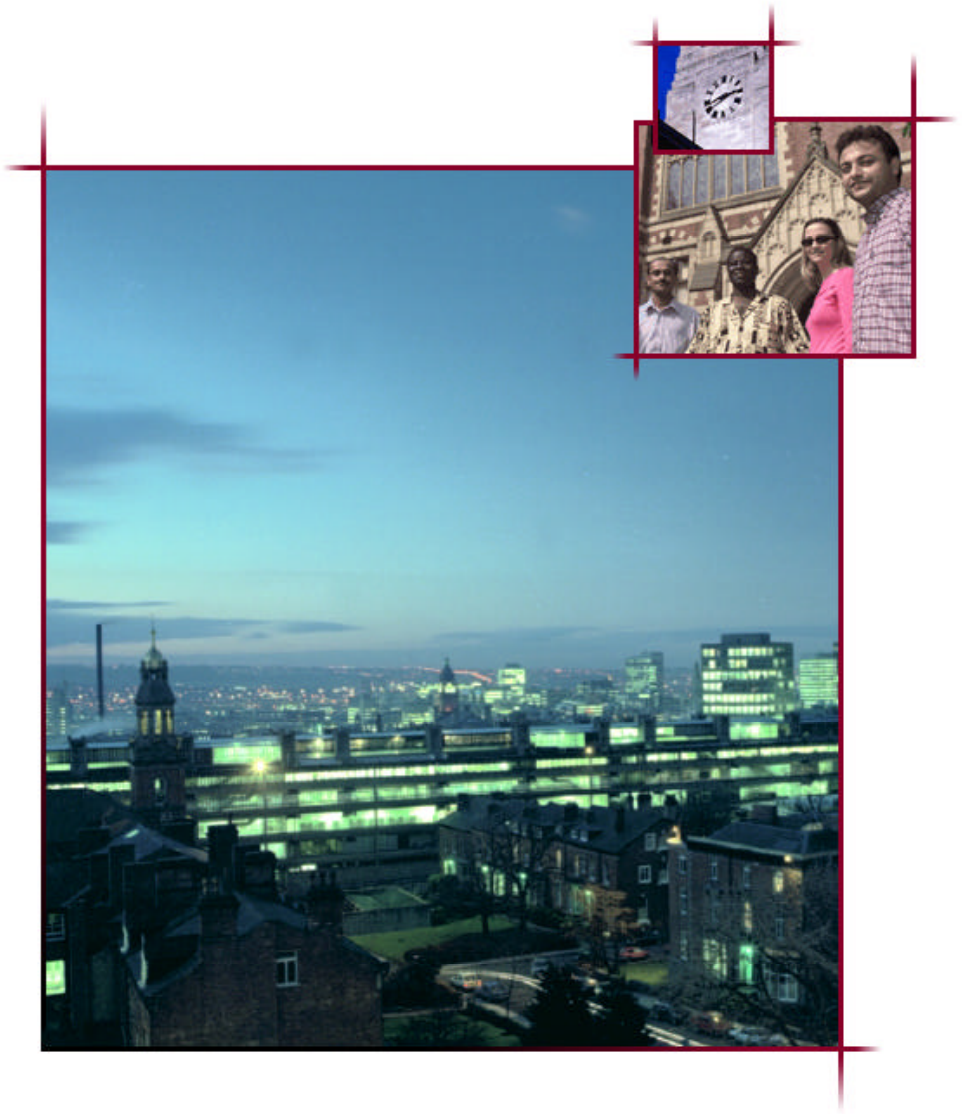

Centre for Studies in Science and Mathematics Education

Biennial Report for 2001-2003

http://www.education.leeds.ac.uk/research/cssme.htm

Contents

INTRODUCTION

The Centre for Studies in Science and Mathematics Education was formally established on 1st March 1970. It is one of the leading international centres for work in this field. Members of the Centre are drawn from a number of academic departments within the University of Leeds. The Centre is dedicated to the highest standards of scholarly work in the study of science and mathematics education at all levels, and to disseminating the outcomes of this work so as to influence policy and practice. Much of the research work of the Centre is undertaken in schools and other educational institutions, and most usually practitioners in these institutions are active participants in its work.

During the last two years the Centre, in common with the wider University, has experienced significant changes, not all of them comfortable. Yet there are good grounds for optimism about the future. The capacity of the Centre to continue to undertake high quality research which influences policy and practice for the better is growing, not least because of its involvement in the recently-announced National Science Learning Centre, of which I will have more to say later. In this introduction I will draw attention to only some of the many activities with which the Centre is involved, and which are listed in greater detail in the body of this report.

First, I must recall that we have lost a number of colleagues from among the academic, technical and clerical staff who have worked in the Centre and contributed to its work over many years. It would be invidious to name some individuals from what would otherwise be a rather long list, but we wish them all well, whether they have moved to other posts or taken a well-deserved retirement, though in some cases 'retirement' does not appear to lessen their involvement with educational research and practice.

