STEM in our schools and colleges

Katy Bloom
STEM Cohesion Team
Engineering & Technology Lead

The STEM Programme – what's it all about?

- Ensuring the future supply of STEM graduates

- Encouraging positive public engagement with STEM

- Providing an opportunity to make the most of existing good practice

  (... in schools and colleges, with education business partnerships, and in STEM education policy)

The STEM Programme Report
DfES and DTI, October 2006

In the light of the Treasury's Science and Innovation Investment Framework, recommendations for:

- better linkage between Science, Technology, Engineering and Mathematics

- better co-ordination of STEM activity at local, regional and national level

- better co-ordination of public and non-public initiatives

- better targeting of government spending

The National STEM Programme

- Building on the government's STEM programme to bring cohesion among STEM partners

- STEM cohesion team
  - *John Holman (National STEM Programme Director)*
  - *Jenifer Burden*
  - *Katy Bloom*

- Building the National STEM Centre, a base for STEM partners to work together
  - *core team with expertise in STEM education*
  - *desk space, admin and facilities support*
  - *comprehensive current and archive STEM resource collection*

STEM skills are valuable, but in short supply

- 59% of employers are having difficulty recruiting enough STEM-skilled individuals to meet their needs

- Larger firms are looking overseas for STEM skills, with 36% recruiting from India and 24% from China

- Employers are committed to encouraging more young people to study STEM

CBI education and skills survey 2008

Figures from JCQ (all ages) show an increase between 2007 and 2008 in entries for each major science subject
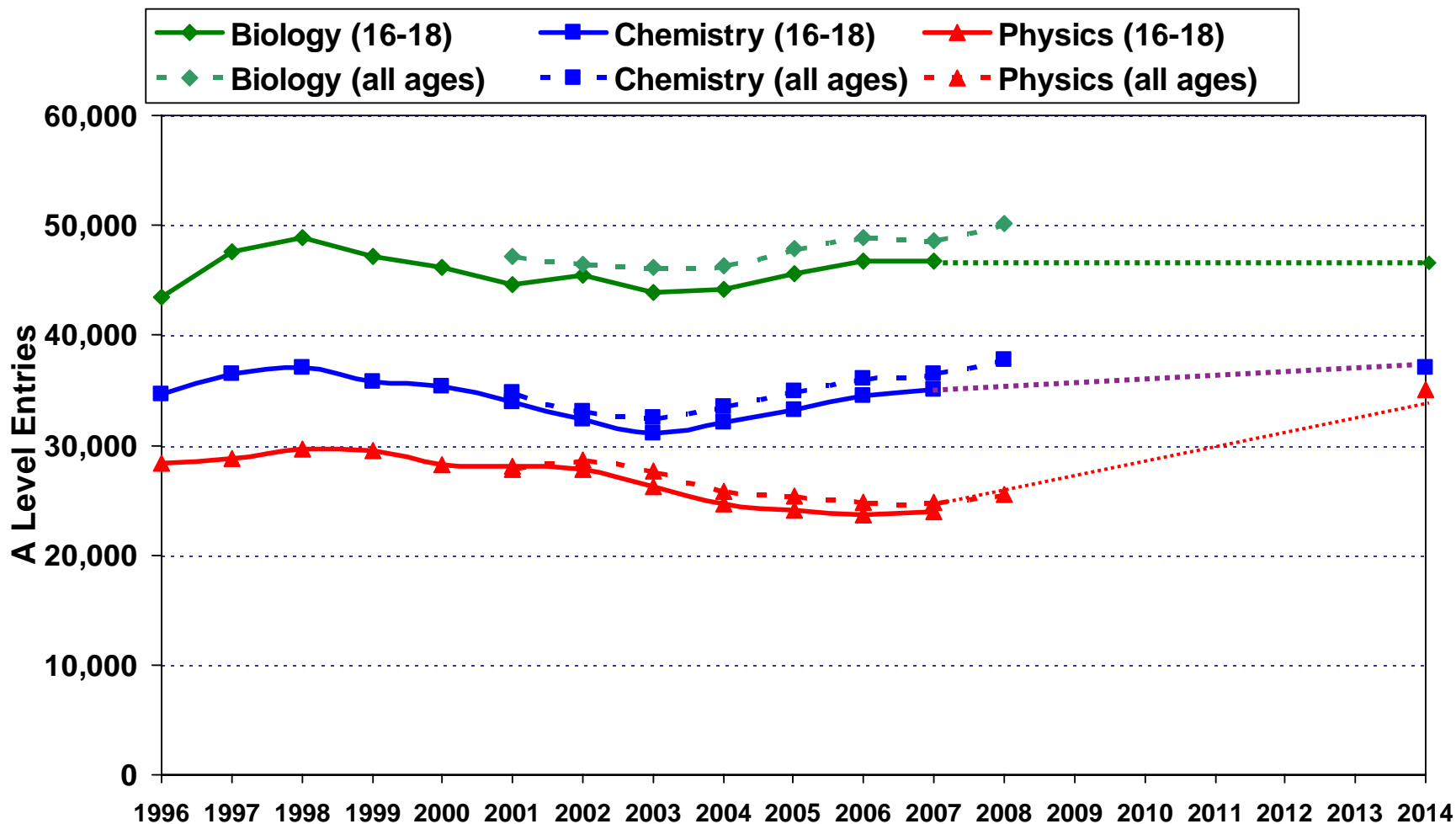
Figures from JCQ (all ages) show a large increase in A level maths entries between 2007 and 2008
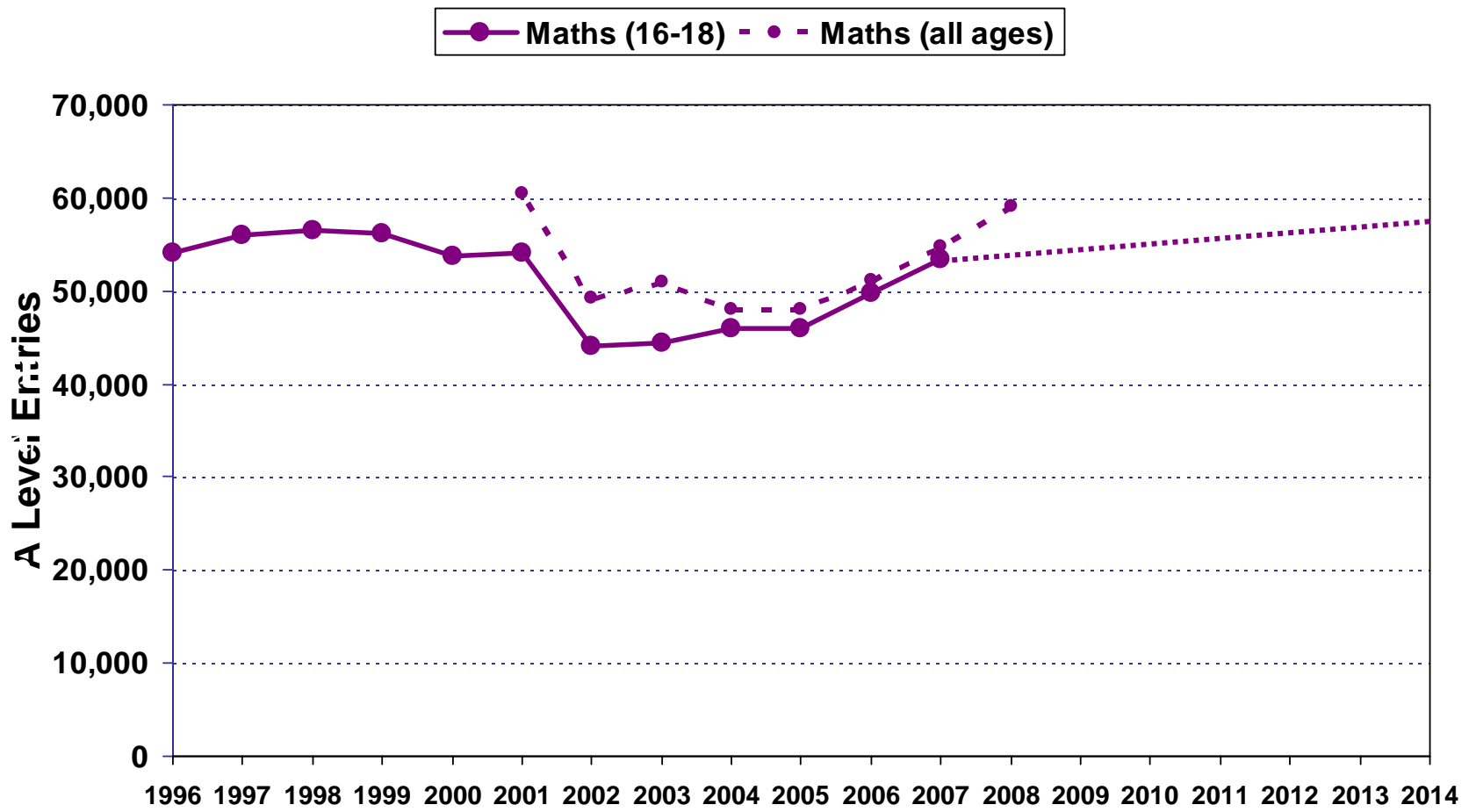
Maths A Level earns a premium

