

The Dutch xAPI Experience

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ABSTRACT

We present the collected experiences since 2012 of the Dutch Special Interest Group (SIG) for Learning Analytics in the application of the xAPI standard. We have been experimenting and exchanging best practices around the application of xAPI in various contexts. The practices include different design patterns centered around Learning Record Stores. We present three projects that apply xAPI in very different ways and publish a consistent set of xAPI recipes.

CCS Concepts

•Information systems → Data management systems; Information storage systems; Information systems applications; •Applied computing → Education;

Keywords

learning analytics, xAPI, learning record store, data standardization, data silos

1. INTRODUCTION

We introduce briefly three xAPI-powered learning analytics research projects that are supported by members of the SURF SIG on Learning Analytics. These projects are UvAInform, ECO and Learning Pulse. We describe the main benefits and disadvantages of xAPI and address why it is important to provide an authoritative set of recipes. Finally, we publish the recipes used within our projects to support consistent application.

The Experience API (xAPI) formerly known as TinCan API was publicly launched in April 2012. The standard is stable, there have been no significant updates to the spec-

ification since 2014 and it is increasingly being adopted¹. Since 2014 we have seen numerous projects and initiatives in Europe that apply the xAPI specification as a metadata approach to securely aggregate learning events ready for digestion by Learning Record Stores and analytics engines. A bandwagon of xAPI showcases and systems is starting to roll in Europe as an increasing number of educational institutions harvest structured and consistent data. A motivator for this is that xAPI delivers three very innovative aspects that are appealing to digital education providers in the 21st century: The xAPI approach is (1) learner activity centered, (2) system independent, and (3) straightforward to implement.

2. EUROPEAN XAPI PROJECTS

In 2012, the first project that applied the xAPI approach was UvAInform at the University of Amsterdam (UvA). The second was the European project ECO. This project has played a central role by developing a complete set of xAPI statements for all activities a learner can interact with within a traditional MOOC or other distance education courses. We finish the overview with the LACE Learning Pulse study that applies xAPI methodology to biofeedback data from wearable devices. The last two projects are both running at the Open University of the Netherlands (OUNL).

In June 2012 UvA initiated a stimulus project for learning analytics known as the UvAInform project. The project included seven pilots mostly centered on dashboard building and a generic infrastructure component, a UvA-developed LRS named Larissa². From 2012 to 2014, the central services of UvA invested in instrumenting open source xAPI connectors for Sakai³ to accelerate and experiment with the use of learning activity data and the Apereo Open Academic Environment (OAE)⁴. The aim was to generate wider adoption by researchers. Researcher involvement was seen as a key factor in understanding and developing learning analytic services and was driven by two contradictory perceptions by

¹<https://github.com/adlnet/xAPI-Spec>

²<https://github.com/Apereo-Learning-Analytics-Initiative/Larissa>

³<https://confluence.sakaiproject.org/display/TINCAN/Home>

⁴<http://oaeproject.org>

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decision makers: (1) learning analytics had the potential to improve services across a spectrum of stakeholders and (2) the lack of hard evidence in 2012 for the impact on learning analytics within the Dutch context.

In early 2014, OUNL received European funding to develop a learning analytics infrastructure for the ECO project⁵. ECO is developing a single entry portal for various MOOC providers. It contributes to increasing awareness of the advantages of open online education in Europe and to develop shared technologies for the different MOOC providers [1]. The ECO project comprises a set of learning platforms that already have their own logging and monitoring system. Each platform can use its proprietary methodology as long as it also provides the required data according to the xAPI specification. Therefore, an LRS architecture with xAPI statements has been established that allows the calculation of learning analytics indicators for each involved platform.

Within another European project called LACE⁶, OUNL and their partners collect and visualize evidences to support learning analytics best practices for K12, workplace learning, and the higher education sector in Europe among other objectives. Within the LACE project, OUNL conducts experimental studies focused on educational evaluation of advanced analytics tools [5]. Among mobile learning analytics they are working with BioFeedback and environmental data to identify conditions for productive and unproductive learning contexts. The Learning Pulse study stores data from four different sources such as (1) RescueTime⁷, a tracking tool that analyzes the tools used on a PC and applies a productivity score, (2) the heart rate of the learners measured through wearable FitBit⁸ devices, (3) weather data through open data weather services and, (4) user ratings about their own past activities.

3. TOWARDS XAPI CONSISTENCY

The most challenging issue for xAPI is the freedom of choice when designing xAPI statements. Anyone can on demand define statements and related vocabulary. This will work for an isolated solution, however, this approach generates considerable issues once the barriers between data silos are broken down and xAPI datasets are combined. The interoperability issue is not a new one and has been described long before the xAPI approach for other standards such as IMS LD [3] and SCORM [4]. Nevertheless, the call for a more standardized approach to collecting data that increases the insights one gains from standardized data is still valid and becomes even more urgent with the learner activity-based data collection.

Several contemporary sources of xAPI recipes exist, the primary library is advertised on the ADLnet website⁹. However, as of October 2015, the documented recipes are limited in extent to a number of contexts (attendance, bookmarklet, checklist, open badges, scorm to tincan, tags, video, virtual patient activities). A secondary set of recipes that expand coverage to initially support cMOOCs [2] are stored in a Github location¹⁰. Although these sources are suggestive

and act as sources of guidance there is currently no clearly authoritative of one source of truth. The lack of authoritative guidance in selecting verbs and others metadata terms generates a huge inconsistency between single statements between providers. For instance, interaction of a learner with a video could be tracked as: *Learner A played the movie How to cook good xAPI* versus *Learner B watched the video How to cook good xAPI*. Both statements express the same experience in slightly different semantic manners. Therefore, xAPI promotes the use of recipes to standardize the expression of experiences, because there are multiple plausible paths to defining that a learner has interacted with an object. xAPI thus relies on the educational community to publicize and deliver standards for these recipes.

UvAInform, ECO and LACE's Learning Pulse have covered a wide range of learner interactions. All three have thus published their underlying xAPI statements. These recipes can be found in a publicly shared Google document. The overview of xAPI statements is available in two ways: (1) a registry of the complete statements in JSON format¹¹ and (2) a spreadsheet with the most important information needed for each statement¹², i.e., a more user-friendly and readable version of the same content. It describes the activity, names the specific action and lists the verbs and types of objects to be used. For each statement it also provides a link to the respective JSON statement in the registry document. These recipes, if incorporated into a defacto standard, will significantly increase the range of recipes and thus support recipe standardization as it is the authors' great wish to be part of an orchestrated process that delivers one authoritative source of xAPI recipes.

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¹¹<http://bit.ly/DutchXAPIreg>

¹²<http://bit.ly/DutchXAPIspread>

⁵<https://ecolearning.eu>

⁶<http://www.laceproject.eu>

⁷<https://www.rescuetime.com>

⁸<https://www.fitbit.com>

⁹<http://tincanapi.com/recipes/>

¹⁰<https://github.com/kirstykitto/CLRecipe>