Despite the financially-driven reduction in the number of colleagues the Centre's work remains of major significance within science and mathematics education. Perhaps the most encouraging aspect of the work of the Centre during the last two years is to be found in the research training that it has provided as a Marie Curie training site within the European Union Framework Four. The Centre is the only one in Europe dedicated to science education, and this has been reflected in the quality of the Marie Curie fellows who have spent time with us. One of the Fellows, Jaume Ametller, has subsequently joined the staff of the Centre. Several have successfully defended their theses, and all who have spent time with us have found the experience professionally and personally rewarding. We have very much enjoyed their company and the contribution they have made to the intellectual and social life of the Centre. We are aware, not least from conversations at the 2003 European Science Education Research Association Conference

in The Netherlands, that there is a significant number of doctoral students keen to visit and work in the Centre.

The Centre has been involved with a range of research and policy-making activity during the last two years. It has maintained and developed its links across the University, notably with science departments, with medicine and with history and philosophy of science, in keeping with its interdisciplinary character. We also have excellent working links with colleagues in a range of European and other countries, notably Sweden, France, Germany, Norway, Brazil and the USA. The details of this work can be found in the body of this report, but it encompasses such diverse fields as curriculum evaluation, the discursive practices of the classroom, teacher supply, evidence-informed practice in science education and undergraduate mathematics education. In some cases this work involves co-operation with colleagues at other centres of science education research, most notably, in the United Kingdom, King's College London, York University and the University of London Institute of Education. Internationally, the Centre is involved in joint projects with the University of Gothenberg in Sweden, the Federal University of Minas Gerais in Brazil, the University of Oslo in Norway, and Harvard University in the USA. Colleagues in the Centre are also involved in a range of research activity associated with current curricular and policy changes in science in England. Notable among these are studies of the new Applied Science GCSE, the 21st Century Science project and projects on socio-cultural aspects of teachers' work. We have strong links with the Association for Science Education, the Institute of Physics and the Royal Society, as well as with governmental bodies such as the Qualifications and Curriculum Authority, for which a range of consultancy work has been undertaken.

In sum, the Centre is excellently placed in relation to a range of influential changes in the science curriculum, and research into understandings of the aims and practices of science education. This involvement extends both to carrying forward such work and ensuring that it is subject to careful scholarly examination.

The Centre's influence is felt in areas other than research: the involvement of its staff with Initial Teacher Training is particularly noteworthy. The Centre now forms the university base for the training of some 100 secondary science teachers annually, and approaching 200 teachers in the primary sector. Many stay in the geographic area and form the basis of a growing partnership with practising teachers. It is very pleasing that the science PGCE training provided was given the highest grade in the last full Ofsted inspection, and this was confirmed in the 'light touch' inspection during 2002-3.

I referred earlier to the National Science Learning Centre. This Centre forms the hub of a network of regional centres: the total investment in the Network from government and the Wellcome Trust is £51m. The White Rose University Consortium, comprising the Universities of Leeds, Sheffield, York and Sheffield Hallam, has successfully bid to host both the National Centre, and one of the regional Centres. The National Centre will occupy purpose built premises in York. Prof. John Leach is co-Chair (with Prof. Robin Millar of the University of York) of the Curriculum Strategy Group. The Network is the most significant innovation in science teacher development for many years, and is likely

to have a major impact on science teaching in this country. It will of course also have an impact on the work of CSSME, and we are delighted to be at the heart of this most important venture.

This Introduction is able to cover only in broad outline the work of the Centre. Its social and intellectual life, the latter based especially around the formal and informal seminar programme, and the Annual Lecture series, continues to flourish. Its research activity was rated of international quality within the report of the last Research Assessment Exercise. Its influence on policy and curricular and pedagogic change is substantial, in a political environment not always sympathetic to academic engagement with matters of educational policy and practice. The many and often conflicting shifts in education policy over the last decade demonstrate the need for such involvement, if proposed changes in practice are to be effective and lead to improvements in the quality of science education.

Jim Donnelly
Director
CSSME

MEMBERSHIP OF CSSME

Members and Associate Members

Dr. Jim Donnelly	Director
Hilary Asoko	Education
Dr. Jacqueline Bell	Education
Keith Bradley	Education
Dr. Bob Bruce	Education
Katie Bloom	Woodkirk High School
Philip Britton	Leeds Grammar School
Prof. David Coates	Biology
Dr. Andy Edwards	Prince Henry's Grammar School
Jonathan Emberton	Calder High School
Dr. Hannah Ensaff	Education
Dr Jane Francis	Earth Sciences
Mike Franklin	Education
Dr Graeme Gooday	Philosophy
Kathrine Hall	Wortley School
Dr. Melanie Hargreaves	Education
Andy Hind	Grangefield School, Pudsey
Dr. Matt Homer	Education
Prof. Edgar Jenkins	Education
Peter Johnson	Education
Dr Terence Kee	Chemistry
Prof. David Layton	formerly Education
Prof. John Leach	Education
Dr. Jenny Lewis	Education
Dr. John Monaghan	Education
Patricia Page	Education
Peter Pool	Education
Ned Prideaux	Lawnswood High School
Dr. Alan Radford	Biology
Philip Ramsden	Association for Science Education
Prof. Trudie Roberts	Medicine
Prof. J. Chris Robson	Pure Mathematics
Dr. Melissa Rodd	Education
Tom Roper	Education
Dr. Jim Ryder	Education
Dr. Phil Scott	Education
Dr. Laura Smith	Ilkley Grammar School
Dr. Bronwen Swinnerton	Education
Dr. John Threlfall	Education
Adrian White	Education
Prof Ed Wood	Biochemistry
Valerie Wood-Robinson	Education

