WEB 2.0 LEARNING PLATFORM: Harnessing Collective Intelligence

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ABSTRACT

The rate of technological diffusion and the pace at which technology is altering how and with whom we connect is astounding. Although not at the same pace, theoretical views of learning and teaching are also changing. Whereas much of the initial e-learning simply patterned old models of teaching and learning, the new technological possibilities and realities encourage us to think differently about what is meant by education (Brown, 2000).

In this paper, we provide a stepping stone in some of the theoretical background, history, and possibilities for learning systems and platforms in the Web 2.0 era. We share a case study that reflects the experiences of a small university that is moving towards E-Learning 2.0 while simultaneously increasing interoperability by using e-learning standards reflected in the widely-used reference model called SCORM (Sharable Content Object Reference Model). We also highlight the strengths and weaknesses of SCORM in allowing for learning management systems to have a Web 2.0 character.

Keywords: Web 2.0; E-Learning 2.0; SCORM; Learning Standards.

THEORETICAL BACKGROUND

The prevailing model of schooling has often imitated the existing economic-subsistence structure of a society (Reigeluth, 1994). Agrarian societies often had little formal schooling; learning and teaching were a part of working side by side with father, mother, and other community members. Then with the advent of industrialization, schools were often seen as "little factories." In often mechanistic terminology, learning was seen and described as a transfer of knowledge from teachers to learners, with certain output expected from a centrally controlled school system. What seems to be happening now is another transformation where in a knowledge economy (Blumen, 2003) both knowledge and learning are viewed differently, with a trend toward systems that support people as learner/teachers (everyone is both a learner and a teacher) (Rogers, Liddle, Allen, 2007).

In this paper we discuss this most recent transformation. Probably the most extreme statement of the industrial, scientific-management view of teaching and learning was made by B.F. Skinner, the famous behaviorist psychologist of the 20th century.

He argued that all people should be seen as mere stimulus-response organisms (Skinner, 1968, 1972). He felt that an organism's behaviors could be studied and controlled by mathematically formulating the correlations between changes in the type and intensity of stimuli applied to the organism (whether it be a tadpole or an 8-year-old child) and the corresponding changes in the organism's behavior. Behaviorists were not interested in what goes on inside the "black box" of a child's mind, because it is impossible to see, measure, or mathematically manage subjective experiences that are going on inside that black box. Subjective responses would require that teachers instruct and students learn in ways that often could be neither scheduled nor managed, and this was scientifically unacceptable.

Cognitivism came onto the scene mainly as a response to behaviorism. Whereas behaviorism ignored the question of what happened in the mind because there was no way to measure it—a "black box" so to speak—cognitivism argued that active processes in the mind and intentional action (Miller, Galanter, and Pribram, 1960) contributed to behavioral and learning outcomes. Interestingly, the development of the computer provided one model (of many) to potentially explain how the brain worked (Pylyshyn, 1984; Rumelhart, 1986). This followed the general idea that there is some kind of mental content that we transmit and receive which is processed by the "software" of the brain and stored in memory devices. It has been suggested, however, that because the computer currently deals only with syntax, not semantics, it is an ill-suited basis for any cognitive theory (Searle 1984).

Arguments against cogntivism have led to other emergent theories that have provided alternatives that seem to better explain what is meant by "learning" and "knowledge." Downes (2006) illustrated the difficulty in the cognitivistic view of knowledge as something that can be stored in a specific place and transferred to others:

> ***To illustrate this concept, I have been asking people to think of the concept 'Paris'. If 'Paris' were really represented by a symbol set, we would all mean the same thing when we say 'Paris'. But in fact, we each mean a collection of different things and none of our collections is the same. Therefore, in our minds, the concept 'Paris' is a loose association of a whole bunch of different things, hence the concept 'Paris' exists in no particular place in our minds, but rather, is scattered throughout our minds. (p. 9)***

