Seven features of smart learning analytics – lessons learned from four years of research with learning analytics

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Learning Analytics (LA) is an emerging field; the analysis of a large amount of data helps us to gain deeper insights into the learning process. This contribution points out that pure analysis of data is not enough. Building on our own experiences from the field, seven features of smart learning analytics are described. From our point of view these features are aspects that should be considered while deploying LA.

1. Introduction

Already back in 2006 Retalis et al. proposed their first thoughts on "Learning Analytics" and considered interaction analysis as a promising way to better understand the learner's behavior. A couple of years later, further activities were organized, especially Long and Siemens (Long & Siemens, 2011) predicted that the most important factor shaping the future of higher education will be big data and analytics. Since then, scientific conferences, different reports (e.g. Horizon report, 2011) and public funding referred to Learning Analytics. Nowadays, discussing about the topic Learning Analytics is attracting many researchers worldwide. According to Siemens and Baker (Siemens & Baker, 2012) LA "is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs". Further research publications refined the definition towards more students' activities (Duval, 2010) or proposed descriptive models and frameworks (cf. Siemens 2011; Elias 2011; Greller & Drachsler 2012; Cooper 2012; Chatti et al. 2012; Friesen 2013).

Within our own work and studies, we worked with LA in diverse contexts of learning in schools and higher education. At first glance, the difference between Educational Data Mining (EDM) and Learning Analytics is not obvious (Baker et al., 2012). Therefore the last years of research was dominated to explain why LA differs from EDM and why a new research field is absolutely necessary. Furthermore the authors did several field studies using learning analytics (Schön et al., 2012; Ebner & Schön, 2013; Ebner et al., 2013; Taraghi et al., 2013; Taraghi et al., 2014a; Greller et al., 2014; Taraghi et al., 2014b). Against this background we tried to formulate features that we consider as crucial for smart implementation of LA. From our point of you, these are effective also in performance support in organizations as well as for learning support in classrooms. These aspects are independent from the context, but important for the support of learning and learners

2. Seven features of smart Learning Analytics

Based on our literature review and our own on-field experiences, we propose a list of seven features of smart Learning Analytics.

1. Learning Awareness: Smart LA should support the awareness of learning. Even if it has components of assessment and controlling, LA is meant to support learning. It is important that each learner is informed about his/her current state in the learning process. Questions like: Where do I achieve the greatest performance and where/when not, are in the center of this aspect. Learning awareness reflects on the idea that the learner is conscious about the evolution of his/her personal learning process and knows how to improve it according to the available data.

2. Privacy Awareness: Considering privacy is becoming a very important issue. It is not only recommended to software developers to keep personal data safety, but also for instructors, teachers, trainers as well as learners. Data confidentiality has to be guaranteed. A secure manipulation and transfer of personal data is a precondition for successful LA programs. Learners should be able to trust their learning environments.

3. Time Awareness: When LA comes into our minds, we are always thinking in learning processes. The term process implies that we follow learning along a timeline. Therefore LA has to provide a possibility where learners as well as instructors, teachers or trainers are able to see how they are performing over a certain time period. They also have to understand that learning is not a snap shot, but a highly steadily growing process over time.

4. Visual Feedback: LA has to provide visualizations of the learning process. Graphics working as feedback channel for the learners (how did I perform till now) as well as instructors, teachers and trainers (how did my class/group perform till now) and finally also for administrators, developers and researchers (how did the program enhance the learning process). Each illustration must be easy understandable and simple. Otherwise learners or teachers will not find them helpful. From our perspective this is a very sophisticated task.

5. Pedagogical Interventions: LA collects data of learners to analyze it. Different visualizations give instructors, teachers and trainers the idea how their learners are currently performing. As Greller and Drachsler (2012) mentioned, LA must be embedded in a pedagogical approach. They claimed that LA will force pedagogical interventions, which may lead to a change of the pedagogical behavior (Van Harmelen & Workman, 2012). LA is strongly linked to pedagogical interventions and brings the educator in the center of the whole learning arrangement.

6. Big Data Centralism: An important reason what LA makes powerful is the potential notion of data centralism. From a technical perspective the main difference between former EDM software and LA can be seen in centralized big data. Due to web technologies it is nowadays possible to let people use the device of their choice, while aggregating the produced learning data centrally. It does not matter if learners are using a smartphone, a tablet or a computer, each single entry will be gathered on the same place. Consequently, the amount of data can get really big and therefore reliable for further research investigations.