Technical staff
Stef Lesnianski
David Wray

Secretarial staff
Pat Compton

RESEARCH STUDENTS

In progress (some registered provisionally for doctoral studies)

		Degree	Provisional title of thesis	Supervisor(s)
Rachel	Arrowsmith	EdD	Language in early mathematics	Diane Shorrocks-Taylor John Threlfall
Kwame	Atta-Oben	PhD	Basic numeracy and the education of refugees	John Monaghan
Amber	Barnitt	PhD	The presentation of science in women's magazines.	Hilary Asoko Jim Donnelly
Matthew	Binding	EdD	An analysis of classroom discourse in schools where science teaching is delivered in English but where English is not the first language	John Leach Phil Scott
Erhan	Bingolbali	PhD	An investigation of undergraduate mathematics and engineering students'conceptual development of the derivative concept	John Monaghan
Gultekin	Cakmakci	PhD	A cross-sectional study of the understanding of chemical kinetics among Turkish secondary and undergraduate students	Jim Donnelly John Leach
Mehmet	Fatih Ozmantar	PhD	An empirical investigation of the role of scaffolding and metacognition in the formation of mathematical abstractions	John Monaghan Tom Roper
Maria Theresa	Guerra Ramos	PhD	Ideas about science in Mexican primary education: curriculum demands and teachers' thinking	John Leach Jim Ryder
Aytan	Gulieva	PhD	A multimodal approach to analysing the treaching and learning of mechanics at upper high school advanced level.	Phil Schott John Leach
Jan	Haskins	EdD	Moral philosophy (Bioethics) and the human-animal relationship	John Leach Jenny Lewis
Luke	Odiemo	PhD	The effectiveness of an eclectically-based pedagogy for the teaching of plant nutrition in a Kenyan context	Phil Scott Peter Tomlinson
Kerem	Karaaðaç	PhD	A comparative study of beliefs and classroom practices of Turkish teachers in preparatory courses and state schools: the topic of functions	John Threlfall John Monaghan
Christine	Kelly	PhD	The development of research skills in undergraduate students in the biosciences	John Leach Jim Ryder
Peter	Kuminek	PhD	Facilitating debate to enhance literacy: supporting the tutor in facilitating CMC.	Rachel Pilkington
Pentecost	Nkhoma	PhD	Teachers' classroom practices that are perceived to lead to success in secondary school mathematics in black South African townships	Melissa Rodd Tom Roper
Guliyeva	Aytan	PhD	A multimodal approach to analysing the teaching of mechanics at upper high school advanced level	Phil Scott John Leach
Louise	Sheryn	EdD	Cognition through the appropriation and internalisation of ICT	J Monaghan
Yianna	Sirivianou	PhD	Students' probabilistic thinking in upper elementary education when working in a computer based problem solving environment	Ian Stephenson John Threlfall

Successfully completed since last report

			Title of thesis	Supervisor
Ahmed	Al-Rabani	PhD	The environmental dimension of geography education in the Sultanate of Oman	Geoff Welford Patrick Wiegand
Emin	Aydin	EdD	Mathematics teachers' perspectives on internal school assessment	John Threlfall John Monaghan
Roger	Crawford	EdD	Factors associated with high levels of ICT capability among 14-16 year olds in English schools	Isobel Jennkins John Monaghan Ken Tait
Ali	Delice	PhD	A comparative study of students' understanding of trigonometry in the United Kingdom and the Turkish Republic	John Monaghan Tom Roper
Rosa	Gunnarsdottir	PhD	Teaching and learning in innovation	Angela Anning Phil Scott
Paul	Hernandez-Martinez	PhD	Undergraduate mathematics and computer science students' use of mathematics	John Monaghan
Andy	Hind	MEd by research	Teaching and learning about the nature of scientific theoretical models as part of an AS level programme	Jim Ryder Phil Scott
Mercy	Kazima	PhD	Malawian students' understanding of probability language	Melissa Rodd Tom Roper
Sesutho	Kesianye	EdD	Teachers learning to assess students' mathematics in Botswana	John Threlfall
Zlatan	Magajna	PhD	Geometric thinking in out of school contexts	John Monaghan Tony Orton
Daz	Twigger	PhD	A longitudinal study of the acquisition of selected science concepts by secondary school children	John Leach Phil Scott

Brazilian Doctoral Students

The following students studied in Leeds for 6-12 months as part of their doctoral programmes.

W. dos Santos	September 2000- September 2001.
C.M Capecchi	October 2002-March 2003
E.D. Amaral	October 2002-February 2003

MARIE CURIE FELLOWS WITHIN THE CENTRE DURING THE PERIOD OF THIS REPORT

Jaume Amettler	Spain	Meaning making in the classroom
Andres Archer	Spain	Children's explanations of living systems
Marion Budde	Germany	Undergraduate learning in physics
Berit Bungum	Norway	Perceptions of technology education
Burkhard Priemer	Germany	Computer based learning
Christian Holmboe	Norway	Cognitive challenges in data modelling
Boy Kramer	Germany	Optimising multi-media learning
Sonja Mork	Norway	Argumentation in science classrooms
Roland Paatz	Germany	Analogy based teaching
Jutta Roth	Germany	Construction of meaning during problem solving
Antti Savinainen	Finland	Conceptual understanding

VISITORS TO THE CENTRE

Dr Orlando Aguiar, University Federal de Minas Gerais Post-doctoral fellow.
Dr. Margareta Ekborg, Malmö University College, Post-doctoral fellow
Prof. Lillian C. McDermott, Director of the Physics Education Group at the University of Washington. The Learning and Teaching Support Network Physical Sciences Guest Lecture at the University of Leeds. In collaboration with Ashley Clarke, Department of Physics and Astronomy.
Prof Werner Peshek and Dr Edith Schneider, University of Klagenfurt, Austria.

