TECHNICAL SPECIFICATION

ISO/IEC TS 20748-3

First edition
2020-03

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

Part 3: Guidelines for data interoperability

Reference number
ISO/IEC TS 20748-3:2020(E)

COPYRIGHT PROTECTED DOCUMENT

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword ... **iv**
Introduction ... **v**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms and definitions ... **1**
4 Abbreviated terms ... **2**
5 Introduction to data APIs for LET purposes ... **3**
5.1 General ... 3
5.2 Experience API (xAPI) ... 3
5.3 IMS Caliper ... 4
5.4 Brief comparison of xAPI and IMS Caliper ... 4
5.4.1 Context for the comparison ... 4
5.4.2 Detailed comparison ... 6
6 Summary of use cases for data interoperability ... **9**
6.1 General ... 9
6.2 Mapping rules for xAPI and IMS Caliper ... 9
6.3 Customized profiles for each specification ... 9
6.4 xAPI for non-specified data (non-profiled data) ... 10
6.5 Necessary for guideline to use both specifications ... 10
7 Guideline for data interoperability ... **10**
7.1 Understanding data flows for learning analytics and data collection process ... 10
7.2 Preparation for data interoperability ... 12
7.2.1 General ... 12
7.2.2 xAPI statements and relationship with its profiles ... 12
7.2.3 IMS Caliper information model and relationship with its profiles ... 14
7.3 Design guide for the mapping rules for xAPI and IMS Caliper ... 17
Annex A (informative) **Use cases and practices for data interoperability** ... **20**
Bibliography ... **41**

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see http://patents.iec.ch).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 36, *Information technology for learning, education and training*.

A list of all parts in the ISO/IEC 20748 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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;

— 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.

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.