies to create, disseminate and evaluate scholarship in our field? This paper explores some of these major research questions for future investigation.

Keywords: Web 2.0, IS research, Bloom's taxonomy, digital taxonomy

1. INTRODUCTION : A RESEARCH AGENDA MODIFIED

As evidenced by recent ISECON publications, millennial students, 21st century skills, and Web 2.0 tools can lead to potential scholarly research and provide valuable information about recruiting, retaining, and preparing students (Saulnier, 2007; Sendall, Ceccucci & Peslak, 2008; Frydenberg & Press, 2009).

While it is difficult to differentiate when the first generation of web tools became Web 2.0, the term "Web 2.0" emerged from the literature in 2004. Web 2.0 technologies have moved participants from "readers to writers" in a participatory, distributed, and collaborative environment. Greenhow, Robelia and Hughes (2009) state that Web 2.0 provides four affordances: "a) user-defined linkages between users and content, ... (b) simple mechanisms to share multimedia content, (c) prominent per-

sonal profiling, ... and (d) intertechnology applications, enabling interfaces with services and features on other sites" (p. 247).

A few questions that research in this area could help answer, include the following three areas:

- Does the digital Bloom's taxonomy proposed by Andrew Churches add to our understanding of how people learn in this digital age?
- How do students use Web 2.0 technologies every day and how can Web 2.0 technologies help them learn?
- How do we evaluate the new ways of disseminating research such as blogs and wikis?

2. BLOOM'S TAXONOMY OF LEARNING OBJECTIVES

It has been the educators' rite of passage to read, comprehend, analyze and evaluate Ben-

jamin Bloom's 1956 taxonomy of thinking skills. The six levels, from lowest order cognitive skills to highest, are: knowledge, comprehension, application, analysis, synthesis, and evaluation (Bloom, 1956). In the 1990s, the skills were modified to use verbs instead of nouns by a student of Bloom's (Anderson, Krathwohl, 2001), from highest to lowest cognitive skill:

- **Creating** - designing, constructing, planning, producing, inventing, devising, making
- **Evaluating** - checking, hypothesizing, critiquing, experimenting, judging, testing, detecting, monitoring
- **Analyzing** - comparing, organizing, deconstructing, attributing, outlining, finding, structuring, integrating
- **Applying** - implementing, carrying out, using, executing
- **Understanding** - Interpreting, summarizing, inferring, paraphrasing, classifying, comparing, explaining, exemplifying
- **Remembering** - recognizing, listing, describing, identifying, retrieving, naming, locating, finding

After 50 + years of use, Andrew Churches (2007) incorporated digital skills into the classic taxonomy. Again from highest order skill to lowest (with the existing skills in italics):

- **Creating** - *designing, constructing, planning, producing, inventing, devising, making, programming, filming, animating, blogging, video blogging, mixing, remixing, wiki-ing, publishing, videocasting, podcasting, and directing/producing.*
- **Evaluating** - *checking, hypothesizing, critiquing, experimenting, judging, testing, detecting, monitoring, (blog/vlog) commenting, reviewing, posting, moderating, collaborating, networking, refactoring, and alpha and beta testing.*
- **Analyzing** - *comparing, organizing, deconstructing, attributing, outlining, finding, structuring, integrating, mashing, linking, tagging, validating reverse-engineering, and cracking.*
- **Applying** - *implementing, carrying out, using, executing, running, loading, playing, operating, hacking, uploading, sharing, and editing.*
- **Understanding** - *interpreting, summarizing, inferring, paraphrasing, classifying, comparing, explaining, exemplifying, advanced searches, Boolean searches, blog*

journaling, twittering, categorizing, commenting, annotating, and subscribing.

- **Remembering** - *recognizing, listing, describing, identifying, retrieving, naming, locating, finding, bullet pointing, highlighting, bookmarking, social networking, social bookmarking, favoriting/local bookmarking, and searching/googling.*

Churches' taxonomy of digital skills does not take all Web 2.0 tools into consideration, and this, indeed, is the problem with revising a recognized standard such as Bloom's Taxonomy. When, and how often, should it be revised? Do we need to revise creating (evaluation) or are "programming," "blogging," "wiki-ing," just variants of "designing/constructing/making" that do not need to be elucidated? Churches does not appear to be suggesting that the basic taxonomy of learning objectives is flawed, only that we have new ways of reaching these objectives.

