



Using portfolio assessment to engage Level 1 Geoscience students in their subject and to develop their learning skills

Abstract

Portfolios provide a means of collecting together materials in an organised way that can help the portfolio creator understand the materials better. This article describes a lecture-based geology module designed to help students create a portfolio of lecture notes, annotated reading and summaries with the aim of improving their early understanding of geology as well as improving their study skills and engagement with their home department.

Introduction

This development arose from three disparate strands. In 2003 the first author attended a “Teaching Petrology in the 21st Century”¹ workshop at the University of Montana, where LeeAnn Srogi (West Chester University) gave a presentation on “Portfolios in petrology: enhancing teaching and learning”. Portfolios have been widely used in PDP and in subjects such as Art and Architecture, but less so for the assessment for learning described in this article. It is accepted that there are assessment problems associated with more open-ended portfolios (e.g. Dempsey, 2009), but more constrained portfolio activities can be less problematic. Secondly, informative discussions with Sarah Maguire (University of Ulster) about retention and transition problems helped to crystallise some ideas about ways that students could be helped to develop better learning skills. Thirdly, a course review in May 2006 provided the impetus to develop a new 7.5 CAT module for 2006-07, which addressed a number of interrelated issues:

1. most students have not studied geoscience prior to entry;
2. student engagement with the geosciences as a discipline and the department;
3. transition and retention matters;
4. improving students’ ways of learning.

It is difficult to deal with wide-ranging, and fundamentally exciting, geoscience topics at introductory level when the background geoscience knowledge of many incoming students is limited. Students with limited prior knowledge of geoscience often think they are disadvantaged compared to some of their peers, which can impact on retention. Modularisation has militated against cross-disciplinary topics showing the true wonder of geoscience in favour of narrow, single topic modules. Thus, new geoscience students are confronted by self-contained, subject-based topics (e.g. introductory mineralogy) and fail to see the bigger picture, leading to frustration and possibly a lack of interest.

New students often have difficulties with the fundamental learning skills involved in combining note-taking, reading and general organisation of paper-based materials into a learning process that works for them. They have problems with scholarship and essay writing, especially in providing the evidence in an essay that they have undertaken the “outside reading” to satisfy one of the major criteria for an upper second class degree. They clearly need help with the transfer from school to university education (Maguire *et al.* 2008).

¹<http://serc.carleton.edu/NAGTWorkshops/petrology03/programguide.html>

The new module

A new module, EOSC111 Special Topics in Geology, managed by Prior and moderated by Boyle, sought to address these issues. Although only 7.5 credits (75 hours study time), it was taught 'long and thin' across the whole session.

Students are required to attend ten lectures from different speakers covering topics like "Mass Extinctions", "Snowball Earth", "Geohazards", "Origin of the Moon", and "Earthquake Prediction". Each lecture is designed to illustrate the scientific method, overtly demonstrating the relationship between evidence, interpretation and uncertainty. Each topic directs students to associated reading deliberately including a mixture of primary sources in journals, chapters in books and web resources. The lectures are split between the first and second semesters and occur at approximately two week intervals. In 2008-09 and 2009-10 M. Williams and P. Williams ran a GEES Subject Centre-funded 2D-3D visualisation project (Williams et al. submitted) as part of EOSC111. Some of the student perceptions reported here came from responses to 2D-3D sessions collated by M. Williams.

Students are also required to attend at least six extra-mural talks from the student society lecture series or the departmental seminar series. This requirement aimed to get students to engage early with the ethos of the department so that they could widen their geoscience knowledge base, become aware of other scientific approaches and begin to see links between topics.

Outwith lectures, students have to develop a portfolio of evidence containing their contemporaneous lecture notes for the special topics lectures, handouts, annotated copies of the reading list and a one page summary, which they write on the basis of their notes, handouts and reading. The reading is designed to cover some aspects of the topic not covered fully in the lecture. Students include the external lectures in their portfolio providing contemporary notes and a summary. The portfolio is geared to help students practise reflecting on a topic and synthesise a structured summary as a means of helping them to adapt to more independent learning in their new university environment.

Assessment

The module is assessed by a written examination [60%] and the portfolio [40%]. The examination supports students in writing a structured essay. Four essay questions are advertised about one month beforehand. Two of these appear on the examination paper. Candidates have to answer one of them in 60 minutes. They commonly have to be led through the logic that the minimum number of the four topics to revise would be three; many hope that two would be enough.