One emerging theory in response to cognitivism, sometimes called connectionism or connectivism (see Stanford Encyclopedia of Philosophy, 2002), moves from the cognitivistic view that brains are like computers with symbols and programs to the view that brains are more like computers when connected together in a network. In this view, knowledge is distributed through connections in networks. Siemens (2004) articulates eight major theses of connectivism:

1. **learning and knowledge rests in diversity of opinions,**
2. **learning is a process of connecting specialized nodes or information sources,**
3. **learning may reside in non-human appliances,**
4. **the capacity to know more is more critical than what is currently known,**

5. nurturing and maintaining connections is needed to facilitate continual learning,
6. the ability to see connections between fields, ideas, and concepts is a core skill,
7. currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities, and
8. decision making is in itself a learning process; choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality; while there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision.

Theoretical discussions often revolve around social constructivism, which also puts a great deal of emphasis of real learning on the situated context of participation in social interactions within what is termed a culture of expert practice (Brown, Collins, & Duguid, 1989; Collins, Brown, & Newman, 1987) or a community of practice (Lave & Wenger, 1999). Lave and Wenger (1991) make a clear distinction between instruction and learning, arguing that formal instruction usually capitalizes on the "exchange value" of learning – learning something in exchange for a grade or a degree; whereas learning in a community of practitioners often involves the "use value" of learning – learning something in a context where it is immediately useful. They also describe the distributed nature of knowledge and the social, participatory nature of learning. Along these lines, the authors of this paper also believe that the learner is not a "receptacle" for knowledge, but rather the learner can be a participant in the dynamic creation and/or discovery of what is to be learned, in the process making learning outcomes contextualized and relevant.

WEB 2.0, E-LEARNING 2.0, AND THE NET GENERATION

The participatory, collaborative, and dynamic online approach of Web 2.0 is where most serious efforts at web-based development are heading. Where Web 1.0 was mostly a medium for reading, Web 2.0 provides many more opportunities for reading and writing. It follows that online learning communities would naturally transform to use a similar approach. O'Reilly (2005) notes six core competencies of the Web 2.0 environment:

- services, not packaged software,
- an architecture of participation,
- cost-effective scalability,
- re-mixable data source and data transformations,
- software above the level of a single device, and
- harnessing collective intelligence.

O'Reilly put special emphasis on the last item, explaining how it seems the central principle behind the success of the giants born in the Web 1.0 era who have survived to lead the Web 2.0 era appears to be that they have embraced the power of the web to harness collective intelligence. This change toward read/write connective technologies has already dramatically influenced the global business landscape, making it possible for smaller companies who do well at harnessing collective intelligence to compete with the largest companies. In describing this impact Tapscott and Williams (2006) describe how;

> *"[t]his new participation has reached a tipping point where new forms of mass collaboration are changing how goods and services are invented, produced, marketed, and distributed on a global basis" (p. 10).*

If the economy is changing so drastically in light of these trends, it makes sense that learning would alter to better prepare today's students for the world in which they will live and work.

In many countries, the internet and the web have now been a part of education for long enough that it is hard to imagine what we would do without them. Many universities offer online courses, many professors post their syllabi and conduct some discussions online, educational software proliferates, and learning management systems (LMS) such as Blackboard and WebCT are commonplace.

Where the initial efforts of e-learning comprised mainly posting and distribution of readable content, the new models foster a participatory approach. O'Hear (2006) says that where the "traditional approach to e-learning ... tends to be structured around courses, timetables, and testing ... an approach that is too often driven by the needs of the institution rather than the individual learner," there is an alternative. O'Hear says;

> ***"in contrast, [E-Learning 2.0] takes a 'small pieces, loosely joined' approach that combines the use of discrete but complementary tools and web services—such as blogs, wikis, and other social software—to support the creation of ad-hoc learning communities."***

As a growing generation of learners and internet users are discovering more of the possibilities for contributing to networks of global communities, traditional online educational approaches seem slow, dry, and out of context. Downes (2006), who has been quite vocal in discussing E-Learning 2.0, offers this question:

