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How Web 2.0 is Changing the Way Students Learn: The Darwikinism and Folksonomy Revolution

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Abstract

In the 21st century, some argue that we have a new breed of students (Oblinger & Oblinger, 2005; Prensky, 2001). Technologies such as Web 2.0 have been held responsible for these changes as students are now becoming active, critical consumers of information (Klamma, Cao, & Spaniol, 2007). Two components of this Web 2.0 revolution are the ideas behind Darwikinism and folksonomy. Darwikinism is a portmanteau of Darwinism and Wikis, which describes how a system similar to Darwin's theory of evolution is ordering and processing wiki information. Folksonomy, again a portmanteau of folk and taxonomy, refers to the way in which Web 2.0 users (folk) are creating a classification system of information on the web. This article looks at the way in which student learning is changing and evolving, driven by the users of Web 2.0.

Keywords: e-learning; Web 2.0; darwikinism; folksonomy; student

How Web 2.0 is Changing the Way Students Learn: The Darwikinism and Folksonomy Revolution

In the 21st century, some argue that we have a new breed of students (Oblinger & Oblinger, 2005; Prensky, 2001). Academics and researchers have claimed that technologies, such as Web 2.0, have been held responsible for these changes (Boulos & Wheelert, 2007; Ferdig, 2007; Klamma, Cao, & Spaniol, 2007; Prensky, 2001). While many Web 2.0 tools were not specifically designed for academic purposes, they possess attributes supporting a change in the way students learn by providing opportunities for students to be involved in active social learning, or various forms of scaffolded learning and venues to publish and to receive rapid, effective feedback (Boulos & Wheelert, 2007; Ferdig, 2007; Franklin & van Harmelen, 2008; Sturm, Kennel, McBride, & Kelly, 2008). Most notably, Web 2.0 provides students the opportunity to move from passive consumers, to active, critical consumers of information (Klamma et al., 2007). This arguably leads to a form of revolution as the content and categorization of the Web is being dictated by the masses, rather than the few. Two components of this Web 2.0 revolution are the ideas behind Darwikinism and folksonomy.

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This article begins by briefly highlighting historical epistemological paradigms which have determined past pedagogical practice. This is followed by an explication of the posited claims that a new breed of students have emerged due to technological influences such as Web 2.0. An overview of Web 2.0 is provided with examples of how specific attributes have changed the way in which students learn. This leads to further explication into the development of a trialogical nature of learning in which students collaboratively create, manipulate and share information in a systematic way. Societal implications are described, and Darwikinism and folksonomy are unpacked to provide two specific examples of how society is determining the direction of learning today.

Changes Throughout History

The philosophical, pedagogical and conceptual underpinnings of learning are interconnected, with many specific changes throughout history identified as change makers shaping the way students learn at particular points in time. For example, the renowned philosopher Locke (1690) used the term tabula rasa (blank slate) as he described the minds of babies. He believed personal sensory experiences were the only method data could be added to this blank slate. Locke argued that humans are incapable of innate ideas or principals. Rationalists such as Descartes (1641) refuted this view, believing that reason was a source of knowledge. Although pedagogical practice often claims to give credence to students' reasoning, traditional schooling seemed to function with the tabula rasa pedagogical approach with the teacher as sage on the stage providing the empty vessels with content.

Throughout history, technologies have played a significant role in the way students learn. Many historians describe the printing press as a technology causing one of the most significant radical transformations towards intellectual life in Western culture (Eisenstein, 1979; Roberts, 1996). Interestingly, since the dawn of the Internet, historians now posit the Internet, in particular Web 2.0, as triggering a change to learning comparable to that during the time of the printing press (Bransford, Slowinski, Vye, & Mosborg, 2008; Builder, 1993; Dewar, 1998; Roberts, 1996).

Toward a New Breed of Students

Students still enter into academic life provided with the cultural and social values, traditions, knowledge, and skills of past generations, but what is different about this new generation of students is that they were born into a world surrounded by ubiquitous technologies during a time of technological transformation. The new breed of students are children born after 1980 who have grown up in a digitally rich environment. Prensky (2001) termed this new generation of students Digital Natives. "Our students today are all native speakers of the digital language of computers, video games and the Internet" (Prensky, 2001. p. 1.). Other terms have been used to describe this generation of students; McCrindle (2006) used the term Generation Y, and other labels include Millennials, Echo Boomers, and Net Generation. What is clear is that they take in the world through a plethora of computer devices including laptops, hand held technologies (cell phones, PDAs, etc.), computers, game consoles, and television.

