Welcome to the latest issue of TISME News, where we share progress and findings from the five research projects which form the Targeted Initiative on Science and Mathematics Education (TISME), funded by the ESRC in partnership with Gatsby, the Institute of Physics and the Association for Science Education.

In this issue we provide a snapshot of our progress over the last year, we report back on our first seminars and highlight some exciting events due to take place later this year.

We would like to take this opportunity to thank all those who have contributed to our work over the last year. Particular thanks are due to all our Advisory Committee members for their invaluable support. We would also like to highlight the commitment of teacher researchers whose involvement has been essential in the work of the five projects.

‘What influences participation in science and mathematics?’ A Briefing Paper from the Targeted Initiative on Science and Mathematics Education (TISME)


The paper provides an overview of the state of knowledge about the key factors that shape the patterns of participation, engagement and achievement in STEM. Presenting new insights from the TISME research into the key factors affecting participation, the report demonstrates that a lack of interest is not 'the problem' underlying low post-16 participation rates. Rather, despite liking science, many young people do not plan to study science post 16 because of a number of factors, including:

- They have very narrow ideas about the 'usefulness' of science qualifications and;
- They do not feel 'clever' enough to pursue post-16 science and science careers.

The paper also explores the significance of family influence in STEM aspirations.
The evidence from TISME research reinforces findings from other studies about the factors influencing participation. For instance, the research confirms that many of the factors that affect student choices are deeply embedded in social and educational structures and processes. They cannot be easily shifted and there are no ready policy prescriptions that will change the picture. However, this is not to say that matters cannot be improved and the paper concludes with a summary of findings and outlines of views on the possible implications for policy and practice. By understanding the causes and processes that determine pupils’ choices, and reflecting on their implications, we will be better placed to develop the policies and practices that will lead to improvement.

A full copy of the report can be found [here](#).


This conference brought together policy-makers, practitioners and researchers working in a range of fields to discuss key issues and set out priorities and an agenda for increasing STEM participation in such a way that society’s needs are met and individual potentials are taken fully into account. The conference showcased debate and engagement with recent research findings from some of the most authoritative studies currently being conducted within the field, notably from TISME.

The conference critically addressed questions, including:

- What can research tell us about why people choose to study mathematics and science?
- Why is the UK failing to deliver equitable participation?
- Have we been funding the right sorts of interventions to date?

The programme included a keynote speech from Professor Jim Al-Khalili, and panel discussions, including:

- ‘Looking Back, Looking forward: what have we achieved in STEM education? What are the issues? Where do we need to go?’
  Panel including Elizabeth Truss MP, Prof. Margaret Brown, Prof. Robin Millar and Annette Williams. And;

- ‘Have we got it right? What STEM education interventions should we be funding?’
  Panel including Mark Stockdale (DfE), Prof. Peter Main (Institute of Physics), Diana Garnham (Science Council) and Prof. Ann Watson (ACME).
Scottish and English Research on science and mathematics education: Learning from each other

**Tuesday 25 June 2013**

Room 433, the University of Glasgow, St Andrew's Building, 11 Eldon Street, Glasgow

This seminar is a collaborative TISME venture, kindly hosted and co-convened by Prof Louise Hayward, Pedagogy Policy and Practice, School of Education, University of Glasgow.

It aims to:

- Examine how the TISME research (conducted largely in England) might inform policy and practice on participation and attainment in Scotland
- Examine how developments in Scotland can inform research policy and practice in England
- Discuss what related research might be conducted in Scotland
- Plan production of a joint synthesis document outlining key issues and ways forward

Further details will be available on our website soon.

### Project Update: ICCAMS Project

The ICCAMS project, based at King’s College London and funded by the Economic and Social Research Council (ESRC) from 2008 until 2012, investigated ways of raising students’ attainment and engagement by using formative assessment to inform teaching and learning of mathematics in secondary school. The study was in two parts.

