

M3T: Communicating Mathematics

1. General information

M3T is an optional course normally for third year BSc or MSci students, although it is also available to fourth year students returning from a year in Europe and to other fourth year students if there are sufficient places. It offers the opportunity of gaining firsthand experience of the education of young mathematicians in a school environment and of gaining a number of transferable skills that are in demand by employers in many occupations.

The course is being offered in co-operation with the Undergraduate Ambassadors Scheme (UAS), an initiative aimed at putting science undergraduates into schools to act as ambassadors for their subject.

M3T will run during the spring term of the students' third or fourth year, but selection and training will normally take place during the previous summer term. During the autumn term students will be put in contact with the mentor teacher in the school to which they have been assigned and will make arrangements for their visits which take place in the spring term. Each student will spend half a day a week in the school for the duration of the spring term. The students will also meet with the Course Coordinators as a group three times in the spring term to review progress.

2. Aims of the Course and Learning Outcomes

The aims are for the student:

- to develop a range of communication and teaching skills appropriate to a particular Key Stage;
- to act as a role model to pupils;
- to gain confidence in communicating mathematics;
- to learn how to develop projects and teaching methods suitable for pupils at school.

On completing the course, students should have achieved the following learning outcomes:

- understand the needs of the individual pupils;
- answer questions on mathematics with the appropriate vocabulary at the selected level up to A-level;
- assess and devise appropriate ways to communicate principles and concepts;
- prepare lesson plans and teaching materials;
- report on what they have learnt.

3. Selection procedure and training

Students will be asked to register their interest in this course by the end of week 5 in the summer term in their second year. The number of places for this course is strictly limited, and so students will be selected for the available places. Students will need to fill in an application form and attend a short interview (about 10 minutes) which will include giving a short presentation on an elementary topic in mathematics, followed by questions. The selection procedure will assess each student's suitability for the course based upon a profile that includes enthusiasm, academic ability, ability to communicate, willingness to operate in a school environment and their potential as an ambassador of mathematics. The selection process will take place after the examinations in the summer term.

Later in the summer term, students will be required to attend a one day training event, during which they will learn about the national educational system, its requirements, nomenclature and potential problem areas as well as information about personal conduct and responsibilities. It will include a session on Child Protection. Each student will be required to pass a Disclosure and Barring Service (DBS) check in order to be able to work in the school; arrangements for the completion of forms required for this check will be available at the training day.

Clearly, a one-day course cannot offer detailed instruction in teaching theory or methods. It should be noted that this course is not designed to act in any way as a teacher-training course.

Students are required to make a firm decision regarding their involvement in M3T towards the end of the summer term.

4. School Visits

The day and time of the weekly placement will be decided on an individual basis to match the timetable of each student and teacher. These are often on a Wednesday afternoon, but there is some flexibility. The number of weeks for which the student will visit the school should not be less than eight, but is usually ten. All these working visits should occur during the school's spring term, the precise number depending upon the school calendar and other circumstances. It may well be in the student's interests to make one or more visits outside the period of the college's term.

The student's role in the classroom should progress from initial observation to constructive support of the teacher, although the level of student/pupil interaction must be agreed between student and teacher, and should at all times be under the teacher's direction.

The initial periods of observation should be used to study the teacher's interaction with pupils, and the approaches taken to the introduction and development of mathematics topics and concepts. If possible, specific situations should be discussed with the teacher. Students should expect to become more involved, possibly working with small groups of pupils on specific topics or activities, or in setting up computer demonstrations. As students gain experience and confidence, they may be asked to take a more responsible role such as taking all or part of a lesson, or in helping in some other way such as with a Mathematics Club project, or with a talk about undergraduate experiences, etc.

Each student will be required to keep a journal of his or her experiences in the school. It is not expected that the teacher will need to read this journal, but it will be used by the student as a basis for the report that will be written as part of the course assessment. College staff will need evidence that this journal is being kept and it is expected to be the basis for tutorial discussion.

Each student will be expected to plan a number of lessons with which they will be involved. These will need to be discussed with the teacher, who will also provide feedback on the finished plans. The plans should also be available for discussion with College staff.

