

Learning Analytics in Project Management teaching

Tracking Practical Activities

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Abstract— During the last years it has been a growing interest in the phenomenon of *Learning Analytics*. In a parallel way, the number of educational sources that can be deployed is constantly increasing. The current work focuses on those information sources that link with practical activities in a Higher Education context. The concept of *edumarker*, which is analogous to biomarkers in health science, is proposed to organize this huge amount of analytical data. There are multiple examples of *edumarkers* that enable the tracking of practical activities and a specific educational context has been selected to show their application. Some preliminary results about the use of *edumarkers* in a *Project Management* course reveal their potential to manage different types of educational data.

Keywords—learning analytics; edumarkers; learning platforms

I. INTRODUCTION

Academics are aware of the growing interest of *Learning Analytics (LA)* phenomenon to address the huge amount of information in several educational areas [1], [2]. In a different context like health there is a useful concept, biomarkers, which represent characteristics that can be measured and evaluated as indicators of normal biological processes. Examples of biomarkers are blood pressure or cholesterol level and they are used to monitor and predict health states. The current work proposes a set of *edumarkers* as indicators of the “healthy” students’ activity in a Higher Education (HE) context. These indicators are focused on practical activities, which are performed in most HE disciplines. Whatever the selected discipline, there are several kinds of items that can be assigned to practices such as their guides or lab handbooks, those resources or materials addressed to support them or the documents that are delivered or produced as outcomes. Table 1 shows some samples of generic *edumarkers* proposed to analyze several practice activity items, for example, the number of accesses to a guide document or the type of actions over a document which is being elaborated.

TABLE 1. ACTIVITY EDMARKERS

Activity item	Educational marker
Practice guides	Number of accesses
Auxiliary resources	Number of downloads
Delivery documents	Type & timing of actions
Lab notebook	Number and type of annotations

While benefits for collecting these *edumarkers* data are evident, the main challenge deals about obtaining them. Most of these data are currently gathered from *LMS (Learning Management System)* or *VLE (Virtual Learning Environment)* [3]. However, it is well known that an important part of the academic activity is performed outside these platforms [4]. Therefore, there is a need to consider the wide spectrum of sources that can be used to extract *edumarkers* in a practice context depending on the target discipline. Table 2 depicts some samples of sources, which can be linked with activity items and specific *edumarkers* (marked with #). For example, in the item of *Practice guides* several measures can be performed to obtain the number of goals addressed through the practical activity or the list of accomplished tasks in this context. In a similar way, the elaboration of written reports or laboratory notebooks where experiment results are annotated can be also used as additional analytical sources.

TABLE 2. ACTIVITY SOURCES

Activity item	Sample sources
Practice guides	Learning guides (#addressed_goals, #assessment_policy), instruction set (#read_instructions), task list (#accomplished_tasks)
Auxiliary resources	Presentation handouts (#number_accesses), technical specifications (#selected_data), image galleries (#chosen_images)
Delivery documents	Written report (#typos or grammatical mistakes, #author_contributions), language worksheets (#correct_expressions), quizzes (#wrong/correct_answers)
Lab notebook	Notebook structure (#number_entries), laboratory record (#type_experiences), experiment results (#obtained_charts)

II. CASE STUDY

Project Management (PM) is a widely spread topic in many bachelor and master degree programs. In this case, we have selected a compulsory course in a Computing degree to show the deployment of the proposed *edumarkers* in practical activities. PM has sound theoretical contents well defined by institutions such as PMI [5] that provides recommendations to plan, schedule, execute, supervise or control a project. Practical activities are usually depending on the discipline where the project is developed but some generic tasks can be formulated such as the *Project Scope Statement* or its *Temporal Scheduling*.