Prensky (2001) argues that the education system of today is not designed to teach these students, who have grown up with different cultural practices that have not only altered their perceptions and practices, but modified the wiring of the brain through a process of neuroplasticity. Digital Natives have greater visual skills, perform multiple activities simultaneously, are able to make innate discoveries, and prefer to learn by receiving information quickly in an active, non-linear way (Frand, 2000; Gross, 2003; Prensky, 2001). “While these individual cognitive skills may not be new, the particular combination and intensity is. We now have a new generation with a very different blend of cognitive skills that its predecessors” (Prensky, 2001. p. 1). Oblinger and Oblinger (2005) concurred with these findings and noted disadvantages in that the students exhibited much shorter attention spans and a need for structure rather than ambiguity. These students are challenging pedagogical practice, causing a clear shift to meet their needs.

Prensky (2001) postulated that the educators were not speaking the same language as the Digital Natives. The educators are “Digital Immigrants” who use an outdated language, from a non-technological paradigm (Oblinger, 2003; Prensky, 2001; Frand, 2000). This argument has attracted widespread attention in academia. However, a number of assumptions are being made in regard to the “new students” such as the misinformed belief that all students are universally technologically competent, and they will use these skills for learning (Kennedy, Judd, Churchward, Gray, & Krause, 2008). While research findings in the past decade indicate that technology usage has significantly increased (Ibid), researchers vacillate between those documenting students using technologies for study purposes (Jones & Madden, 2002), and students who are not (e.g. Oliver & Goerke, 2007). Educators must facilitate in the learning of all students, but be mindful that students’ learning styles and needs may be different with the influence of the new technological epoch (Crompton, 2011).

Web 2.0

Historians described the Internet as a significant component of academic change, and this is supported by Internet World Statistics (2011) indicating that approximately one third of the world’s population has Internet access, with a 30% increase in the past decade. Web 2.0 is the name given to what is described as the second generation of the World Wide Web, providing tools to be used to advance a person’s thought and knowledge through connections with others (Mathiasen & Schrum, 2008). Web 1.0 was a read-only medium of static websites, while Web 2.0 is a new strain of websites created to connect its users through active participation to enable collaboration and sharing of knowledge among the users; Richardson (2006) referred to this as the read-write web. This is not a brand new idea; Licklider and Taylor wrote an article on the use of the computer as a communication device in 1968.

Weblogs (blogs), wikis, podcasting, folksonomies, social networking sites, and Really Simple Syndication (RSS) are a few good examples of Web 2.0 websites. These websites have moved away from the traditional webpage set up, similar to the format of a book, and their reverse-chronological structure, often of micro content, provides a different web experience. One of the main differences between Web 1.0 to Web 2.0 is in the authorship. Web 2.0 applications replace the traditional didactic media delivery with the “wisdom of the crowd” (Madden & Fox, 2006). To explain further, Web 1.0 relies on Webmasters, which

ironically, as the name suggests, describe the select few 'masters' who have publishing and distribution options. Web 2.0 allows all those with Internet access the option of not only being a consumer of web-based content but also the ability to become involved in creating and producing the content. Chang (2006) termed these new web surfers as 'prosumers'. To enable access for all, Web 2.0 pages were designed to abolish the need for qualifications in web design, or an esoteric knowledge of the web, allowing students of all ages the ability to be both consumers and prosumers. This has a direct effect on the way in which students learn as they are offered the opportunity to question what is accepted as knowledge. Students are not following Locke's (1690) tabula rasa approach to learning, waiting for the teachers to impart knowledge, but they are connecting with the larger Internet society to be actively involved in learning. During the next section of this article, the diachronic implications are further unpacked with regard to the way in which collaboration and networking have altered the way students learn.

Trialogical Learning

Web 2.0 is functioning through a trialogical learning approach. Trialogical learning is defined by Paavola and Hakkarainen (2004) as a form of learning where students are collaboratively creating, manipulating and sharing information in a systematic way. This is different from the monological (cognitive) and the dialogical (situated cognition) approaches described by Paavola and Hakkarainen, which are still used in many schools today. The monological learning approach would be similar to Descartes' (1641) philosophy, as the Cartesian epistemology describes learning as a process working within a monologue of conversation in the mind as a method of knowledge acquisition. This learning paradigm is centred on the participant, without external influence.

