

Winning team – collaborative teaching of university mathematics

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Teaching a subject such as university mathematics, which many students find difficult, involves many challenges. For instance, being able to discuss a topic and pose appropriate and penetrating questions is key to learning it. However, determining which questions are worth asking, and why, is a demanding task (Mason, 2000), and might be even more demanding for students, particularly early in their university studies. Furthermore, the bulk of mathematics teaching taking place at most universities is done within the context of study programs not aimed primarily at mathematics, but rather some other field of study, for instance, engineering or natural sciences. Many of these students will require examples of how mathematics connects to their chosen field of study in order to appreciate the relevance of studying mathematics. However, seeing these connections, as well as connections between different mathematical topics, is difficult for many students, and their teachers might lack awareness of how their own field of expertise connects to other fields.

Thinking about how to counter some of these challenges, we have recently begun considering the idea of collaborative, or team, teaching. Having two teachers, either from different fields or from different areas within one field, collaborating on teaching a course can provide different viewpoints on the topics considered and problems posed in the course, as well as connections to other disciplines. Having two teachers in the classroom opens up for discussion, showing by example the type of questions experts pose when engaging with a topic, and can help foster a classroom climate where students also engage in discussion. In this short presentation, we outline a planned project on team teaching in Calculus. First, however, we briefly sketch what is meant by team teaching, and give a few examples of its use in university mathematics education.

Collaborative teaching is nothing new – in different forms, it has been used for centuries. Nowadays various forms of team teaching are used in schools, where several teachers collaborate on course preparation, implementation, and assessment. There are several models for such teaching (Friend, Cook, Hurley-Chamberlain & Shamberger, 2010, p. 12), ranging from “one teacher, one assistant” models, via parallel and alternative teaching through to team teaching proper, with two teachers in the classroom together, taking shared responsibility for content. The research literature on team teaching of university mathematics

mostly consists of case studies in the context of teacher education. These studies either involve mathematicians and mathematics educators co-teaching mathematics content and methods courses (e.g. Ford & Strawhecker, 2011) or educators from mathematics and some neighbouring field, like science or ICT, co-teaching a cross-disciplinary course (e.g. Kalchman & Kozoll, 2012).

What we intend to do is somewhat different. A team of two instructors with backgrounds in different areas of mathematics (analysis and algebra/geometry) will co-teach a first-semester Calculus course, sharing responsibility for content, planning and assessment. For at least a large part of the course, the two teachers will lecture jointly, presenting and discussing content together. In this way, we hope to address some of the challenges discussed above. Having instructors with different mathematical backgrounds discussing the topics and posing questions can provide students with alternative ways of viewing content and approaching problems. Central concepts of Calculus like, for instance, functions or continuity, are viewed differently in different branches of mathematics, and highlighting these differences can help students get a firmer grasp of these concepts. Furthermore, having two experts asking appropriate questions, not only to the students but also to each other, can help students gain insight into the processes of doing mathematics, and what type of answers might be expected.

From a research perspective, taking a discursive view on learning (Sfard, 2008) we are particularly interested in to what extent the team teaching might contribute to a classroom climate more conducive to students' active participation in mathematical discourse, and how the mathematical discourse of the students develops through participation in such a course. Furthermore, we view team teaching of this kind as having great potential for teacher development, with participating teachers being able to learn from one another as well as jointly developing innovative teaching practices.

References

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