RESEARCH PROJECTS

Evidence-based practice in science education

John Leach, Phil Scott, Jaume Ametller, Andy Hind and Jenny Lewis were members of the Evidence-based Practice in Science Education (EPSE) Research Network, funded by the Economic and Social Research Council's Teaching and Learning Research Programme between 2000 and 2003 (£438k). The work was conducted in collaboration with colleagues at the Universities of York (Robin Millar; Network Co-ordinator) and Southampton (Mary Ratcliffe) and King's College London (Jonathan Osborne). The Network undertook four inter-related projects. Two focussed on the learning of science content. Project 1 looks at how diagnostic assessment can be used by teachers to provide reliable evidence about their pupils' understandings. Project 2 focused on devising and evaluating short teaching packages, based on existing research evidence, to teach some key ideas in science more effectively. Project 3 developed and evaluated materials to improve pupils' learning 'about science', such as their understanding of the scientific approach to enquiry, and of ideas like risk that often feature in media reports about science. This is widely seen as crucial for better public understanding of science. Finally, Project 4 drew upon the experience of the first three to explore with teachers and other practitioners the factors which facilitate or inhibit the use of research evidence in their work. CSSME staff were involved in Projects 2 and 4. The outcomes of the Research Network's activities are to appear in the book *Evidence-based practice in science education?*, which will be published by RoutledgeFalmer in 2004. Information and publications from the project can be found at:
http://www.york.ac.uk/depts/educ/projs/EPSE.

The work of EPSE Project 2 has been drawn upon in a research project in Sweden, entitled Teachers and Researchers as knowledge builders for better school science. (Vetenskapsrådet – the Swedish research council; ca. £50,000). The project is a collaboration between the Universities of Gothenburg and Leeds, and the teacher education colleges in Skövde and Borås in Sweden. See
http://www.education.leeds.ac.uk/research/scienceed/sweden.htm.

Teaching about the nature of scientific knowledge and investigation on A/AS level science courses

This project is funded by The Nuffield Foundation, and involves Jim Ryder, John Leach and Andy Hind. Current A/AS level science syllabuses identify developing students' understandings about the nature of science as a course aim. However, for many areas of the nature of science there are no teaching resources currently available to support teaching at A/AS level. Furthermore, very little is known about teacher knowledge and expertise required for effective teaching about the nature of science. This project has developed teaching resources and strategies to promote students' understandings about aspects of the nature of science in A/AS level science courses. These resources have been evaluated in the classroom by a team of local science teachers. Further details are available at the project website:
http://www.nuffieldfoundation.org/aboutscience/index.shtml

Supporting physics teaching 11-14

From September 2002 Dr. Phil Scott has been working 2-days per week with the Institute of Physics (IOP), as co-leader of the *Supporting Physics Teaching 11-14* project. This is a ground-breaking project which involves the research-based development and evaluation of materials to support the teaching of physics in the UK to 11-14 year-olds. These highly innovative materials, presented on CD ROM, will have a major impact on physics teaching within this age range, as they will be used by *all* PGCE students following science courses from September 2005. The IOP has sponsored the project to a total sum of £750,000, with a significant sum coming to the University of Leeds for research and development work.

Evaluation of the Supporting Physics Teaching project (Electric Circuits)

The Supporting Physics Teaching project aims to improve teachers' understandings about physics, to develop their insights into the learning challenges for pupils, and to develop their awareness of different approaches to teaching in this area. The focus of the project is primarily on those teachers teaching physics in schools who are not physics specialists. This 12 month evaluation, co-ordinated by Jim Ryder, aims to evaluate the impact of preliminary teacher training activities, and support materials, related to the teaching of electric circuits. It is funded by the Institute of Physics.

The supply of science and mathematics teachers

This project, involving Jim Donnelly, Edgar Jenkins and Tom Roper, was funded by the Society for Studies in Education. It had three main elements:

- the organization of a workshop on aspects of the issue. This took place in December 2001 at the Royal Society, and a report of the conference has been issued.
- a review of the issues, literature and statistics associated with the supply of science and mathematics teachers.
- an empirical study of the attitudes of undergraduates. This study involved 1200 undergraduates at a total of 5 universities.