The dialogical approach to learning is characterized by the students' interaction between people and the surrounding environmental materials (Paavola & Hakkarainen, 2004). This is similar to Vygotsky's (1978) socio-constructivist theory of learning. Finally, the trialogical approach to learning is similar to the dialogical approach in that it places emphasis on the artefacts, such as academic content of Web 2.0, and the manipulations of these artefacts among groups of people. The trialogical approach to learning is similar to constructionist learning philosophy supported by Papert (1980), who posited that students learn best when they are actively involved in constructing social artefacts.

Changing Society and Web 2.0 Accommodations

Other changes have emerged in our society today which many see as the negative attributes to the influx of technologies such as Web 2.0 (Putnam, 2000). For example, people no longer need to interact directly with other people for many everyday requirements, such as grocery shopping, booking flights, paying bills, etc. We are living in a highly commercialized society with a focus on individualism and independence. In the book Bowling Alone: The Collapse and Revival of American Community, Putnam described a high level of disconnect within communities. The trends in social capital in America were significantly down. Putnam questions if the Internet and other such technologies are causing disconnect in today's society.

Following Putnam's argument, one could consider that the designers and users of Web 2.0 social software are attempting to fill this gap, as new types of communities and ways of connecting people are utilized. As society seems to push forwards toward individualism and independence, people are perhaps looking for interdependency, and a way to be a part of a larger community. While empirical evidence identifies information exchange as the primary reason for using the Internet, both social support and friendship were also identified as highly desirable attributes (Ridings & Gefen, 2004). Hence, the argument could be made that the students born into the technological epoch could be embracing Web 2.0 as an opportunity to build community reviving social capital.

While providing the historical, philosophical, and pedagogical underpinnings leading to a new way for students to learn, this article has so far highlighted how this new form of learning is connecting the student to the Web 2.0 community for active involvement of the learning process and for gaining social support. While the users of Web 2.0 are directing their own personal learning, they are also acting as part of a community of learners who are determining the direction of learning today, through the learning artifacts available (e.g. Darwikinism), and the way in which they are categorized (e.g. folksonomy).

Darwikinism

Darwikinism is a neologism created as a portmanteau of Darwin and wiki. Darwikinism describes the similarity in nature between Darwin's species evolution and the artifact evolution demonstrated by wikis (Wikimedia: Meta-Wiki, 2011). Wikipedia is a popular wiki which functions as an encyclopedia, and was originally created with publishing access provided to a select group of people who were able to publish following a peer review process. This was time consuming and therefore little was published to the website. Wikipedia later changed this system to provide publishing and editing access to general Internet users through a simple WYSIWIG (What You See Is What You Get) program interface. According to Wikipedia's statistics (accessed December, 2011) there are 15,947,595 registered users of the site. Today, there are many different global, local, and private wikis available to students that function on the same principles. Artifacts in a wiki are never considered completed; they are in a constantly evolving process that is determined by the wiki's user base.

Darwin's theory of evolution connects to the way in which the wiki ensures the validity and reliability of the content. Once an author publishes an artifact, that artifact is subjected to editing and replacement in a continuous process to form a "better artifact," one which is deemed to be more accurate. Artifacts or sections of artifacts which are not deemed of quality will be removed and replaced.

There are various approaches to the way in which wiki users manipulate and edit artifacts, although inclusionism and deletionism have been identified as two broad categories to describe the majority of editorial practices on wikis (Wikimedia: Meta-Wiki, 2011).

At one end of the inclusionists' spectrum, there are those who prefer not to delete artifacts. Instead they amend parts that they feel are not fit. Inclusionists postulate that while a webpage is not limited by space, in the way that a hard backed encyclopedia would be, there is room for all comments to be made, and those comments should be visible for all. Editors at the other end of the spectrum follow the deletionism paradigm, and will remove

the whole article if it does not meet their criteria. While extreme poles have been described, editors can fit at different places on the spectrum between the two groups. Both the inclusionism and deletionism practices provide an example of how Darwin's theory of evolution is being enacted within the content of a wiki, with constant editing of artifacts to ensure that only the "fittest," most accurate artifacts, survive.

