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Commentary on:

Semantic Learning Webs

Rod Sims

In prefacing their paper with quotes on the future of the internet and semantic webs, the authors provide a comprehensive framework from which to reflect on the development of semantic learning webs, addressing key factors such as high-order learning, learning objects, communities of practice and effective means to traverse the complexity of web-based documents. Through their discussion the authors enable the reader to reflect on a significant question for technology-based learning: Are we moving to a learning space or place in which intelligent agents will support our interactions within *knowledge neighbourhoods* (communities), or might the future of learning be more concerned with the mobile, wired, connected individual?

Overall, the authors present a succinct argument for the learning community supported by complex semantic networks. To substantiate the potential of their vision, they present a case study in the domain of global warming to illustrate the ways in which *knowledge charts* (representations of community knowledge), *knowledge neighbourhoods*, and *knowledge navigation* (tools to assist processing of knowledge) might be implemented. In doing so, they highlight the importance for learning systems and environments to be able to support the complex learning requirements of the individual knowledge seeker.

In my reading of the paper, the value of enhanced organisation for learners to more effectively access and collate information to support efficient knowledge construction is well argued. More importantly, the authors provide a coherent narrative on the key issues surrounding semantic learning webs – clearly stating that while it is comparatively easy to describe them technically, the reality remains a vision, an aspiration for the future. The reasons for this, they argue, are twofold: the underpinning technologies have yet to reach full maturity and the concept is reliant on the reusability and interoperability of learning objects.

To reflect on the paper and the arguments presented, I have chosen to focus on specific issues which address a key question that must be raised when emergent systems and visions of the future are considered: "to what extent will these (in this instance semantic learning webs) make a difference"?

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Learning: Motivation, Engagement and Interaction

The authors suggest that "armed with these new semantic tools, learners may be capable of becoming robustly critical thinkers, able not only to move easily through the surfeit of information resources but also to examine and critically assess the varied religious, scientific, economic, ethical and political claims and counter-claims which find fertile ground on the web". And the means of achieving this through the semantic webs described requires an integration of content, taxonomy, hypertext navigation and conceptual interpretation.

However, the implementation of semantic learning webs to support such knowledge-rich environments also demands consideration of the characteristics of the individual learner. For example, in the case study on global warming, the authors identify the learners as those who are motivated and engaged with the content and therefore actively in pursuit of different threads to support or clarify and various arguments. This however is not representative of all learners, and in my experience technology systems are too often built to support learning, but do not give adequate consideration to the specific cognitive needs of the learner and the processes by which engagement with the content can occur.

What characterises navigation through semantic webs is the location of and access to arrays of content material, which the user has to interpret for relevance to their specific goal. While this supports the motivated learner, specific research on interactivity (Aldrich, Rogers, & Scaife, 1998; Sims, 1998, 1999) indicates that the content object itself should contain interactive components to enable the learner to explore, experiment and test observations and hypotheses. Too often the assumption is made that navigation **to** a content object is sufficient for engagement to occur. I do not support this position, and for a knowledge environment to be pedagogically effective, there must be inbuilt learning strategies to enable the learner to contextualise content and construct new levels of meaning and understanding. To achieve this, individual learning resources must be characterised by manipulation of, and control over, content.

The proposed semantic web environments provide the corridors and doors to relevant content, but do the learners know how to open those doors and interact with the material revealed?

Learning Objects

The application of learning objects – "separable units of educational material which can be combined and reused in a variety of contexts" – and their reusability and interoperability is also identified as a key attribute for effective semantic learning webs. While the concept of learning objects has infiltrated all sectors of education and training, a significant issue is that this proliferation has resulted in a wide range of interpretations of their characteristics.

In the educational sectors in which I currently consult, the term learning object is typically applied to what used to be called computer-based learning, with the e-learning applications common in commercial training frequently little more than PDF images of paper-based manuals. In comparison to these original CAI or CBT modules, the major difference is that, through forms of meta-tagging, learning objects can be accessed through specific search engines. Consequently, all of these objects are capable of being combined with other objects and re-used in different contexts. However, it is also possible that these objects, while tagged similarly, might have been created by different organisations and with different or conflicting learning strategies.

Consequently the question arises as to whether the competing interface and information designs have a consistency that will enable the learner to maintain engagement as the different objects are accessed, but without that learning suffering from interference. Certainly if the learner is motivated to access and understand different aspects of a content domain, the integrity and consistency of different learning objects will be less critical than those presented to a learner who may be struggling with both the domain and the interface. But this is not always the case.

Similarly, the extensive efforts being put into specifications and standards for learning objects are critical for the effective use of learning management and content management systems. But the cynical observer might see this as more about selling software and systems rather than education and learning. Even with an integrated set of reusable, interoperable learning objects, questions such as "to what extent does the learner have control and mastery over the environment in which they are presented?" and "does quality and effectiveness of learning remain a consideration?" must continually be posed.

Communities

It is also important to comment on the extent to which 'communities of practice' (Wenger, 2000) or 'communities of learners' will emerge as a result of, or through, semantic learning web technologies and systems. The authors clearly articulate their vision of "semantic neighbourhoods for learning" through the concept of *Knowledge Neighbourhoods*, "locations in cyberspace where learners can congregate into groups or larger communities with the goal of acquiring knowledge about some topic". The key to the success of these communities is common interest, continuing but dynamic membership and participation. However, whether these neighbourhoods can be established with the expectation they will be populated by a community, or whether the communities will first establish themselves and then seek the most appropriate commination infrastructure remains debatable.

