

Irish Mathematical Society

Position Paper on Service Teaching of Mathematics

Introduction

This position paper arose out of a discussion at the annual general meeting of the Irish Mathematical Society (IMS) in 2005. A Committee for Service Teaching of Mathematics was set up and this committee presented a discussion document to the 2007 annual general meeting. The discussion document was made available on the IMS website and members were asked to comment. This position paper draws on the discussion document and the discourse that followed it. It aims to outline the IMS policy on service teaching.

What is Service Mathematics?

For the purposes of this document, we will define service mathematics to be mathematics taught to students who are not in mathematics degree programmes. The majority of such students are enrolled in Engineering, Science, Medical, Business or Finance programmes. These students need to use mathematics in their chosen discipline. It is important that they not only be able to apply standard techniques intelligently, but that they have the mathematical maturity to create and apply new techniques in the future.

Service Mathematics in Ireland.

All university departments of mathematics teach service mathematics courses. For most, service mathematics makes up a large proportion of their teaching. In the Institute of Technology (IoT) sector almost all mathematics courses could be described as service courses. As a result, many IoT's do not have identifiable departments of mathematics and the mathematicians may be working in different schools and faculties. Recently, the Mathematics and Statistics Service Teaching Community of Practice has been set up through the National Digital Learning Repository. The aim of the Community of Practice is to foster collaboration and the sharing of resources for service teaching. Research projects on service teaching are being carried out in some Irish institutions.

Why is Service Mathematics important?

It is important that graduates entering professions where mathematics is used have received a sufficiently strong education in mathematics so as to be able to perform their jobs effectively. With an increasing proportion of calculations begin carried out by computer, it might seem that the relevance of a mathematics education is actually decreasing. Whilst computers have a valuable role to play throughout mathematics and its applications, there are very real bounds to their usefulness. There is no substitute for an understanding of

the subject: to use a computer effectively one first has to understand the right techniques to employ, and secondly one has to understand the limitations of those techniques. As progress is made, the opportunity or necessity arises to develop new mathematical ideas and techniques. Only those people with an extensive and thorough grounding in mathematics will be in a position to drive such change. At third level, mathematics plays an increasingly important role in a diverse range of quantitative disciplines. This is evidenced by the emergence of courses on, for example, financial mathematics and mathematical biology, which are now taught at many institutions. In turn, it is likely that over the coming years, the prevalence of mathematics across industry and commerce will increase in similar fashion.

What issues can arise?

Students from other disciplines who are required to study mathematics sometimes struggle to see the relevance of their mathematics modules to their course and may become demotivated as a result. For this reason it is important that the lecturer uses examples pertinent to the students' discipline and that courses are tailored to students' needs and background. To this end, the content of courses should be discussed on a regular basis with client departments.

Service mathematics is often taught to large classes. This is not ideal for many reasons. These large classes often contain students with vastly different levels of mathematical preparedness. Thus it can be difficult to structure the course so as to keep everyone interested. In smaller groups, individuals can be given more attention and more active learning can take place.

In the current climate of budget devolution, the decision of who is to teach service mathematics courses is often resource driven, rather than being decided solely on academic grounds.

Who should teach Service Mathematics?

There has been some debate internationally on the question of whether service mathematics is best taught by mathematicians or by specialists in other disciplines. It is the considered view of the IMS that mathematicians should teach service mathematics. Mathematicians have the deepest understanding of the material and are familiar with recent advances and so can incorporate them in their courses. They also know the limitations of certain procedures and have the ability to view problems from a wide range of perspectives. Mathematics is widely acknowledged as a difficult subject to teach and mathematicians have the most experience of explaining mathematical concepts. They appreciate the importance of introducing topics in a sensible order so as to facilitate student understanding. Mathematicians are best placed to use their passion for mathematics to encourage students to appreciate the ideas behind the techniques they teach, and to discourage surface learning. At second level, the importance of ensuring that teachers are qualified to teach a subject is recognised by the Teaching Council, and it would seem prudent that this philosophy be

extended to third level. It is vital that the quality of instruction in service mathematics courses be consistently high and that mathematics departments show the value they put on these courses by assigning their best lecturers to them.

Conclusions:

- (i) Service mathematics is important to Irish society and the Irish economy.
- (ii) Service mathematics courses should be taught by mathematicians.
- (iii) Mathematicians should consult specialists in client disciplines regularly on the syllabii of service mathematics courses.
- (iv) Students in service mathematics courses should receive top quality mathematics instruction.
- (v) Students in service mathematics courses should be given the tools to appreciate and create new mathematics themselves.
- (vi) Service mathematics should ideally be taught in small groups.
- (vii) It is desirable that identifiable groupings of mathematicians in IoT's be formed.

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