

[P26] Replacing a formal examination question with a problem-based assignment: effect on student learning

John Green

School of Life Sciences
Napier University, Edinburgh

INTRODUCTION

The purpose of this study was to assess the effect on student learning at Masters level of replacing assessment of a topic by formal written examination with a problem-based assignment (continuous assessment). The project was undertaken as part of the FAST (Formative Assessment in Science Teaching) project.

THE TOPIC

The topic centres on the microbiology and technology of production of potable water. The topic comprises one third of the module *Water and waste treatment* in the Masters course *Aquatic Ecosystems Management*. The topic involves ca. 40 hours student work and assessment of it equates to 5 SCOTCAT points.

THE PROBLEM

The original learning outcome was *Critically evaluate the unit processes used in potable water treatment* and assessment of the topic was a question (1-hour to answer) in a formal written exam. Although such an outcome was consistent with corresponding benchmarks (SCQF Level 11) it was hard to justify that in answering the one-hour exam question (phrased along the lines of *Critically evaluate the unit processes used in potable water*

treatment) that students were in fact critically evaluating. Simply put, outcomes and assessment strategy were not aligned.

THE CHANGES MADE TO LTA STRATEGY

The learning outcome was changed to: *Recommend an appropriate strategy for producing potable water for a given population from water in a given reservoir*. The LTA strategy was modified to include analysis of reservoir water for quality indicators and examination of the reservoir catchment area, and the one-hour written exam question was replaced with a problem-based, continuously assessed assignment.

THE PROBLEM-BASED ASSIGNMENT

The assignment closely reflecting the outcome, was based on a realistic situation, was designed to engage students in independent research and integration of unfamiliar topics, and it involved students in recommending, predicting and critically assessing.

THE AIM OF THIS PROJECT

The aim of this project was to evaluate whether or not replacing the formal exam question by the problem-based assignment:

- promoted achievement of high-level outcomes consistent with SCQF Level 11 benchmarks;
- promoted development of generic (employability) skills;
- delivered a more formative experience to students.

EVALUATING THE EFFECT OF THE CHANGE

The effect of the changes was evaluated using:

- my professional judgement;
- a questionnaire of my own devising, comprising mainly open questions;
- SOLO analysis (Biggs and Coulis, 1988) of students' responses.

DID THE CHANGE PROMOTE ACHIEVEMENT OF HIGH-LEVEL OUTCOMES CONSISTENT WITH SCQF LEVEL 11 BENCHMARK?

My professional judgement was that it did. Successful completion of the assignment showed that students had applied critical understanding and had made informed judgements. My judgement was that such was not the case when assessment had been by formal exam.

Students' responses by questionnaire supported my own judgement. An example of a comment was *the assignment gives you plenty of time to explore the topic and think about the answer, whereas in exams time constraints rarely make this possible.*

SOLO analysis of students' responses showed that the greatest proportion of work (75%) was at the *extended abstract* (highest) level, which is characterised by hypothesising,

deducing and qualifying conclusions. The remainder was at the *relational* level, the next level down the scale, which is characterised by understanding and using relevant data and their interrelationships. My judgement was that in the exam answers on the topic students had worked mainly at the *multistructural* level (the next level down from *relational*), which is characterised by linkage of isolated data (supplied data only), and generalising without deduction and induction.

DID THE CHANGE PROMOTE DEVELOPMENT OF GENERIC (EMPLOYABILITY) SKILLS?

My professional judgement was that it did. Successful completion of the assignment involved aspects such as making informed judgements in the absence of complete information and developing original responses (which had not been the case with the exam question), and was more like to have developed skills such as exercising initiative and taking responsibility for one's own work. All of these generic skills are benchmarked by SCQF at Level 11.

Students' responses by questionnaire supported my own judgement. Students agreed that the exercise: increased their confidence in learning independently; increased their confidence in coming up with their own ideas; promoted their ability to think about a topic from different angle; increased their ability to integrate subjects; improved their ability to time manage.

DID THE CHANGE DELIVER A MORE FORMATIVE EXPERIENCE TO STUDENTS?

My professional judgement was that it did. It was not our policy at the time of this study to give formal feedback on exam performance to successful students, and it is hard to see what new generic skills students at masters level would have gained from formal examination.

Students were given comprehensive individual feedback on the exercise (in the form of positive comments, criticisms, and suggestions for improvement) written on their work, as well as gradings, marks and comments relating to each assessment criterion put on a marking proforma. In addition a model answer to the exercise was provided to each student. Subsequent informal discussions with students indicated that they had taken time to read comments on the marked exercises, and had integrated these comments with feedback given in the model answer.

Students' responses by questionnaire supported my own judgement. Students considered that the exercise had helped them with subsequent assignments, and they expected that it would help in future assignments. An example of a comment was *it taught me how to think about a problem deeply and widely, and from the feedback given I became aware of my shortcomings.*

CONCLUSION

Evaluation showed that replacing the formal exam question by the problem-based assignment:

- promoted achievement of high-level outcomes consistent with SCQF Level 11 benchmarks;
- promoted development of generic (employability) skills;
- delivered a more formative experience to students.

LESSON LEARNED

Reappraisal of alignment of benchmarks, learning outcomes, teaching strategy and assessment strategy can have a positive impact on student learning.