Each student will be required to implement a special teaching project. The choice of the project should be made following discussion with the teacher and with the course coordinators. It should be targeted at a specific mathematics concept or activity for which there is a perceived need in the school. The project may be a novel method of presentation appropriate to the topic or a pupil activity, and will almost certainly involve the preparation of special materials. If at all possible it should be used in the school with a class or a small group of pupils before the end of the course. The nature of the project and materials must be discussed fully with the teacher, particularly if it is to be used in the school. If equipment is being used, then safety issues must be addressed and the teacher's advice should be carefully followed.

Assessment

The assessment of M3T takes into consideration the course outcomes:

- Communication skills, both one to one and with an audience.
- Understanding the needs of individuals.
- Interpersonal skills when dealing with colleagues.
- Staff responsibilities and conduct.
- The ability to improvise.
- Giving (and taking) feedback.
- Organizational, prioritization and negotiating skills.
- Handling difficult and potentially disruptive situations.
- Public speaking.
- Team-working.
- Standard teaching methods.
- Preparation of lesson plans and teaching materials.

M3T is assessed on the basis of four components:

- journal of teaching activity (approximately 2500 words)
- end of module report (approximately 5000 words)
- end of module presentation on ‘special project’ (15 minutes)
- teacher’s end-of-module report

M4T Mastery Project

If you are in your fourth year and taking M4T, in addition to the M3T requirements there will be an additional mastery project, which will consist of producing an essay on a set topic connected with the secondary mathematics curriculum.

Mark distribution

| Assessment method | % contribution to final mark |
|--|------------------------------|
| 1. Journal of teaching activity (approximately 2500 words) | 25% |
| 2. End of module report (approximately 5000 words) | 40% |
| 3. End of module presentation (15 minutes) | 25% |
| 4. Teacher’s end-of-module report | 10% |

1. The elements to be included in the teaching journal:

An introduction which will include the following which can then be further expanded in lesson descriptions:

- a general description of the school, the teachers and the pupils encountered during your placement,
- a description of your position and how you contributed,
- descriptions of any other activities you undertook,
- a critical analysis of your experiences in the classroom (e.g. situations to avoid, teaching strategies that work, pivotal tasks that help ensure success)

The next part of the journal should consist of a chronological account giving details of the lessons at which you assisted, which should include critical descriptions of lessons (or part lessons), with details of how they were planned, the mathematics you dealt with, how they were received, and what the feedback indicated about how the mathematics was understood.

The journal will be marked (out of 25) according to the following criteria:

| | |
|---|---|
| Presentation | 4 |
| Structure and organisation | 5 |
| Description of the school | 4 |
| Student's role and description of teaching activities | 6 |
| Critical analysis and conclusion | 6 |

2. The elements to be included in the end of module report:

The written report should be based on your special project and, where appropriate, should cross-reference to elements of your teaching journal. The report should include (but not be limited) to the following,

- a description of the special project,
- details of how and why the topic of the project was selected,
- a brief taster of the project teaching method and of materials produced,
- the rationale of the choice of teaching method and any materials produced,
- a report on how it was received (if it was possible to use it with pupils),
- a critical discussion of its worth, the conclusions to be drawn and how it could be improved.

The written report should be around 5000 words or the equivalent in figures; it should not be a chronological account of your time in the school as this is covered by the journal.

The report will be marked (out of 40) according to the following criteria:

| | |
|---|----|
| Presentation and organisation | 5 |
| Selection of topic | 5 |
| Evidence of understanding of pupils' requirements | 5 |
| Execution of the project | 10 |
| Feedback from pupils/teachers | 5 |
| Quality of critical analysis. | 10 |

3. Submission Details

You will need to hand in two copies each of your Teaching Journal and Project Report, bound separately, to the UG Maths Office (649) by the deadline, which will be set as the same date as the M3R/M4R deadline. Don't forget to include a statement that it is your own work.

4. Oral presentation

The oral presentations take place in mid June during the 2 week period that our undergraduate orals for all projects take place. The duration of the presentation should be 15 minutes (not including questions). You will have 15 minutes to make your presentation to a small audience including the course coordinators, a moderator (an academic member of staff not associated with the organisation of M3T) and other M3T students. This will be followed by a few minutes of questions.

