Gamification for Achieving Sustained Engagement in Programming Classes

TREO Talk Paper

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Abstract

One of the challenges that many programming instructors face in classes is to deal with sometimes greatly varying skill levels of students. The imbalanced skillsets among students in such classes may result in more experienced students not feeling adequately challenged, or less experienced students feeling pressured and experiencing a fast pace in class that makes it difficult to grasp a new topic before fully comprehending previous materials. We present a flexible, gamification-based approach that helps instructors create more customized learning environments, tailored to the students’ needs. Gamification is defined as “the use of game design elements in non-game contexts” (Deterding, Dixon, Khaled, & Nacke, 2011). It has been used as an effective way to increase learning experience in areas such as industry, education, and health. Implementing such a tool happens naturally and unintrusively. Stronger students will feel more challenged on a voluntary basis while weaker students will have the flexibility to learn new materials at their own pace. In addition, this approach helps to sustain student engagement over the course of the semester.

A competitive gaming platform is modeled with basic features to incentivize the fulfillment of both mandatory and voluntary assignments. It should be noted that the completed objectives are not the main grading criteria but can support overall grade in form of extra credits. The instructor ensures that the course content is adequately represented with mandatory assignments (level 1), however, throughout the semester students can unlock optional assignments based on personal choices (level 2 and 3).

While assignments (level 1) are mandatory and count for most of the grade, students do have to complete a predetermined number of level 2 and level 3 assignments, however they can choose at will. Often such assignments offer in-depth learning experience of concepts already covered in level 1 assignments. Instead of affecting the grade, assignments may also provide other incentives, such as forgiveness cards for late submissions. Each completed assignment has a score attached. Students can view their progress against their classmates in an anonymized scoreboard. A personal map will be unlocked with each score increase and only a full score will reveal the entire map to students. An integrated leaderboard provides students with a subtle form of competitiveness that can improve learning effectiveness without adding pressure.

The gamification tool can be fully integrated into popular LMSs, such as Canvas, minimizing instructor effort. Assignments can be managed on canvas while grading automatically updates the leaderboard and related data in the application.

In this talk, we will explain our proposed solution accompanied by our preliminary design and user interface components. We implemented the system over the course of two semesters with great success and would like to share our experiences and the effect it had on the students’ performance and motivation.

References