7. Knowledge Structures Acquisition: The last feature of smart LA considers the new knowledge that emerges from the analysis of data and that is important for pedagogical scientists. New insights and perspectives may let us rethink how people are learning. Knowledge structures can be derived and can influence the existing algorithm running in the background of LA software. Dynamical adoption to the learner's needs is one of big challenges in close relation to the data gathered in the background.

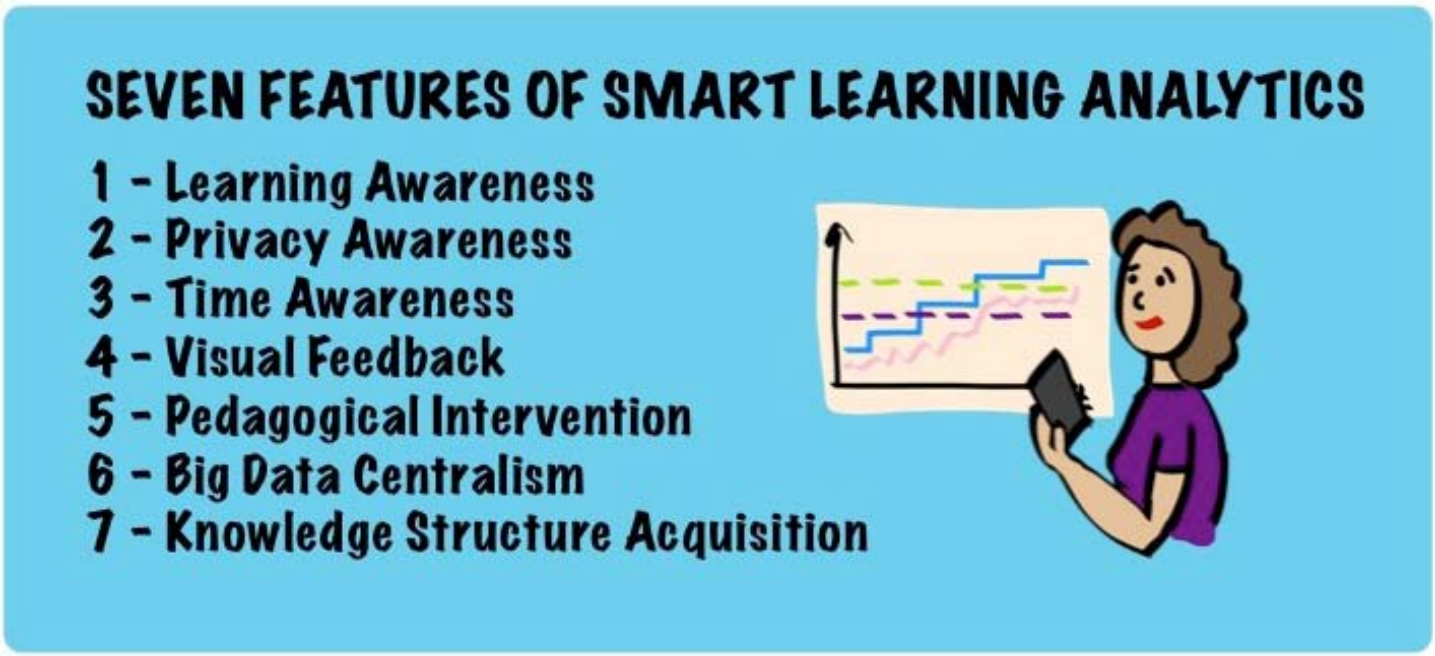

Fig. 1 Seven features of smart Learning Analytics

3. Conclusion

Fig 1. summarizes seven features of LA we suggest to bear in mind while implementing LA. The main issue is that the data itself will not lead to any valuable insights into how learning occurs or might happen. It is about the people who get it in an appropriate way in order to enhance their knowledge about the learning process. Learning Analytics should support learners to enhance their performance, educators to get a better picture about their students' learning and also should support scientists to understand how learning in a particular domain happens. The seven proposed features of smart LA supports the development.

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