Flip with care

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The term *flipping the classroom* has appeared recently as a new approach to distribute the activities between two contexts: before the lecture, during the lecture. Although the term has no formal definition, it appears when opposed to the traditional view of a lecture in which students are given new material and some activities to carry out *after* the session. A *flipped classroom* assumes that students may work in certain activities *before* attending the lecture. These activities may include reading material, visualizing videos, answering questions, etc. But the this approach is not entirely new. Other learning strategies such as Active Learning, or Just in Time Teaching rely on the same premise of activities used to prepare a lecture. Relying on previous activities has the risk of students attending the lecture with significantly different levels of engagement. This risk is irrelevant in a conventional classroom as the material is assumed to be totally new to students, but if the lecture includes activities that rely in student participation, this risk seriously jeopardizes the success of the session. In this paper we postulate the use of learning analytics and a fast feedback loop to monitor student engagement with the previous activities and report the results to instructors before the session.

Active learning is defined by Felder and Brent (2009) as *anything course-related that all students in a class session are called upon to do other than simply watching, listening and taking notes"*. Numerous studies point to this type of techniques as an effective strategy to increase student participation and as a consequence the overall improvement of a learning experience. Additionally, Just in Time Teaching (JiTT) was proposed by (Novak, 2011) as a way to combine technology and active learning. Students are given a set of resources to prepare a lesson with a set of so called *warm-up exercises* that must be submitted and graded before the session. These exercises are automatically graded and reported to the instructor before the lecture so as to tailor the activities accordingly.

The widespread of technology in education and the increasing presence of mobile devices has brought an equally large capacity to observe and record the events occurring in a learning environment. This information can be used to create new models for educational institutions to improve decision making, teaching, learning, etc.(Long and Siemens, 2011). The use of this data implicitly assumes the existence of a feedback loop by which data is collected, processed, reported back to the stake holders, and new actions that transform the environment are decided and deployed. Campbell, DeBlois, and Oblinger (2007) denoted this loop as *The five steps of analytics*.

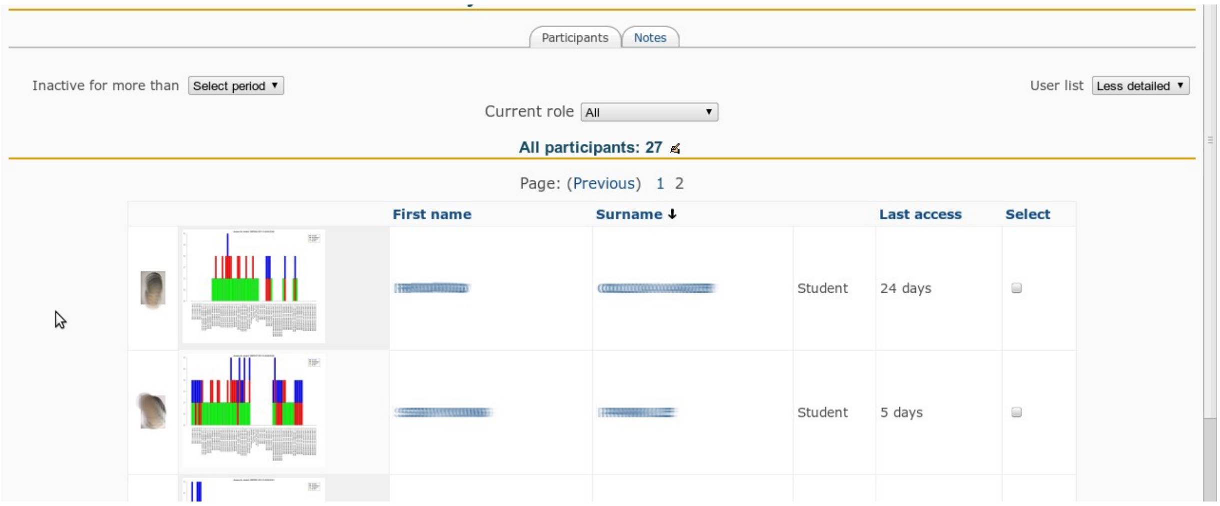
In this paper a feedback loop is proposed to capture how students interact with course material during the period previous to the lecture. This information is collected and processed to produce a visualization offered to instructors. An instructor may prepare different activities for the lecture and choose the most appropriate based on the information provided by these visualizations. For example, if a discussion in groups is scheduled, the instructor may create those groups with different objectives depending on the level of perceived participation in the previous activities.

An initial pilot experience has been created and deployed to see the merit of this approach. The objectives of this experience are: 1) verify the feasibility of capturing events while students interact with conventional course material, 2) deploy an immediate feedback loop based on the collected events, 3) provide the visualizations to the instructors unobtrusively, and 4) analyze the impact in lecture activities.

Capturing events related to student engagement with course material was done by modifying the conventional course material creation pipeline to embed multiple choice questions in the middle of the course notes. Students read a few paragraphs of the material and right next to them, there is a short number of simple questions. Students interact with the questions through three events: check answers, request solutions, and clear the answers to try again. The interactions with these questions are recorded and sent as conventional page requests but have no effect on the page. The level of integration of these questions in the course material can vary depending on the conditions imposed by the hosting application. For example, if the platform allows access to the user name (using a JavaScript embedded in the page), the data is recorded with the user identification.

These interactions with the embedded questions are collected and processed to produce an intuitive visualization for the instructors. Every instructor has a graphic representation containing, for each question, the number of correct and incorrect answers, and the number of times a solution was requested. The process of collecting these events, processing the data and producing the visualization has been streamlined so as to be executed with a high frequency. Instructors, then, have an almost immediate view of how students are participating in the activity.

But as important as producing these visualization is to offer them to teaching staff in no additional burden. This is specially challenging when using institutional learning management systems (LMS). The solution proposed is based on the use of a *add-on*. Add-ons are simple extensions that when installed in a browser may post-process a web page on arrival. Instructors are required to install an add-on in their browsers. This script is sensitive to a page in the LMS that modifies and inserts the visualisation. The following figure shows the visualizations for each student embedded in the course listing page.



Additionally, the home page of the course is also modified to include a visualization with the data collected for the entire group divided by questions. Interviews with the instructors revealed that their class activities were influenced by the embedded visualizations.

References

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