Supporting Self-Reflection in Personal Learning Environments Through User Feedback

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Abstract. Self-regulated learning (SRL) is a crucial skill in the era when people need to learn during their whole lives. However, the traditional educational system, which is teacher-centered, does not cultivate this competence very well. In this paper we propose an approach to stimulate reflection of learners about their own learning processes, which is an important part of SRL. The approach is based on a mashup recommender that provides guidance in creating Personal Learning Environments and a widget supporting self-reflection of learners. They receive information on their usage of individual widgets and provide feedback assigning learning activities to these widgets. The aim is to raise awareness of the learners on their learning activities and how they cover the whole spectrum of SRL. We expect that this tool complemented by other ones, will support self-regulation of learners.

Keywords: personal learning environments, recommender, widget, mashup, ontology, learning activities, self-regulated learning

1 Introduction

Self-Regulated Learning (SRL) [1] means overtaking the responsibility by the learner for his or her own learning process, its self-monitoring, and control aiming at learning objectives. From the psychological perspective the learner must use both cognitive and meta-cognitive strategies. The cognitive ones focus on processing of learning materials, while the meta-cognitive ones deal with the application of cognitive strategies, i.e. their planning, monitoring, and regulation. Research suggests that the quality of application of the cognitive learning strategies is crucial for successful learning and that it can be improved by training. From the implementation point of view the concept Personal Learning Environment (PLE) is in line with the SRL requirements. PLE describes the tools, communities, and services that constitute the individual educational platforms that learners use to direct their own learning and pursue educational goals. Compared to course-centric solutions (like Learning Management Systems) PLE is learner-centric, i.e. students are in charge of their learning process, emphasising meta-cognition in learning.

The ROLE project[3] aims at support in the individual assembly of accessible learning services, tools and resources in responsive open learning environments, which permit personalisation of the entire learning environment and its functionalities, i.e. individualisation of its components and their adjustment or replacement by alternative solutions.

A psycho-pedagogically sound framework for supporting the individual composition of learning services [2] is being developed in order to support SRL. The main principles of the ROLE Psycho-Pedagogical Integration Model (PPIM) are Personalisation and adaptability, Guidance and freedom, Motivation, Metacognition and awareness, and Collaboration and good practice sharing. The ROLE SRL process model is learner-centric, made up of three meta-cognitive learning phases [3]: Forethought, Performance, and Reflection. Including also the idea of self-profile for personalisation, PPIM has four phases: Learner profile update, Selection of learning resources, Learning with selected resources, and Reflection on learning achievements. In addition to these phases, a taxonomy of learning activities has been created, which describes the cognitive and metacognitive processes when widgets are used for learning.

2 Support for Creating Personal Learning Environments

In the recent years a trend became very popular to create small applications for specific purposes with limited functionalities. For example an approach is described in [4], which focuses on a user interface that easily allows for selecting and adding widgets to a learning environment. Background technology (Wookie server) is presented in [5], that allows for rendering widgets on a Web page. Though there are many activities to create small applications and mashup technologies, there is still a lack of support to create pedagogically sound learning environments consisting of small applications.

In [6] we presented an approach and an integrated tool that supports the creation of personal learning environments suitable for self-regulated learning. The rationale behind this approach is an ontology of cognitive and meta-cognitive learning activities that are related to widgets from a Widget Store. Patterns of such learning activities allow for providing the user with appropriate recommendations of widgets for each learning activity. The system architecture follows a Web-based approach and includes the Mashup Recommender widget and its backend service, the ontology available through a Web service, the Widget Store with its interface to retrieve widgets, and the integration into the learning environment framework. The pedagogical approach regarding the usage of this technology is based on self-regulated learning taking into account different levels between guidance and freedom. Figure 1 shows a screenshot with the Mashup Recommender in a bundle and five further widgets that allow for goal setting and competence evaluation, self-reflection, text reading, and note taking.

