Learning Technology Standards and Inquiry-Based Learning

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Abstract

The proliferation of technology-enhanced learning environments and digital learning resources in formal educational institutions (both K-12 and higher education) has led to a corresponding interest in improving the cost-efficiency related to developing and deploying such materials within these institutions. In the e-learning industry, which has been primarily concerned with training in corporations and the military, this issue is approached through standardization of digital learning material in the form of learning objects. The Sharable Content Object Reference Model (SCORM) has emerged as the predominant approach to standardization among early adopters of learning object technology. While SCORM might aim at being agnostic with respect to pedagogical approaches, there is some concern that SCORM-based learning objects would not be well suited to all of the pedagogical approaches desired within formal educational contexts – particularly within those emphasizing social aspects of learning and inquiry-based learning. An alternative standard that attempts to describe use of learning objects more broadly and with greater flexibility is that of the IMS Learning Design (LD).

We analyze the implications of the SCORM and LD specifications for the particular pedagogical domain of technology-enhanced inquiry learning. Our analysis builds on the extensive research conducted on technology supports for inquiry learning. We focus on a specific technology-enhanced inquiry science environment that has been designed through years of classroom-based research: The Web-based Inquiry Science Environment (WISE). Several important characteristics of the WISE pedagogical approach serve to illuminate our discussion on learning objects and standards. Learning activities are carried out in a social or collaborative context within WISE; they occur primarily in a classroom setting; they are student-centered, and they are concerned with ill-structured problems. These characteristics are not unique to inquiry science projects, but rather represent an approach to pedagogy and curriculum design that is increasingly common within formal education.

The challenges of implementing SCORM within learning contexts that emphasize the social nature of learning have been recognized for some time. A major contribution from this chapter is the analysis of how requirements of a specific pedagogical approach are accommodated by SCORM, identifying the particular elements of the SCORM specification that are problematic. Our analysis shows that when decontextualized learning resources are aggregated into larger units, tensions appear between the SCORM specification and the content designer's intentions for creating inquiry science projects. Several important issues are problematic, such the ability to ex-

press collaborative activities, the tracking of students' activities within a group context, the support of teacher interventions, or the accommodation of students' un-anticipated use of learning resources. The major contribution of IMS Learning Design is its capability to express the designer's instructional strategy together with the resources prepared for the learning situation. Our analysis indicates that inquiry-based science projects can be fully described within this specification. However, the descriptive approach taken in IMS LD leaves more detailed issues unspecified. For example, IMS LD does not set out to specify the mechanics of delivering a unit of learning. This means that specification of requirements for any run-time environments, such as WISE, is absent from LD to a large degree. We conclude that LD offers sufficient scope and flexibility to capture the rich social or collaborative contexts of pedagogical approaches such as those employed by WISE, but currently lacks the degree of specificity to be of great use to developers.