The work of the project led to two main publications and several conference papers, which are listed elsewhere in this report. The project has been influential in recent shifts in recruitment policy within the TTA and DfES

Remaking science education through application

This major study, which begins in October 2003 and runs for three years, is concerned with a key government initiative, the GCSE in Applied Science, which is one of the 'GCSEs in vocational subjects'. The initiative enables schools to introduce a substantial vocational/applied element into the secondary science curriculum. It is an important part of a wider policy aim: to link the compulsory school curriculum to the world of work. The study will examine the processes within which Applied Science is created (within policy documents, institutional arrangements, pedagogies, and the attitudes and actions of groups such as parents, pupils, higher education institutions and employers). It will investigate how the tensions between different perspectives are resolved, and the extent to which 'applied science' represents a novel version of school science. Finally it will evaluate the influence of GCSE Applied Science on other strands of reform within school science, and its significance for the broader policy of diversifying the late secondary curriculum. The Research Fellow for the study is Dr. Jacqueline Bell

Evaluation of Salters-Nuffield Advanced Biology

Dr. Jenny Lewis is undertaking a 2-year evaluation of the pilot for this new A level, funded by the development team. The main focus of this evaluation is the extent to which this new course is implemented as intended, within the classroom, and the extent to which the support and guidance provided matches the needs of teachers and students.

Students' experiences of undergraduate mathematics

This is a 3-year project, funded by the ESRC, with King's College London tracked undergraduate mathematics students' attitudes to their courses as they progress. Its aims were to

- understand more about the ways in which mathematics undergraduates' attitudes to the subject change over the period of study;
- understand what experiences and knowledge contribute to building positive attitudes to both students' own competence and to mathematics as an academic discipline;
- explore the ways in which undergraduate students feel they are helped and/or hindered in their learning of mathematics;
- identify ways in which students can be encouraged to complete a mathematics degree rather than transferring, failing or withdrawing;
- explore the reasons why students elect to study mathematics at university and also why they select or reject a teaching career.

Within the context of university mathematics, the study is informed by, and will contribute to, theories relating to affect (beliefs, attitudes and emotions) and to induction into academic communities of practice. The aim is to take a holistic view of student experience. While cognitive change have not been the subject of the study, perceived progress in advanced mathematical thinking is clearly a key factor, and hence the work is informed by studies in that area.

Graphic calculator use in Leeds high schools

This project, involving John Monaghan and Melissa Rodd, examined graphic calculator (GC) use in Leeds High Schools. Quantitative and qualitative census data on GC use and non-use were obtained. The research team consisted of University and local teachers. We found that the key factors which contributed to use were: expertise within mathematics departments; regard for GC as learning aides from mathematics staff and as ICT from senior staff; a 'critical mass' of older/higher attaining students. Key factors which inhibited use of GC were: lack of time to learn how to use the calculator and how to teach with it; concern over recent examination restrictions; perceptions of computers being a resource priority.

See http://education.leeds.ac.uk/research/mathseducation/graphcalc.htm

Secondary school statistics and ICT

University of Leeds funded. May 2003 – August 2004.
Dr. John Monaghan
This research will investigate:
1) The potential of interactive statistics software for generating school-based activities using web-based data sets.
2) Ways in which ICT-based activities can make links to real world applications of mathematics.

Mathematics materials for the able pupil

John Threlfall, along with other members of the School of Education's Assessment and Evaluation Unit (http://education.leeds.ac.uk/research/aeu.htm) is involved in working on the QCA World Class Arena project (http://www.worldclassarena.org) to develop mathematics materials for the gifted and talented for pupils from 9 to 13.

OTHER PROFESSIONAL ACTIVITIES BY STAFF AT THE CENTRE

Editorial Board Membership

Dr. Jim Donnelly
Editor, *Studies in Science Education*

Prof. Edgar Jenkins
Studies in Science Education, Canadian Journal of Science, Mathematics and Technology Education, International Journal of Technology and Design Education, Science and Education

Prof. John Leach
Science Education, Research in Science Education, Journal of Research in Science Teaching, Learning and Instruction, Revista Brasileira de Pesquisa em Educação em Ciências

Dr. John Monaghan
International Journal of Computer Algebra in Mathematics Education (Assistant Editor), *International Journal of Computers for Learning Mathematics, Teaching Mathematics and its Applications* (Editorial Advisory Group)

Mr. Tom Roper
Assistant Editor of the *Mathematical Gazette*

Dr. Jim Ryder
International Journal of Science Education; Physics Education.

Committee Membership

Dr. Jim Donnelly

- Advisory Committee for the Evaluation of the GCSE AS-level 'Science for Public Understanding 2001-2
- Advisory group studying for Royal Society-funded project on Assessment in Science 14-19 2002-3

Prof. Edgar Jenkins

- Royal Society Education Committee,
- Assessment Committee of UMR STEF (Paris),
- International Advisory Committee IOSTE, Advisory Committee,
- Relevance of Science Education Project (University of Oslo).

Prof John Leach

- Member of the DfES Standards Unit Science Expert Group (2003-)
- Reviewer for the PEARL Consortium (a project to design labwork for undergraduate science learners working remotely, funded by the EC, involving science educators at the Open University, the University of Porto, Trinity College Dublin and the University of Dundee)(2000-2003)
- Member of the Steering Group of the Qualifications and Curriculum Authority project to oversee science curriculum developments post 2000

Dr. Jenny Lewis

- Secretary to the Academic Committee, ERIDOB, November 2000 – 2004
- Vice President of Institute of Biology; Chair of the Education and Training Board, April 2000 - March 2004
- Member of the Advisory Board, Learning and Teaching Support Network (LTSN) Centre for Bioscience, Nov 2000 – 2003
- Member of KS3 Pilot Science Advisory Group (DfEE), Nov 2000 – present

Dr. John Monaghan

- International Committee on 'Computer Algebra in Mathematics Education'

Mr. Tom Roper

- Vice-Chair of UCET Management Forum

Dr. Jim Ryder

- Advisory Board for the Learning and Teaching Support Network for the Physical Sciences (funded by HEFCE).