Initially, the ICCAMS research team conducted a large nationally representative survey of around 7000 students examining the understandings and attitudes of current students across Key Stage 3. This survey uses tests first developed by the Concepts in Secondary Mathematics and Science (CSMS) study enabling a comparison with the understandings of students in the 1970s as well as a detailed analysis of current students’ mathematical understandings.

Subsequently, working collaboratively with a group of teachers, the team developed a series of research-informed lessons and professional development activities that enable teachers to integrate formative assessment within the secondary mathematics curriculum. The ICCAMS approach was then evaluated in an intervention study with a wider group of teachers and schools.
The main ways in which our findings have had impact outside of academia is through our meetings with and presentations to policy makers and others. From the outset, we heavily involved policy makers on our Advisory Committee. As a result we soon received invitations to meet with and make presentations to senior members of these and other organisations. Our BERA 2010 papers received extensive coverage in the press (including national broadsheets). We played a central role in the Royal Society’s 2011 residential conference for policy makers ‘Research, policy and practice in science and mathematics education’. Four of the schools with which we worked used feedback from the research for school improvement purposes. We have had a number of meetings and made presentations to the Institute of Physics and Michael Reiss is now a member of its Girls in Physics Advisory Group, while Tamjid Mujtaba is advising them on matters to do with ethnicity. Michael Reiss has also been advising the Science Council on its Careers from Science *futuremorph* campaign. UPMAP has also had social and economic impact on the Advisory Committee on Mathematics Education, the Association for Science Education, BIS, the DfE, the Gatsby Charitable Foundation and the Nuffield Foundation.

Project update: *epiSTEMe*

The scientific impact of the project’s research-in-progress is through conference presentations and journal papers.

Conference papers during the year under review include one presented in the TISME symposium at the Annual Conference of the American Educational Research Association in April 2012 and another presented at the TISME Annual Conference in June 2012.

Journal papers to date from the project are as follows:

Using international study series and meta-analytic research syntheses to scope pedagogical development aimed at improving student attitude and achievement in school mathematics and science. *International Journal of Science and Mathematics Education* 9(2), 419-458.

Chance by design: devising an introductory probability module for implementation at scale in English early-secondary education. *ZDM – The International Journal on Mathematics Education*, Special Issue on Classroom-based interventions in mathematics education, 45(2) online.

The major way in which the project’s research is currently being used outside academia is through the teachers from the mathematics and science departments of 30 secondary schools who have undertaken professional development on the teaching approach developed by the *epiSTEMe* project now making use of it and the supporting teaching materials. Further schools are now requesting the *epiSTEMe* materials in order to taking up the teaching approach in response to information on the project website.

A small-scale trial of the *epiSTEMe* Forces intervention continues in schools in Chile.

Discussions have been initiated with intermediary organisations which may be able to help disseminate the *epiSTEMe* approach and findings.

The project’s research has been presented at a range of user events organised by the TISME programme.
ESRC Targeted Initiative on Science and Mathematics Education

Project update: EISER

Since the formal end of the EISER project the following progress within this ongoing research programme has been achieved:

- Submission to research journal of a further research publication arising from EISER analysis:
- Homer and Ryder have been conducting a follow-on study funded by the Nuffield Foundation: ‘Participation and attainment within post-compulsory: A-level science courses: a comparison between students completing GCSE 21CS and students completing other science specifications’. Interim report October 2012. To be followed by a working seminar at Nuffield Foundation, July 2013.
- Ongoing impact-related activities (see below, and also Impact Report completed November 2012)

EISER team members have attended TISME project meetings, seminars and dissemination events. EISER has contributed to TISME policy briefing papers and two joint TISME submissions as part of the current DfE National Curriculum Review. Within the TISME network EISER provides a distinctive focus on how statutory policy impacts on school practices. For example, EISER researchers, and a practising teacher involved as a participant in our study, led a session on the policy-practice interface from a teacher perspective at a TISME teacher dissemination event at the Royal Society in February 2012.

Project update: ASPIRES

The ASPIRES project is a five year, longitudinal study of children's science and career aspirations from age 10-14. It is now in its fifth and final year and is due to finish at the end of December 2013.

