Supporting health sciences education with IMS-based multimedia repository

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ABSTRACT

Recently, the IMS Learning Resource Meta-Data Specification [1] was released, paving the way for efficient repurposing of educational multimedia in a multitude of learning environments. The goal of the current project is the development of a national repository of multimedia that supports all levels of health sciences education and that is in accordance with the IMS specifications. An n-tiered, distributed database system will facilitate the discovery, exchange, and implementation of digital multimedia.

Keywords

XML, distributed objects, metadata, education, IMS.

1. INTRODUCTION

In a recent survey among health science educators [2], respondents rated the desirability and likelihood of a large number of scenarios in future computer-based education. The scenario "By 2010, curricular materials for students and faculty will be delivered on Websites" was rated the most likely future development and also one of the most desirable outcomes. In fact, despite some initial skepticism [3], the World Wide Web has already become a ubiquitous vehicle for the delivery of medical courseware. As a result, digital multimedia—including images, video, and animations—have become indispensable for teaching health sciences.

The current trend is that educators develop their own collections of digital multimedia. The irony of this trend is that in spite of emerging Internet technologies that make searching and sharing of digital media easier than ever, an extraordinary amount of effort is being expended on duplicating these collections. Furthermore, these collections employ a variety of technologies that hinder interoperability. It would be easier to share such digital multimedia if a standard metadata scheme were collaboratively developed and disseminated among medical educators.

The IMS Learning Resource Meta-Data Specification [1] is a widely supported standard that defines a mechanism to assign educational materials with descriptive metadata. It defines metadata fields, permissible values, and XML bindings. The key capabilities of IMS include its object-oriented design, an extendible metadata model, and its non-proprietary nature. These characteristics will allow educational multimedia, including those for the health sciences, to evolve, expand, and interoperate with a multitude of educational systems [4].

2. NDMLHS

With support of the National Science Foundation and the National Library of Medicine, the inception of National Digital Multimedia Library for Health Science Education (NDMLHS) was realized in Fall of 2000. The main goals of the NDMLHS are (1) to develop a national repository of digital multimedia that is freely accessible through the web and that supports all levels of health sciences education; (2) to expand the IMS Learning Resource Meta-Data Specification to accommodate idiosyncratic metadata describing multimedia used in health science education; (3) to develop XML import and export tools that interface with IMS-compliant course management systems; (4) to plan for an online peer-review system that would address the quality assurance of the repository.



Figure 1. N-tiered system architecture for National Digital Multimedia Library for the Health Sciences.

2.1 N-tiered system architecture

In the overall design of the N-tiered system architecture, interoperability and scalability were given high priority. The three tiers (depicted in Figure 1) have relatively independent functionality: (1) rendering and user interface; (2) operations and analysis; (3) data storage and management. Each of the tiers employs a different set of technologies emphasizing nonproprietary interaction between tiers.

2.2 Possible applications

Figure 2 shows a possible application of the object-oriented organization of education materials. With XML multimedia can be re-purposed in a flexible manner and can be seamlessly integrated in a variety of learning environments that support different learner communities.



Figure 2. Repurposing of educational objects in different learning environments. Educational objects (such as images, movies and text) that are stored in repositories can be retrieved across institutions over the Internet. IMScompliant XML metadata will facilitate the implementation of the objects in a multitude of learning applications.

2.3 Significance

To our knowledge, this project is the first, large-scale initiative to develop an XML standard for medical educational materials that is in accordance with the IMS Learning Resource Meta-Data Specification. Preparing for this project in 1999, working groups representing a consortium of medical colleges (see Appendix) achieved a consensus of how medical multimedia ought to be cataloged. This consensus was a crucial step towards the subsequent development of a broadly accepted XML metadata standard that is in compliance with IMS. Furthermore, the National Library of Medicine has lent support for this project and will host the multimedia repository. Once implemented, the NDMLHS could significantly improve the access to high-quality multimedia, aiding educators in the health sciences field—particularly those with limited institutional resources.

3. ACKNOWLEDGMENTS

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4. REFERENCES

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APPENDIX

Medical Colleges participating in the metadata working group: UC Los Angeles, UC San Francisco, UC San Diego, UC Davis, University of Southern California, Drew University, University of Utah, University of Oklahoma, University of Nevada, Loma Linda University, and Stanford University.