The lecture topics are split between first and second semesters, allowing assessment of the portfolio to be formative at the end of the first semester and summative at the end of the second semester. Students are not required to submit their portfolios for formative assessment, but the majority do. Formative feedback reviews the notes, reading and summary statement for each lecture attended and includes an indicative overall mark. Students are given further formative feedback with their summative portfolio grade after semester two, especially in relation to how they have taken on board semester one feedback. In general, students who did not submit their portfolio at the end of semester one get feedback that their portfolio would be better if they had. All portfolios are returned before the formal examinations period.

Outcomes

The module has been a success: student assessment performance in the module has been good and their feedback positive. The requirement to attend six extra-mural talks has improved attendances at invited speaker sessions and provided the spur for new students to engage more fully with the life of the department.

A significant minority of students did not submit their portfolios for formative assessment at the end of the first semester. This was probably a strategic decision, as no summative marks were involved. Ironically, it is also apparent from talking to the students that many were uncertain about how they were 'doing' at University. Submission of the portfolio for formative assessment would have given them some early feedback to find out how they were 'doing', but we suspect some students were worried about the feedback and so avoided it by not submitting their portfolio.

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Students were only given explicit instructions about what should be in the portfolio, not how to organise it. Very few portfolios were easy to use at the end of the first semester. Problems included: no contents page; notes and summary hard to identify; headings missing; systematic ordering of material by topic absent or limited; and many submissions came in plastic document wallets making assessment time-consuming. Most students used first semester feedback positively to improve their portfolios with title pages, tabbed separators, and logical ordering of material in a sufficiently large ring-binder. Students who, through non-submission, did not get formative feedback produced generally poor portfolios for summative assessment.

It is notable that students who did not hand in a portfolio for formative feedback at the end of the first semester did less well in portfolio assessment and examination than students who did (Figure 1, compare open circles and triangles). Simple numerical averages bear this out: 32 students who submitted no portfolio for formative assessment averaged 50% for their portfolio and 57% for their exam. Equivalent grades for 78 students receiving portfolio feedback (average indicative grade 56%) were 71% and 65%.

It is unclear if this is just self-selection amongst the students (the better ones do everything), or if the better performance is a result of better engagement with the process. We suspect they were helped by engaging with the formative feedback process so that they gained a better understanding of how they were 'doing' and what they could do to improve further.

Student feedback indicates that students appreciate the module. Free-text written comments have been informative. The question 'Did the recommended reading help you understand the topic better?' had these indicative responses:

"Yes, a more in-depth understanding was achieved."

"Yes, but there was too much of some of it, for example earthquake prediction."

"Yes, the recommended reading was very important."

"Yes, but it was heavy going at times. I struggled with annotating the reading."

"Some of it. Some was too in-depth and a bit daunting."

There is clearly recognition that reading is important and helpful, but the amount expected appears daunting to some students.

The question 'Did this module encourage you to attend other lectures?' had these indicative responses:

"Yes, I made an effort to attend Herdman lectures and seminars due to the requirements of this module and found them interesting. I am not sure I would have done so otherwise."

"Without this module I would probably never have bothered with Herdman Lectures. It was a good way of introducing them."

"No, some seminars I found boring because I didn't understand them."

Again there is evidence that the module has succeeded in engaging students (but obviously not all!) with the subject and departmental activities in a way that they may not have without the module requirement to attend extra-mural lectures.

In response to the question 'Was portfolio development useful?' the following are indicative responses:

"Good for revision as it made you sort your notes out and understand them after each lecture so it was just revision and not re-learning things."

"Yes, it helped me learn to organise my notes, summarise lectures and annotate reading materials."

"Yes. A lot. I would have struggled with the exam without the portfolio."

These comments, and others like them, are perhaps the most informative. They suggest that the module has succeeded in embedding good study skills and

that the students understand their worth. The portfolio is an assessment tool that produces a grade, but more importantly it is about enhancing students' learning skills. We emphasise that these skills are not just for this module, and should be transferred to all modules, but we have done no research into how effective this transfer is.

Summary

In summary, we think this module has been a successful experiment in addressing a number of concerns. In particular:

- Students learn how to incorporate reading into their lecture-based learning materials.

- Students get early formative feedback on a substantial piece of work so that they have a clear idea of how they are “doing” at university and what they can do to improve.
- Students improve their organisation of topic-based learning materials.
- Students engage more with departmental activities, and their improved sense of belonging is positive.

We believe a module like this could be used widely in earth sciences, and other disciplines, to engender improved study skills, better engagement with the subject and host department, and ultimately better students.

