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Engineering the Future: working together to enhance understanding, commitment and participation in engineering

Engineering The Future

Elsa Ekevall and Ernie Spencer

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Engineering and Physical Sciences Research Council

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Engineering the Future

- EPSRC funded project (PI - Prof. Gordon Hayward)
- Faculty of Education University of Glasgow
- Deepening understanding of engineering and embedding engineering across school and university sectors.
- working in partnership with Electronic and Electrical Engineering lecturers from the Universities of Glasgow and Strathclyde
- physics teachers in ten Scottish schools
- policy communities

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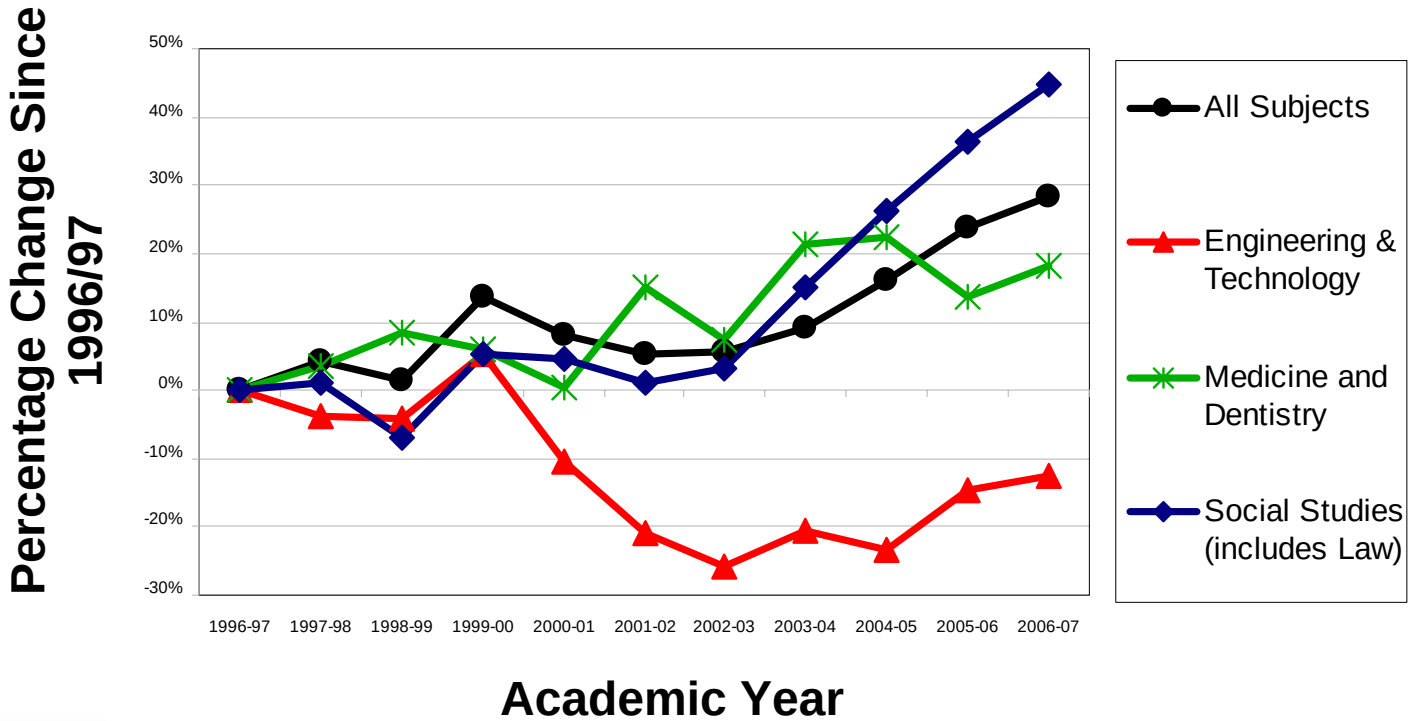
Numbers studying engineering



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Why Engineer the Future?

- Most young people are uninformed about the nature of engineering and its diverse career paths.

- Young people who are aware of engineering often have the wrong perception of engineering.