Darwikinism is one Web 2.0 example of how students' learning is changing. The way in which everyone has equal access to publish and edit wiki artifacts is challenging conventional thinking in regard to who makes the claim as to what is accurate, or even what knowledge is. In addition, the anonymous operational nature of the Internet allows users who may be afraid to speak out openly an opportunity to do so. The novice is able to work with the erudite without fear of ignorance. The operational nature of wikis provides the reader with fresh eyes. Students are no longer looking at artifacts with the belief that it must be correct due to its published status (Bruns, 2005). Instead, students are now actively reading and reflecting on the vast array of knowledge representations available, challenging the one-way (teacher to student) flow of information (Klamma, et al., 2007; Lee & McLoughlin, 2007).

Within the concept of Darwikinism, hypermedia environments (e.g., wikis) provide a cognitive tool for supporting the student exploring and constructing knowledge (Moos, 2009). Cognitive tools are defined as tools which amplify the student's cognitive capacities during thinking, learning, and problem solving (Lajoie, 2000; Lajoie & Azevedo, 2006; Vygotsky, 1978). For example, the student may publish an essay to the wiki, and the larger Internet community may assist by adding and deleting content to make the essay is more accurate. The student will be able to watch the essay evolve and use the knowledge he or she gains to write a better quality essay in the future. Search engine rankings connected to wiki pages are another excellent example of Darwikinism. Internet users can choose to ignore wiki pages they deem as lesser quality; with the lack of traffic visiting the site, the wiki pages will be "buried" under many other pages which are regarded as better quality. Wiki artifacts that are considered high quality will gain high traffic and additional hyperlinks through people blogging about the wiki pages, producing high rankings on search engines (Evans, 2007).

While many wikis operate with the user offered anonymity, empirical evidence indicates that students provide a higher quality of work when they know it is going to be published to the global audience, as the students see a higher purpose for the artifacts they create (Warschauer, 2006). Papert (1991) wrote about constructivism being especially effective within a context in which the student is consciously engaged in creating a public entity, from building a sandcastle on a beach to developing an idea on a wiki. Students also remain cognizant that while they are active critical consumers of Internet content, others will be critically studying the artifacts they have published to the wiki.

Needless to say, as the many users of Web 2.0 are continually developing and editing the content published to the Internet, it has developed a need for the significant content of the Internet to be categorized. While search engines were developed to support key word searches, another method called folksonomy has been developed through the many users of Web 2.0.

Folksonomy

Folksonomy is another portmanteau neologism. The term, coined by Thomas Vander Wal (2004), was created from the words folk and taxonomy, fashioned to describe a taxonomy formed by folk/people. Taxonomy is certainly not a new idea; Aristotle (384-322 B.C.) could be described as the father of taxonomy when he classified organisms by type and binomial definition. In 1876, Melvin Dewey created the Dewey Decimal System, a method of categorizing books; although it has been subject to numerous revisions, his basic principle is still in use today. What is different about folksonomy is that it was not born from an idea of one person, but created from a collective group. To explain how folksonomy emerged, an explication of the concept beginnings is necessary. As the users of Web 2.0 began to publish artifacts onto the web, they often used words to describe them. For example, if a person published a photograph of his or her dog by a lake, in the descriptive tag he or she could include the words dog, lake, and perhaps cute. These are ad hoc keywords, or tags, to describe that particular artifact. These words are providing meaning from that person's own understanding. Web 2.0 users are selecting words from their own vocabulary and adding explicit meaning, or inferred understanding, of that artifact; this creates a hook from which to retrieve that particular artifact. Web 2.0 has been described as a tool for networking, collaboration, and knowledge sharing (Chatti, Jarke, & Frosch-Wilke, 2007), which is how this individual taxonomy advanced from this distinct system of tagging. As the users of the Internet have used tags to describe their artifacts, when a user browses his or her chosen key word/tag, not only will his or her artifact appear, but also artifacts belonging to others who have chosen to use that tag. People can retag others' artifacts to reflect their own opinions/culture.

