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Information technology for learning, education and training — Learning analytics interoperability —

Part 3: Guidelines for data interoperability

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Foreword

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Introduction

The increasing amount of data being generated from learning environments provides new opportunities to support learning, education and training (LET) in a number of new ways through learning analytics. Learning analytics is terminology that is used to refer to both an emerging field of discourse and an emerging technology. It spans the use of diverse sub-technologies, workflows and practices and is applied to a wide range of different purposes. For instance, learning analytics are being used to collect, explore and analyse diverse types and interrelationships of data, such as: learner interaction data related to usage of digital resources; teaching and learning activity logs; learning outcomes and structured data about programmes; curriculum and associated competencies.

As an emerging technology, learning analytics address a diverse group of stakeholders and cover a wide range of applications. Learning analytics raise new interoperability challenges related to data sharing; privacy, trust and control of data; quality of service, etc. The following issues are identified as general requirements for learning analytics applications.

For the learner:

— tracking learning activities and progression;

— tracking emotion, motivation and learning-readiness;

— early detection of learner's personal needs and preferences;

— improved feedback from analysing activities and assessments;

— early detection of learner non-performance (mobilizing remediation);

— personalized learning path and/or resources (recommendation).

For the teacher:

— tracking learners/group activities and progression;

— adaptive teacher response to observed learners' needs and behaviour;

— early detection of learner disengagement (mobilizing relevant support actions);

— increasing the range of activities that can be used for assessing performance;

— visualization of learning outcomes and activities for individuals and groups;

— providing evidence to help teacher improve the design of the learning experience and resources.

For the institution:

— tracking class/group activities and results;

— quality assurance monitoring;

— providing evidence to support the design of the learning environment;

— providing evidence to support improved retention strategies;

— support for course planning.

In addition, learning analytics practice can build upon prior work in LET standardization and innovation but there are several factors that require special attention. These factors include:

— requirements arising from the analytical process;

— data items required to drive operational LET systems are not always the same as desired for learning analytics;

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— volume, velocity and variety of the data collected for analytics indicate different IT architectures, which imply different interoperability requirements;

— use of learner data for analytics introduces a range of ethical and other socio-cultural issues beyond those which arise from exchanging data between operational systems.

Therefore, this document gives a conceptual description of the behaviour of components related to learning analytics interoperability. In particular, this document specifies learning activity data interoperability which focuses on xAPI and IMS Caliper for the learning analytics process and interoperability.

Use cases will be collected to discover problems that arise in data transition points between heterogeneous learning data in schools, higher education and the workplace.

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Information technology for learning, education and training — Learning analytics interoperability —

Part 3: Guidelines for data interoperability

1 Scope

This document specifies guidelines for mapping between different learning analytics data representations. Using xAPI and IMS Caliper as reference specifications, this document introduces data API regarding learning analytics as well as guidelines to use the APIs, which can be generalized to other contexts. Both syntactic and semantic mappings are in scope.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
assessment
means of measuring or evaluating learner understanding or competency

[SOURCE: ISO/IEC TR 20748-1:2016, 3.2]

3.2
dashboard
user interface based on predetermined reports, indicators and data fields, upon which the end user can apply filters and graphical display methods to answer predetermined business questions and which is suited to regular use with minimal training

[SOURCE: ISO TS 29585:2010, 3.3]

3.3
data analysis
systematic investigation of the data and their flow in a real or planned system

[SOURCE: ISO/IEC 2382:2015, 2122686]

3.4
data collection
process of bringing data together from one or more points for use in a computer

EXAMPLE To collect transactions generated at branch offices by a data network for use at a computer centre.

[SOURCE: ISO/IEC 2382:2015, 2122166]

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3.5
data flow
movement of data through the active parts of a data processing system in the course of the performance of specific work

[SOURCE: ISO/IEC 2382:2015, 2121825]

3.6
data source
functional unit that provides data for transmission

[SOURCE: ISO/IEC 2382:2015, 2124348]

3.7
data storage
means for storing information from which data is submitted for delivery, or into which data is put by the delivery authority

[SOURCE: ISO/IEC 13888-1:2009, 3.7]

3.8
interoperability
capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units

[SOURCE: ISO TS 19101-2:2008, 4.17]

3.9
learning analytics
measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs

[SOURCE: ISO/IEC 20748-1:2016, 3.11]

3.10
learning outcome
what a person is expected to know, understand or be able to do at the end of a training programme, course or module

[SOURCE: ISO/IEC 17027:2014, 2.57]

4 Abbreviated terms

API application programming interface

LET learning, education and training

LMS learning management system

LRS learning record store

LTI learning tools interoperability

VLE virtual learning environment

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