

Introducing badges in first-year Chemistry

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Context

Background overview

The department of Chemistry and Polymer Science offers two first-year Chemistry semester courses (Chemistry 124 and Chemistry 144) to approximately 960 students. These modules serve as both main stream and service modules with most students having to take it as a requirement for their selected (non-chemistry) study programme. First-year general Chemistry students repeatedly mention a lack of interest and negative beliefs about their ability to be successful in Chemistry in addition to pointing out the module's difficulty and high work load in the annual, institutional student feedback questionnaires. Furthermore, a shared concern amongst lecturers in the module is that very few students seem to make the effort to stay up to date with the work outside of examination times.

Subject area and established practice

Chemistry 144 includes basic introductory chemistry topics such as solubility, acids and bases as well as organic chemistry. The approximately 960 students in this large module are typically divided into five groups with a team of eight academics from the Chemistry department taking responsibility for two or three of these groups for a certain block of time.

Formal contact sessions for this module comprise three 50-minute lectures per week as well as six two-hour tutorials and five three-hour laboratory sessions spread over the course of the semester. Formal assessment in this module consists of a class test in the second half of the semester, an examination at the end of the semester, six tutorials, each consisting of an online pre tutorial test, tutorial group work and a multiple choice post tutorial test and five laboratory practicals, each consisting of an online pre-practical test and a practical report. The online tests (tutorial and practical) need to be completed by students before the start of their particular tutorial or practical session and they receive three chances to achieve a best mark which will count towards their performance mark.

Each question in all of the online tests has three generic versions which are randomized (together with its distractors) every time the test is attempted. The main aim of the online pre-tutorial tests is to provide students with additional exercises on the basic chemistry concepts covered in a specific

section. In this way they are expected to take responsibility in preparation for a tutorial session which is usually more problem solving based. The main aim of the online pre-practical tests is to motivate students to prepare for a specific laboratory practical using their laboratory instruction manual as well as text book.

The challenge

Students previously did not always attempt their online assessments in time and mostly waited until the last minute to attempt these. They furthermore did not necessarily show to make use of all three allowed attempts in order to use the opportunities as part of a learning process, but rather just concentrated on receiving a mark that is high enough for them, regardless of how many opportunities this took.

Learning opportunity

Badges were introduced in Chemistry 144 during the second semester with the aim to improve student motivation and therefore also participation by awarding of badges in addition to the allocation of marks.

Pre-prac exercises:

- The Blue Flask = Full marks for the first pre-prac.
- The Bronze Flask = Full marks for any two pre-pracs in a row.
- The Silver Flask = Full marks for any three out of the five pre-pracs.
- The Golden Flask = Full marks for all five pre-pracs.



Pre-tut exercises:

- The Blue Mole = Full marks for first pre-tut.
- The Bronze Mole = Full marks for any two pre-tuts in a row.
- The Silver Mole = Full marks for any four pre-tuts.
- The Golden Mole = Full marks for all pre-tuts.



Tutorials:

- The Blue Einstein = Full marks for first tutorial.
- The Bronze Einstein = Full marks for any two tutorials or where you have improved on a previous tutorial.
- The Silver Einstein = Full marks for any four tutorials or where you have consistently improved for four tutorials.
- The Golden Einstein = Full marks for all six tutorials or where you have consistently improved in all six tutorials.



Clicker participation:

The Blue Cellphone = If you have participated in 2 clicker activities.
The Bronze Cellphone = If you have participated in 4 clicker activities.
The Silver Cellphone = If you have participated in 6 clicker activities.
The Golden Cellphone = If you have participated in 8 clicker activities.



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Student experience

SUNLearn allows for the awarding of badges for tasks completed in a course and were therefore used for this purpose. Out of the total of 16 badges, 1156 awards were made during this course. By pre-setting the criteria most of the badges could be awarded automatically through the SUNLearn grade book. There was however 5 badges that were awarded manually, which was quite a time consuming process.

To evaluate the impact that the badges made on students' motivation in this course, quantitative data was obtained from SUNLearn regarding student participation in the course's online activities. These were compared to the participation of this same group of students in the previous semester (Chemistry 124), when badges were not yet implemented.

Online task	Term 1	Term 2
Preprac 1	44%	41%
Preprac 2	36%	40%
Preprac 3	32%	32%
Preprac 4	41%	41%
Pretut 1	37%	31%
Pretut 2	36%	32%
Pretut 3	27%	25%
Pretut 4	33%	44%
Pretut 5	32%	45%

This figure compares the participation of students during the first (Chemistry 124) and second (Chemistry 144) semesters. It shows the percentage of participating students who attempted the prescribed online tasks three times. Students who obtained full marks on their first attempts were removed from this analysis.

Unfortunately, this data does not show any noticeable change in the students' participation in the online activities. As mentioned earlier, the

students each had three available attempts per activity in order to obtain the best possible mark. It makes sense that if a student obtained full marks in their first attempt that they will not repeat the exercise. Therefore, taking this into consideration we unfortunately found that the number of students who attempted the online activities a total of three times does not differ much between the two semesters.

In addition to the quantitative data, qualitative data was collected by means of a questionnaire. The results provided valuable insight regarding the potential use of badges to increase the motivation of students to participate more in online tasks and to thereby improve their understanding of chemistry. Not surprisingly, very few of the students have ever participated in online activities where similar awards were allocated. However, they also did not realise that they had to claim their badges after it was rewarded. Unfortunately, this meant that these students did not see the badges in their personal profiles, which some of them mentioned were a bit discouraging. Still, the majority of students were very positive about the idea of the introduction of badges in Chemistry 144 and did report this intervention to act in a motivational way.

Conclusion

This first attempt at the use of SUNLearn badges to motivate student learning through participation in online tasks has excited us about the potential of this fairly new development. We are currently exploring research on this topic in order to guide our future plans.

