

Developing clinical reasoning through online quizzes: Carrot and stick versus “I want to learn”

TC Postma, J Thompson

Introduction

Academic success at University level is dependent on a variety of factors (1). One of these factors is conscientiousness (1). Conscientiousness is a personality trait that can be described as the effort taken by a learner to complete a task thoroughly and accurately (1). Conscientiousness relates to the concept of self-regulated learning (2). Self-regulated learning entails self-motivation, strategic planning, self-efficacy belief, self-control, and self-monitoring (1, 2), reflection and adaptation when required (2). The development of self-regulation skills is important in order to achieve academic success (2).

Traditional lecture-based teaching and learning have a tendency to encourage information gathering and rote learning amongst students, which often results in a surface learning approach (3). Such approaches can be regarded as the direct opposite of self-regulated learning. The University teacher is therefore faced with the conundrum of how to change student behaviour to get students to be less dependent on what the teacher does and to become more self-sufficient in the learning process.

Online quizzes have been used in disciplines such as Anatomy (4) and Physiology (5), as formative learning exercises to get students to engage with study material on their own before official lecture periods (6). Online quizzes have been related to improved educational outcomes (5, 6).

The first problem the teacher is faced with is to motivate the students to engage with the activity (7). A minimal summative assessment credit, such as 1%, 2% or 3%, is often linked to each of the quizzes just to get students to engage with the activity. Higher credit levels however increase the risk of unwanted behaviours amongst students since the quizzes are taken unsupervised (7).

Typically students are allowed multiple attempts to complete the online quizzes. Questions and distractors are often randomized. Moreover detailed feedback is usually not provided as part of these exercises. Students usually only receive a total score (8). Students then have to figure out which questions they got wrong and then have to go back and update their knowledge in order to achieve a higher score during further attempts. Students are not prohibited to work together and may even be encouraged to collaborate in the process. There is however evidence that this type of learning is not conducive to collaborative learning and that most dental students prefer to do the tests individually (8).

Online quizzes appear to be useful to motivate students to engage with study material, to test their own knowledge, and to put in an extra effort to improve their scores. Lecture periods can subsequently be devoted to the provision of feedback on the concepts students tend to struggle with.

Local context

Online quizzes have been introduced as part of the Module: Integrated Dentistry in the first year of study (IDE170) as from 2014. Online quizzes have been introduced as from 2015 in the second year of study (IDE270). Third year students are also exposed to quizzes in the Module: Comprehensive Patient Management (TBW370).

Aim and Objectives

The aim of the study is to gauge students' perceptions regarding the use of online quizzes as well as the impact of the online quizzes on students' engagement with related academic exercises and ensuing academic performance.

The objectives of the study are as follows:

- To describe the time periods students engaged with the online quizzes, per cohort, and per individual student.
- To relate time spent on the quizzes to continuous assessment scores
- To thematically analyse written student feedback on the value of online quizzes

Materials and Methods

Study design

A mixed methods study design was followed. The quantitative part of the study included retrospective and prospective analyses of student engagement (expressed as time) and academic outcomes (continuous assessment marks). The qualitative part of the study included anonymous written reflections about the students' participation in the online quizzes.

Study population

Third year dental students from the School of Dentistry, University of Pretoria (approximately 60 students in 2016) served as the study population for the TAU project.

Format of the quizzes

All the first and second year quizzes were administered using a multiple choice format. Third year quizzes also contained jumbled sentence formats in addition to multiple choice formats. First and second year students were allowed unlimited attempts. Third year quizzes were limited to five attempts. Questions and distractors were randomized for multiple

choice formats. Students could save attempts and continue later. Only the final score was provided as feedback when attempts were submitted.

In the first year of study detailed feedback was provided in combined feedback sessions before the major summative assessments. In the second year of study each of the five quizzes were followed by a feedback lecture. Third year quizzes were also followed by a feedback lecture.

First year quizzes focused on concepts and terminology related ethics, occupational health and safety, infection control, and basic tooth anatomy. Second year quizzes were constructively aligned with the requirement for students to diagnose basic dental caries, tooth wear, periodontal, pulpal and periapical and tooth loss problems. Third year quizzes focused on the diagnoses and treatment planning of the above-mentioned conditions.

Measuring student engagement

Students gave written permission to have their Blackboard Learn online activity reports (2015-2016) analysed for research purposes. The Pearson correlation coefficient was used to compare time spent on the online quizzes with continuous assessment scores.

Qualitative component of the study

Third year students wrote a structured written reflection on the online quiz experience

The following questions were posed to the students as part of this project.

- What motivated you to complete the online quizzes?
- Did the online quizzes you encountered in Integrated Dentistry contribute to your learning in the module? Please explain your answer?

Student reflections of the online quizzes were qualitatively analysed and thematically coded using the methods described by Braun and Clarke (2006) (9). Frequency distributions were calculated for each code.

Results

Quantitative results indicate that second year students spent 10 hours on average on online learning activities (mostly online quizzes) in preparation for the five lecture periods (2 hours per lecture period) in the second semester of 2015, with the peak times the night before the scheduled lecture periods.

To date in 2016, third year students spent 7 hours on average on online learning in preparation for four case discussion class sessions. Their peak times were equally distributed on the day before and the day of case discussions.

Students who spent less than 4 hours online achieved a mean continuous assessment score (made up by all the quiz scores) of 56%. The mean assessment score for those who spent four to six hours online were 63%. The mean scores for students who spent 6 to 8 hours and more than 8 hours were 68 and 71% respectively. Third year students' performance in continuous assessment that was below the class median correlated positively ($r=0.30$) with online time spent in the course. This was however not the case for above-median performance.

Third-year qualitative results ($n=65$) revealed that student participation in the online quizzes were both intrinsically and extrinsically motivated. Forty one percent (41%) of students mentioned one or more reasons why they participate in the online quizzes that could be interpreted as elements of self-regulated learning. The self-motivational belief of a need to learn more and to expand knowledge and the opportunity to reflect on what they know appeared to be main intrinsic motivators that contributed to their participation in the online quizzes. On the other hand, students' perception that online quizzes are compulsory with deadlines and the fact that the quizzes counted as part of the summative assessment were the main extrinsic motivators.

The majority of students agreed that the online quizzes contributed to their learning because it gave them the opportunity to practice what will eventually be assessed in an authentic context. The most students reported that they completed the tests more than once to improve their marks and a small minority mentioned that they repeated the quizzes to gain a better understanding of the work.

Conclusion

The results of this study suggest that despite the presence of some extrinsic motivational factors - carrots (marks) and sticks (deadlines) - participation in the online quizzes appears to be facilitating some self-regulated learning behaviours where students take responsibility for their own learning to enhance their knowledge and abilities. It should however be noted that only 41% of the students mentioned behaviours that could be directly linked to intrinsic motivation.

The results also suggest that below- median performance may be enhanced by increasing the time spent of online quizzes. The question however remains how this could be achieved in reality.

More action research is required to gain a thorough understanding of the students' self-regulation behaviours in relation to academic success.

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