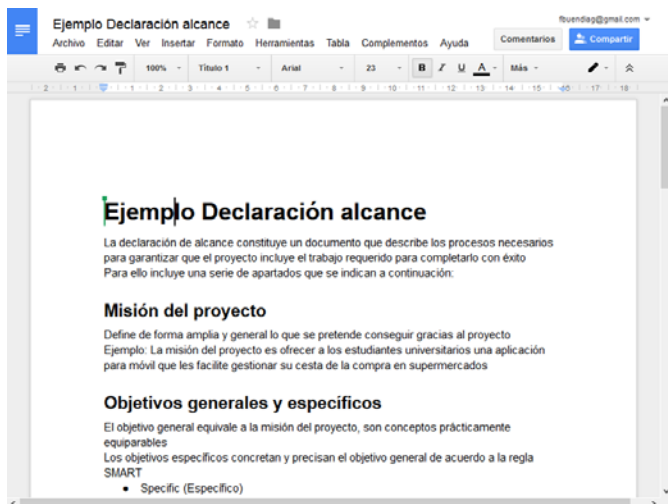


Figure 1. Scope template.

Figure 1 shows a sample of document that can be used as a template to write down a *Project Scope* in a *Google Drive* environment. Several resources to support the preparation of the *Project Scope* are provided within the Learning Management Platform (*LMS*) called *Poliformat* [6]. This platform enables the generation of reports that measure accesses for these resources. Moreover, the *Google Drive* framework offers the “activity stream” feature that allows users to track the number and type of accesses for documents in this framework. For example, we can detect the number of edit actions over those documents that are delivered through *Google Drive* or the different contributions of users who are editing these documents in a collaborative way. Figure 2 shows a chart that compares the percentage of students performing different actions in the context of a given practical activity. The darker bars in the chart represent how many students are accessing those files that can be searched for in order to help their work. These bars display a decreasing percentage of students as the number of accesses is higher what is rather understandable. Meanwhile, the grey bars represent the distribution of students who are doing edit actions on the proposed activity.

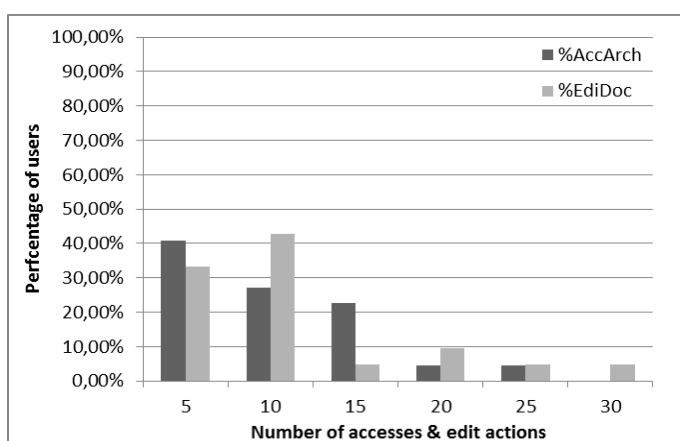


Figure 2. Statistics comparison between file access and edit activity.

In this case, there is a higher concentration of actions in a range about 10 with a big gap (near 20%) regarding the percentage of students that search for related files in this data range. That situation shows that not always there is a strong match between both types of actions.

III. CONCLUSIONS

The current work has shown the diversity and number of information sources that underpin the process of *Learning Analytics*, even in a specific educational context addressed to track practical activities in HE. The concept of *edumarker* can help to structure this huge amount of information and link it with analytical purposes. A case study has been used to test the usefulness of *edumarkers* in a Project Management course, which is taught in a Computing Bachelor Degree. Despite of the limited magnitude of the target study, it has provided enough evidence about the advantages of structuring and organizing different data sources when practical activities are developed. The proposed case has presented the possibility to combine data gathered either from LMS platforms or alternative frameworks as Google Drive. More research is required to contribute with criteria that allow instructors to generate *edumarkers* suitable for the practical activities they design, implement or assess. These criteria have to be combined with contextual information around the course practice such as the course learning goals, the knowledge corpus or the assessment methods used in the course. Additional studies are being developed to check the use of *edumarkers* in other HE disciplines. Further works include a systematic approach to define *edumarkers* in different educational contexts as well as their link with information sources that provide analytical data and general guidelines to deploy them. Moreover, a Web dashboard application is planned to support the *edumarker* management.

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