
Group Work Reluctance in Maths Education

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Mathematics students, like all others, come to conceive of first year courses by what is presented and how they are delivered (Entwistle 1998). If presentation takes the form of lectures exclusively focused on a finished product, students are unlikely to gain insight into the processes that underpin the mathematics (Dreyfus 1991) and their learning will tend simply to become reproductive and “cookbook” in nature.

Considerable research has been carried out in the last half century on the relationship between the quality of students’ learning and styles of teaching. Kember and Gow (1994), for example, identified two orientations in relation to lecturers’ teaching in higher education: “knowledge transmission” and “learning facilitation”. They linked these to the way in which students adopted “reproducing” and “meaning” orientations respectively in their approaches to studying. It is generally accepted that students who adopt a “meaning” orientation to studying are more likely to understand their course content and therefore stand a better chance of doing well in their assessments (e.g. Entwistle & Ramsden 1983).

In acknowledging that students’ learning styles differ, it can be assumed that some will always find lectures an engaging and useful style of teaching; many more, however, will not. It is by offering a range of teaching methods that a larger percentage of the student cohort will engage with the course content and be more likely to adopt a “meaning” orientation in their approach to studying. Using group-based and other styles of interactive learning is one of the traits of the “learning facilitation” orientation to teaching. In most subject disciplines, types of group work can involve communication, verbalisation and the development of shared understanding. Many, however, and this includes both students and lecturers, find it difficult to see how these processes can apply to the learning of mathematics.

Project aims and objectives

The primary aim of this project is to gain a better understanding of both lecturers’ and students’ attitudes towards the use of discussion, group-based learning and similar teaching methods in undergraduate mathematics courses. The objectives by which this aim is to be achieved are as follows:

- To investigate the reasons why many mathematics undergraduates appear to dislike these types of teaching methods.
 - To relate these attitudes to the students’ conceptions of teaching and learning.
 - To relate these attitudes to the students’ prior experience of these teaching methods both in mathematics and other subjects.
- To investigate the reasons why mathematics lecturers rarely use these types of teaching methods.
- From this understanding, to produce a set of guidelines to aid mathematics lecturers in their future use of group-based learning.

Research Methods and Timescale

The project started in February 2001. The initial few weeks were spent compiling a questionnaire and administering it to a total of 244 current first year students in the Departments of Mathematics at University College London, the University of Plymouth and The University of Birmingham. It



A maths project funded by
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investigated the students' attitudes towards, and prior experience of, different teaching methods, both in mathematics and other subjects, as well as their conceptions of learning.

This questionnaire also asked students whether they would be prepared to be interviewed to investigate further their attitudes, experiences, and understanding of group work. Interviews took place with those students who volunteered during March and April. Interviews also then took place with lecturers in each of the departments to investigate what teaching methods they use, or have previously used, and how they perceive their students have responded to these methods. Since then the project team have been analysing the questionnaire and interview data.

Preliminary findings

Overall the students' attitudes to group work and discussion in mathematics have been more positive than negative*. There is a statistically significant difference at the 5% level between the students' positive (mean=3.81) and negative (mean=2.44) attitudes to group work and discussion.

Student A: *"I suppose it's more efficient than having to search through something on your own. It's more enjoyable and it's less lonely, less stressful as well. And if it's someone I feel comfortable with then it's - I don't know, I can't....It's much more helpful - and it's a two-way thing as well. I can help the other person and they can help me".*

Students considered that informal discussion with others was more useful in terms of help with practical problems than with theoretical concepts. There is a statistically significant difference at the 5% level between the students' responses to the statements:

"I find it more useful to memorise the theorems and formulae on my own than to discuss concepts with others" (mean=2.81)

"When I have no idea how to start a maths problem I find it useful to discuss possible approaches with others" (mean=4.26).

Student B: *"We often talk about the homework and things...We don't tend to talk about the course so much if we've been in the lectures...that might change when it comes to exams - I can imagine we'll be asking each other to explain things because*

* Students' attitudes were investigated by their responses to statements using a Likert scale (strongly agree = 5, agree = 4, neutral = 3, disagree = 2, strongly disagree = 1). Half of the statements used were representative of a broadly positive attitude towards group work, the scores from which were averaged to provide a student's positive attitude score. The other statements were representative of a broadly negative attitude, which were also averaged to give a student's negative attitude score.

we don't understand them when we go back".

At 1st year undergraduate level group work tasks that are based on practical examples can help ease the initial transition from school to university mathematics. However, once the students have formed their own informal working groups, more formal group work tasks could be used to promote the discussion of theoretical concepts.

Dissemination

The final results of the data analysis, both quantitative and qualitative, will be disseminated through the LTSN. This will be in the form of a broad set of guidelines for group work activities with mathematics undergraduates. These guidelines will highlight many of the issues that need to be considered when introducing group work, from promoting informal discussion amongst students through to formally assessed group projects, while encouraging lecturers to take into account their specific local contexts. A research paper is also in preparation.

Acknowledgements

Acknowledgements are due to all students who completed the questionnaires and volunteered to be interviewed during the course of this project, as well as the members of staff whose wealth of experience has been invaluable. Finally our grateful thanks also goes to the LTSN Maths, Stats & OR Network for funding this research.

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