Table: 1
Learning Models of 19th, 20th, and 21st Centuries

	19th Century	20th Century	21st Century
Teaching style	Lecture	Lecture	P2P collaboration
Curriculum	Books, blackboard	Textbooks	Community-generated content
Location	One-room schoolhouse	Classrooms	Anywhere
Interaction	Q&A	Labs	Self-directed exploration, teamwork
Objective	Survival	Employment	Lifelong learning skills
Tools	Blackboard	Labs	Personal devices
Result	"Book learning"	Memorized facts and information	Adaptation, growth

"What happens," I asked, "when online learning ceases to be like a medium, and becomes more like a platform? What happens when online learning software ceases to be a type of content-consumption tool, where learning is 'delivered,' and becomes more like a content-authoring tool, where learning is created?" The answer turns out to be a lot like Web 2.0:

"The model of e-learning as being a type of content, produced by publishers, organized and structured into courses, and consumed by students, is turned on its head. Insofar as there is content, it is used rather than read— and is, in any case, more likely to be produced by students than courseware authors. And insofar as there is structure, it is more likely to resemble a language or a conversation rather than a book or a manual." (p. 13)

The move by some large universities towards digitization and open sharing of content indicates that value is not strictly tied only to content transfer, but rather value comes from a particular learning community that uses content in creative, interactive, and meaningful ways.

Table: 1 captures our conceptualization of some of the changes in learning models over the last three centuries.

The model of the 21st century incorporates more participation, collaboration, and flexibility in creation, adaptation, and use of learning materials.

In Prensky's (2001) well-known article, he makes the distinction between digital natives and digital immigrants, with today's young students being digital natives because of the ubiquitous nature of technology use during their entire lives. Lohnes and Kinzer (2007) argue, however, that the typifications of the "Net Gen" students (e.g. digitally literate, connected, multitasking individuals, likely to be visually oriented learners; Oblinger & Oblinger, 2005) are generalizations that need a more nuanced view. In their research of the ways in which liberal arts college students use technology, they discovered a difference between home preferences and school preferences. At home, these students tended to be more like the descriptions of Net Gen students, but at school they resisted using laptops (often seeing them as a barrier to creating and maintaining a learning community) instead preferring a "notion of a classroom community, fostered by small class sizes, a particular model of teaching based on real-time human contact, and frequent interaction with faculty members outside the classroom" (Lohnes & Kinzer, 2007, ¶15). They argue that their findings echo Roberts' (2005) statement that "the Net Generation's general expectations regarding leading-edge technology have not fully impacted its expectations about the use of technology to support learning" (3.6).

While it is true that certain aspects and characteristics of the current educational system will most likely prove resilient as the preferred method for learning certain topics, it is very likely that Web 2.0 trends will penetrate more of the educational system than we can now imagine.

In trying to prepare for "Web 2.0 Students" (Thompson, 2007), many universities are already exploring the instructional use of Web 2.0 technologies such as student blogs and instructional blogging (Glogoff, 2005), wikis (Ferris & Wilder, 2006), iPods and podcasting (Duke Digital Initiative, 2006), text messaging (Carnevale, 2006), and other social software such as distributed classification systems (Mejias, 2006).

Each of these technologies supports learning approaches that more closely resemble the expectations of this generation of students toward an ideology of "open communication, decentralization of authority, [and] freedom to share and re-use" material (Wikipedia.com, 2006, "Introduction," 4).

Downes (2006) questioned what happens when online learning becomes more like a platform where learning is not so much "delivered" as it is created. Along with that, what will occur when students create the content, and their identity shifts from being receivers only to being learner/teachers? This type of learning by explaining can be facilitated through an online learning platform that allows individuals to be learner/teachers, tapping into collective intelligence by collaborating in the creation, reorganization, ranking, sharing, and reuse of rich content, assignments, and assessments.

