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► **To cite this version:**

Yves Noel, François Bouchet, Roland Mergoil, Vanda Luengo. Towards a modular and flexible Learning Analytics framework. Learning Analytics and Knowledge 2020, SOLAR, Mar 2020, Frankfurt, Germany. pp.178-179. hal-03005330

**HAL Id: hal-03005330**

**<https://hal.science/hal-03005330>**

Submitted on 14 Nov 2020

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# Towards a modular and flexible Learning Analytics framework

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**ABSTRACT:** This paper introduces a Learning Analytics platform which aims at being modular, evolving and flexible. The general framework architecture is completely independent from the digital systems to which it is connected. It collects learning data of various origins in data storages. Then it extracts a subset of the data which is aggregated into a data warehouse. Finally, these data are processed through various algorithms. Such a framework reinforces the control of data integrity in an experimental context and allows the students to refine the authorizations they give about their data. These data processing lead to indicators that will be used in student and teacher dashboards allowing a clear and fast access to learning information. In a second step, the platform will compute student profiles, facilitating the design of adaptive courses for each student.

**Keywords:** Modular framework, Trusted learning analytics, Student consent

## 1 INTRODUCTION

Public French Universities welcome students with increasingly diverse profiles and face large population. To cope with this, Sorbonne University wants to offer to students adapted learning paths, give teachers a tool to adapt learning activities to the student needs and inform the students about their learning and commitment. For this purpose, we propose to develop a whole coherent framework centered on Learning Analytics. Such a platform has to be evolving and resilient because the digital environment is changing quickly. The pedagogical objectives can be achieved only if the acceptability by the stakeholders is strong. Furthermore, and in order to allow the appropriation of the framework it is built following ethical rules co-design with the main stakeholders.

## 2 THE FRAMEWORK

The platform framework consists of several interconnected components (see Figure 1). Since digital learning traces can have very different origins and formats, we have planned a first modular layer to collect and store these heterogeneous traces. In practice, this layer consists of a set of Learning Record Storage (LRS) databases, each LRS being used for storing the learning traces (using xAPI standard) of a given source. At first, only two LRS will be created: the one storing the learning traces from Moodle and the one storing the traces from the video platform of our university. We may eventually add a 3rd LRS associated with a serious game platform.

These LRS data will be translated (to Caliper<sup>1</sup> standard) to be associated in a Learning Record Warehouse (LRW) data warehouse ensuring the integrity and consistency of stored traces. Some of the traces collected are very detailed and are not intended to be associated in the LRW; they are only stored in the LRS. Although these data are useful for the source that generated them, they could be only unnecessary noise due to the instability or reliability of the source that can be an experimental source. The LRW also collects data from Student Information Systems (it is not possible in an LRS). Finally, a Learning Analytics Processor<sup>2</sup> (LAP) will process data from the LRW to compute indicators used in dashboards, or models used by the LAP itself.

The implementation of the platform does not only mean the technical deployment of the chosen architecture, but also the construction of a framework to ensure that the digital traces collected and the algorithms, comply with national and European regulations on the protection of data (GDPR). The platform framework modularity allows students to refine the authorizations they give about their data: the authorization can be specific to a source (Moodle, video platform, ...), and also restricted to a purpose (collect only, analysis for the student or analysis for the teacher/university). This fine control exercised by the student should increase the adoption of our platform by the learners. In addition, we have planned to provide ethical rules to our system. These rules will be co-constructed with the different actors involved (in particular students). We aim to implement trusted Learning Analytics following the DELICATE checklist as described by (Drachsler and Greller 2016).

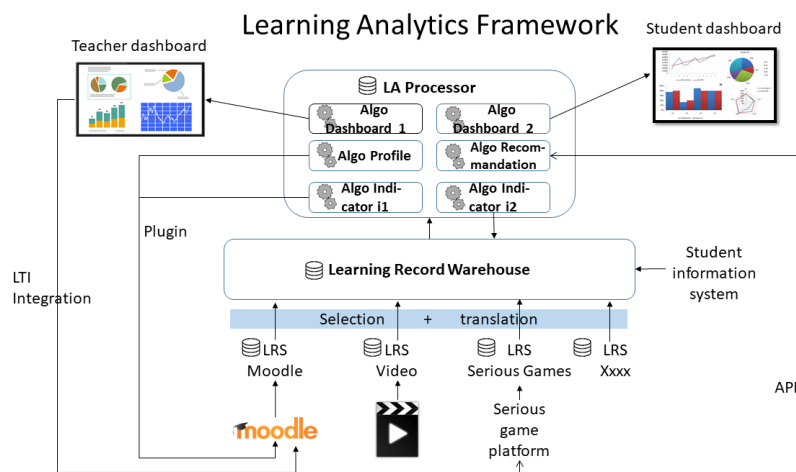


Figure 1: Schematic view of the Learning analytics framework architecture

## REFERENCES

- Drachsler, H. & Greller, W. (2016). *Privacy and Analytics – it's a DELICATE issue. A Checklist to establish trusted Learning Analytics*. 6th Learning Analytics and Knowledge Conference 2016, April 25-29, 2016, pp. 89-98. Edinburgh, UK.  
DOI: <http://dx.doi.org/10.1145/2883851.2883893>.

<sup>1</sup> <https://www.imsglobal.org/activity/caliper>

<sup>2</sup> <http://apereo-learning-analytics-initiative.github.io/LearningAnalyticsProcessor/>