Marks will be awarded for delivery (e.g. audibility, legibility, use of PowerPoint etc, 40%), content (e.g. clarity of explanations, pace of explanation and appropriateness of mathematical level, 40%) and bonus (e.g. enthusiasm, initiative, use of time, general impression 20%).

Marking criteria

First class: extremely clear and accurate description of the school, the role in the classroom and the teaching methods used; shows deep understanding of the needs of the pupils, and demonstrates an ability to answer pupils' questions clearly and readily; can explain the connection between demonstrations and examples and the concepts of mathematics; shows that the lesson plans and teaching materials will hold the interest and the enthusiasm of the pupils and increase their understanding; thorough analysis of any particular successes and any failures to communicate; original and thought-provoking description of the special project, showing clearly the relation between the project and the mathematical concepts to be illustrated; demonstrates how the success of the project as a whole depends on the various parts; shows a high level of self-analysis; shows a good ability to evaluate relevant literature. The written report has a coherent structure, with no or very minor errors of spelling, punctuation and grammar. The oral presentation demonstrates excellent use of presentation aids and materials; is audible and retains the interest of the audience; keeps to time (allowing for a few questions).

Upper second class: clear and accurate description of the school, the role in the classroom and the teaching methods used; shows clear understanding of the needs of the pupils, and demonstrates an ability to answer pupils' questions clearly and with appropriate vocabulary; demonstrates knowledge of the connection between demonstrations or examples and the concepts of mathematics; shows that the lesson plans and teaching materials will keep the interest of the pupils and help them learn; explicit analysis of any particular successes and any failures to communicate; clear and interesting description of the special project, showing the relation between the project and the mathematical concepts to be illustrated; describes how the success of the project as a whole depends on the various parts; shows a good level of self-analysis and an ability to evaluate relevant literature. The written report has a coherent structure, with few errors of spelling, punctuation and grammar. The oral presentation demonstrates good use of presentation aids and materials; always audible; keeps to time (allowing for a few questions).

Lower second class: a description of the school, the role in the classroom and the teaching methods used; shows understanding of the needs of the pupils, and demonstrates an ability to answer pupils' questions with appropriate vocabulary; demonstrates some knowledge of the connection between demonstrations or examples and the concepts of mathematics; shows that some of the pupils learn from the use of the lesson plans and teaching materials; some discussion of any successes and any failures to communicate; a clear description of the special project, showing some connection between the project and the mathematical concepts to be illustrated; a description of some of the aspects of the project; shows some attempt at self-analysis and an awareness of relevant literature. The written report has a recognizable structure, with some errors of spelling, punctuation and grammar. The oral presentation demonstrates satisfactory use of presentation aids and materials; generally audible; keeps roughly to time (allowing for a few questions).

Third class: a partial description of the school, the role in the classroom and the teaching methods used; shows limited understanding of the needs of the pupils, and sometimes is able to answer pupils' questions with appropriate vocabulary; demonstrates little knowledge of the connection between demonstrations or examples and the concepts of mathematics; the lesson plans and teaching materials prepared are little help to the pupil's learning; little discussion of any successes and failures to communicate; an incomplete description of the special project, showing very little connection between the project and the mathematical concepts to be illustrated; a confused or very partial description of the aspects of the project shows hardly any attempt at self-analysis or awareness of relevant literature. The written report is disorganized, with frequent errors of spelling, punctuation and grammar. There is generally an unsatisfactory use of presentation aids and materials within the oral presentation, which is barely audible; does not keep to time.

Fail: muddled or incomplete description of the school, the role in the classroom and the teaching methods used; shows little or no understanding of the needs of the pupils, and finds it difficult to answer pupils' questions appropriately; is unable to explain the relation between demonstrations or examples and the concepts of mathematics; the lesson plans and teaching materials are inappropriate to the pupils and their stage of development; does not attempt to analyze the failures; no analysis of the degree of the student's success; failure to address the central ideas of the special project and poor description of the mathematical concepts involved; no description of the integration of the parts of the project. The written report is disorganized or fragmentary, with many errors of spelling, punctuation and grammar. There is poor use of presentation aids and materials in the oral presentation; poor audibility; misjudging the time needed to give the presentation.