Development of a VLE Recipe for xAPI: process and implications

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Purpose: The Jisc Effective Learning Analytics Initiative is “working in collaboration to build a learning analytics service for the sector”, with “over 50 universities and colleges signed up to the initial phases of the implementation” (Jisc, 2017). Cetis LLP was awarded a contract by Jisc to support the development of xAPI recipes for the Initiative. This paper describes the work carried out and its implications.

Design: Data inputs to the Effective Learning Analytics system comes from two sources. Firstly, data is gathered from institutional systems, which maintain records of students’ identity, courses, assessment results, etc. The requirements of the UK Higher Education Statistics Agency (HESA, n.d.) provide some coherence, but there remain inconsistencies which are barriers to a sector wide analytics service. Consequently, Cetis LLP were asked to work on a Universal Data Definition (UDD). Readers interested in this work can consult the Jisc Learning Analytics Unified Data Definitions, currently in version 1.3 (see ‘Resources’ below).

Secondly, data is gathered from the interactions between learners and institutional systems, particularly Moodle and Blackboard, and xAPI is used to ensure that this data can be consumed reliably by the analytics systems. To this end, Cetis LLP has worked with Jisc to define a set of xAPI recipes, which is now available in version 1.0 (see ‘Resources’). Cetis LLP has facilitated dialogue with vendors and education institutions, maintained the Github repository, and resolved issues raised them, with input from Jisc when needed.
Results: Release 1.0 of the VLE recipe, August 2017, consists of a set of platform-independent statement templates that send data to the Jisc Learning Record Warehouse. Full statement examples are included, and the data needed to create the statement is identified. The statement templates are:

- Logged in
- Logged out
- VLE resource viewed
- Assignment graded
- Assignment submitted

‘Forum contribution’ and ‘Library loan’ are scheduled for 1.1. Examples for Blackboard and Moodle are provided. As far as possible all entities are the same across statements. To this end, a common vocabulary was developed, with IRIs and definitions for verbs, activity types, etc, as well as for extensions used in the recipes. A set of common structures represents actors, verbs, objects, contexts and results. Work has also started on recipes for ‘Attendance’ and ‘Mobile App Usage’, with a single statement provided in each recipe.

Implications: When the team has been asked to provide an xAPI statement for a particular purpose, the specification has proved sufficiently powerful and flexible, with clear guidance on how to construct an appropriate statement. We have seen no technical problems to cause us to doubt Ben Betts of HT2 Labs, who asserted that “the adoption rate of xAPI is probably unprecedented in our industry” (Betts, 2017). We also note the excellent work underway in developing the necessary infrastructure, for example the Apereo Learning Analytics Initiative (see resources). Our uncertainties,
however, have emerged from engaging with vendors, institutions, and analysts, who have a wide range of priorities and perspectives. It is relatively easy for vendors to generate the xAPI compliant JSON from their applications, and many have done so, but it is more complex to work with stakeholders to establish what this data represents, and how it should be processed. Indeed, the relatively small number of recipes which we have developed in v1.0 hides the richness of the conversations informing the design, as shown by the fact that in the first 12 months of the project the Cetis LLP team resolved 96 issues and made 302 commits on GitHub related to the xAPI work.

We have developed a recipe for use with VLEs, i.e. “a way of expressing how a common type of learning activity could be syntactically represented” (ADL 2016, p.19). We have also provided a vocabulary, which has been the focus for much of the discussion with institutions and vendors. ADL (2016, p.19) associates vocabularies with profiles, rather than recipes, and our experience suggests that the development of effective, shareable vocabularies and profiles will be critical to the further adoption of xAPI. There are, as yet, few profiles and vocabularies available as examples. Moreover, the development of profiles is complex. Firstly, the flexibility of xAPI leads to a temptation to create new statements for every stakeholder request, and to stretch the specification to facilitate analysis. Secondly, Jisc have shown exemplary commitment to working with the community of adopters. Nevertheless, in any product development process, there is limited time to discuss each profile decision with unlimited stakeholders. There is no established method for reconciling the needs stakeholders. We invented the process as we went along, starting in Google Docs, and then moving to GitHub, and felt the need for guidelines.
Some of our stakeholders requested queries for the high-level concept ‘intervene’; others wanted to distinguish between interventions (e.g. automated interventions, email interventions, and face-to-face interventions), and when a student was passive recipient of an activity. In practice, we might expect that many stakeholders would like to query at both levels, requiring nesting. The specification is clear that “A SubStatement MUST NOT contain a SubStatement of its own, i.e., cannot be nested” (ADL, 2012). It is possible to add information to the context property, “such as the instructor for an experience, if this experience happened as part of a team-based Activity, or how an experience fits into some broader activity.” (ADL, 2012). However, this approach would lead to the development of ad hoc ontologies of activities for each profile, which would be hard to inspect or share. ADL recognised this problem in the Companion Specification for xAPI Vocabularies (see resources), recommending a Linked Data representation of the relationship between vocabulary items. At the end of 2016 Cetis LLP recommended this approach for future Jisc work. Many details about how to approach this remained, however, unclear. Since then, ADL and DISC have created a profiles specification to “improve practices for creating Profiles”, making use of Linked Data (ADL, 2017). Our experience indicates that this is a necessary step with the potential to greatly increase adoption of xAPI.

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Resources:

1. Jisc Effective Learning Analytics
   https://www.jisc.ac.uk/rd/projects/effective-learning-analytics
2. Jisc Learning Analytics Unified Data Definitions repository:
   https://github.com/jiscdev/analytics-udd/
3. Jisc xAPI recipe repository: https://github.com/jiscdev/xapi
4. Apereo Learning Analytics Initiative
   https://www.apereo.org/communities/learning-analytics-initiative
5. xAPI specification https://github.com/adlnet/xAPI-Spec/blob/master/xAPI-About.md
6. Companion Specification for xAPI Vocabularies, 1.0 (2016)
7. xAPI Profiles specification
Reference list