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Britain's most famous engineer?

www.tvscoop.tv

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Why Engineer the Future?

- Most engineering students surveyed cited family links and classroom experiences as key factors in encouraging them to study engineering.
- “Providing people with information about engineering improves and clarifies understanding of the scope and breadth of engineering and importantly, generates interest in the profession”.

[Public Attitudes to and Perceptions of Engineering and Engineers 2007']

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Imagine a Future without Engineers?

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What is Engineering the Future doing?

- **Developing and sustaining excellent teaching of engineering and associated concepts in schools and universities.**

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Developing and sustaining excellent teaching of engineering and associated concepts in schools and universities.

Produced a set of key ideas:

a) about the nature of engineering and its motivating power

- Using science (in particular physics) and mathematics principles to make functional, practical, useful products.
- “Hasn’t been done doesn’t mean can’t be done”.
- Improves quality of life and personal benefits.

b) the essential characteristics of high quality engineering learning experiences

- ... reflection on, thinking about strategies for problem-solving, design, evaluating; drawing on science and mathematics knowledge; explanations by learners of intentions, processes, solutions;
- constructive feedback, self- and peer-assessment in respect of: knowledge needed for an engineering problem/project and the design – build/make – evaluate – adapt process.

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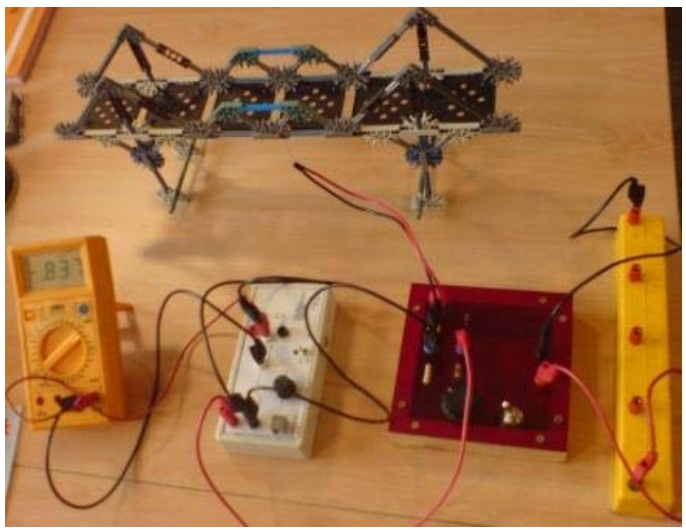
What is Engineering the Future doing?

- Developing and sustaining excellent teaching of engineering and associated concepts in schools and universities.
- **Developing practical engineering experiences through school/university partnerships.**



