What is Web 3.0?: the next generation semantic web. Part 1

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The internet has changed the way we think of information and technology. Now, all our students are born into a digital era that is significantly changing their literacy and information encounters and the ways they can learn. Participative new media tools have altered the shape and experience of learning, and have provided teacher librarians in this changing learning environment with new skills, new tools and new ways of working with literacy, information literacy and digital fluency (O'Connell, 2008). If there is any doubt about the scope and impact of the new technology environment, the *NMC Horizon report. 2011 K–12 edition* (Johnson et al, 2011), issued annually since 2009, has identified and described emerging technologies that are having a significant impact on K–12 education, reiterating the diversity of influences in the learning spaces of our schools.

For some, the 21st century school library seems to be trapped on a treadmill of technological progress, while for others the mystique of new technology provides the only impetus needed to go further, faster, and in more directions at once. The best course, as always, is somewhere in the middle, and depends on an understanding of the emerging capacities of the internet that is now hardwired into our students' lives.

Where we have come from

We think of Web 1.0 as the web we browsed, and Web 2.0 as the read/write social web. Now, most educators work quite happily in a Web 2.0 environment, contributing to and connecting through the web. Web 2.0 revolutionised the means at our disposal to filter and share. Whether by managing information by social bookmarking or RSS reads and feeds, or by communicating within and beyond our school community via blogs, wikis, twitter, slideshows, podcasts, *YouTube*, or *Facebook*, students, teachers and teacher librarians have entered into digital conversations. In its 2.0 incarnation, the digitally shifted school library transcends the physical space to bring services and programs to every student and teacher throughout the school wherever learning takes place (O'Connell, 2006). Our widgets, portals, Apps, tags, feeds and aggregators provide us with our tools of trade for communication and information curation. Many of us collaborate using tools that support communication and sharing, and we even use cloud computing somewhere on the web to facilitate our transactions without question (think of *Google* docs, *Flickr*, *Dropbox*, *Elluminate*, and even *Kindle* books as examples). Web 2.0 is part of our learning environment.

What is Web 3.0?

Predicting the future can be hazardous, but there are plenty of pointers to alert us to the next shift in our web experiences. The next wave is approaching, or maybe it is already here.

We already accept and work with the following:

- Personal learning environment – relying on the people we connect with through social networks and collaborative tools e.g. *Twitter*, *Yammer*.
- Personal learning network – learning content is not as important as knowing where, or to whom, to connect and find content e.g. *Skype* in the Classroom, *iTunes U*.

- Personal web tools – used for tracking our life and powering our learning e.g. photos to *Facebook*, excursion pictures to *Flickr*.
- Cloud computing environments – supporting open access between sources and devices rather than being locked to software and individual computers e.g. *Edmodo*, *Evernote*, *Diigo*.
- Mixed reality – encompassed by e-devices and augmented reality e.g. e-books, QRcodes, Layar browser.

Think of the emerging Web 3.0 environment as the portable, personal web, focused on the individual, on a lifestream, on consolidating content, and which is powered by widgets, drag and drop, and mashups of user engagement. This socially powered web is exploding, and is the new baseline for all our internet and technology empowered interactions.

Importantly, Web 3.0 is much more. It refers to a third generation of internet-based services that collectively will allow the emergence of *the intelligent web* – otherwise known as the semantic web.

The semantic web

The word semantics is from the Greek concept to give signs, meaning, or to make significant. The idea of the semantic web, of exploiting the possibilities for serendipitous reuse of linked data, dates back at least to Sir Tim Berners-Lee's plenary talk at the first International World Wide Web (W3C) Conference at CERN in Geneva in 1994. The semantic web refers to the extension of the World Wide Web through the embedding of additional semantic metadata, using semantic data modelling techniques such as RDF and OWL. What does this data modelling (or description) achieve and what does it mean for us?

The semantic web of our new Web 3.0 era is about using the power of technology to make semantic connections between disparate sources and data pools. The semantic web is built on strategies to embed semantic annotations into data (O'Connell, 2010), in order to allow for transaction and interoperability between data sources. This makes it possible to federate, query, browse, and gather information from disparate internal and external sources of information. The ultimate goal is to enable computers to do more useful work for us by teaching machines to read web pages.

The semantic web is really about two things – meaning and interoperability (Figure 1). It is about:

1. common formats and metadata which allow for integration and combination of data drawn from diverse sources, where the original web mainly concentrated on the interchange of documents.
2. language, or ontology, for recording how the linked data relates to real world objects, allowing a machine to *understand* the semantic meaning and the difference between Jaguar (car) and jaguar (animal).

The semantic web allows a person, or a computer, to start off in one database, and then move through an unending set of databases which are connected, not by wires, but by being about the same thing. Rather than just identifying keywords and expressions, the semantic web concentrates on indentifying the meaning of content.

