
Mapping University Mathematics Assessment Practices

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Chapter 3

Research Skills in Mathematics

Abstract This case study presents a new assessment strategy for a compulsory third year mathematics module assessed by a project. The novelty of the assessment consists of the introduction of the assessment of students' CV writing skills (written after input from the local careers office), oral presentations and peer reviewing of project drafts.

3.1 Background and rationale

This module replaced a history of mathematics module which was assessed by an individual project and a closed book exam. The department decided to replace it after students expressed dissatisfaction, feeling that its assessment was too demanding for the credits accrued. In addition, there was an institution-wide requirement to have an independent research module. The new *Research Skills in Mathematics* module has a project as final outcome, although the assessment includes presentations, CV writing and peer review of project drafts. It also introduces components aimed at improving students' employability skills.

3.2 Implementation

Research Skills in Mathematics is a year three project module spanning the whole academic year. There is only a small amount of large group, direct teaching: 6 lectures and computer labs, which includes some instruction on essay writing. Students are then assigned to supervisors according to their subject preference: pure mathematics, applied mathematics or statistics. The students meet with their supervisor three times a year for about one hour. Supervisors have a list of projects students can choose from. These include titles such as "Pierre de Fermat and his contribution to number theory", "Practical mathematical finance", "The oscillation of a liquid drop" and "History of the four colour theorem". During the first meeting the student and the supervisor decide the topic for the project. The students are also encouraged to contact the institution's careers office and discuss their first assignment: the preparation of a CV. The second assignment consists of a first draft of the project. This first draft is discussed in the second meeting with the supervisor where improvement and future development of the projects are discussed. After submitting a second draft of the project, each student reviews three of their peers' projects and the

supervisor also gives feedback. In the last day of the spring term students submit the final project and they present it to their supervisor and their peers. The supervisor marks both the final project and the oral presentation.

The project is intended to be carried out independently. Students are told that their supervisors will respond to no more than 2 emails from them (in addition to the face-to-face tutorials). It is expected to be between 9 and 11 pages long and is submitted through Turnitin software to check for plagiarism. The intention is that the project should be written in such a way that a non-expert should be able to read it.

There are some perceived disadvantages. There is considerable organisation needed to co-ordinate students and supervisors (both of whom can need some extra support) and the ability to do this is very dependent on a reasonable staff-student ratio. There is also the concern that under-engaged students may get even less engaged with this type of course and assessment as there is little overt pressure on them.

The key advantages of this assessment appear to be twofold. On the one hand students engage with some transferable skills useful in the workplace, such as CV writing and oral communication, and on the other they are allowed to engage with mathematical content in a more active way. Selecting a mathematical topic with the supervisor, drafting a project and peer reviewing other students' project requires more active participation in the process of learning mathematics than a standard lecture course would.

3.3 Assessment

Stage	No. of students	Assessment pattern
Year 3	180	80% final project 5% CV writing 5% peer reviewing of projects 10% presentation

3.4 Discussion, learning and impact

Students' feedback indicates that they are happier with this module than with the previous history of mathematics module. Students on the whole appreciate being tested on a new set of skills, such as the ability to critique peers' work and essay writing. One student commented:

I really enjoyed the Research Skills course. I think having a project group really helped as we had people to support us. For example we got together to do mock presentations. I think

the CV assignment was a very good idea (although I moaned at the time). Have now used the CV I made for research skills to apply for both jobs and courses.

Initially, some students were uncomfortable with giving feedback on their peers' work but with practice they started to appreciate this side of the assessment as well. Students appear to gain a different appreciation of mathematics; by having to read mathematics papers and books and digest them for the project, they appear to gain a different understanding of the nature of mathematics. Some of them can become very engaged and excited by this approach. Another student commented:

Overall though I understand that the module was important and I learnt a great deal from it.

The lecturers appreciate having one-to-one contact with their students and the fact that they get to know them better this way. Lecturers also value that students engage with mathematics in a more active and creative way, by presenting a piece of mathematics from a research paper or a book in their own words to a non-specialised audience. Marks for this module are slightly higher than they were for the history of mathematics module which it replaced. However, the assessment structure and content are completely different and the lecturer interviewed felt that any direct comparison is not possible.

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