CHALLENGES OF USING LEARNING ANALYTICS TECHNIQUES TO SUPPORT MOBILE LEARNING

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ABSTRACT

Evaluation of Mobile Learning remains an open research issue, especially as regards the activities that take place outside the classroom. In this context, Learning Analytics can provide answers, and offer the appropriate tools to enhance Mobile Learning experiences. In this poster we introduce a task-interaction framework, using learning analytics techniques to support educational decision making, that has been designed by extending the results of well-established studies in this field with the aim of dealing with the complexity of Mobile Learning.

KEYWORDS

Mobile Learning, Learning Analytics, Semantic Web, Linked Open Data, Educational Decision Making

1. INTRODUCTION

In the last few years, Mobile Learning has been increasingly used to support learning experiences both in formal and informal contexts (Ahmed & Parsons, 2013; Jones, Scanlon & Clough, 2013). People using mobile and ubiquitous technologies for learning produce abundance of data as a result of their activities and interactions with the context; consequently, datasets built on these data are different both in size and type from the ones stored in VLEs (Merino et al. 2013; Ferguson, 2012). Moreover, according to Traxler (2007), the evaluation of a Mobile Learning experience has to consider a number of independent variables that influence the learning process; it is necessary to analyze a large amount of data and find relationships amongst data, in order to improve the learning experience, as well as to personalize contents and teaching methodology. Learning Analytics applied to Mobile Learning offers a promising framework to evaluate a "noisy phenomenon where context is everything" (p. 6, Traxler, 2007). In fact, Learning Analytics in Mobile Learning is a challenging research topic, due to the distinguishing features of Mobile Learning related to the technologies used, learners' mobility, the possibility of having localized data and information, the large amount of data that can be collected during a learning session, and the social dynamics that characterize the context in which learning takes place.

2. THE TASK-INTERACTION FRAMEWORK

In this poster, we introduce a framework based on the relationships between the different types of interactions occurring in a Mobile Learning activity and the tasks which are pedagogically relevant for the learning activity. In particular, the task-interaction framework deeply described in Fulantelli et al. (2014) is rooted in the task model for mobile learners introduced by Taylor et al. (2006) and Sharples et al. (2007), in the work on classification for Mobile Learning projects done by Frohberg et al. (2009) and in the classification of interactions for learning analytics proposed by Agudo-Peregrina et a. (2014).

Specifically, while we have designed the task-interaction framework with the aim of dealing with the complexity of Mobile Learning, the framework extends the Frohberg' results, by introducing an interaction layer to activate learning analytics processes and support educational decision making strategies. In fact, Frohberg and colleagues introduce a classification for Mobile Learning projects, based on Taylor and

Sharples' model, by defining specific scale values for each of the six factors in the model: context, tools, control, communication, subject and object. The same factors, which have proved extremely effective in describing Mobile Learning projects in a structured way, were used in our study to guide the interpretation of the learning processes in a Mobile Learning experience. For this to happen, at first glance we have identified practical activities performed by students which characterize their behavior according to each of the six categories described by the factors. Then, we have considered the students' interactions in a Mobile Learning experience, by identifying which types of interactions, amongst those described by Agudo-Peregrina et al. (2014), can best characterize the students' behavior, and consequently, should be considered important in the activation of learning analytics techniques to support educational decision making strategies.

In table 1 we give an overview about the links between each of the six factors proposed by Sharples and Taylor, the corresponding scale range identified by Frohberg et al., and the types of interactions identified in our framework. Furthermore, examples of indicators are also provided for each factor. Considering the factors in detail, for the Context factor, which reflects the importance of the environment for the learner, Frohberg identifies four categories: independent, formalized, physical and socializing. These labels represent the environment where learning takes place. The values for the context factor range from independent, where the learner's environment and his/her learning subject are in no way connected, to socializing, where learners exchange everyday experiences and support each other in a learning experience. The analysis of activities related to the context factor refers to the student-context interaction. In fact, as stated above, this type of interaction represents the relationships between the student and the context in which the learning activities take place. The difficulties in identifying context boundaries in Mobile Learning experiences constitute an obstacle to the definition of the relevant indicators for measuring and capturing information about this type of interaction.

Table 1. Overview of types of interactions combined with Mobile Learning factors

Factor	Issue	Values/Scale range	Interactions	Examples of indicators
Context	Relevancy of environment and learning issue	independent, formalized, physical and socializing	Students / Context	Position of a student in relation to the other students.
Tool	Pedagogic role of tools	From: content delivery To: content construction	Students / Content	# access to content, # creation of new content
Control	Responsibility for learning process and goal	From: full teacher control To: full learner control	Students / Teacher	# messages between students and teachers (Note: the direction is highly relevant)
Communication	Social setting	From: isolated learners To: cooperation	Students / Student Students / Teacher	# message between students and between students and teacher
Subject	Previous knowledge	From: novice To: expert	Students / Content Students / Teacher	# access to content , # request for teacher intervention
Object	Level	From: know To: synthesize and evaluate	Students / Context Students / Content	indicators strictly related to the type of learning experience

REFERENCES

Agudo-Peregrina, A.F., Iglesias-Pradas, S., Conde-González, M.A., Hernández-García, A. (2014). Can we predict success from log data in VLEs? Classification of interactions for learning analytics and their relation with performance in VLE-supported F2F and online learning. *Computers in Human Behavior*, 31(2014), 542-550.

Ahmed S., Parsons, D. (2013). Abductive science inquiry using mobile devices in the classroom. *Computers & Education*, 63, 62-72 (http://dx.doi.org/10.1016/j.compedu.2012.11.017).

Ferguson R. (2012). Learning analytics: drivers, developments and challenges. *International Journal of Technology Enhanced Learning*, 4(5/6), 304–317.

Frohberg, D., Göth, C., Schwabe, G. (2009), Mobile Learning projects—a critical analysis of the state of the art. *Journal of Computer Assisted Learning*, 25 (4), 307–331.

Fulantelli G., Taibi D., Arrigo M. A framework to support educational decision making in Mobile Learning. *Computers in Human Behavior* (2014), http://dx.doi.org/10.1016/j.chb.2014.05.045

Jones, A. C., Scanlon, E., Clough, G. (2013). Mobile learning: Two case studies of supporting inquiry learning in informal and semiformal settings. *Computers & Education*, 61, 21-32.

Merino P. J. M., Valiente J. A. R. & Kloos C. D. (2013). Inferring higher level learning information from low level data for the Khan Academy platform. In D. Suthers & K. Verbert (eds.), LAK (p./pp. 112-116), : ACM. ISBN: 978-1-4503-1785-6

Sharples, M., Taylor, J., & Vavoula, G. (2007). A theory of learning for the mobile age. In R. Andrews & C. Haythornthwaite (Eds.), *The sage handbook of e-learning research* (pp. 221–247). London: Sage.

Taylor, J., Sharples, M., Malley, C. O., Vavoula, G., & Waycott, J. (2006). Towards a task model for mobile learning: a dialectical approach. *International Journal of Learning Technology*, 2, 138–158.

Traxler, J. (2007). Defining, Discussing, and Evaluating Mobile Learning: The moving finger writes and having writ…. *International Review of Research in Open and Distance Learning*, 8(2).