There have been a number of similar Web 2.0 tools to utilize this tagging revolution, such as Diigo and Del.icio.us, which are social bookmarking services. Rather than using the web browser's favorites function to store favorite websites, these web-based tools allows users to create an account and store their favorites on-line. As users store the webpage or artifact, they are prompted to provide at least one tag to be used for categorization; to assist, users are offered suggested tags they have used before, or tags that have been used by others users to tag similar items. These tags are used as a collective social tool to organize and share information as constantly evolving superimposed structures of meta-data (Rollett, Lux, Strohmaier, Dosinger, & Tochtermann, 2007). Similar to Darwikinism, the users are the creators and operators of these tools. Students are able to tag artifacts based on their cultures and beliefs in participation with the larger community. John Dewey (1964) wrote of a child centered learning approach: "…connection must be made to the mind and its material. There is no question of getting along without this bond of connection" (pp. 354-355).

The whole idea behind tagging is that the student draws from his/her own personal connections to create an appropriate tag. Dewey (1964) made an analogy describing a learner as an explorer who takes descriptive notes while investigating a new land.

No one would benefit of the explorer's trip if it was not compared and checked up with similar wanderings undertaken by others….the map, a summary, an arranged and orderly view of pervious experiences, serves as a guide to future experience; it gives direction, it facilitates control; it economizes effort, preventing useless wandering, and pointing out the paths which lead most quickly and most certainly to a desired result (p. 350).

The explorers notes are similar to the folksonomy system of tagging; not only do the users create their own tags, but they are also supported by the tags of other Internet explorers. For example, if students wished to find information about dinosaurs, they could search the web themselves, or they could search del.icio.us or Diigo to learn what another user has found on that particular subject. Students' learning does not need to stop at what the teacher provides, or even the information they are finding from their own Internet searches; these students are gaining access to information from prior searches made by the greater community, accessing "the wisdom of the crowds" (Rollett et al., 2007).

As the Internet community developed the system of tagging, this led to Tagclouds, tag networks, and clusters. Using a method of statistical analysis, Tagclouds reveal the dominant and interconnected nature of the tags categorized by the evolving folksonomies. Tagclouds are visual representations of set tag words that are formed into a cloud shaped cluster. The size of the words in the cloud typically represents the frequency of the word. For example, if the tag Internet is used more than any of the other tags, Internet will be the largest word in the cloud. Clustering algorithms are also often incorporated into Tagclouds, ensuring that tags of a similar content are placed together. Many social networking sites such as Diigo and del.icio.us use Tagclouds to support navigation. This is again similar to Dewey's (1964) explorer analogy, although rather than just focusing on individual notes/ tags from one explorer, the cloud shows a collection of notes/tags from thousands of explorers. There are also claims Tagclouds can support searches, browsing, impression formation or gisting, and recognition/matching (Rivadeneira, Gruen, Muller, & Millen, 2007) through the way in which the users of the Internet utilize the Tagclouds for their specific needs. Therefore, while students are able to develop their own system of tagging, and they can also utilize the Tagclouds in a way in which they choose to learn.

Conclusion

Web 2.0 is a highly dynamic entity, evolving at an exponential rate. This article provides a brief insight into the influence Web 2.0 has had on the way in which today's students learn and explicated Darwikinism and Folksonomy as two examples highlighting how these changes have evolved. Many academics have provided empirical and theoretical evidence identifying attributes of Web 2.0 that are changing the way in which students learn. These attributes include opportunities for active social learning, venues for publishing and receiving rapid, effective feedback, and opportunities for students to move from passive consumers to active, critical consumers of information (Boulos & Wheelert, 2007; Ferdig, 2007; Franklin & van Harmelen, 2008; Klamma et al., 2007; Sturm, Kennel, McBride, & Kelly, 2008). While this article is written to emphasis the way in which Web 2.0 is changing the way in which students learn, it would be a mistake to attribute Web 2.0 as the sole driver of this change. The majority of students' formal learning takes place within educational establishments, and one must account for teachers' technological perceptions,

abilities, and pedagogical practice which encourage or inhibit this change in the way students are learning with technologies such as Web 2.0 (Crompton, 2011; Franklin & van Harmelen, 2008).

The new learners are challenging the traditional flow of information (Klamma et al., 2007; Lee & McLoughlin, 2007), moving from the monological, to the dialogical, and finally to the trialogical approach to learning (Paavola & Hakkarainen, 2004) as students learn while they collaboratively create, manipulate and share information with the larger community. The teachers' role is to facilitate in the learning process and to consider ways in which they can turn the knowledge the students are gaining into wisdom.

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