Another research area proposed by Johnson & Fuller (2006) and others is whether Bloom's taxonomy can be used to "benchmark" the content of a computing degree. Johnson & Fuller (2006) examined 54 assessments given to first year computer science students. Five faculty members were asked to decide which of the levels in Bloom's taxonomy (using the original 1956 terminology) were assessed by that particular assessment.

Bloom Level	Mean # Assessments
Knowledge	42
Comprehension	37
Application	36
Analysis	11
Synthesis	2
Evaluation	1

The researchers found considerable disagreement among the five faculty evaluators, especially between those who taught the courses and those who evaluated the assessments but did not teach the courses. Some of the faculty also expressed the opinion that the higher two levels of the taxonomy are appropriate only for students in their last year at the university. As a result, Johnson & Fuller (2006) suggest that a higher application level be added to the taxonomy as the capstone experience.

Whether or not these digital activities are worthy of explicitly mentioning, another issue arises -- how do we ensure that they produce significant learning outcomes for our students?

3. WEB 2.0 RESEARCH QUESTIONS

In the late 1990s, Windschitl (1998), Roschelle & Pea (1999) and others proposed research agendas for the Internet. This agenda must be updated in light of the paradigm shift that Web 2.0 technologies entail. The following paragraphs skim several areas of potential research on the use of Web 2.0 technologies for IS researchers.

Broadening conceptualization of classroom (Greenhow, et al, 2009). Today's students, whether they are K-12 or college students, use Web 2.0 technologies in their daily lives and many believe that use of these technologies in school would increase their engagement and their learning (Lenhart, Arafeh, Smith & Macgill, 2008). As several studies have shown, faculty are underprepared to deal with incorporating Web 2.0 technologies into their classrooms.

As Greenhow et al (2009) point out, we need to understand how the use of technology across the whole day and across our life span has educational, technological, social and ethical implications. How do students use ubiquitous technology? (DeGagne & Wolk, 2007)

Skill development and transfer of these skills; i.e., in what ways does Web 2.0 support teaching and learning?

How do we provide our students with the higher order cognitive skills to develop skills of innovation, leadership, multidisciplinary collaboration, and problem solving in a distributed, digital environment? (Saulnier, 2007; Hamel, 2007; ISTE, 2007).

How do we foster the need for, and the joys of, lifelong learning to our students?

Which mode of instruction (i.e., face-to-face, online or hybrid classrooms) is most effective and under what circumstances? Are there technologies that work best in small classes? Large classes?

Can Web 2.0 technologies help connect students to one another? To the instructor? (Conn, Boyer, Hu & Wilkinson, 2009).

What kinds of collaborative educational environments (Zhang & Su, 2007) should be developed?

Application of specific Web 2.0 tools

Appendix A lists of few of the available Web

2.0 tools in the areas of blogging, aggregating, writing, presenting, tagging, social networks, video and pod-casting, collaborative editing, digital story telling. There are many open questions about students' information seeking behaviors and with the enhanced capabilities of Web 2.0 technologies, many questions about how students communicate, collaborate, and create knowledge.

Equality of access to knowledge

A fourth set of research questions could focus on access to the knowledge creation and skill building that Web 2.0 technologies can provide (Greenhow, et al, 2008). Universal accessibility of the Internet and now, Web 2.0 has important implications (Shneiderman, 2000; Zajicek, 2007).

Along with access to knowledge, new problems have emerged that may have a large negative effect on our students, including the issue of cyberbullying (Wright, Burham, Inman, & Ogorchock, 2009).

There are many other questions that Web 2.0 technologies pose for researchers. However, the final question that this paper addresses how these new ways of creating and disseminating knowledge change how we engage in our scholarship.