Consultancy

CSSME members have been involved in various research consultancies which have informed both science and mathematics curriculum developments and science teacher professional development in the UK.

John Leach and Edgar Jenkins produced a report to the Qualifications and Curriculum Authority (£1000), entitled *International Trends in Science Education: the case of Australia, Canada, France, the Netherlands, New Zealand, Sweden and the USA.* John Leach, Hilary Asoko, Edgar Jenkins and Jim Ryder carried out a focus group study for QCA to gauge perceptions of teachers and others about scientific literacy in the national curriculum (£10,000). These two reports were commissioned by QCA to support the development of the new GCSE science course *21st. Century Science*. John Leach, Jenny Lewis and Phil Scott were consultants to the team which developed the Key Stage 3 strategy for science, commenting on proposals for the treatment of conceptual content in physics, chemistry and biology (CfBT, £3,200).

Dr. John Monaghan was Technology consultant for the International Baccalaureate, 2001-2003 and adviser to the project 'The development of a measure or measures capable of monitoring and assessing the way in which the use of ICT in a school may impact on attainment. January – April, 2003. Ian Stevenson, project leader. Sponsor: BECTA.

CSSME Annual Lectures

The CSSME Annual Lecture for 2002 was given on Thursday 7th March 2002 by Professor Celia Hoyles of the University of London, Institute of Education

> ***Improving proving: insights from a longitudinal study of students' mathematical reasoning***

The lecture for 2003 was given Thursday March 6th by David MacKay, of the Qualifications and Curriculum Authority (QCA), who spoke on :

> ***A new science curriculum after Key Stage 3?***

SEMINAR PROGRAMME 2001-2, AND 2002-3

CSSME operates two seminar series. The informal seminar programme operates on Thursday mornings and provides a flexible and relaxed setting for students and members of the Centre to present work in progress and obtain supportive comment. The formal seminar programme occurs at 4pm, also on Thursdays. The list of seminars within the formal programme given during the period of this report appears below.

2001-2

Thursday 11 October 2001
Martin Hollins, Qualifications and Curriculum Authority
The science curriculum for the 21st century

Thursday 8 November 2001
Dr. John Monaghan and Dr. Melissa Rodd (School of Education)
The graphic calculator project

Thursday 14 March 2002
Professor John Leach, Andy Hind, Dr. Jenny Lewis and Dr. Phil Scott (School of Education)
Evidence-based practice in science education

Thursday 25 April 2002
Guy Claxton, University of Bristol
What can science education contribute to education for the Learning Age?

Wednesday 15 May 2002
Anthony O'Hear, University of Bradford
Humanism and science education

Thursday 13 June 2002
Prof. Sally Brown, University of Strathclyde
Evaluating the quality of research

2002-3

Thursday 10 October 2002
Dr Phillip Kent, London University, Institute of Education and Imperial College
The future of mathematics in engineering education: views from universities and professional practice

Thursday 11 November 2002
Prof. Trudie Roberts, Prof. of Medical Education, University of Leeds
Medical education and issues of professional competency

Thursday 19 December 2002
Dr. Barbara Jaworski, University of Oxford
Theory and practice in mathematics teacher education and teaching development

Thursday 13 February 2003
Prof Eileen Scanlon, Open University
Reporting contested science

Thursday 3 April 2003
Dr. Lynne Cameron, University of Leeds
Metaphor and science education

Thursday 15 May 2003
Justin Dillon, King's College London
Science education and sustainable development

STUDIES IN SCIENCE EDUCATION

Studies in Science Education, a journal devoted mainly to research reviews in science education, continues to be edited from the Centre. The present Editor is Dr. James Donnelly. Dr. Phil Scott has recently agreed to act as Assistant Editor from 2003. During the period covered by this report four issues of the journal have been published (vols 36-9), including the following indicative articles:

Tina A. Grotzer. Learning to Understand the Forms of Causality Implicit in Scientifically Accepted Explanations

Angela Calabrese Barton. Urban Science Education Studies: A Commitment to Equity, Social Justice and a Sense of Place

Grady J. Venville, John Wallace, Léonie J. Rennie, John A. Malone. Curriculum Integration: Eroding the High Ground of Science as a School Subject?

PUBLICATIONS BY STAFF AT THE CENTRE

Books

Donnelly, J.F., & **Jenkins, E.W.** (2001) *Science education: policy professionalism and change* (Paul Chapman/SAGE publication)

Donnelly, J.F. (2002) *The supply of school mathematics and science teachers. Issues, evidence and policy options* (Leeds: CSSME)

Donnelly, J.F. (2002) *The supply of school mathematics and science teachers: undergraduate attitudes mathematics teacher deployment* (Leeds: CSSME)

Mortimer, E.F. and **Scott, P.H.** (2003) *Meaning making in secondary science classrooms.* (Buckingham, UK: Open University Press)

Edited Journals

Donnelly, J.F. *Studies in Science Education* vols. 36, 37, 38 and 39.

