Commentary on:

Use of the Semantic Web to Solve Some Basic Problems in Education

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The approach outlined in Koper's paper is a good way to address the many ambiguities surrounding the notion of the Educational Semantic Web: work bottom-up on some specific problem targets and determine how the addition of explicit semantic representations can enhance the efficiency or effectiveness of the learning process. Since the paper presents a clear argument about the potential advantages that such explicit semantic representations could bring, I will focus only on a few places where the argument did not convince me. Many of the questions I raise are applicable to the wider notion of a semantic web at least as much as to the particular focus on the paper – on explicit semantic representations for learning designs and for

Issues for discussion around the Learning Design representation projects:

- Can the same representation serve to preserve and share knowledge for people as well as provide an interpretable representation for automatic presentation of learning elements? The current IMS Learning Design specification appears to have significant value as a representation for the latter. But it is limited to descriptions of the presentation structure resulting from a learning design. It does not serve as a means to preserve the reasoning or knowledge which led to the design [raising interesting issues about what is meant by a 'learning design'…].

- Much of the promise described as a potential outcome from explicit learning design semantics has been promised before from approaches to 'intelligent tutoring systems'. Can we go beyond the labour intensive methods required to encode the semantics on which the successful examples of these systems are based? At issue here is the local context in which pedagogical knowledge is embedded. As a gross oversimplification, we could characterize the relevant knowledge as instances of the schema 'when learners with attribute C show behaviour B, it can be treated as an instance of gap G and can be addressed with instructional element E which follows pattern P'. Which of these knowledge elements will be inferred from semantic web information

and which will still be labouriously hand-coded by instructional designers? [G and P don't appear in the internal representations of deployed intelligent tutoring systems, but I assume that some inference on them lies behind the additional promise the author foresees in the educational semantic web].

- I am not sure what it means to suggest that a *semantic representation can serve as a means to create more advanced and complex learning designs than is possible without such a representation*. It is evident that the existence of a representation as a cognitive amplifier or memory prostheses enables people to manage much more complex structures than would otherwise be possible – the author cites musical notation as one example, symbolic representations in chemistry or mathematics are similar. But the particular value of a semantic representation – i.e., one in which aspects of the structure's meaning are made explicit and subject to manipulation – remains to be seen. I am sure the author is not suggesting that new learning designs will be generated automatically.

- I am not an expert in Latent Semantic Analysis – some one more up-to-date in this area should answer the author's question as to whether *it is possible to derive the higher-level role of a semantic object type by using…Latent Semantic Analysis*. From my limited knowledge, the answer would be in the negative: LSA can measure the extent to which the occurrence of semantic patterns is similar in different elements of a set, but this is not sufficient to derive a role for particular components. Even if it were, what problem scenario would this address?

The Learning Design work represents a mature research effort. The newer work on self-organizing learning networks is harder to assess. My major concern is again with the need for context to properly interpret the meaning of learners' actions. For a self-organizing learning network to offer support to learners, the semantics of their actions and intentions must be inferred from their behaviour in order to build up representations of successful and unsuccessful interaction patterns. This is very difficult in practice, especially without a rich set of semantic representations provided by experts as a seed. In previous research with IBM Corporation we examined the use of learner traces with the goal of constructing intelligent agents which could interpret their progress[1]. We found many instances in which identical

[1] Carey, T.T., R.B. Nonnecke, J.O. Mtterer and D. Lungu, Prospects for Active Help in Online Documentation, Proceedings 10th Annual ACM SigDOC Conference: Going Online - the New World of Multimedia Documentation. Ottawa Canada, October 1992.

traces represented quite different user situations, which could only be interpreted in the light of learners' knowledge state [including the state of uncertainty about their needs and goals]. The company eventually determined that an intelligent agent based on the decontextualized traces was likely to offer inappropriate advice, e.g., suggesting a more efficient way to navigate somewhere that learners had arrived but did not in fact want to be.

While I commend the bottom-up, problem-driven approach to experimenting with the semantic web, I felt that the paper could have presented stronger problem scenarios. The stated problems in Table 1 appear to be at too large a scale for tractable demonstrations projects to be developed. The two specific issues outlined are at a better scale, but it was not clear to me how the sub subsequent discussion related directly to their solution. Another approach would be to identify a set of scenarios of learner problems which the researchers feel their research will be able to address. A set of 10-12 such scenarios could be illustrative of large classes of learner challenges which are implicitly the targets of the research. This would help focus the research and aid in evaluating its success.