4. HOW TO EVALUATE NEW WAYS OF DISSEMINATING RESEARCH

The Horizon Report 2010 (page 7) states:

New scholarly forms of authoring, publishing, and researching continue to emerge but appropriate metrics for evaluating them increasingly and far too often lag behind. Citation-based metrics, to pick one example, are hard to apply to research based in social media. New forms of peer review and approval, such as reader ratings, inclusion in and mention by influential blogs, tagging, incoming links, and retweeting, are arising from the natural actions of the global community of educators, with increasingly relevant and interesting results. These forms of scholarly corroboration are not yet well understood by mainstream faculty and academic decision makers, creating a gap between what is possible and what is acceptable.

Greenhow et al (2009) highlights an emerging trend in library science disciplines called *social scholarship*. It "connects traditional formal scholarship practices ... with more informal, social Internet-based practices" (p. 253). Tools such as Delicious, CiteULike, and Zotero are helping to build online repositories of resources and recommendations and to share them with others. These tools, and others, allow scholars to disseminate, discuss and evaluate research while creating a large, collaborative, online knowledge repository. There are unprecedented collections of data available and a wide variety of useful tools for scholars.

One major area of uncertainty is how to evaluate web-based information without the "safety" of a peer-review process that occurs with most journals and conference proceedings. Is a popularity rating appropriate? An author credential section? Should we provide options for comments and debate? A benefit of Web 2.0 is the low threshold for participation, which can result in less qualified reviewers or fresh opinions. Who controls the discussion? Can we ensure that the discussion remains on task? We tell our students to look for the validity of author and the web address, but is this sufficient for these new ways of disseminating scholarship?

Additionally, three obvious areas that arise are the ethical implications of plagiarism and disappearing data and issues for tenure and promotion.

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Appendix A: A Brief List of Web 2.0 Tools

Blogging		
	Bloglines	www.bloglines.com
	Blogger	www.blogger.com
	Google Blogspot	www.blogspot.com
	Word Press	www.wordpress.com
	Blogit	www.blogit.com
Microblogging		
	Twitter	www.twitter.com
Aggregating (i.e., RSS feeds)		
	Bloglines	www.bloglines.com
	Google reader	reader.google.com
	iTunes	www.apple.com/itunes
Video Casting		
	You tube	www.youtube.com
	Vimeo	www.vimeo.com
	Teacher Tube	www.teachertube.com
Tagging & Social Bookmarking		
	Del.icio.us	www.delicious.com
	Digg	www.digg.com
	StumbleUpon	www.stumbleupon.com
	Diigo	www.diigo.com
	Furl	www.furl.com
	Mister Wong	www.mister-wong.com
	Ma.gnolia	http://ma.gnolia.com
	CiteULike	http://www.citeulike.org
	Zotero	http://www.zotero.org
Social networking		
	Facebook	www.facebook.com
	Myspace	www.myspace.com
	bebo	www.bebo.com
	Ning	www.ning.com
	Classroom 2.0	www.classroom20.com
	Elgg	www.elgg.com

Collaborative editing & word processing		
	Hosted wikis	www.pbwiki.com www.wikispaces.com www.wikidot.com
	Google docs	docs.google.com
	Zoho	www.zoho.com
	Writeboard	www.writeboard.com
	Thinkfree	www.thinkfree.com
	Lulu	www.lulu.com
	Biblio	www.biblio.com
Photo sharing		
	Flickr	www.flickr.com
	Picassa	Picasaweb.google.com
	Picnik	www.picnik.com
	Tag Galaxy	taggalaxy.de
Animating	Wix	www.wix.com
Digital story telling	Voice Thread	www.voicethread.com
	Storybird	storybird.com
	Animoto	animoto.com
	Xtranormal	www.xtranormal.com
	Voki	www.voki.com
	Blabberize	blabberize.com
Presenting	Slideshare	www.slideshare.com
	Glogster	www.glogster.com
	Prezi	www.prezi.com
Screen Capturing	Jing	www.jingproject.com
Mind Mapping	Mind42	www.mind42.com
	Mindmeister	www.mindmeister.com
Surveying	Google Forms	www.google.com
	Survey Monkey	www.surveymonkey.com
	Poll everywhere	www.polleverywhere.com
	Wufoo	www.wufoo.com