Tutorial: Why data standards are critical for EDM and AIED

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SUMMARY

As EDM and AIED innovations proliferate, the ability for diverse products to consistently interpret each other's data will emerge as a critical issue. Formal data interoperability standards that enable diverse datasets to be curated, accessed, merged/compared and fruitfully analyzed will play a crucial role in research and in the successful mass adoption of products based on that research, as will standards that enable systems to produce data that can be mined by existing and yet-to-be-invented algorithms. Yet this important topic is often neglected by researchers and system developers, who naturally focus on the specific problems they set out to solve and do not consider how they can either contribute or consume data produced by other systems or how their innovations will fit into larger ecosystems. This tutorial is intended to:

- Raise awareness of the role of standards and their criticality for EDM and AIED;
- Provide participants with an understanding of the nature, status, and current activity of multiple international standards development effort relevant to educational data;
- Provide participants with insight into how they can beneficially apply standards and, in some cases, contribute to their development.

TOPICS

This tutorial will cover following topics:

- **Why schools, corporations, and government agencies require standards conformance in procurement**: How standards interact with regulations and requirements to facilitate the free exchange of information and data, to prevent "lock-in" and thereby lower costs, to ensure quality and minimal levels of functionality, and to protect the integrity and privacy of data.
- **How standards shape product categories and markets**: How standards can define functionality, product capabilities, and market segmentation. In many instances, standards determine which of a number of competing approaches will dominate. They can shape markets and lead to winners and losers and long-term consequences for producers, consumers, and researchers alike. There are obvious examples in areas such as telecommunications and manufacturing, but there are also examples in educational technology relevant to EDM and AIED.
- **How standards can support research and lower market entry barriers for innovative products**: How standards make it possible for innovative component technologies to be independently developed without requiring a vertical monopoly, and how they support research by making it possible for data produced by one system to be understood by another.
- **Types of standards (governance, process, and data interoperability)**: People often think of standards as relevant only to technical interoperability, e.g. to determining data formats, sizes, shapes, tolerances, and the like. But there are other types of standards as well, including process standards such as ISO 9001 and Software Engineering Standards and governance standards that address issues such as data preservation, curation, ethics, and privacy. All of these will play a critical role for EDM and AIED.
- **International standards organizations**: A survey of standards development organizations (SDOs). This segment will briefly explain the structure of international standardization, the principles by which ISO, IEC, IEEE, W3C, and similar SDOs abide (openness, consensus, balance, due process, right of appeal), the differences (and similarities) between these and industry consortia, and the SDOs that are most relevant to EDM and AIED.
- **How standards are made**: The standards development process has been refined over many years to ensure that each SDO can be productive within its principles and goals. This segment will describe how standards development works so that participants have an idea of what it entails and how to participate.
- **A brief history of standards related to educational and training technology**: Starting circa 1996, various organizations and consortia began developing standards, some better known and more widely adopted than others. We will briefly survey this history with a view towards extracting some key "lessons learned" that apply generally to standards development: The perfect is the enemy of the good; standards are a poor way to define systems but a great way to define how they interoperate; simplicity and modularity leads to adoption; industry participation is vital; and how to avoid standards wars.
- **Current international standards activity relevant to EDM and AIED**: This is a major segment that will touch on a large number of relevant standards, including:
    - Metadata standards
    - Format standards (e.g. data shop)
    - Competency and learner information standards
    - Data reporting and curation standards

- Platform standards
- Big data and AI ethics
- Student data governance
- Possibly needed additional standards

Each standard will be summarized and described in terms of what problem(s) it solves, how it works, who developed it, who uses it, how it fits in with other standards, and what the presenters see as its future.

- **Tools for applying standards to EDM and AIED**: This segment will focus in on a few high-value standards and applications of standards to EDM and AIED. This segment is the punchline of the tutorial and will cover the standards that the presenters feel are most important. It will focus on existing or emerging technologies that participants can apply now or in the near future and will provide concrete examples of how standards are applied in software.
  - Using standards to report and collect data
  - Data set efforts (Datashop, Dataport)
  - The US DoD's Total Learning Architecture and related unification efforts
- **How to get involved in the standards development process**: This last, short segment will provide participants with information on how to get involved if they are interested, to be followed up offline.
- **Questions and Answers**: Adequate time will be set aside to address participants' questions and issues.

Presenter Relevant Bios:

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