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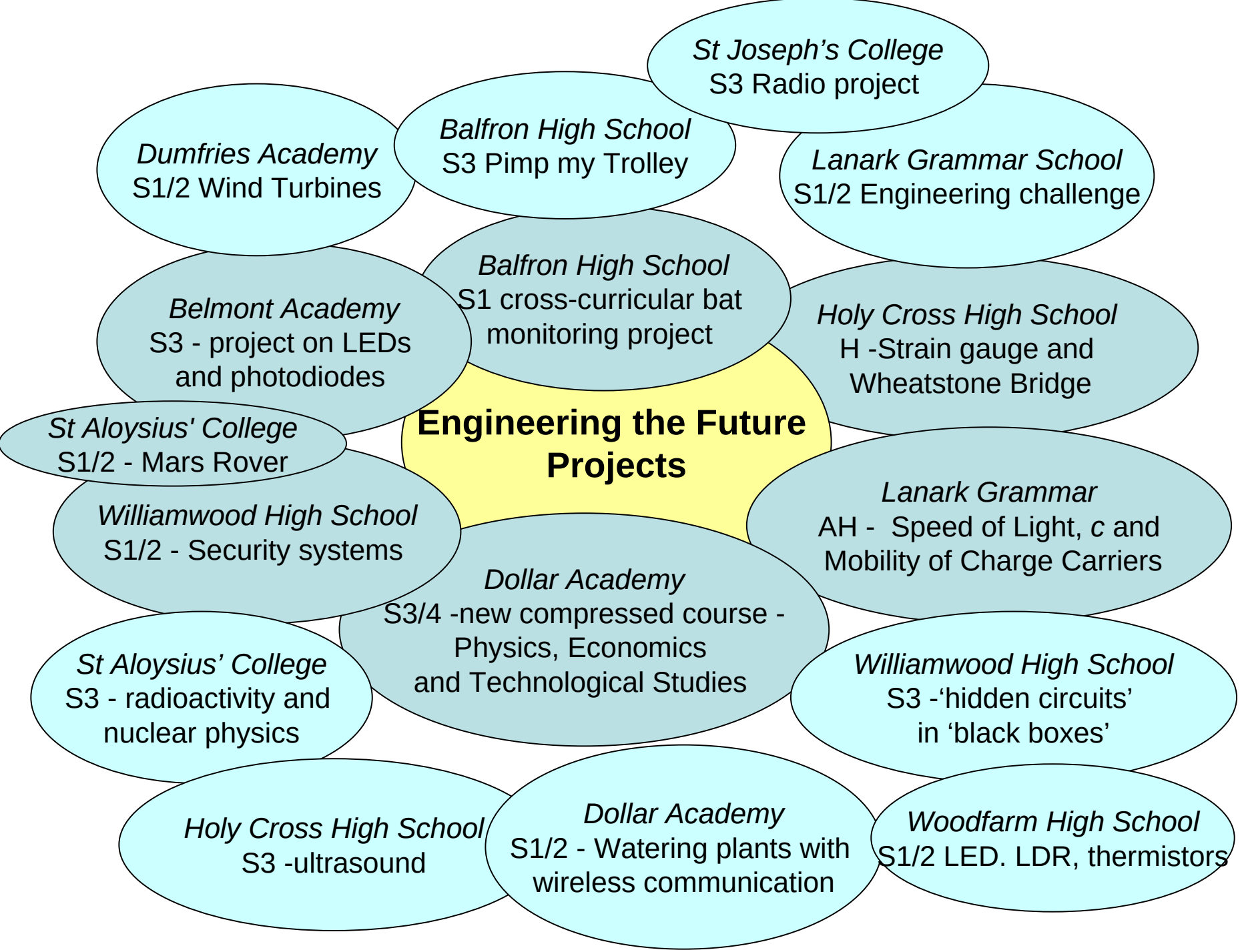
St Joseph's College
S3 Radio project
Dumfries Academy
S1/2 Wind Turbines
Balfron High School
S3 Pimp my Trolley
Lanark Grammar School
S1/2 Engineering challenge
Balfron High School
S1 cross-curricular bat monitoring project
Belmont Academy
S3 - project on LEDs and photodiodes
Holy Cross High School
H -Strain gauge and Wheatstone Bridge
Engineering the Future Projects
St Aloysius' College
S1/2 - Mars Rover
Williamwood High School
S1/2 - Security systems
Lanark Grammar
AH - Speed of Light, c and Mobility of Charge Carriers
Dollar Academy
S3/4 -new compressed course - Physics, Economics and Technological Studies
St Aloysius' College
S3 - radioactivity and nuclear physics
Williamwood High School
S3 -'hidden circuits' in 'black boxes'
Holy Cross High School
S3 -ultrasound
Dollar Academy
S1/2 - Watering plants with wireless communication
Woodfarm High School
S1/2 LED. LDR, thermistors

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What is Engineering the Future doing?

- Developing and sustaining excellent teaching of engineering and associated concepts in schools and universities.
- Developing practical engineering experiences through school/university partnerships.
- **Investigating careers provision in the project schools.**

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Investigating careers provision in the project schools.

- In almost all cases the pattern of guidance was entirely responsive and not directive
- Engineering might be occasionally mentioned to pupils who were very good at science or mathematics.
- Careers guidance and materials did not normally explain the nature of engineering.
- Produced two leaflets
  - “Engineering - is it for you?” aimed at S2 (age 13/14)
  - “Electronic and Electrical Engineering – is it for you?” aimed at S4 (age 15/16)

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- Investigating careers provision in the project schools.
- **Embedding engineering in curriculum policy.**

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The world outside school	**sTEM**
The school curriculum	**STEM**

Reproduced from the 'Update on STEM report' presentation at the BA Science Communication Conference 2007, Professor John Holman, Centre Director, National Science Learning Centre.