Maths is the only A-Level subject that adds to earnings – by up to 10% - even when the employer is unaware of the person's qualifications.

Sloane & O'Leary 2005
The Return to a University Education in Great Britain,
National Institute Economic Review

UCAS acceptances for 08-09
(as of 15 October 2008)

- Mathematics has increased by 8.1% to 6,421 compared with 2007-08

- Chemistry is up 4.4% to 4,004

- Physics is up 3.3% to 3,325

- Engineering averages 6.4% (ranging from 14.9% for civil engineering to -11.3% for combinations within engineering)

- All subject areas growth is 6.3%

hefce

Declining/static trend in A level entries for physics, chemistry and maths over the last 30 years
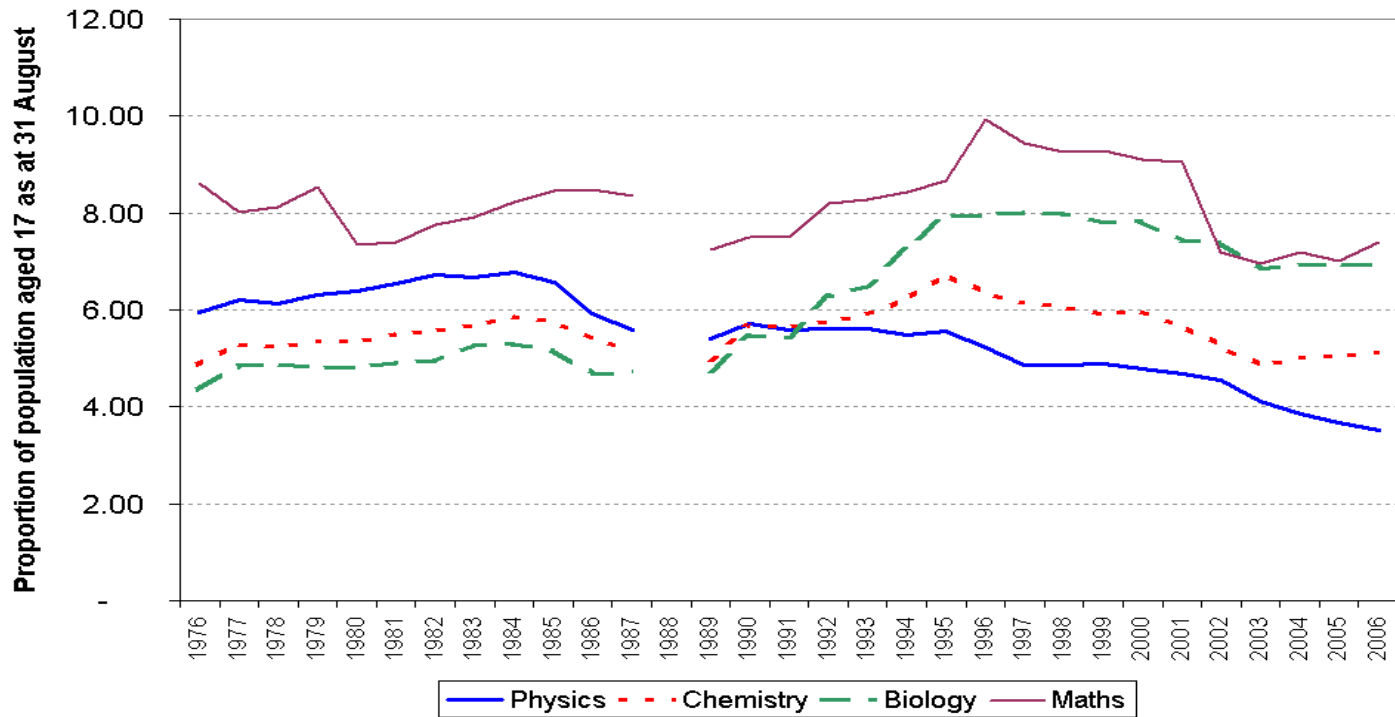
Entries shown as a proportion of the population aged 17 to take into account changes in the size of the cohort

PISA 2006

Programme for International Student Assessment

30 countries from the Organisation for Economic Co-operation and Development (OECD)

27 partner countries

2006 study focused on Science, results published December 2007

Nearly 500 schools in England and Wales took part in the 2006 study

PISA 2006

Science

- UK performance is significantly above the OECD average

- 7 countries (including Japan) performed significantly higher than England

- 13 countries (including Germany) are not significantly different from England

- 36 countries (including France and USA) performed significantly worse than England

PISA 2006
Science is valuable for me
percentage of students agreeing with positive statements about the personal value of science

OECD average	UK	USA	Germany	Japan
63	64	72	54	55

PISA 2006

I would like a career in science

percentage of students agreeing with statements about the value of a career in science

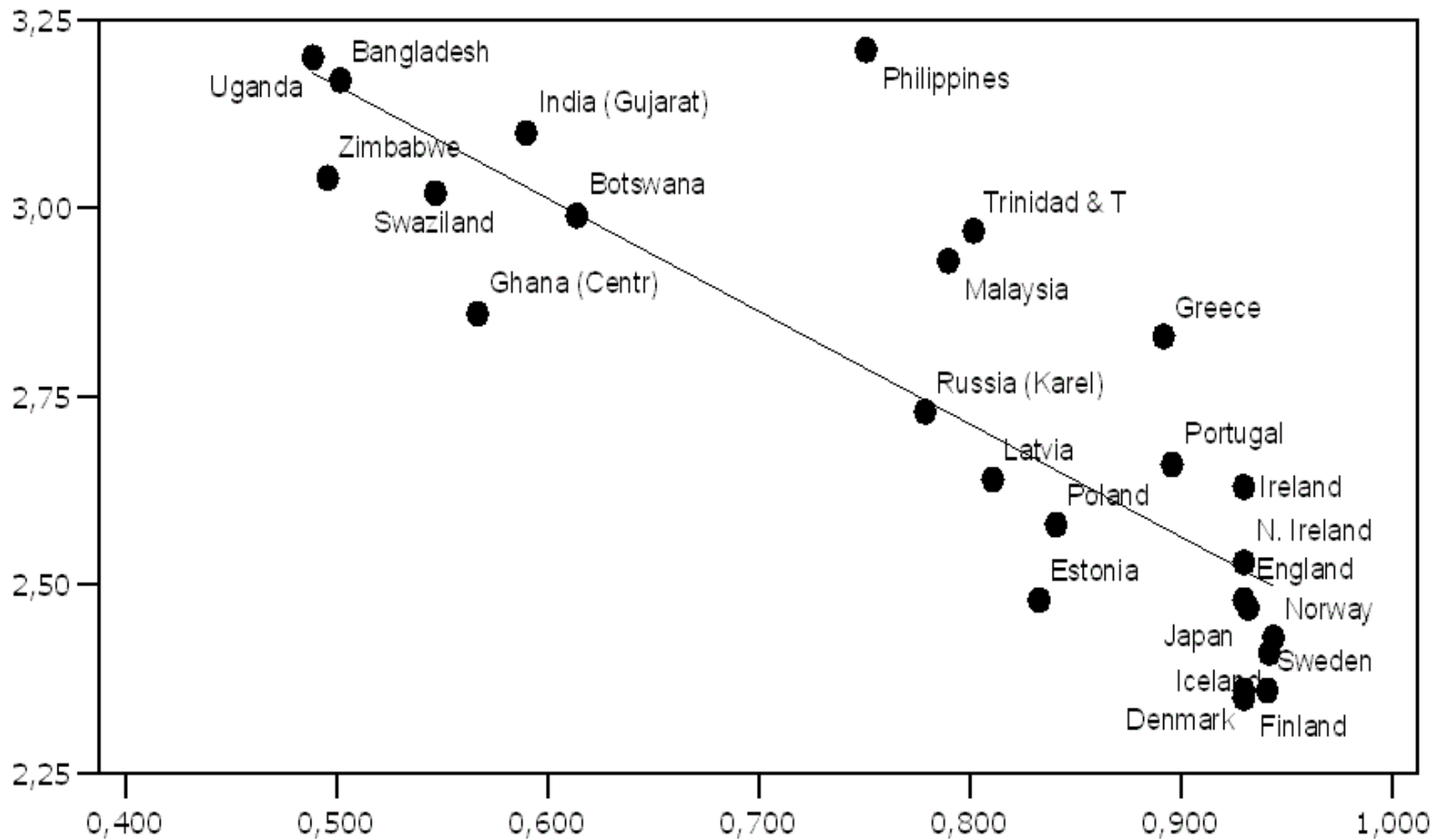| OECD average	UK	USA	Germany	Japan
29	25	36	26	21

