Metadata for Collaborative Learning: What to Reuse?

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Abstract
Metadata developments are common in standardization activities, not only for learning technology area but all over the areas of electronic information representation. However, development itself is not the final goal from practical point of view. Our research project is developing a metadata to represent, record and reuse collaborative learning (CL) activity. There are many alternatives and combination of representation framework for the CL metadata. The selection of the framework depends on the aim and the goal of metadata development. If the goal is focused on representing pedagogical aspects of CL, one should choose a different description framework from ones discussed in standardization activities.

1. Introduction
Metadata development was started by Dublin Core Metadata Initiative (http://www.dublincore.org/), and became common in standardization activities. In learning technology area, ADLNet (http://www.adlnet.org/) proposes a metadata for learning contents called SCORM (Sharable Content Object Reference Model). Recently the latest proposal of SCORM is discussed as an international standard in ISO/IEC JTC1 SC36 (http://jtc1sc36.org). In this SC36, WG2 (http://collab-tech.jtc1sc36.org/) focuses on the standardization of collaborative learning (CL) [1]. These metadata proposals aim the interoperability and reusability of WWW based learning materials in different organizations / WWW servers. Since these standards focus on the technical interoperability, they should be designed to fit any pedagogical variation for any teachers.

Our research project [2], supervised by Prof. Okamoto of University of Electro-Communications, is developing a metadata for CL. The CL activity is different compared to ordinary instruction / learning activity from pedagogical point of view. CL has a theoretical basis of social constructionism / constructivism theory. This theory focuses on the knowledge and skill transfer between members in the same learning society, not on well prepared teaching materials or knowledge transfer from a teacher. Then, the major learning activity is supported by bidirectional communication between learners, not by one-way communication from the teacher to the students. Learning materials may be prepared, but interim or final outcomes of learners or information achieved from environment should affect other learners during these discussion and communication.

The goal of our project is not to establish the industrial standard to represent CL, but to represent the CL activity from pedagogical point of view, to record and share the CL activity, clarify the characteristics of CL, and transfer the skills to enable and ease the CL activity to teachers and learners. Since our goal is different from SC36 WG2, metadata and its descriptive framework should be different.

2. Descriptive Framework of CL
There are some necessary conditions to choose framework. First, the framework should be capable to describe details of CL activity. Too generalized one does not fit. Second, dynamic actions and interactions should be described. CL
activity is a dynamic one by nature. Thus just the static
description of objects is not sufficient. Third, learners’ inner
status should be described. Even if some interaction occurs
between the learners, it should not be necessarily affect the
learners as “learning trigger”. When he has a question and he
receives a hint for the question by the communication, he may
insight the answer to the question. Even if there is a hint for
the question, it will not affect a learner when he does not be
conscious of the question. Fourth, recorded log will be
effective to be scanned and reused by another teacher or a
learner. In order to ease this reuse, critical point should be
abstracted and clearly stated. Based on these conditions, the
author is proposing four graphical frameworks of Table 1.
Many of these frameworks are represented as graphical ones,
but they are able to be represented as computer-readable text
formats.

We developed a tentative object model for CL [2]. Also we
are trying to acquire real classroom activity logs according CL
and apply them to the tentative model for the verification.
Even now it is clear that just the object model is insufficient to
describe CL activities. So we are moving to develop
sequence and state-transition models and according metadata
to represent CL activities. With use of these precise
representations of CL activities, it will be useful not only to
share electronic data in a semantic structure, but also to share
pedagogical knowledge and skills for CL activities.

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References
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<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Object Model</th>
<th>Sequence Model</th>
<th>State-transition Model</th>
<th>Rule Model</th>
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</thead>
<tbody>
<tr>
<td>Example</td>
<td><img src="image" alt="Object Model" /></td>
<td><img src="image" alt="Sequence Model" /></td>
<td><img src="image" alt="State-transition Model" /></td>
<td><img src="image" alt="Rule Model" /></td>
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<tr>
<td>Good for hierarchy or relationship representation</td>
<td><img src="image" alt="Characteristics" /></td>
<td><img src="image" alt="Characteristics" /></td>
<td><img src="image" alt="Characteristics" /></td>
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</tr>
<tr>
<td>Only Static</td>
<td>Good for dynamic representation</td>
<td>Number of objects limited</td>
<td>Good for status change in one object</td>
<td>Good to describe actions and trigger conditions</td>
</tr>
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<td>Decide range and granularity</td>
<td>Time scale dependent</td>
<td>Trigger from outer environment can be also described</td>
<td>Applicable to abstract sequence and state transition</td>
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Table 1 Frameworks for Collaborative Learning