References

- Dempsey D. 2009 The Promise and Challenges of Portfolio Assessment, http://serc.carleton.edu/files/departments/program_assessment/promise_challenge_portfolios.ppt Accessed on 8th August 2010
- Maguire S., Carter C. and Curran R. 2008 Pre-entry qualifications – staff perceptions versus reality, *Planet*, 19, 31-35
- Williams M., Williams T.P. and Boyle A.P. submitted. Using internet-based problem-solving activities to enhance students' understanding of 3-dimensional spatial relationships. *Planet* 24, in print.

Exam vs Portfolio Performance

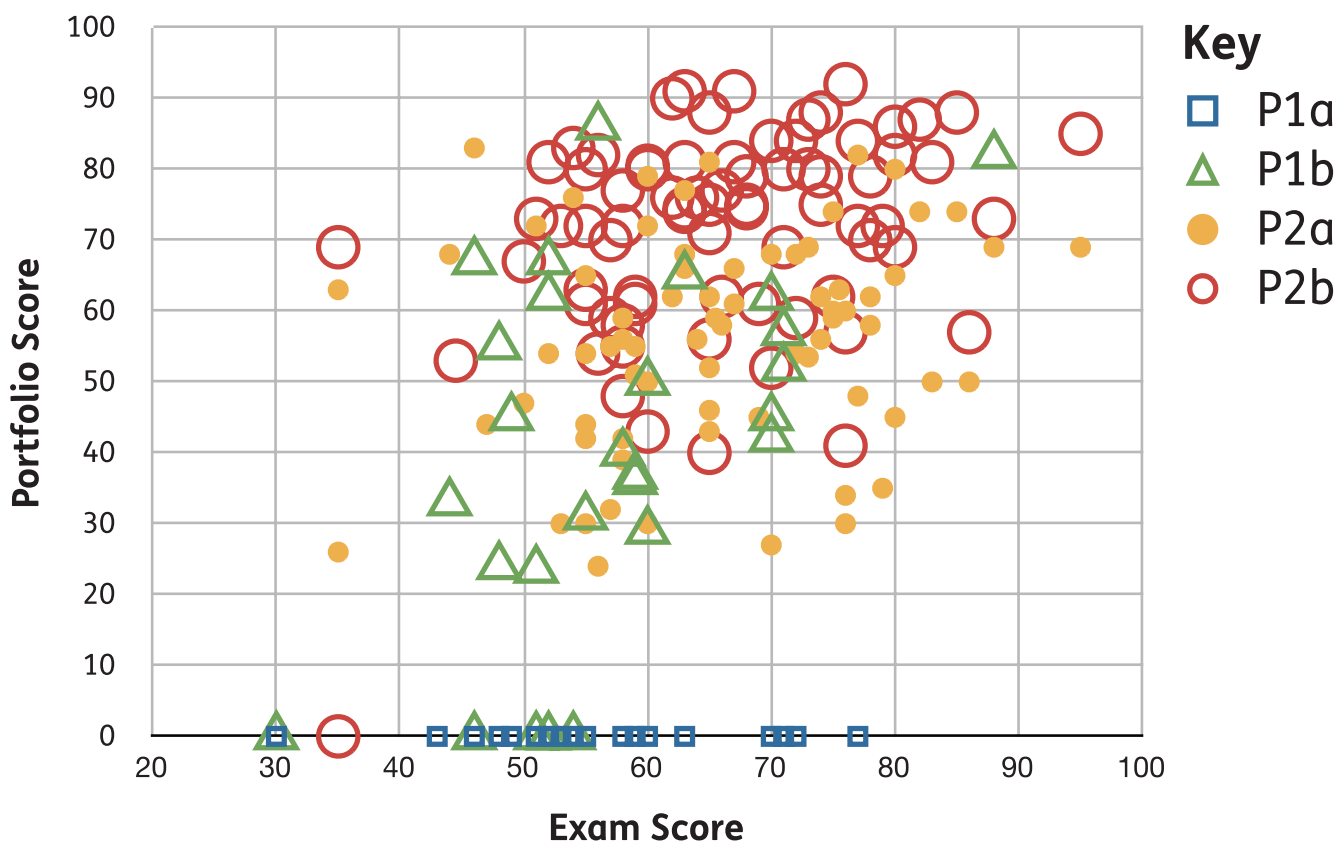


Figure 1: Comparing final written examination scores with first and second semester portfolio scores for 110 students over four sessions (2007-2010). P1 students (triangles) did not submit a portfolio for formative assessment (P1a) but generally did for semester 2 (P1b). P2 students submitted portfolios for formative assessment (P2a) and also, with one exception, for semester 2 (P2b). The black triangles on the baseline of the graph are students who did not submit a portfolio.