[3] http://www.role-project.eu/

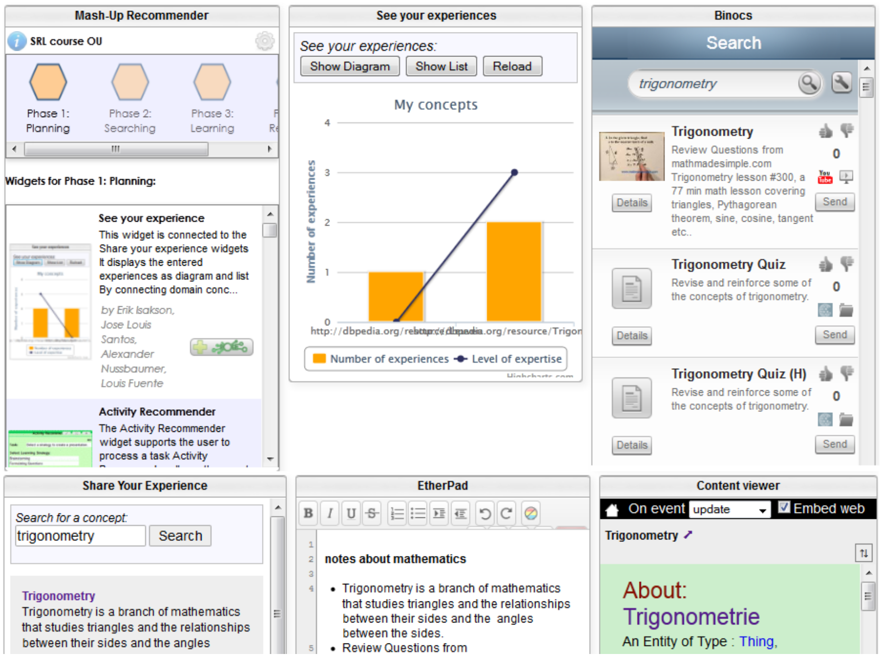

Fig. 1. This figure shows a screenshot of a widget bundle with the Mashup Recommender and five widgets (for goal setting, self-evaluation, content searching and viewing, note taking, and self-reflection).

The basic assumption of creating good PLEs is that the assembly of widgets to a widget bundle should follow a pedagogical approach. In contrast to existing approaches where just widgets are compiled to a bundle, our approach proposes to start with the consideration which SRL activities should be supported by the PLE. In a second step widgets should be found for the selected SRL activity and added to the widget space. Because of the relations between SRL activity and widgets, widgets can be recommended for a PLE. In contrast to collaborative recommendation approaches that are based on social usage data to generate recommendations, this approach is based on a predefined ontology. The advantage of this approach lies in the fact that the learner's attention can be drawn to meta-cognitive aspects of learning even if other learners do not follow these aspects.

3 Usage and User Feedback

The previous section described how guidance is provided to create a widget bundle consisting of widgets taking into account that this bundle should be usable for self-regulated learning. However, it does not reflect how this bundle is actually used. If widgets for several meta-cognitive activities are available, we cannot know if learners are using these widgets and if they perform these learning activities. To this end we present a learning analytics approach to help learners to use the widgets for self-regulated learning or to make them aware of their purposes. According to the idea of learning analytics, traces of the learners' behaviour should be captured and presented to the learners in a meaningful way, in order to increase awareness and to improve learning progress.

The ROLE technology includes the possibility of collecting usage data in a structured way using so-called Contextualised Attention Metadata (CAM) [7]. CAM data include the information which user has done which activity with which object and in which context. Using this information we can identify which learner has actually used which widget when and how often. An approach to use CAM data to visualise usage statistics of widgets has been made in [7, 8].

Considering the fact that the available widgets address different cognitive and meta-cognitive activities, it becomes clear that a learner should use all widgets in a bundle (at least from time to time). In order to stimulate the usage of all widgets we propose a visualisation that shows all widgets in a list and gives graphical feedback how often they have been used. Figure 2 shows an outline, how graphical feedback can be given. All widgets in the current widget space are listed and for each widget it is graphically shown, how often it has been used compared to the other widgets. The lengths of the bars indicate the relative numbers of usage compared to the total number of widget usage. This kind of feedback does not tell the learner that some widgets have to be used more or less often, but it just gives information about the usage in order to stimulate the learner's reflection on the own behaviour.