The technical *back-end* of the semantic web is complex and structured, and beyond the need-to-know experience of the average teacher. However, it provides teacher librarians an explanation and rationale for the move to RDA, the new, unified cataloguing standard (see Glossary), from AACR2 for information organisation standards for libraries. RDA addresses the needs of the Web 3.0 future by providing a flexible metadata framework for describing all types of resources to ensure increased discoverability and access. We are part of the evolution of Web 3.0 in resource provisions. We also need to be part of the next step in integration of Web 3.0 into the learning matrix of our students.

What are the implications?

The implications for education are profound because they will impact on our information literacy strategies and knowledge construction processes. Teacher librarians are always enthusiastic about ways to revolutionise knowledge discovery. Information and content has always been king – but what might be different now as a result of the emerging semantic web? The intelligence is in the connections, and the semantic web is helping to develop ways of understanding the relationship between things.

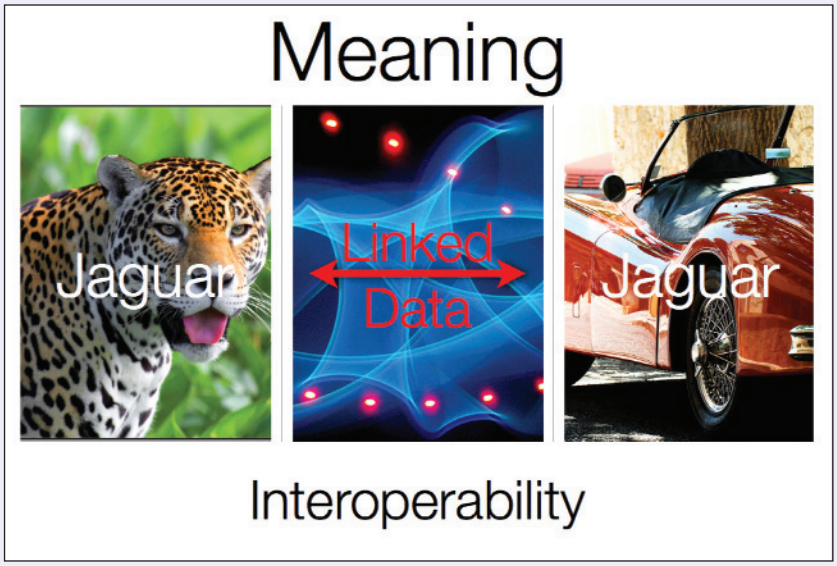

Figure 1 The semantic web is about meaning and interoperability

What happens when the web gets smart enough to help us organise and evaluate information, or recommend and shape our choices, personalise our learning, or augment our thinking? According to Ohler (2008), under Web 3.0 the web becomes our personal learning agent, identifying relevant information from any source that is semantically accessible, and providing an information synthesis tailored to our personal learning objective. Imagine receiving an information report that uses the semantic web to draw together many sources, including websites, articles, scientific repositories, chapters in textbooks, blog dialogue, *YouTube* content, information stored on mobile phones, modelling in virtual environments, and in fact, relevant material from any source that is accessible via semantic techniques. Ohler (2008) suggests that such a report would be grouped around knowledge areas that emerged from the research with keywords identified and listed for further investigation.

Web 3.0 and the semantic web herald a new era of information behaviours and knowledge discovery. Now that we have reviewed the important elements facilitating the emergence of the semantic web, come further on the Web 3.0 journey of discovery in the next article, 'Web 3.0: preparing our students for tomorrow's world', which will appear in the next issue of *Scan*. ■

Glossary

Linked data builds upon standard web technologies, such as HTTP and URIs but extends them to share information in a way that can be read automatically by computers. This enables data from different sources to be connected and queried <linkeddata.org/>.

Metadata is a set of descriptive elements about data (literally *data about data*) designed to facilitate resource description and discovery <www.ukoln.ac.uk/metadata/>.

Ontology is a description of characteristics of data elements and the relationships among them in a domain. Ontologies are a key component in research efforts to establish a semantic web, distinguishing semantically richer systems from thesauri, classifications and folksonomies (Weller, 2007).

Resource Description and Access (RDA) is the new bibliographic description standard for libraries, archives, museums and information organizations. Built on the foundations of AACR2, RDA is a comprehensive set of guidelines for the description and access of print materials and digital media (Hillmann, Coyle, Phipps, & Dunsire, 2010).

Resource Description Framework (RDF) is a group of specifications developed by the World Wide Web Consortium (W3C) as a model for metadata description. The concept of a resource is generalised in RDF to mean anything that can be described with metadata. This allows metadata to be applied to anything that can be identified, even if it cannot be directly retrieved on the web. RDF is thus compatible with the RDA where the metadata is largely machine-readable and the resources described are not (Hillmann et al., 2010).

Web Ontology Language (OWL) is a family of knowledge representation languages for authoring ontologies (Hillmann et al., 2010).

World Wide Web Consortium (W3C) develops *interoperable technologies* (specifications, standards, software, and tools) for enhancing the web including HTML, DHTML, XML and many others <www.w3.org/standards/semanticweb/>.

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