Enhancing Learning Analytics in Distributed Personal Learning Environments

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Abstract — This paper describes LePress, a WordPress plug-in that enhances blog-based personal learning environment (PLE) with features and semantics that facilitate planning, implementation, and analysis of learning flows. The paper introduces learning flows in LePress, and then explains learning semantics the LePress supports. In order to demonstrate the advantages of LePress for learning analytics, we describe how it can facilitate explicit data collection and analysis of learning activities in blog-based PLEs. In order to demonstrate the advantages of LePress for learning analytics, we describe how it can facilitate explicit data collection and analysis of learning activities in blog-based PLEs.

Keywords - Learning Analytics, Learning semantics, PLE.

I. INTRODUCTION

The data sources for learning analytics can be either formal or non-formal [1]. In non-formal settings, the data is drawn from open social networks like Mendeley, Delicious, and Slideshare is used. On the other hand, the institutional LMSs like Moodle and BlackBoard are the most common formal data sources. In both cases, the data used for analysis is structured by the source system. Blog-based personal learning environments (PLE) are usually built with various tools not specifically designed for learning. Such tools (e.g., WordPress, Blogger.com, Drupal, Elgg) often have no learning-related semantics in the data that can be collected. Gathering the required data from such heterogeneous environments can be difficult without modifying the source code of the tools that generate the data. And, even when the data can be extracted from distributed PLEs, there will be a new challenge: how to interpret such data in the context of any pedagogical or learning theory?

One possible way to address such an issue is the use of ontologies to bind together data from different vendors. Semantic technologies can link learning content with learning activities and other participants of learning process [2]. Unfortunately, there are still no good solutions to extract pedagogically meaningful data from distributed informal learning environments.

This paper aims to identify the problems related to gathering meaningful learning-related data from PLEs, so that such data can be used for learning analytics.

II. PERSONAL LEARNING ENVIRONMENTS

While the impact of online classroom to learners is examined well enough today [3], conducting formal courses in distributed PLEs still is a new kind of activity. Razavi & Iverson [4] proposed the concept of a learner’s personal learning space, which particularly consisted of e-portfolios, blogs, and social networking functionalities. Schaffert & Hilzensauer [5] defined PLEs as “Web sites or services where learners are able to produce learning content or reflections, and store documentations about their learning processes (e.g. Weblog postings).” So far, weblogs are widely accepted as an important PLE tool, and widely used by educators in different settings. This is, of course, not an obligatory condition, as a PLE is itself a collection of different online and (or even) offline tools.

Two most popular use cases of weblogs in education today are e-Portfolio of a learner, and course provision platform of educators. However, an educator who tried to adapt a blog for managing an online course has likely faced many issues because blogs were originally designed as a publishing platform, without any support for learning tasks. We fully agree with the claim of Kim that “Current educational blogs are normally not customized for educational purposes in terms of user interface and, functional features” [6] When designing the LePress, we made an attempt to solve this issue by adding some features for learning flow.

III. LePress

We consider LePress as a tool that plays a “course coordination space” (CCS) role, which was introduced by Scott Wilson [7]. CCS acts as a mediator between a personal system and enterprise institutions with all their formal requirements. The main actors in such interactions are institutions, teachers (facilitators), and students (learners). LePress is designed to cover most requirements of teachers and learners, with a less attention paid to institutional requirements.

LePress is built on top of a popular open blog platform WordPress. This allows teachers to implement a formal course without leaving a habitual and friendly WordPress environment.

At first we defined a simple assessment workflow where a teacher assigns homework, a learner works on and submits back to teacher, who grades the works and gives feedback.

We mapped these activities on the blogs of teachers and learners trying to find possible ways for their implementation in blog publishing workflow.

Then we had to make a connection between formal learning activities and blog publication. We identified the main concepts for course artifacts, and mapped them onto con-
cepts related to blog publication process. We have implemented two types of semantics in LePress:

1) **Backend semantics: the course activities**

We have defined learning semantics by mapping blog categories to courses, teachers’ blog posts to assignments, and students’ blog posts to homework. Comments on posts are mapped in parallel to implemented homework and to teachers’ feedback.

2) **Semantic metadata: enrollment and assignments**

We have also implemented hidden data into LePress. This data related to the course participants and dates of assignment deadlines, and can be gathered directly from a blog web site using hCard and hCalendar microformats. Such kind of data in future can be also embedded into the blog by using RDFa, which support an unlimited amount of mixed vocabularies.

**IV. ENHANCING LEPRESS FOR LEARNING ANALYTICS**

One of the main challenges of learning analytics is disconnectedness of data types, which are typically stored by LMS from educational theories and pedagogic concepts. Although a typical LMS (e.g. Moodle or BlackBoard) is designed for managing and monitoring online courses, a large part of metrics the LMS provides for learning analytics is quite generic: page views, number and frequency of comments or posts, duration of sessions, time on task, social network formation. There is still a large gap to be filled in if an analyst seeks to interpret the default LMS student tracking data within the context of any learning theory.

This challenge only increases when a distributed blog-based PLE is used instead of LMS. The data that can be collected in blog-based PLE has a limited value for Learning Analytics, as blogs were not designed for the learning purpose. However, we clearly see possibilities to extend and customize these types in accordance with IEEE LOM specification, to make them more useful for learning analytics.

A. **Implementing Semantic Learning Annotation in PLE**

The foundation for learning-related semantics was laid 5-10 years ago by the learning technology standardization movement, which formalized standards and specifications like IEEE LOM, IMS LD, IMS QTI and SCORM [8]. Collection of similar data from a blog-based PLE is a more complex task, as it requires adding standardized semantic annotation to blog objects. There are two approaches to implementing this goal. The first approach (used in LePress) is based on a special software-mediator, which can act as a superstructure integrated into PLE architecture as an add-in module (plug-in). For systems that do not allow any extensions, but provide public API, an alternative approach can be implemented. A dedicated external service can track all learning-related activities through API, add a semantic annotation to them, and store semantic triples in external repository.

B. **Adding Pedagogy to the Semantics in PLE**

Even a simple blog affords the implementation of various pedagogical scenarios. A simple blog publishing activity like “writes a blog post” or “writes a comment” can mean different things in different context. For example, a teacher’s comment could be a scaffold, formative feedback or summative assessment. If a teacher and students could (or are invited to) define which learning category their post belongs to before submitting it, it would clearly increase the potential of PLE data for deeper learning analytics.

Here is one example. In VLEs like FLE3 or IVA2 has been implemented a collaborative learning method called Six Thinking Hats [9], which develops metacognitive skills of learners by forcing them to select a Hat with a suitable color before they can submit a post to a course forum. Black Hat means that comment is of critical nature, Green Hat indicates constructive proposal etc. The Hat label is added to each post in this discussion, thus enhancing the vocabulary of Learning Analytics. Six Hats labeling can be added also to LePress assignment by installing the FLE4 plug-in for WordPress3.

**V. CONCLUSION**

This paper described the work-in-progress on ways of extending the semantic capabilities of the weblog based LePress component for PLE. Initially LePress was designed as a learning flow manager between blogs but after adding the support of learning flows to WordPress, we found that we can add learning-related semantics to WordPress objects also. Now we are about to proceed with extending this semantics in order to get valid and reliable data and enabling learning analytics.

**REFERENCES**


1 FLE3, http://fle3.uiah.fi

2 IVA LMS, http://www.htk.tlu.ee/iva