ROLE OF STANDARDS IN E-LEARNING

Standards in any industry are useful to ensure that when multiple entities are engaged in the creation of what should be interoperable parts they have the specifications needed to build these parts in a way that they do indeed "fit" seamlessly in the intended way. As examples of this, Bush (2002) offers colorful stories regarding the establishment of standards for fire hydrants and the hoses that are supposed to connect with them and the battle for standards in the way railroads were built in 19th century America. If there are no standards, or if these standards are not sufficient, the natural result is that the ideals of re-usability, interoperability, and scalability are seriously hampered. We argue that the lack of standards, or the creation of ill-suited standards, tends to isolate the efforts of any one person or entity, limiting the capacity of harnessing collective intelligence.

Of recent note has also been the discussion regarding standards in creating and sharing learning objects. According to Wiley (2000), "the main idea of 'learning objects' is to break educational content down into small chunks that can be reused in various learning environments, in the spirit of object-oriented programming." The use of objects in software development has been quite successful, leading to better reuse and improved software architectures. It is natural that some would want to transfer these successes to the field of education. Learning objects provided a new way to think of learning content. The idea was that these 'small chunks' would act as types of building blocks that were self-contained and reusable, able to be aggregated into larger structures (such as a traditional course), and tagged with metadata so that they would be easily searchable.

The recognition of needs for standards in e-learning can be tracked back to when it was primarily called computer-based training (CBT) and the aviation industry created a committee specifically to look at how to increase hardware consistency and system interoperability for their CBT. Soon organizations around the world (IEEE, ADRIADNE in Europe, Dublin Core, EDUCAUSE IMS Consortium, ADL, etc.) began efforts to determine specifications for learning-related technologies (Masie, 2003). The desire was to create some kind of standard for making learning content sharable. The learning pieces are now referred to as sharable content objects (SCOs), sometimes also called learning objects. The US Department of Defense also became interested simply because of the enormous amount of money they were investing in technology-enhanced learning, and according to Hodgins (2000) they initiated the Advanced Distributed Learning (ADL) Initiative so that regardless of source or application, all branches of the US military could still use, exchange, manage, track, and re-use their learning technologies, content, and data.

The result of their efforts was a reference model for sharable content called the Sharable Content Object Reference Model (SCORM). Although everyone is not required to be SCORM conformant, Masie (2003) offers a few examples of where people would benefit from using aspects of SCORM:

- If you wish to track learner progress and mastery, and use rules to determine the learner's path through content, you will want to use SCORM "Run Time Environment" and "Sequencing."
- If you don't need to track the learner but do want to export your content to other SCORM learning management environments, you will want to use Content Packaging_in the "Content Aggregation Model" part of SCORM as an interchange format.
- If you want your content to be searchable and usable in particular contexts, you will probably want to use the metadata part of the "Content Aggregation Model" for tagging your content. (p. 20)

SCORM currently assumes that learning will be directed through an IT system (e.g. an LMS), that learning will be delivered on the web, and that changes in the reference model are forthcoming (Masie, 2003). Reusable Learning (2007) provides one helpful primer for those first becoming familiar with SCORM. It is important to recognize that SCORM is not a standard in itself, but rather "a reference model that serves to test the effectiveness and real-life application of a collection of individual specifications and standards" (Masie, 2003, p. 14). Beck (2003) compiled an extensive list of learning object collections, some of which are SCORM-conformant. Yet, despite the initial momentum regarding learning objects, Parish (2004) documented some of the difficulties encountered. Among the challenges we see, both learning-object repositories and enterprise-scale learning management systems are not generally used to track learner use (which would be helpful in order to learn more about the learning process, thus supporting improvement of the material so that it will be more useful to future learners).