Results from our second survey (conducted when the cohort we are following reached Year 8), found that children age 12/13 still like their science teachers, find their school science lessons interesting, say their parents think it is important for them to learn science and hold generally positive views of scientists. However, they are still unlikely to aspire to become a scientist. They also appear to engage in fewer out-of-school science activities in their spare time compared to when they were in Year 6.

Similarly high proportions (over 70%) of pupils in Y6 and Y8 agree that they learn interesting things in science. Around 80% of Y8 pupils also agree that they have enthusiastic science teachers and that their teachers care if pupils understand the lessons and expect them to do well. In line with findings from Y6 pupils, Y8 children also express largely positive views of science and science careers. For instance, Y8 children also seem to have positive views of careers in science, with 79% believing that scientists do valuable work and the majority agreeing that scientists are respected by society (62%) and make a lot of money (63%).

However, despite liking science, less than 17% of Y6 pupils and 15% of Year 8 pupils agreed that they would like to become a scientist in the future - although other STEM careers are more popular, such as engineering (25%), inventor (26%) and doctor/medicine (35%).

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Overall, our data indicated that the most consistently popular aspirations expressed by pupils in the surveys and interviews were for careers in the arts, sports, medicine and teaching. Among Year 8 pupils, business also emerged as a very popular choice.

The latest ASPIRES Research Summary, based on phase 2 of the project, was published in March 2013 and can be found at http://www.kcl.ac.uk/sspp/departments/education/research/aspire/ASPIRESPublications.aspx

Updates

- The latest annual report has now been completed and submitted to the ESRC.
- Planning is now commencing for the final TISME dissemination event next summer
- We have two more publications due to be launched in the coming year.

TISME Projects in the media

An article based on the latest findings from the ASPIRES research project and entitled 'A science job? You’ve got to be Einstein, say children' has been published in The Times.

Feedback from a seminar organised by the Targeted Initiative on Science and Mathematics Education (TISME) has been turned into a document that forms part of the ESRC impact toolkit on what needs to be considered when engaging with teachers and schools. A copy of the document can be found here.

Louise was interviewed live on 9 January 2013 at 12.50 on BBC Radio Ulster by Wendy Austin about children and their aspirations to work in science.

TISME Publications

What influences participation in science and mathematics?

The paper provides an overview of the state of knowledge about the key factors that shape the patterns of participation, engagement and achievement in STEM. Presenting new insights from the TISME research into the key factors affecting participation, the report demonstrates that a lack of interest is not ‘the problem’ underlying low post-16 participation rates.

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<th>TISME Linking Research and Teaching (June 2012)</th>
<th>The National Curriculum Review: A synthesis of research evidence from TISME (June 2012)</th>
<th>Mapping and Classification of STEM Interventions (June 2012)</th>
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<td>Summarises teachers’ and researchers’ perspectives about the value of close collaboration, suggesting practical ways that links can be strengthened for the mutual benefit of both parties. Draws on emerging learning from the TISME projects and TISME’s February 2012 seminar.</td>
<td>Provides evidence based recommendations for the National Curriculum Review (NCR), drawing on both TISME research and reviews of research carried out by the TISME project teams.</td>
<td>Beginning to generate a ‘map’ of the discourses structuring the current wealth of interventions aimed at increasing engagement, achievement and participation in mathematics and science.</td>
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TISME NEWS

TISME and social media

TISME can now be found on both Twitter @TISMESciMaths and on Facebook—come and join our discussions!

TISME is co-ordinated by a team from the Department of Education and Professional Studies at King’s College London: Professor Louise Archer Lead Coordinator, Professor Justin Dillon and Dr Jeremy Hodgen.

Contact us: Tel +44 (0) 20 7848 3139 Email tisme.admin@kcl.ac.uk

TISME is funded by the ESRC in partnership with the Gatsby Charitable Foundation, the Institute of Physics and the Association for Science Education:
http://tisme-scienceandmaths.org