



**Science,
technology,
engineering and
mathematics**
research at NFER





STEM research at NFER

In a global market, the UK must ensure that it can meet the demand from employers for graduates and technicians with knowledge and skills in science, technology, engineering and mathematics (STEM). To do this, there must be enough students participating and achieving in STEM subjects post-16 and in higher education. NFER has a growing body of work in this area, which provides sound evidence for decision makers and programme managers.

This leaflet gives a brief introduction to our work in the STEM areas, with some of the key findings from recently completed projects.

NFER's expertise

NFER has significant expertise in research and evaluation studies in relation to the STEM agenda. Our work includes extensive consultations with pupils and students, teachers, university staff and support staff, employers and key stakeholders, including policy makers.

Our evaluation work explores 'softer' outcomes such as changes in perceptions, attitudes, intentions and practice, as well as 'harder' impacts in relation to subject choice, attainment at the key stages and in further and higher education, and career destinations. We have experience both of large and small scale studies and use a range of quantitative and qualitative research methods.

Our STEM track record includes a wide range of research and evaluation studies relating to enrichment and enhancement activities, subject and career choice, and teachers, teaching and learning.

Research under way now

- Evaluation of the STEM programme in the East Midlands, which aims to develop STEM skills and literacy in the region in order to increase the flow of people entering the STEM workforce, for the East Midlands Development Agency.
- Evaluation of Chemistry for Non-specialists, which is a training programme designed to increase the knowledge, skills and confidence of non-specialist teachers of chemistry, for the Royal Society of Chemistry.
- A study exploring the extent to which the current model of initial teacher training (ITT), through courses such as the postgraduate certificate in education, meets the needs of schools in relation to teaching mathematics and physics, and how ITT might need to change or adapt in order to improve the provision of specialist teachers at key stage 4 (ages 14 to 16), for the Gatsby Foundation.
- A research study to explore the impact so far of government policies and initiatives in increasing participation in STEM study and employment and to assess key priorities for the future, funded by NFER and the Wellcome Trust.
- Investigation of the provision of built environment education to schools in London, the South East, Yorkshire and the Humber, funded jointly by the Department for Culture, Media and Sport and NFER.

Our research provides useful information to policy makers, practitioners and professional societies.

Enrichment and enhancement activities

Recent projects in this area include the following.

- An ongoing evaluation of the Chemistry for our Future (CFOF) programme, for the Royal Society of Chemistry

Key findings: The CFOF programme is increasing chemistry knowledge, practical skills and awareness of higher education opportunities amongst pupils, aiding a smoother transition to university life, developing transferable skills and increasing motivation amongst undergraduates. The programme also offers new teaching approaches and materials and increases the understanding of chemistry careers amongst staff at higher education institutions. Institutions have also benefited from increased partnership working.

- An evaluation of the Increased Flexibilities programme for 14 to 16-year-olds, for the Department for Children, Schools and Families

Key findings: The most common areas of provision were information and communications technology, engineering and motor vehicle technology. The majority of students who took part achieved their qualifications at the end of the programme and nearly all progressed to further education and training.

- An evaluation of Science Year and Planet Science, for Planet Science

Key finding: The Science Year and Planet Science initiatives aimed to tackle stereotypes about science and extend engagement with science, both during and following secondary education. They were generally effective, but needed to run for longer periods to have long-term impact.



Subject and career choice

Our research in this area provides useful information to senior policy makers in government, professional societies, educationalists and career advisers.

- An evaluation of chemistry careers advice and materials and an investigation of how young people make subject and career choices, for the Royal Society of Chemistry

Key findings: Young people's subject and career choices were influenced by their perceptions of chemists and careers in chemistry, and their feeling that learning chemistry is difficult. Chemistry was seen as a subject route to medicine or veterinary science. They liked the materials from the Royal Society of Chemistry, but wanted more contact with real chemists via talks, demonstrations and work experience.

- An investigation of the factors affecting A-level and undergraduate subject choice in physics and chemistry by ethnic group, for the Institute of Physics and Royal Society of Chemistry

Key findings: The study investigated influences on ethnic minority groups under-represented in physics and chemistry at A-level and degree level. The most important influences were enjoyment of the subject, future ambitions, and perceptions of careers in the physical sciences. Families and peer groups also influenced their decisions, but not to as great a degree. Some influences were stronger for some ethnic groups.

- A study to determine how year 9 students (age 13 to 14) and their adult influencers can be better supported with advice and background information relating to careers in the science, engineering and technology (SET) sectors, for the Engineering and Technology Board

Key findings: There is generally a lack of knowledge about the variety and range of SET careers. Two-thirds of the students had some interest in SET careers and would have benefited from more information on the range of opportunities available to help them with career decisions. Young people showing less interest in SET careers also required information to dispel misunderstandings.



Teachers, teaching and learning

Our work in relation to the teaching and learning of STEM subjects helps to inform future decisions and practice regarding curriculum delivery, teacher deployment and teacher professional development.

- An investigation of the deployment of mathematics and science teachers and support staff to deliver the curriculum, for the Department for Children, Schools and Families

Key findings: At least 76 per cent of mathematics teachers and 93 per cent of science teachers were specialists – either they had a mathematics/science-related degree or had specialised in mathematics/science during teacher training. When deploying staff, heads of department gave priority to year groups or courses that involved national assessment.

- An exploration of the potential for a Royal Society Fellowship programme, with the aim of increasing capacity in STEM education research, for the Royal Society

Key findings: Interviewees were unanimously positive about the suggestion of a fellowship programme. Among other recommendations, they suggested that the programme could develop practical research skills (such as writing bids and managing projects) and give people freedom to pursue their own research interests.

- An exploration of the use of information and communications technology in the classroom in primary and secondary schools, as part of the Second Information Technology in Education Study for the Local Government Association

Key findings: Teachers exploited the capabilities of ICT to introduce new approaches that had a range of benefits for students, including improved motivation, increased confidence and self-esteem, enhanced social skills, improved group-working and cooperative skills, and enhanced achievement.

Information about current STEM research is available on our website at www.nfer.ac.uk/research-areas/science-education.

- A six-year exploration of pupils' experiences and perspectives of the National Curriculum and assessment, including pupils' attitudes towards STEM subjects, for the Qualifications and Curriculum Authority

Key findings: Of the 314 pieces of research included in this review, science was the subject area on which pupils' perspectives had been researched most often. The body of research showed that pupils' attitudes towards learning science, i.e. enjoyment and perceptions of its relevance, decline as they go through their school careers. Where real-life relevance and practical application is conveyed, pupils find their science learning more appealing.

More about NFER

The National Foundation for Educational Research (NFER) is the UK's largest independent educational research body. NFER gathers, analyses and disseminates the results of research in order to make a difference to learners of all ages, and especially to the lives of children and young people. With offices in Slough, York and Swansea, NFER employs over 250 staff, including more than 150 researchers.

NFER's clients benefit from a full range of bespoke facilities to support research, including an extensive library and information service, specialist statistical and survey administration services, marketing, publishing, media and web services.

Our STEM clients

Department for Children, Schools and Families
Qualifications and Curriculum Authority
Engineering and Technology Board
Royal Society of Chemistry
European Science Research Council
General Teaching Council
Local Government Association
Institute of Physics
Planet Science
Gatsby Foundation
East Midlands Development Agency
Royal Society

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