Students' attitudes to science: 800 Year 9 students aged 14

- Two-thirds of students think science has a positive influence on society.

- 25% of students think that it would be good to have a job as a scientist, but almost 33% indicate that they definitely do not want a job as a scientist.

- 80-85% of students believe it is important for the country to have well qualified scientists – though most do not want a job involving science themselves.

Judith Bennett and Sylvia Hogarth, University of York for the National Science Learning Centre. Surveys in 2006, 2007 and 2008
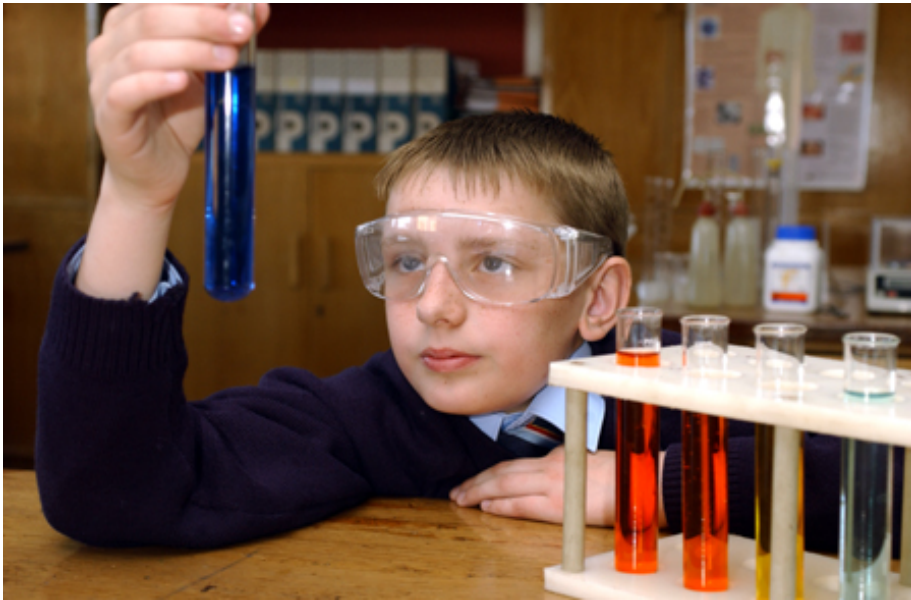
Horizontal axis: Human Development Index
Vertical axis: Scores on questions designed to measure positive attitudes towards studying science
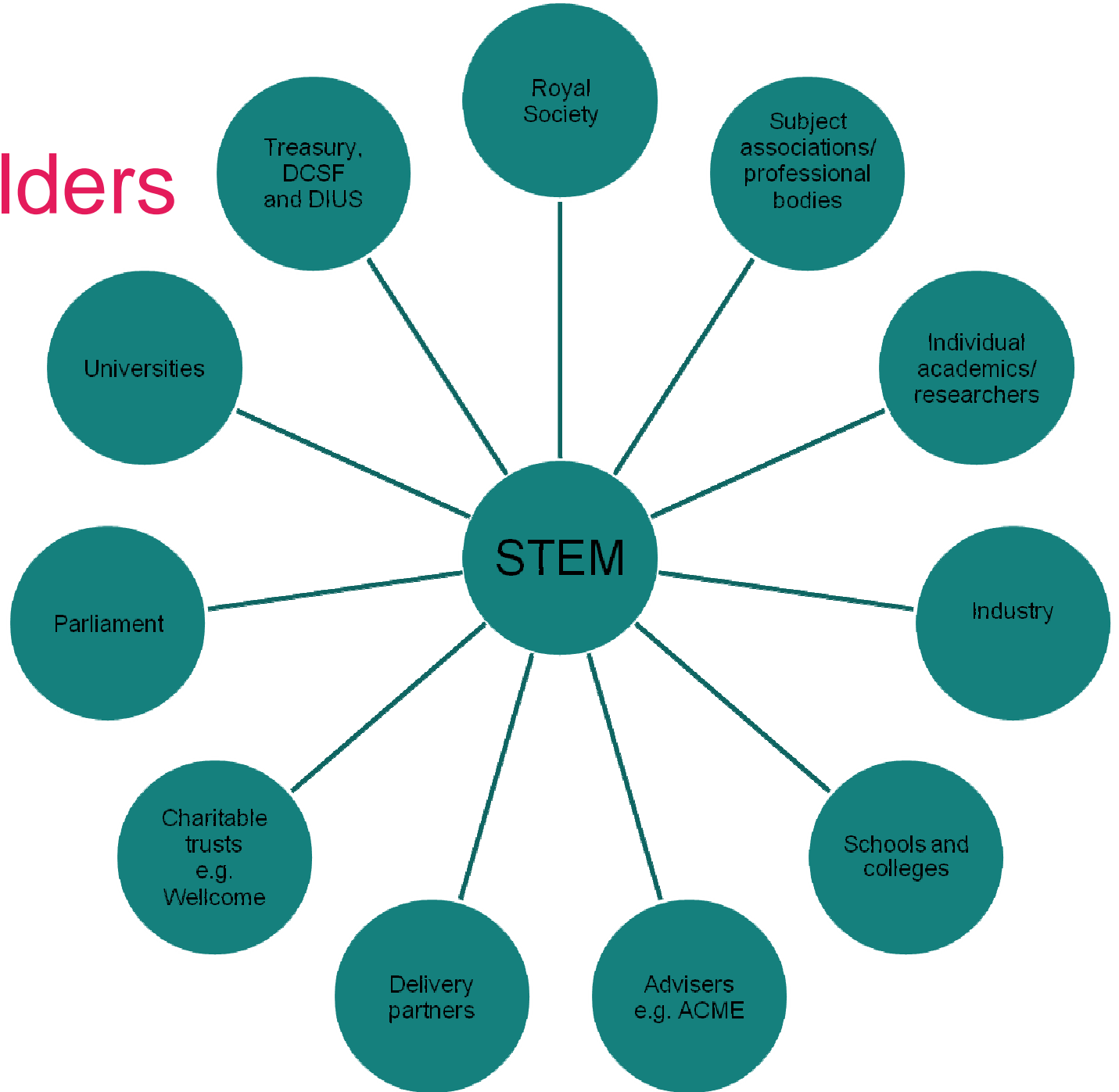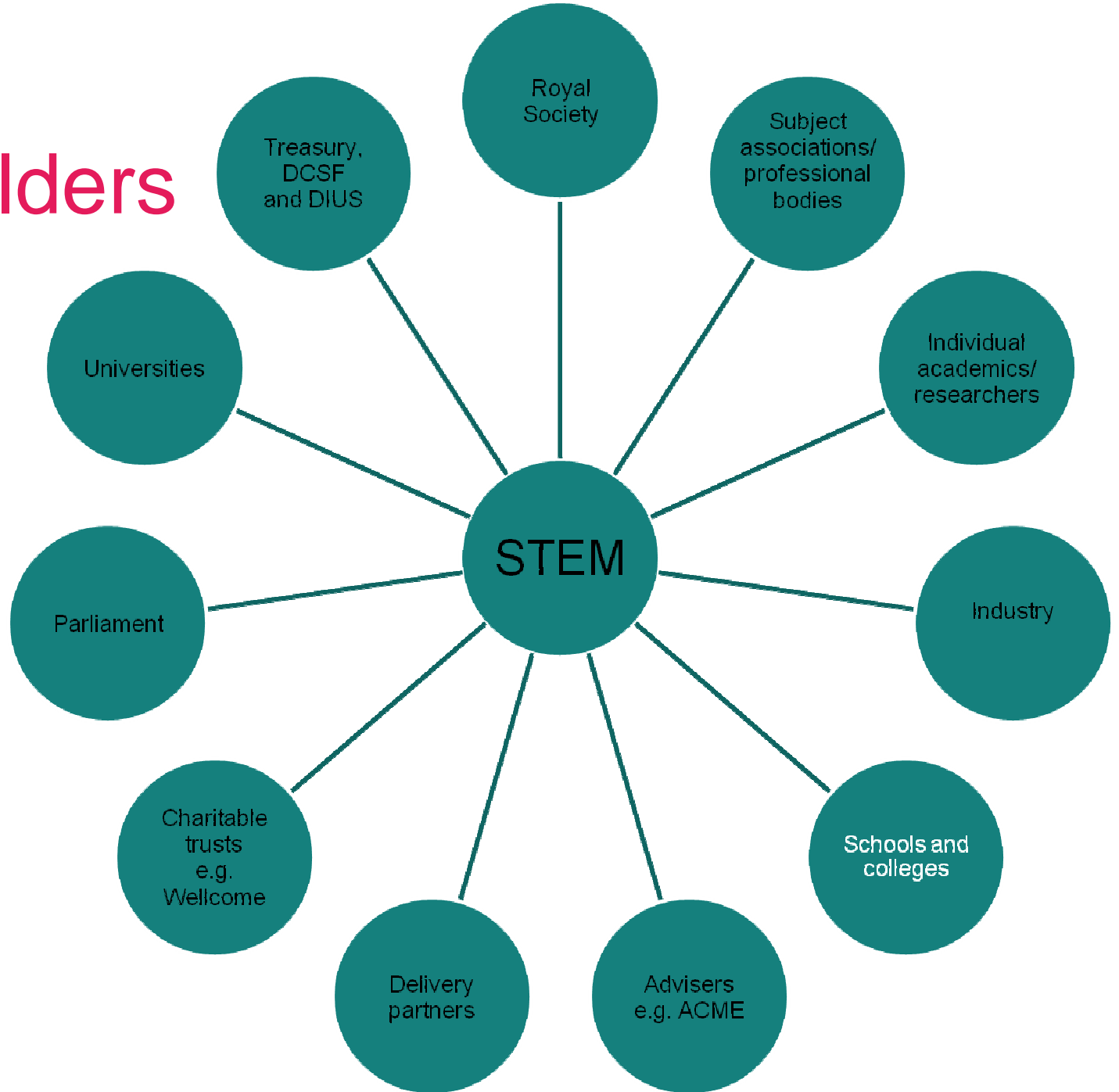
Svein Sjoberg, University of Oslo: Project ROSE

