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Abstract

Probably the most important message that we must give to students doing first year mathematics is that, to have any chance of success in mathematics, a student must actually do mathematics. No amount of listening to lectures or reading textbooks can substitute for attempting problems. For this reason tutorials are an extremely important part of our subjects, particularly those in first year. This importance is borne out by student surveys which indicate that students learn more from tutorials than they do from lectures. Unfortunately tutorials are expensive to run and so we must make the most of our opportunities.

Blackboard Tutorials in First Year Mathematics

**Graham
Williams**

Probably the most important message that we must give to students doing first year mathematics is that, to have any chance of success in mathematics, a student must actually **do** mathematics. No amount of listening to lectures or reading textbooks can substitute for attempting problems. For this reason tutorials are an extremely important part of our subjects, particularly those in first year. This importance is borne out by student surveys which indicate that students learn more from tutorials than they do from lectures. Unfortunately tutorials are expensive to run and so we must make the most of our opportunities.

Individual tutors run their tutorials in a variety of ways but, in the past, the general pattern for tutorials in the Department of Mathematics has been the same. Some time was devoted to a discussion of assignments, both those being returned and those about to be done, followed by a general question time when the students could ask for clarification on any topic. Any spare time was spent on questions set by the tutor, with either a presentation by students of their results or perhaps individual work with individual assistance from the tutor.

During the Spring Session of 1992 we tried a different method of running tutorials in MATH 101. The method had been used at a number of universities including LaTrobe and New England. Both Sid Morris (the Dean) and Phil Broadbridge (Department Head) had run tutorials in this way before and suggested the method with some enthusiasm. The central idea is to use a room that has enough blackboards for every student to be able to use a board at the same time. Sid Morris found a suitable room in the ITC building - an internal room with only one door and no windows. He had it converted for our use by putting blackboards on all four walls. The room is now fondly referred to as "The Blackboard Room" by tutors and students.

When students arrive they are given a sheet of questions to attempt and they start work immediately by writing their solutions on their piece of board. Their working is on view for the tutor to see and also, more importantly, for the other students to see. Anyone who is stuck on a problem can then look around to see what the others have done and with these clues can then proceed with their own solution. This has several advantages:

- the tutor doesn't have to answer every question,
 - students are more receptive to ideas they get from their fellow students rather than tutors
- ideas that they have "borrowed" in this way from others seem to be of more value,

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- usually, perhaps after some initial nervousness, the students are quite happy to have the work on view and the weaker (or shyer) ones are able to contribute without the pressure of an individual presentation in front of the class,
 - an additional benefit is that Mathematics becomes much less of a solitary activity and more of a cooperative effort and there are often quite vigorous discussions about various approaches and solutions.

During the tutorial the tutor moves around the room helping those that are stuck or adding additional points that may have been missed. Very rarely does the tutor address the group as a whole so the students spend the whole of their time at the tutorial “doing” rather than listening to a mini-lecture from the tutor.

At the end of the tutorial solutions are handed out for all the problems. This is essential as, of course, there is no way they can take their own working away with them! It is necessary to ensure there are enough problems for the best students which means weaker students may only get through some of them in the tutorial. However, since all students get the solutions they can finish at home or at least refer to the solutions if they have to attempt a similar problem.

There are some small disadvantages but in our experience they are far outweighed by the positive aspects.

- Questions and solutions must be prepared beforehand which means there is some loss of flexibility. However it is not expected or required that all students should finish all questions ; they get the solutions whether they attempt the questions or not. Although the same questions are prepared for all students the tutors have the option (rarely taken) of adding their own questions to suit particular groups.

- Students are unable to take a copy of their work away with them. During preliminary discussions this appeared likely to be a major problem but in practice is almost no problem at all. Students are much happier to take away correct solutions than have their own efforts.

- Blackboard tutorials are much harder work for the tutor, physically and mentally, than the more traditional style and the numbers in each tutorial must be decreased. We have found it rather difficult to manage more

than 16 in a class.

At the end of the session we surveyed the students who had used the Blackboard Room. Of the 120 replies over 90 said they found the new method more useful and they had covered more work. More importantly, though, over 85 said they had enjoyed the tutorials more. The general view was that there was much greater involvement in the tutorial but at the same time the atmosphere was relaxed and there was little pressure on the individual.

Before running the first tutorial, most of our staff were somewhat sceptical about the idea. However, without exception, all of the tutors in MATH 101 are most enthusiastic and when given the choice between taking a blackboard tutorial or a tutorial in an ordinary room the choice is always for the blackboard style.

Following the success of our first trial session we have had another room converted. Room 15.204 in the Austin Keane building also has blackboards on all four walls and with these two rooms we are now able to run about two thirds of all our tutorials in this manner.

Although this report has discussed its use in MATH 101 the room was also used extensively in STAT 131 and to a lesser extent in MATH 121 and MATH 151. I believe the methods have a lot to offer in all courses and certainly should not be restricted to first year. Nor indeed should they be restricted to Mathematics.

Anyone interested in observing one of these tutorials in progress should contact me so we can arrange a time. However, since the aim is to get everyone involved, you should expect to attempt the questions yourself!

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