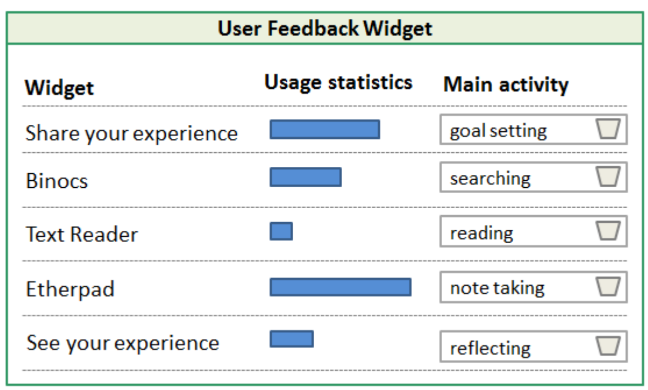

Fig. 2. This figure shows an approach for a feedback widget. It displays how often a learner has used a widget and for which purpose.

The second type of help to use a widget space properly in the sense of self-regulated learning is to ask the learner how a widget has been used. Considering the ontology of learning activities the learner is asked which learning activity she has primarily performed with a widget. This can be performed by offering a set of possible learning activities for each widget in a drop-down list and let the learner choose one (see Figure 2). Due to filtering mechanisms not all learning activities have to be offered, but only those that might fit according to the ontology. This approach stimulates the learner to think about the own cognitive and meta-cognitive actions.

Combining both support strategies brings up a list of widgets to the learner indicating how often these widgets have been used and for which purpose. Together this reveals which learning activities are dominant in the learning process of a learner. Furthermore, it can also turn out, if widgets are used differently as originally planned by learning facilitators.

4 Evaluation

An evaluation of the presented approach was made with ten PhD students (seven male and three female students). To this end the approach and its background were briefly described and the diagrams of this paper were shown to them. Then they were asked three questions, (1) if they understand this approach, (2) if they think that the feedback bars help them in the learning process, and (3) if entering the learning activity helps them in their learning process. The questions were related to rating scales with five options between *strong disagree(1)* and *strong agree(5)*. The overall result of these questions (mean values) was good to rather good (see Figure 3). Furthermore, they were asked about strengths and weaknesses of this approach. The analysis of the given answers revealed that most of the participants would like to have more detailed information about the feedback bars regarding their exact meaning (for example exact values). In order to avoid a too high cognitive load, additional information could be provided on demand. Some participants were also interested in comparing the feedback information with other learners. The simple and clear user interface, as well as the idea of relating learning activities to widgets were seen as strength of this approach.

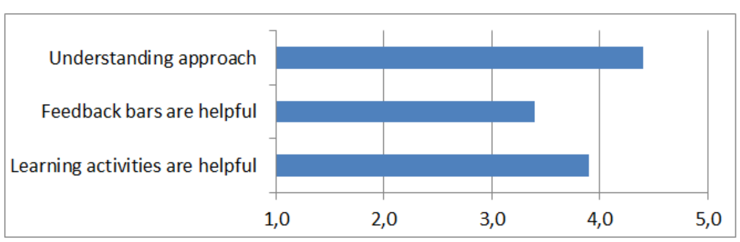

Fig. 3. This figure shows the result of the closed evaluation questions (n=10).

5 Conclusion and Outlook

This paper presented an approach to stimulate the reflection of a learner about the own learning process. This approach is based on a Mashup Recommender for PLEs that gives guidance in terms of creating a bundle of widgets, which is appropriate for self-regulated learning. Using a taxonomy of learning activities widgets are recommended in order to enable learners' performance of different cognitive and meta-cognitive learning activities. In addition to the help of recommending widgets for different learning activities, the presented approach helps to use the widgets for self-regulated learning. Learners get feedback which widgets they have used and how they used these widgets in terms of learning activities. Both types of feedback (feedback from the learning environment and feedback to the learning environment) should stimulate reflection on the own learning process. An initial evaluation revealed that the participants understand this approach and expect benefit for the learning process from it.

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