Leach, J., Andrews, R. and Williams, J. (2002). Special Issue on Subject Knowledge and Application, *British Educational Research Journal*, 28(5).

Chapters in Edited Books

Chambers, G.N. & **Roper, T.** (2002) 'Why students withdraw from initial teacher training for secondary schools: the Leeds experience' in Menter, I.; Hutchings, M.; Ross, A. (Eds), *The crisis in teacher supply; research and strategies for retention*, Trentham Books; Stoke on Trent.

Donnelly, J.F. (2001) 'Instrumentality, hermeneutics and the place of science in the school curriculum', in F. Bevilacqua, E. Giannetto & Michael R. Matthews (eds.) *Science education and culture: the contribution of history and philosophy of science* pp.109-28 (Dordrecht: Kluwer Academic Publishers)

Donnelly, J.F. (2002) 'Structure contingency and application: the early articulation of chemical industry and academe in the United Kingdom', M. Bougard (ed.) *Alchemy, chemistry and pharmacy* pp.177-88 (Turnhout, Belgium: Brepols).

Donnelly, J.F. (2002) 'Science and mathematics undergraduates' attitudes to teaching as a career', J.F.Donnelly *The supply of school mathematics and science teachers* pp.1-33 (Leeds: CSSME)

Jenkins, E.W. (2001) Research in science education in Europe: retrospect and prospect. In H.Behrendt, H.Dahncke, R.Duit, W.Gräber, M.Komorek, A.Kross and P.Reiska

(eds.), *Research in science education, past, present and future*, Dordrecht, Kluwer, pp.17-26.

Jenkins, E.W. (2001) Constructivism in school science education: powerful model or the most dangerous intellectual tendency? In Bevilacqua, F., Giannetto, E. and Matthews, M.R., *Science education and culture: the contribution of history and philosophy of science*, Dordrecht, Kluwer, pp.153-64.

Jenkins, E.W. (2002) Linking school science education with action. In W-M Roth and J.Desautels (Eds.), *Science Education as/for sociopolitical action*. New York, Lang, pp17-34.

Jenkins, E.W. (2002) Some policy issues in the supply of science and mathematics teachers. In: J.F.Donnelly (ed.), *The supply of school mathematics and science teachers: issues, evidence and policy options*, Leeds, CSSME, pp.71-4.

Leach, J. (2002) 'The use of secondary data in teaching about data analysis in a first year undergraduate biochemistry course' . In D. Psillos and H. Niedderer (Editors): *Teaching and learning in the science laboratory.* Dordrecht, NL: Kluwer pp.165-178.

Leach, J. (2002) 'Students' understanding of the nature of science and its influence on labwork'. In D. Psillos and H. Niedderer (Editors): *Teaching and learning in the science laboratory.* Dordrecht, NL: Kluwer pp 41-48.

Leach, J., Driver, R., **Scott, P.** & Wood-Robinson, C. (2002) 'Children's ideas about ecology: theoretical background, design and methodology' in S. Amos and R. Boohan (Editors): *Teaching science in secondary schools: a reader.* London: RoutledgeFalmer.

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Leach, J. (2001). *Learning about data analysis in biochemistry.* LTSN Bioscience Bulletin, December 2001. Leeds: LTSN Centre for Bioscience.

Leach, J., **Lewis, J.** and **Ryder, J.** (2001). *Researching learning and teaching in the biosciences.* LTSN Bioscience Bulletin, Spring 2001, No. 2. Leeds: LTSN Centre for Bioscience.

Jenkins, E.W. (2003) Scientists in the classroom. the cold war reconstruction of American science education. *Education in Russia, the Independent States and Eastern Europe*, 21 (1) 2003, pp.40-1 (book review).

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Monaghan, J. (2002) Ways of researching teachers using computer algebra systems. *36th Tagung für Didaktik der Mathematics* (conference proceedings). Berlin: Verlag Franzbecker, pp.31-38.

Monaghan, J. (2002) Teachers using technology: issues, problems and ways forward. *Proceedings of the 5th T3 Symposium: Grafische en Symbolische Rekenmachines in het Wiskunde – en Wetenschapsonderwijs.* Oostende.

Roper, T (2002) Who is teaching secondary mathematics, in *The Supply of School Mathematics and Science Teachers: Undergraduate Attitudes and Mathematics Teacher Deployment*: A report of a project funded by the Society for Educational Studies, Editor, Donnelly, J., published by the Centre for Studies in Science and Mathematics Education (CSSME), University of Leeds

Threlfall, J & **Pool, P.** (2002) Promoting creativity through assessment, *Proceedings of the International Conference on Creativity in Mathematics Education and the Education of Gifted Students*, Riga, Latvia, 15-22 July 2002

CONFERENCE PRESENTATIONS BY STAFF AT THE CENTRE

Donnelly, J.F. (2001) 'Searching for a humanistic account of science education' at the *Third Conference of the European Science Education Research Association*, Thessaloniki, Greece.

Donnelly, J.F. (2002) 'Undergraduates' attitudes to teaching as a career' at the *Annual Conference of the Society of Educational Studies*, York. Invited lecture.

Donnelly, J.F. (2003) Invited Lecture 'A new tree in the wood': on the introduction of technology into the *Norwegian National Curriculum*, Trondheim.