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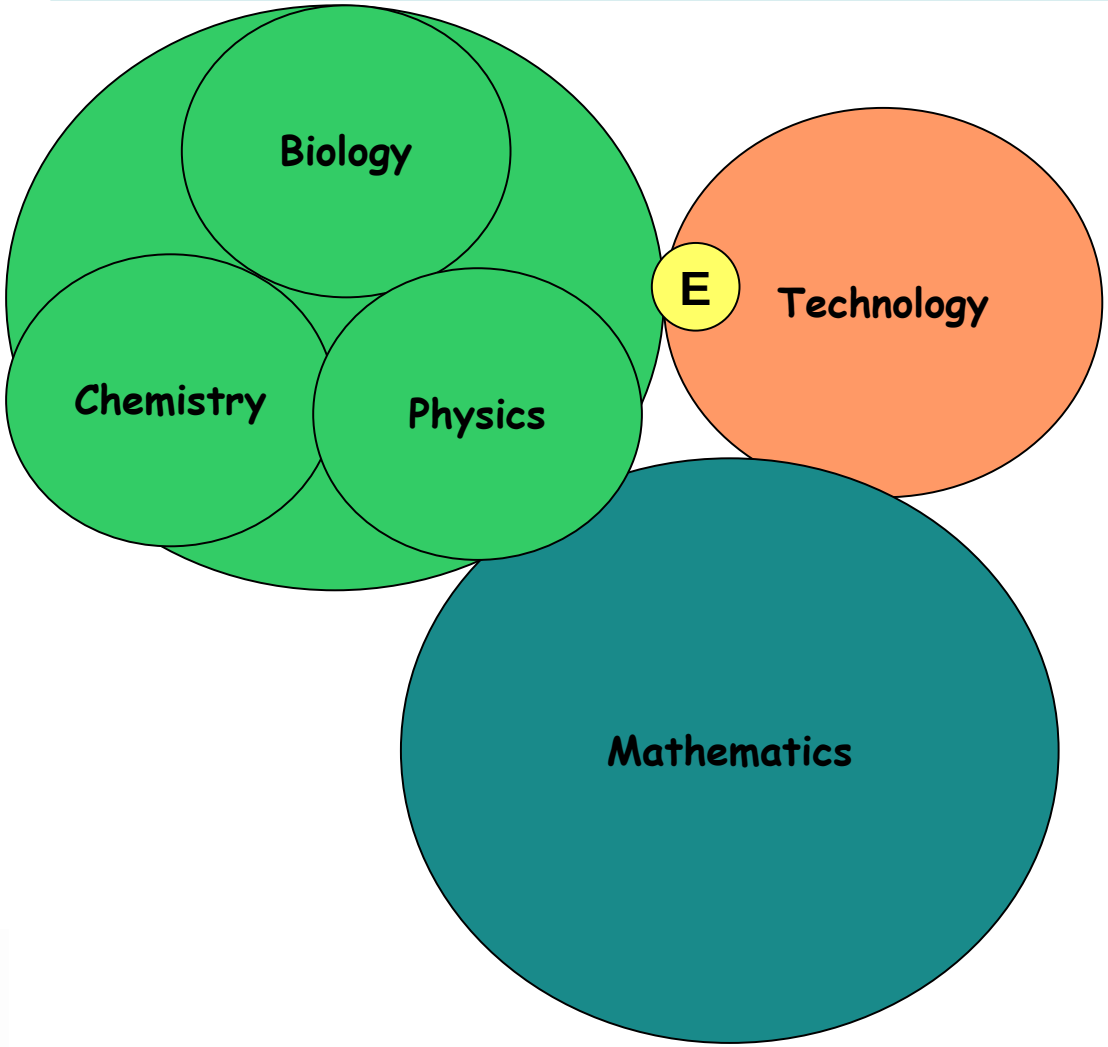