Neither do they easily allow for customization, feedback, or aggregation of the pieces into units that maximize the collaborative potential of the internet. Additionally, the entire idea behind the effort has been criticized with the argument that learning design and reusability are incompatible (Downes, 2003). Despite criticisms and the fact that ADL was not commissioned by a standards-approving body, SCORM has been voluntarily adopted by multiple governments and much of the learning industry as a whole (Masie, 2003). ADL is also now looking to pass the baton for this effort to another organization that might have the energy and resources to improve upon their initial work (Blackmon, 2007).

For those who look to use SCORM as a reference model and for those who take the responsibility of improving SCORM or related specifications in the future, we want to examine the implications of the current version of SCORM in light of the trends towards Web 2.0 learning environments. Although there are multiple options besides SCORM for promoting E-Learning 2.0, and any organization could build a system specific to an E-Learning 2.0 situation that is capable of using any technology, we specifically investigated SCORM in this paper because of the defined package specification, the robust sequencing model, and its widespread use.

CASE STUDY

The following case study explores the efforts of a small university in creating technology-enhanced learning experiences that manifest Web 2.0 characteristics at the same time as becoming SCORM conformant.

It exemplifies some of the driving forces and difficulties behind both efforts. Brigham Young University Hawaii (BYUH) is a small and diverse campus of approximately 2400 students, with more than half of these students coming from 70 different countries. The university has a special mission to educate students from Asia and the Pacific Islands. However, because of the limited resources of the university and the current on-campus enrollment cap, many qualified applicants from these countries are not admitted. Until recently, the formidable cost of course development has precluded the use of distance learning as a logical alternative for reaching these students. However, rapid development tools are beginning to emerge that allow the relatively easy creation of basic class content by instructional developers. BYUH has started an e-learning development initiative in which students trained in instructional design theory and multimedia authoring develop online courses under the mentorship of a professor of instructional design and development. The expectation is to experiment with the development of low-cost, high-quality distance learning courses that can serve target audiences both in Asia/Oceania and on campus.

This development process comprises roughly three stages. The first stage, which is in progress at this time, is to convert selected on-campus classes to online classes. The end products of this stage are mainly digital video recordings of the live classroom with B-roll images inserted from documents, PowerPoint, graphics, videos, and other materials used in the classroom presentation. The recordings will also have a menu that breaks down each one-hour lesson into chucks of mini-lessons with digital video control so that learners can access, repeat, or forward any part of the instruction instantly. The second stage will be to create learner-computer and learner-instructor interactions, learning games, support materials, and assessments.

For the most part, these activities should be automated so that they can be more scalable, but learner-instructor interactions through synchronous and asynchronous means such as chat room, web conference, blog, archive-able and searchable threaded discussions, etc., are still needed to ensure a rich learning experience.

The third stage will be to create a mechanism for intra-community and inter-community learner-to-learner interactions that can allow users to share, improve, and add instructions. Intra-community interaction refers to interaction within a well-defined learning community, for example, students in Samoa who are taking Education 200.

Inter-community interaction refers to any interaction outside of this well-defined learning community. There can be interaction between students who are taking the same course from Samoa and Hong Kong, or between students who are taking the course for credit and those who are interested in the course because of professional development needs.

This three-stage process coincides with the development of e-learning from 1.0 to 2.0. While the first stage provides the baseline instructions of the course, the second stage enriches the experience and solves learning problems that may not have been foreseen in the creation process. These two stages are typical of the basic and advanced levels of E-Learning 1.0. Although they lack the interactions that will come with the third stage, they do fulfill the required learning needs. The third stage aims at not only improving the learning experience, but also improving the course itself and extending the individual's learning beyond the original prescribed curriculum. Thus, it fulfills O'Reilly's (2005) core competencies of Web 2.0, especially in architecture of participation, cost-effective scalability, remixable data source and data transformations, and harnessing collective intelligence.

The current version of SCORM has the promise of facilitating development during the first two stages, but is lacking in support for the third stage. By developing course content units with SCORM-compliant metadata, individual learning objects can be more easily shared among courses and offered as individual seminars. More importantly, by using a SCORM-compliant LMS, we can scout for existing learning objects from other educational institutions that, with proper copyright approval, we may use in enhancing our courses. SCORM will also allow us to better track student progress and make curriculum changes.

