
Personal informatics for learning

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Abstract

Learning analytics dashboards support learners and teachers by enabling awareness, reflection, sensemaking and improved understanding of learning behavior. Our experiments show that many such applications do not meet student expectations. Challenges include promoting change of behavior and increasing motivation. In this paper, we present our results in the learning analytics.

Author Keywords

Learning analytics, Visualization, Reflection, Awareness, Sensemaking

ACM Classification Keywords

H.5.2 [Information interfaces and presentation]: User interfaces; K.3.2 [Computers and Education]: Computer Science Education

General Terms

Design, Experimentation, Human Factors

Introduction

The field of 'learning analytics' focuses on tracking learning activities, in order to promote self-awareness, reflection, sensemaking and improved understanding, through algorithmic analysis (in educational data mining) or information visualization [1]. We focus on how we can present traces of learning activities (as

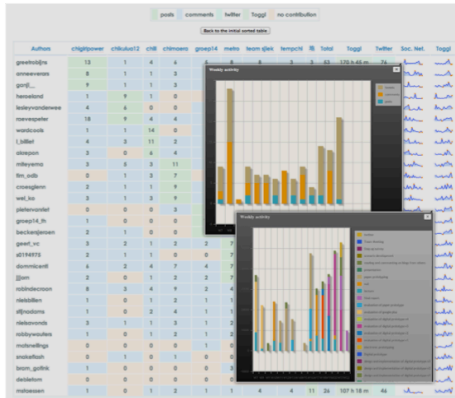


Figure 1 StepUp! 'Big Table' view (<http://ariadne.cs.kuleuven.be/stepup/>)

captured in web logs, social media, etc.) in ways that help learners or teachers to steer the learning process.

The research we want to share and discuss during the workshop, focuses on three key questions: 1) What are relevant learner actions?, 2) How can we translate the traces of those actions into visual representations that support learning? and 3) How can we assess real learning impact?.

Previous work

In our courses, we apply learning analytics through a variety of visualizations. We typically follow an 'open learning' approach where engineering students work either individually or in small groups of three or four on realistic project assignments. Students are encouraged to use twitter (with course hash tags), wikis, blogs and other web 2.0 tools such as Togg¹, TiNYARM² and Rescuetime³. This allows them to report and communicate their work to fellow students in a 'community of practice' kind of way on the one hand, and with the outside world on the other hand.

Traces about student activities are collected and visualized, so that students and teachers can easily keep track of what goes on and provide timely feedback where needed. In the spirit of 'open learning', all students have access to all data the teacher can see.

We designed, implemented, deployed and evaluated StepUp!, a learning analytics dashboard (see Figure 1),

¹ <http://www.toqql.com>

² <http://atinyarm.appspot.com/>

³ <http://www.rescuetime.com>

in six case studies [2]. Our evaluations focus on evaluating a variation of Li's stage-based model for Personal Informatics applications [3]: Does StepUp! enable 1) awareness 2) self reflection 3) sensemaking, and 4) new understanding and changed behavior?

Our results show that StepUp! provides transparency to the community and helps to understand how others spend their efforts. However, measuring the impact of these tools is difficult and therefore not often evaluated, although some long-term studies point out a correlation between use of dashboards and lower percentages in dropouts of courses[1].

In order to assess changed behavior, we analyzed StepUp! logs and student behavior. We found some positive correlations that could indicate an impact. However, these correlations are not present across the different case studies. Moreover, results show that (i) only a limited number of student change their behavior, (ii) that the change was not sustained for much longer than a week, and (iii) that the use of our tool was not systematic.

We asked the students which learning issues they consider important. We evaluated how StepUp! addresses these issues and compared them with additional learning issues, found in literature, that were already evaluated in previous experiments with positive results. StepUp! addresses better the latest learning issues rather those considered by themselves.

Discussion

Based on the evaluations, we have identified two main problems that are the focus of our current work.

Motivation

Students report motivation as one of their main learning issues. Rewards can motivate students to achieve their learning outcomes, however it can also have a negative effect on the students and their desire to learn [4]. However, encouragement and praise can strongly influence student motivation [5]. Although currently, our RSS readers notify us when our students write a post in their blogs, it requires staying up-to-date with our reading, which is sometimes not an easy task due to time constraints. Complementarily to the RSS system, we consider adding a notification system to StepUp! that notifies a blog contribution to the teaching assistants and professors by traditional email or to the Smartphone in order to get quicker reaction from them to give positive feedback with motivational statements compatible with constructive feedback. Furthermore, the system can track if these reactions are actually provided and if not, send a reminder. In our view, this system would reinforce connectiveness of both teachers and students.

Badges, commonly used in personal informatics applications, can help to support positive behavior [6]. In our context, we can for instance award a badge for the most discussed student blog post or tweet in a particular week. Open Badges⁴ offers the possibility to integrate easily a badge system in applications. By spreading badges through social networks, we can further strengthen the connection with the outside world, an important aspect in our 'open learning' approach.

⁴ <http://openbadges.org/>

StepUp! focuses on tracking efforts rather outcomes.

We track contributions such as blog posts, comments and tweets: these are valuable outcomes of learning effort. In addition, we also track time spent on activities, i.e. effort and students focus strongly on that aspect.

As one of our main goals is to move beyond time tracking, we will further integrate goal related aspects, such as the number of prototypes implemented by the group, a percentage that indicates how much of the course goals has been achieved, and intermediate results of student activities such as user evaluations in our course on Human-Computer Interaction. Beyond just tracking the number of prototypes, we can also include the percentage of changes compared with the previous version. These changes should have an impact on the user evaluation results.

To track outcomes rather than efforts, allows us to focus also on the means to achieve them. For instance, the evolution of how they are performing might be influenced by how many times they meet to work on the course, either virtually or face-to-face..Would that have any effect on their learning? Furthermore, tracking shared resources among students and the respective reactions ('retweet', 'like', 'comment') on this sharing action, might indicate the impact that one has had in the community or even if the student is contributing to the engagement of others. The means can thus be very important to understand yourself and others.

Other StepUp! issues that we will also address include:

Knowing the student

Tracking student and teacher mood and relating it to performance may provide valuable insight.

Addressing intentional gaming of the system

Students report that StepUp! may promote non-useful contributions to the community and over-reporting of time on the different activities of the course. We want to experiment with ways to address this problem.

Bootstrapping issue

We need to engage students faster in the use of the application. A notification system can help to kindly remind the user the positive sides of the application.

Visualizing user traces

We need to further investigate effective visual representation of the user traces in order to provoke self-reflection and potentially changed behavior.

Conclusions

Personal Informatics is a broad field where we can find a diverse set of applications in various domains such as (personal) health, sport, productivity and learning. These applications aim to promote positive behaviors on users and share the same challenges such as how to gather information regarding the user, processing the data, how to visualize it in an understandable way for the user and evaluating the impact in iterative cycles.

This paper presents an overview on the lessons learned from our experiments dealing with different users that have different motivations by nature but, at the same time, they share a common 'open learning' methodology to work with. Continuous motivation of using personal informatics applications can play an

important role in our courses. However, the nature of the tracked data can influence to the students creating negative pressure and decreasing their motivation and this possibility make us to focus on outcomes rather on spent efforts. How to deal with this issue is therefore the key topic we would like to discuss and work on during the workshop.

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