S т е M
inside the classroom

sTEm
outside the classroom

Many stakeholders

Royal Society

Treasury, DCSF and DIUS

Subject associations/ professional bodies

Universities

Individual academics/ researchers

STEM

Parliament

Industry

Charitable trusts e.g. Wellcome

Schools and colleges

Delivery partners

Advisers e.g. ACME

Many stakeholders

Integrating STEM

1. Integrating the teaching of S, T, E and M within schools and colleges

2. Integrating STEM teaching in schools with the world outside

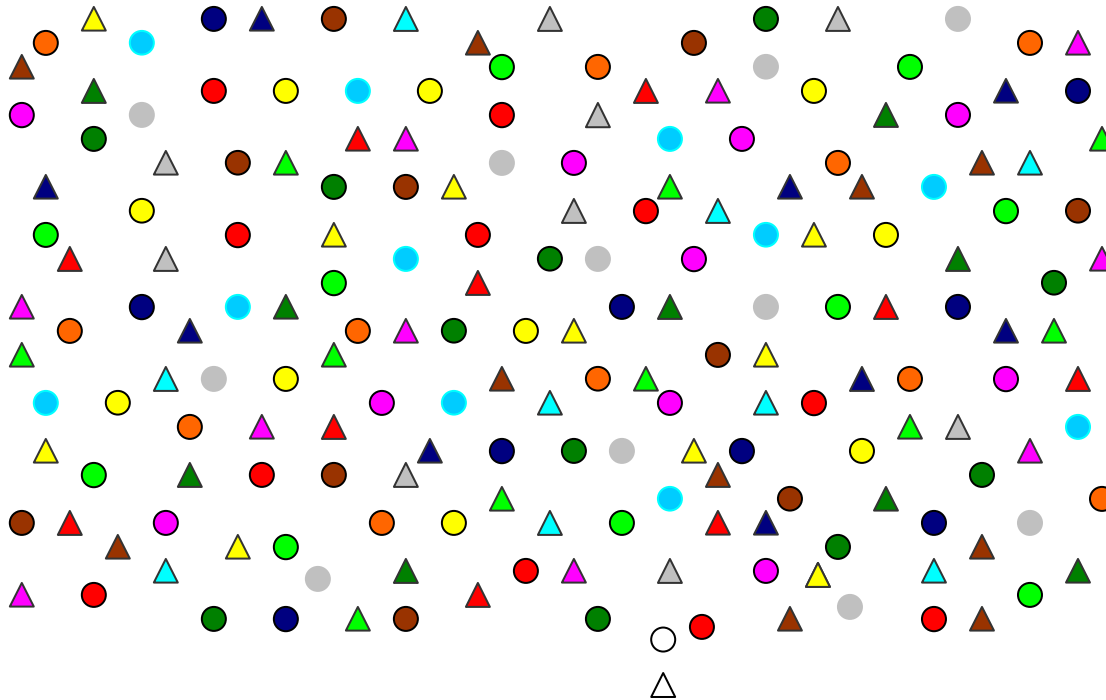3. Integrating the efforts of other partners

Integrating STEM
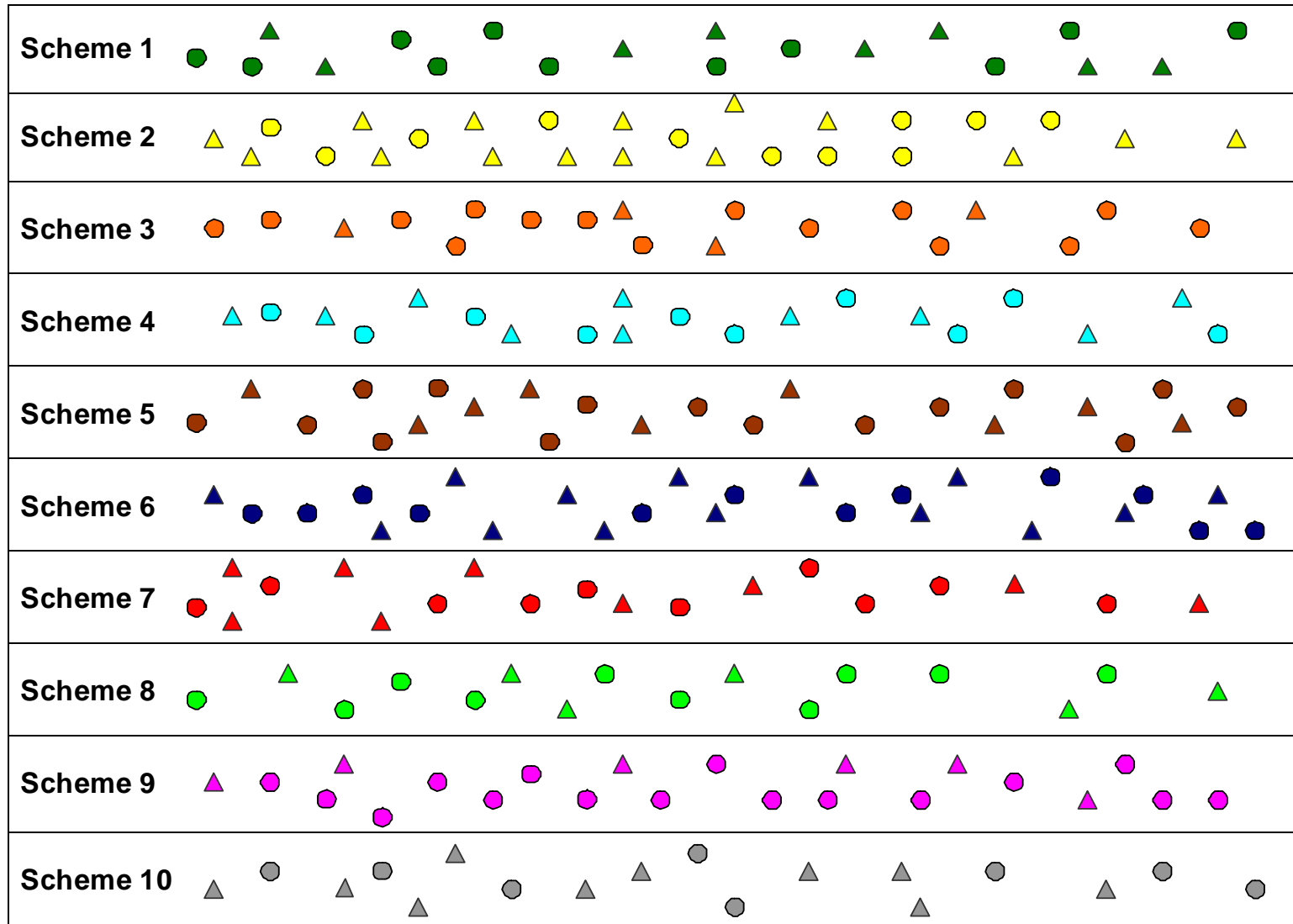
1. Integrating the teaching of S, T, E and M within schools and colleges