However, the current version does not define how student interactions can be tracked as anticipated in the third stage and in some second-stage activities. At any rate, we still anticipate great value in pursuing SCORM-compliance, which will more likely allow instructional contents to be compatible with both current and future systems. However, we do encounter a number of obstacles in this e-learning development process.

The first obstacle is accessing technical know-how of SCORM. As it is still a relatively new standard and is not widely adapted for college-level distance learning programs, it is difficult to identify well-trained individuals to help with the development, especially for a small university like BYUH.

One solution is to rely on colleagues in the SCORM community to assist and share. So far, the progress has been encouraging. The second obstacle is the lack of qualified instructional designers/developers. A conditional solution came a couple years ago when the university started offering instructional design and developing classes. Currently, there is a small group of seniors and recent graduates who are striving to develop high quality instructional products.

One example is the successful creation of an online training program for the Food and Beverage employees of the Polynesian Cultural Center—Hawaii's number one paid tourist attraction. The program was developed entirely by students, and initial assessment shows that it is effective at improving employee performance. It is a conditional solution because it relies on the quality of student developers and availability of faculty mentors. The third obstacle is the variability of technology infrastructures in target areas. While some areas, such as Hong Kong and Singapore, have high-speed internet connections, others, such as Samoa and Mongolia, do not. To solve this problem, all course content will need to be dubbed into three versions simultaneously. The first version will be running on a LMS hosted in the United States where the content is developed.

This version will be able to make use of all course features. The second version will mirror data from the central LMS to in-country servers where users can either access it offsite or in a LAN environment. In this version, users can still access all course features, although there may be delay between the latest course materials in the main server and the local server.

This arrangement will work especially well for countries such as Mongolia, where many of the activities will take place within a relatively small geographical area in the capital city. The third version will save course contents into CD or DVD-ROM so that no internet connection is required. The different types of interactions will take place in traditional paper correspondence, occasional conference calls, or email when a low-speed connection is available. The second and third versions can also be combined to offer an online-offline experience.

As e-learning design, development, and delivery tools continue to advance, they are enabling institutions and individual faculty members to create technology-enhanced learning experiences with relative ease. What is needed are;

- **tools that can integrate Web 2.0 features into the learning environment effectively and**
- **advancement in the standards that can better reflect 2.0 characteristics.**

The BYUH case illustrates an institution's gradual migration from e-learning 1.0 to 2.0 and the role that SCORM plays in this process.

The next section covers three of the core competencies of Web 2.0 environments, principles that are prevalent in the third stage of development in the BYUH case.

SCORM AND A WEB 2.0 GLOBAL LEARNING COMMUNITY PLATFORM

Earlier we cited O'Reilly's (2005) six core competencies of the Web 2.0 environment. Three of these competencies are of interest in relation to technical strengths and weaknesses of SCORM 2004, 3rd edition:

- **remixable data source and data transformations,**
- **an architecture of participation, and**
- **harnessing collective intelligence.**

These issues along with the information on the related features and limitations in the current version of SCORM are summarized in Table: 2, a discussion of which follows.

Table: 2
E-Learning 2.0 Approaches and SCORM

Approach Consistent with e-Learning 2.0	SCORM Feature	Current SCORM Limitation
Remixable data source and data transformations	Requirements set for assigning metadata tags Allows for a system which could allow smart searching and combine various objects in new ways (SCORM 2004 3rd Ed. – CAM, p. 4-3)	In practice, most existing SCORM content aggregations contain little (or none) of this metadata.
Remixable data source and data transformations	Allows pulling learning objects together with some sequencing using sub-manifests (SCORM 2004 3rd Ed. – CAM, p. 3-19)	ADL discourages use of sub-manifests until the IMS Global Consortium, Inc. releases a newer version of the IMS Content Packaging Specification that resolves some issues