As a practicing online teacher, with students enrolled in twelve-week courses, I have witnessed little evidence of communities existing or emerging within the course. However, many of these students report a community that forms externally to the online learning environment. Within the virtual classroom, the relationships tend to be 1:1 (instructor:student) rather than the many:many that characterise collaboration. The concept of community for me is that of groups of people who choose to live or work together (virtually or physically) and which form over extended periods of time. Communities of practice form over extended periods of time as a result of common interests or needs and frequently across or external to existing, formal organisational structures.

For communities of learners to form therefore requires a choice being made by those individual learners, and for other learners with whom they communicate making similar choices. Certainly in a full academic program such a community can evolve, but it is a human initiated and controlled dynamic. Because a number of learners are connected to or working with a computer-based environment does not imply community. Consequently the operations of a semantic learning web in facilitating knowledge construction need also to address the means by which collaboration and personal space are also enabled.

Beyond Tomorrow

With respect to semantic learning webs, my argument and reflections have briefly considered how we learn, the efficacy of reusable learning objects and the process of community development. Underpinning those factors is a consideration of whether

computer systems are seen as independent from the human condition, or whether the technological and biological will ultimately merge.

Too often it seems we try and focus the development of computer systems on replicating and enhancing the familiar environments of the face-to-face classroom. The assumptions we make are often based on being able to integrate the teacher, the library or the classroom into the computer interface. However, there is a more subtle assumption, that the cognitive processing between a learner and a learning object is the same as that between a learner and a teacher in the classroom. But why do we make this assumption?

I am heartened by research being undertaken in electracy (fro example, Erstad, 2003) and the challenge posed by Prensky (2001) to accept the divisions between the digital natives and digital immigrants. It is paramount that we continually challenge the conventional image we have of complex computer systems and the way people think and learn. In doing this, I have come to the view that the relationship we have with computers is different to other forms of communication, and that it represents a different or new form of cognition. One means to view this is through the different ways we encounter computer-based systems (Hedberg & Sims, 2001) or as a colleague suggested to me, the human-computer interaction is actually "somewhere between cognition and perception". Before we invest in and create complex computer networks and navigation faculties, we need to further develop our understanding of the communication and cognitive processing that is taking place when we engage digitally. Educators have come to rely on existing concepts of learning-styles or intelligences (for example, Driscoll, 2000; Gardner, 1993) to inform the design of learning systems. I argue that it is timely to consider digi-learning and digi-telligence as alternatives and dynamics we must address.

The social environment we share is changing and moving rapidly to something that is likely to change the very fabric of our society. The internet is becoming an omnipresent force that will not only enable anyone to know where we are at any moment of the day, but also allow us to access whatever piece of information we require wherever we are. The convergence of medicine, biology and technology is moving so fast that the spectre of nanobots populating our bodies for medical and psychological wellbeing is fast moving from science fiction to prototype to reality. In fact, being connected and wired biologically is not unrealistic and the difference between human and android may become truly blurred.

In Summary

The authors conclude that "the Semantic Web (or Webs) will provide yet more opportunities for learning in the form of greater access to a multiplicity of diverse learning objects". Similar projections were made for the PLATO system in 1979, where users, networked across the world, would be able to access "over 10,000 hours of computer-based learning resources". There were also comparable promises made with the release of HyperCard in the 1980s.

From my perspective, each new generation of digital technology has provided the opportunity for a new generation of researchers and developers to create new strategies and systems for learning with technology. But too often it seems, lessons learned from the past appear forgotten. In the current environment, development initiatives are characterised by learning management and content management systems, reusable and interoperable learning objects, collaborative tools for communities of practice and navigable semantic webs.

With respect to this, the authors suggest that the Semantic Web will "provide the means for learners to navigate through the plethora or sources, find help in their interpretation of material by contextualising it to debates and narratives, and actively enter into these debates or construct these stories as members of living online communities of learners".

However, as I read this sentence I couldn't help but think of the pre-computer days when learners, a teacher, a librarian and a library might achieve the same outcome.

The challenge therefore is to harness the power and capabilities of networked technology to provide users with an individualised, contextual learning environment. Neal Stephenson (1996) provides a vision for this in his post-cyberpunk novel The Diamond Age, where the book is transformed into a hybrid of global positioning systems, personal information databases, human participants and 'sensitive' portable/mobile interfaces to enable an individual to have their own unique experience and access to knowledge, information and lifestyle.

Finally, the authors provide two alternatives as being most voluble to learners – the Magic Mirror of the internet proposed by Kaku (1998) or the semantic learning web – and they select the latter. I tend towards the former, but suspect that we will yet be in for major surprises in the way learning and technology evolves.

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About the Reviewer

Professor Rod Sims has been working in the field of computers and learning since 1979, commencing with the implementation of Control Data's PLATO system into Australia. Since then he has worked in all facets of computers and learning – as developer, teacher, academic and researcher. His extensive writings have focused on the effectiveness of learner-computer interactions and his current research activities are assessing the use of collaborative tools in massively multi-user environments.