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3. Integrating the efforts of other partners

The concept: Where we are moving from

Government funded initiatives
Non-Government funded initiatives

The Concept: 200 or so initiatives sorted into 10 Action Programmes ('schemes')

Priorities

- Get the STEM curriculum right

- Provide the right education infrastructure

- Get the best STEM teachers

- Provide excellent professional development for teachers

- Enhance and enrich the STEM curriculum

- Show what rich careers STEM qualifications can lead to

Action Programmes

Get the curriculum right

AP9 Widening access to the formal science and mathematics curriculum for all students, including access to triple science

- *Lead Organisation: Department for Children, Schools and Families*

AP10 Improving the quality of practical work in science

- *Lead Organisation: SCORE (Science Community Representing Education, convened by the Royal Society)*

Provide the right infrastructure

AP11 Programme to build capacity of the national, regional and local infrastructure

- *Lead Organisation: Department for Children, Schools and Families*

Get the best teachers

AP1 Improving the recruitment of teachers and lecturers in shortage subjects

- *Lead Organisation: Training and Development Agency for Schools (TDA)*

How the world's best-performing school systems come out on top
McKinsey, September 2007

Three things matter most:

- Getting the right people to become teachers
- Developing them into effective instructors
- Ensuring the system is able to deliver the best possible instruction for every child

How the world's best-performing school systems come out on top
McKinsey, September 2007

'Above all, the top performing systems demonstrate that the quality of an education system depends ultimately on the quality of its teachers'

Provide excellent professional development

AP2 Improving teaching and learning through CPD for mathematics teachers

- *Lead Organisation: National Centre for Excellence in the Teaching of Mathematics*

AP3 Improving teaching and learning through CPD for science teachers

- *Lead Organisation: National Science Learning Centre*

AP4 Improving teaching and learning by engaging teachers with engineering and technology

- *Lead Organisation: Royal Academy of Engineering*

Enhance and enrich the curriculum

AP5 Enhancing and enriching the science curriculum

- *Lead Organisation: SCORE*

AP6 Enhancing and enriching the teaching of engineering and technology across the curriculum

- *Lead Organisation: Royal Academy of Engineering*

AP7 Enhancing and enriching the teaching of mathematics

- *Lead Organisation: Advisory Committee on Mathematics Education (ACME)*

Show what rich careers STEM can lead to

AP8 Improving the quality of advice and guidance for students (and their teachers and parents) about   STEM careers, to inform subject choice