An architecture of participation; Harnessing collective intelligence	**Specifies exposing metadata – allowing a platform to search, combine, and make pieces useful for other purposes (SCORM 2004 3rd Ed. – CAM, p. 4-3)**	**Created more from the standpoint of a single author or single team authoring instead of collective content authoring and assigning of metadata tags Difficult for a community to access and alter or add metadata tags, because these changes would all need to be altered in the manifest document itself**
Harnessing collective intelligence	**Specifies some "stubs," places to save data on comments, interactions, and scores of students For example: Comments From Learner (p. 4-23), Comments From LMS (p. 4-30), and Interactions (p. 4-48) Providing placeholders for student comments and interactive activities (SCORM 2004 3rd Ed. - RTE, Section 4.2)**	**No standards on what used for or how interactions get passed back and forth, used, and pulled back in to the learning experience Stubs seem to be intended mainly for quizzes LMS is not required to do anything with it, which essentially equates to no one worrying about it**

Strength of SCORM is that one of its main goals is to make remixable data sources and data transformations easier create and use. This aligns well with the Web 2.0 trends.

Although there is not a defined system for how to mix and match learning objects, built into the SCORM specifications are requirements for assigning metadata tags (SCORM 2004 3rd Ed. – CAM, p. 4-3). This metadata allows for a system to be created which could fairly easily allow smart searching of different learning objects, as well as the capacity to combine the various objects in new ways.

However, the authors are aware of no existing systems that take advantage of this metadata for searching and storing learning objects. Therefore, in practice, most existing SCORM content aggregations contain little or none of this metadata. SCORM also allows for pulling two learning objects together into one object with some sequencing around it using sub-manifests. However, ADL also discourages the use of sub-manifests until the IMS Global Consortium, Inc. releases a newer version of the IMS Content Packaging Specification that resolves some issues around sub-manifests (SCORM 2004 3rd Ed. – CAM, p. 3-19).

Although it is a benefit that SCORM specifies exposing metadata, so a Web 2.0 community platform can search, combine, and make pieces useful for other purposes, there are clearly some limitations to how these specifications were created.

SCORM was created more from the standpoint of a single author or single team authoring specific learning objects that can then be given to others to mix and match, instead of collective content authoring and assigning of metadata tags or classification. The models are more aligned from the perspective of someone like an instructional designer coming up with content, tagging and posting it, but not from the perspective of collective authoring. It is even more difficult to allow for a community to edit metadata tags, because these changes would all need to be altered in the manifest document itself as this is where the metadata resides (SCORM 2004 3rd Ed. – CAM, p. 4-3). It would be possible for a "folksonomy" of people to create community-generated tags that a system would then programmatically push into the manifest, but we are unsure how it would perform when SCORM specifications were not originally intended for community-driven categorization.

This influences the relative difficulty of using SCORM to meet the Web 2.0 core competencies of having architecture of participation that harnesses collective intelligence. As one example of the difficulties, a significant current weak spot of SCORM is that there is very little defined with regard to the interaction of learners. It is designed for a student going through a learning object, but there is no standard for defining the range of student interactions with a teacher or how the student interactions get processed on the LMS, much less any kind of specification for interactions within a whole community. There are some "stubs", places to save data on comments, interactions, and scores of students (SCORM 2004 3rd Ed. - RTE, Section 4.2), but no standards on how to use this information or how these interactions get passed back and forth, used, and pulled back in to the educational experience. This is an understandable weakness, as this is a very challenging area to standardize. Yet we believe unless there are some alterations in the SCORM standards, the paradigms by which SCORM-conformant instruction are created will be outdated and less helpful in Web 2.0 environments. In the SCORM 2004, 3rd ed, RTE (Run Time Environment) document, there are the following "stubs": Comments From Learner (p. 4-23), Comments From LMS (p. 4-30), and Interactions (p. 4-48). These standards provide placeholders for student comments and interactive activities, but seem to be intended mainly for quizzes. In the case of a quiz, each question is considered an interaction where the learner's response is a letter, number, etc. that corresponds to an answer, or an open text response. These standards provide a way for this information to be stored, but it is up to the LMS to decide what to do with this information. Additionally, the LMS is not required to do anything with it, which essentially equates to no one currently doing anything with it.