Hind, A., **Lewis, J.**, **Leach, J** & **Scott, P**. (2002) 'Evaluating an evidence-based approach to designing and implementing a teaching sequence about plant nutrition' at *European Researchers In Didaktik Of Biology* Toulouse, France 22-26

Leach, J., **Ametller, J.**, **Hind, A.**, **Lewis, J.** & **Scott, P.H** (2003) 'Evidence-informed approaches to teaching science at junior high school level: outcomes in terms of student learning' at the *Annual Meeting of National Association for Research in Science Teaching (NARST)*, Philadelphia, USA.

Leach, J.T. & **Scott, P.H.** (2001) 'The concept of learning demand as a tool for designing teaching sequences' at the *American Educational Research Association Annual Meeting*, Seattle, USA.

Lewis, J. & **Leach, J**. (2001) 'Reasoning about socio-scientific issues in the science classroom' at *European Science Education Research Association conference*, Thessaloniki, Greece.

Monaghan, J. (2002) Keynote speech at the *36th Tagung für Didaktik der Mathematics*, Klagenfurt, Austria

Monaghan, J. (2002) Keynote speech at the *5th T3 Symposium: Grafische en Symbolische Rekenmachines in het Wiskunde – en Wetenschapsonderwijs*, Oostende, Belgium

Monaghan, J. (2003) Conference Committee, *Commission Inter-IREM,Math-Informatique, European Congress – Integrating Technologies into Mathematics Education*, Reims, France. See http://www.reims.iufm.fr/Recherche/Cadre_recherche.htm

Monaghan, J. (2003) Conference co-organiser and co-ordinator of the Assessment group, *The Third CAME Symposium, Learning in a CAS Environment: Mind-Machine Interaction, Curriculum & Assessment*. Reims, France. See http://www.mathstore.ac.uk/came/events/reims/index.html

Roper, T. (2003) 'Who is teaching mathematics and science in secondary schools' at the *Fourth IMA Conference on the Mathematical Education of Engineers*, Loughborough University.

Ryder, J. (2002) 'The place of 'knowledge about science' in science education'. Invited keynote at the *Annual Symposium of The Finnish Mathematics and Science Education Research Association*, University of Joensuu, Finland.

Ryder, J., Hind, A. & **Leach, J.** (2001) 'The design of materials and strategies for teaching about the epistemology of science' at the *European Science Education Research Association Third International Conference*, Thessaloniki, Greece.

Ryder, J., Hind, A. & **Leach, J.** (2003) 'Teaching about the epistemology of science in school science classrooms: case studies of teachers' experiences' at the *European Science Education Research Association conference*, Noordwijkerhout, The Netherlands.

Ryder, J., Hind, A. & **Leach, J.** (2003) 'Enacting lesson resources for teaching about the nature of theoretical models in high school science classrooms' at the *National Association for Research in Science Teaching Annual Conference*, Philadelphia.

Paper presented in the symposium 'Teaching about science: Lessons from classroom research'

Scott, P.H (2001) Invited discussant to international symposium: 'Constructing data from classroom observation records: theoretical and methodological issues', at the *European Science Education Research Association Third International Conference*, Thessaloniki, Greece.

Scott, P.H (2002) 'Discursive activity on the social plane of high school science classes: a sociocultural tool for analysing and planning teaching interactions'. Invited presentation (with Professor Harry Daniels and Professor Anne Edwards) in the international *BERA Special Symposium*: 'Developments in sociocultural and activity theory analyses of learning in school', at the *American Educational Research Association Annual Meeting*, New Orleans, USA.

Scott, P.H (2003) 'Meaning making in high school science classrooms'. Invited presentation at *Encontro Internacional Linguagem, Cultura e Cognição*, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil.

Scott, P.H & Jewitt, C. (2002) 'Meaning making in science classrooms: a joint perspective drawing on multimodal and sociocultural theoretical perspectives'. Invited presentation in international symposium, 'Language, action and communication in science education: the role of ICT, multimodality and referential perspectives in meaning making' at the biennial *ISCRAT (International Society for Cultural Research and Activity Theory) Conference*, Amsterdam, The Netherlands.

Threlfall, J. & Tait, K. (2001) 'The relationship between performance on computer-based mathematics tests and skill on computer skill tests' at the *Second International Conference of the Association for Educational Assessment (Europe)*, Krakow, Poland

The Centre for Studies in Science and Mathematics Education
University of Leeds

The Centre for Studies in Science and Mathematics Education was formally established on 1st March 1970. Apart from a course of initial training for graduate teachers of science and mathematics, suitably qualified students may prepare for the following higher degrees: M.A., M.Phil., Ph.D., Ed.D. (Inquiries should be directed to Dr. Jim Donnelly, Centre for Studies in Science and Mathematics Education, The University, Leeds, LS2 9JT). The Centre also operates as a site within the Marie Curie research training scheme of the European Union (http://www.leeds.ac.uk/external-affairs/european/mcts/educsite.htm). There are well-developed research interests in a number of fields including: children's learning of scientific and mathematical concepts; the social history of politics of science and technology education; computer-based learning of science and mathematics; the implementation and evaluation of science and technology curriculum innovations; the national assessment of children's scientific attainments, adult scientific and technological literacy and the public understanding of science. A website for the Centre may be found at:
http://www.education.leeds.ac.uk/devt/research/cssme_ScienceEd.htm