- *Lead Organisation: National STEM Careers Co-ordinator at Sheffield Hallam University (Kate Bellingham)*
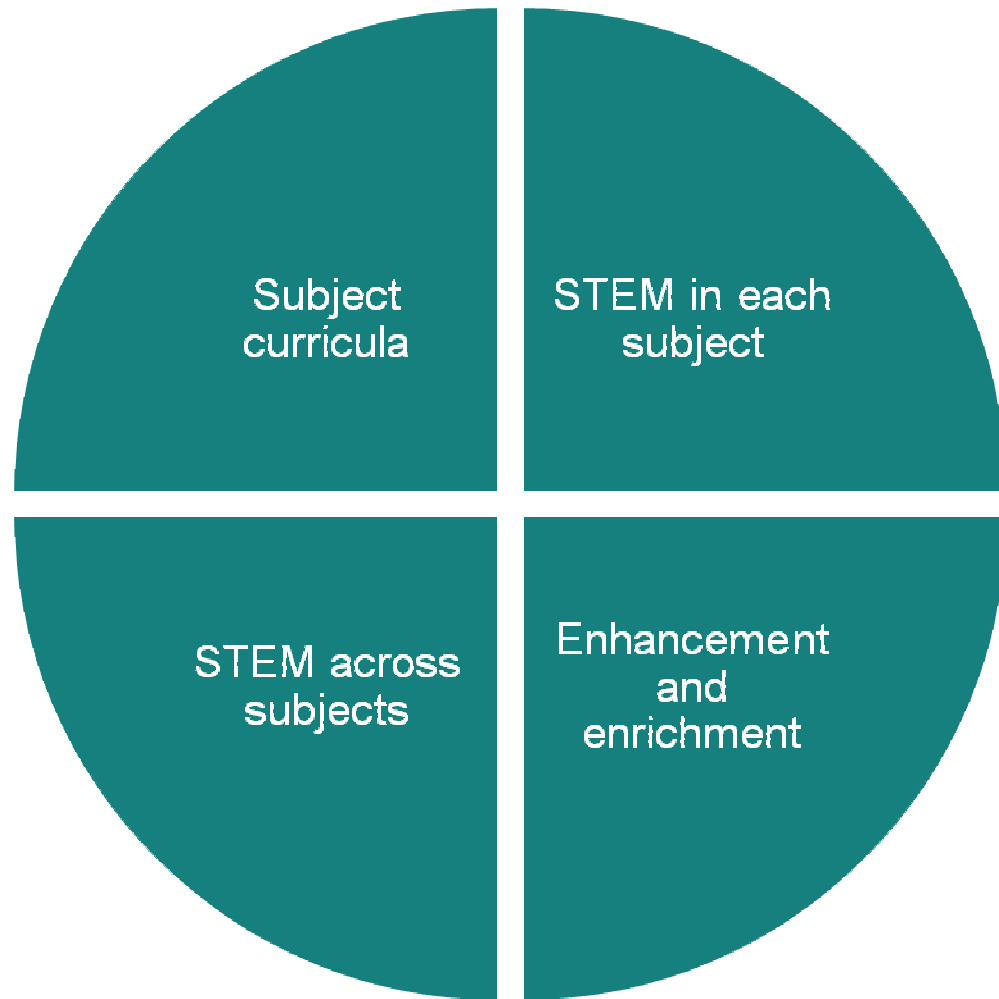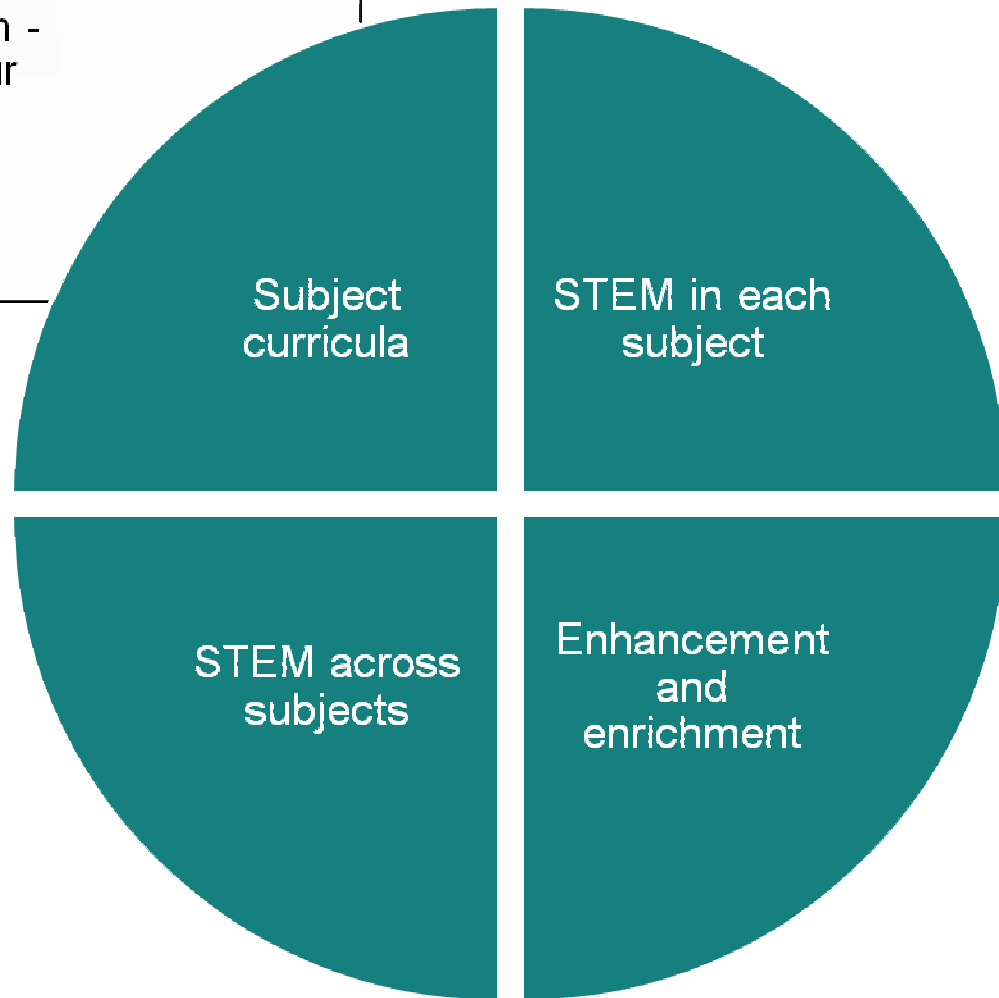
Example

AP6 Enhancing and enriching the teaching of engineering and technology across the curriculum

- *Lead Organisation:*
  Royal Academy of Engineering

- RAEng working collaboratively with SCORE and ACME to produce STEM Directories for schools and colleges.
  Work carried out under the umbrella of the newly formed E&E Strategic Management Group, chaired by STEMNET, and alongside the STEM Directories manager.
  Plans are being developed to move the Directories online.

In schools and colleges

- Developing each subject curriculum - what's right for our students?

Subject curricula

STEM in each subject

STEM across subjects

Enhancement and enrichment

- Developing each subject curriculum - what's right for our students?

- Where can we reinforce STEM examples, and illustrate related careers?

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- Curriculum mapping, cross-curricular projects, cross-curricular themes, a STEM curriculum ...

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Subject curricula

STEM in each subject

STEM across subjects

Enhancement and enrichment

- Curriculum mapping, cross-curricular projects, cross-curricular themes, a STEM curriculum ...

- What's available and working? Who do I need to talk to? What about time and money?

Across the STEM community

- Working together towards common priorities

- Concentrating resources instead of dispersing them

- Widening expertise - sharing what works

- Business partners using Action Programmes to identify opportunities for engagement that match their interests

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