

# TransMaths

## Research Briefing

March 2011

### Transmaths Research Implications for the National Curriculum Review

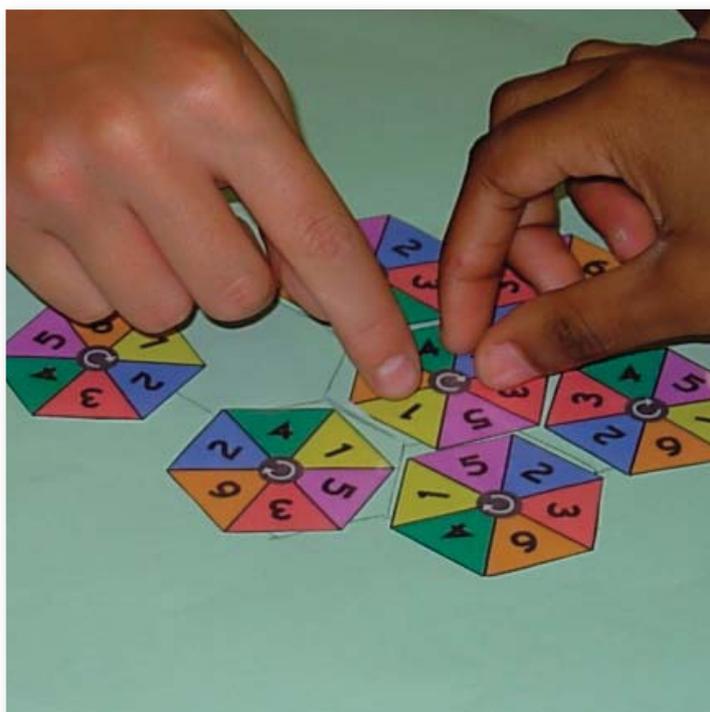
The research of the Transmaths projects has been supported by ESRC (major and minor), ESRC –TLRP (major), and ESRC follow-on grants over the past 5 years to investigate students' mathematics education in transition between compulsory, 16-19 post compulsory and early university phase when students' choices, dispositions and motivations become particularly important.

The major findings and implications for the curriculum review are as follows:

1. In general, the National Curriculum and the resulting GCSE courses do not sufficiently encourage students to choose mathematics in post-compulsory education.
2. In addition GCSE does not provide an adequate preparation for students to progress into further study of mathematics in post-compulsory education. In particular at key stage 4 courses do not ensure adequate facility with algebra and do not sufficiently encourage problem-solving/modelling skills and the application of mathematics more widely.
3. Furthermore, learners are not encouraged to learn mathematics for its own sake, to learn to study/work autonomously, or to enjoy challenging mathematics, but are rather becoming experts in passing narrowly defined assessments and tests/examinations.
4. The consequence is that the curriculum de facto is becoming driven by the tests and exams that emphasise procedures and routines, rather than concepts and understanding: the curriculum IS the 'test'. (This is becoming clear in the text books that are vastly inferior to those of some other countries.)
5. This curriculum emphasis then encourages a narrowing of pedagogy, which again shapes a narrow 'implemented curriculum' in practice. Working socially in groups and teams, discussing problems and arguments, and working on projects over extended periods of time occur relatively rarely in upper secondary classrooms as students prepare for GCSE.
6. The management of schools in turn revolves too much around the proportions of learners 'successfully' acquiring a GCSE grade C, and that as early (and even as often) as possible: which is itself a totally inadequate grade for starting A-level studies in mathematics.
7. This can result in degrading the quality of mathematics teaching that really might encourage students to choose mathematics and prepare students for further post-compulsory study. Even thoroughly unethical practices are now reported to be common, such as repeatedly entering students early for GCSE and other qualifications whether this entry is in their interests or not.
8. We found that programme design can have a positive impact on learning and learners' dispositions towards further study of mathematics. Even if curriculum specification is narrowly conceived as defining only knowledge to be learned it is still the case that how this is organised can be crucial in defining implementation and ultimately learner experience and therefore developing dispositions let alone understanding. Lists of content to be covered and assessment of this coverage focus teachers and learners on rules and procedures. We found deeper engagement and understanding in alternative programmes that emphasised connections, modelling and applications.

## Implications and recommendations

The implications of these findings must be a root and branch re-vitalisation of mathematics and mathematics teaching that places problem solving and applications at its heart, and that seeks to challenge all students to argue, to understand, and to reflect as well as to carry out procedures and algorithms. Such reforms are being discussed or implemented in many of the worlds best education systems, East and West, North and South: this involves reviewing School management, assessment, and pedagogical approaches as well as the intended curriculum. It seems most important that the specification of the curriculum is considered as an important design challenge that tackles not only what is in the curriculum but also how this can be best organised to ensure more positive learning outcomes in important aspects such as dispositions towards further study as well as attainment.



## The warrant

One of the strengths of the Transmaths projects that investigated transitions of students from school, through college and into Higher Education, is that it drew on a variety of methods. It used large-scale questionnaire surveys of students at six data points, developed case studies of two (feeder) schools, five colleges, and thirteen university courses (mostly in STEM), and tracked a number of students in more depth through a series of longitudinal interviews. This provided a rich base of data for analysis.

In addition, we developed a conceptual framework over the five years duration of the projects.

Specially constructed instruments were developed and validated to measure important new affective learning outcomes such as their dispositions towards further study that included mathematics.

The case studies were developed from mainly qualitative investigations and involved observations of teaching in different settings with interviews of students and teachers. Triangulation was supported by the collection of other course documents and data, and interviews with other stakeholders such as Heads of Departments. The series of longitudinal biographical style interviews about students' transitional experiences provided further deep description and insight into the transitional process.

Our methodological approach is imbued with the notion of generating practical knowledge in partnership with students and their teachers as informed and knowledgeable participants. This partnership approach also provides an ethical (and triangulating) basis for all the empirical, analytical and reporting work. A series of meetings with teachers assisted in this respect. Finally, our warrant is also enriched by the projects' advisory groups, which consisted of academics and practitioners with relevant experience, and which met regularly with the project team.

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### Further information:

[www.education.manchester.ac.uk/research/centres/lta/LTAResearch/transmaths/](http://www.education.manchester.ac.uk/research/centres/lta/LTAResearch/transmaths/)