On another level, there are no existing standards in SCORM for learners to do anything as basic as "turn in" assignments, submitting documents to either a teacher or a community. We can find no existing standards that would mark a participant's work as an "assignment," allowing learners to show what they have done, and to get comments back on that information. SCORM has some of the fields, but more discussion needs to occur with regard to defining interactions.

Difficulties like these at least partially indicate deficiencies in the current edition of SCORM for meeting the needed sharable standards for E-Learning 2.0 environments. Although nothing necessarily prevents from collective authoring models, it is clear that it was envisioned more from the paradigm of a single author (e.g. an instructional designer) coming up with content, tagging the content and then posting the content for others to use and mix with other content. Even if systems outside of the SCORM umbrella were created to interact and edit SCORM-conformant content, there would most likely be performance issues that arise from needing to alter the manifest each time changes are made and this makes us question how quick or useful this would be in real-time distributed environments.

Masie (2003) states that although SCORM does not address everything, it also does not limit other possibilities, and they encourage practitioners to simply use the standards as far as they go and then create custom solutions to key problems until standards are established. As we think more about collective intelligence in the creation and tagging of content, as well as the value of the interactions during the creation process, we suggest that standards be created which are more helpful for collective authoring and real-time interactions.

DEMO AND DISCUSSION

What would an ideal Web 2.0 learning platform look like? In our estimation, this platform would incorporate an open, transparent educational process, bringing the best available instruction to the surface where everyone can access and improve upon it. This allows for an open model of learning and encourages education to evolve and improve much more quickly.

Materials that are effective and popular naturally become visible and are iterated upon. Having a base of user-generated content, this platform fosters instruction that is more current and customized to the audience, powerful because content acquires meaning through relevance. With an E-Learning 2.0 platform, instruction takes on a living, growing quality - cross-pollinated by user contributions, weeded and pruned by user feedback. Any platform providing more Web 2.0 functionality in user-friendly ways will organically harness the collective intelligence that has come to define the era. Indeed, the authors have directly experienced the value of tools such as blogs and wikis as applied to the traditional classroom, and we are greatly encouraged by the increased level of interaction and learning that we have experienced in these environments.

Additionally, over the next semesters the eBusiness Center will be hosting a competition at BYU where students will be involved in uploading content through a new online tool developed by Agilix, intended to eventually be a SCORM-conformant global community learning platform. To demo this tool and participate further in the conversation regarding this topic, please go to http://www.agilix.com/BrainHoneyDemo

CONCLUSION

E-Learning 2.0 offers the opportunity to reach the individual empowerment that was the goal of early online learning efforts. Web 2.0 and E-Learning 2.0 reflect a break from the way things have been done, offering an alternative to the highly centralized industrial model of learning of the past era. Born in each human is a natural affinity to learn, but perhaps never before in the history of time have our opportunities and networks been as large as they are today.

As personal, social and flexible technologies proliferate, re-usability and interoperability will also increase in importance. According to Tapscott and Williams (2006), "In today's complex and fast-moving economy, the economic deficiencies and liabilities caused by the lack of standards surface faster, and they are more jarring and consequential than in the past" (p. 21). As illustrated in our case study, however, there are limitations to facilitating Web 2.0 interactions under the current version of SCORM. SCORM (2004, 3rd Ed) is definitely making progress in that it has the promise of facilitating development of content created by single parties, but it does not seem to take into account community generated content and multiple party metadata tagging.

Our recommendation is for thoughtful discussions regarding the creation of simple standards that are more helpful for real-time interactions and authoring that better harnesses collective intelligence.

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