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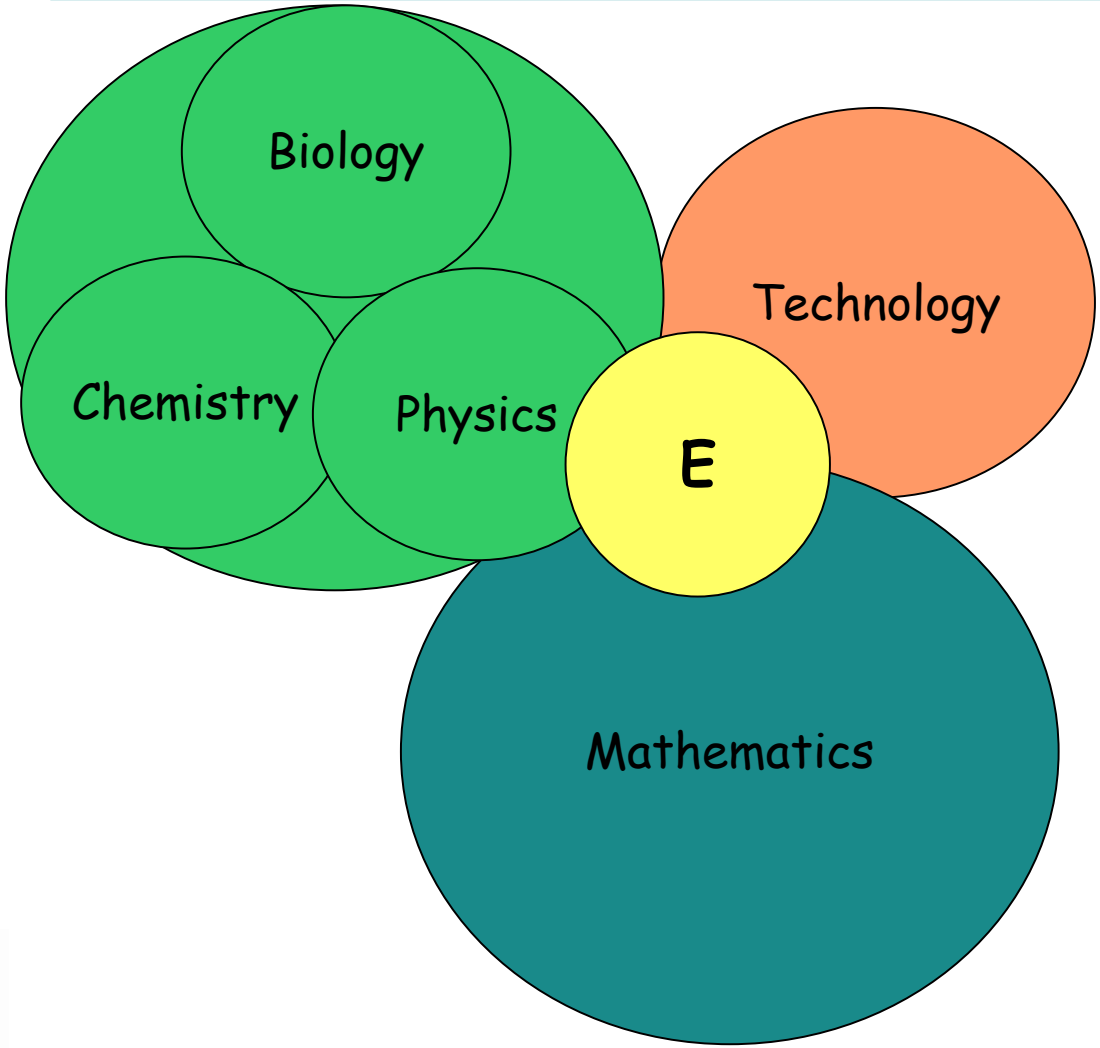

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- **Promoting curricular continuity from school to university.**

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Promoting curricular continuity from school to university.

- Teachers and university staff appear to have enjoyed the processes and practice of collaboration.
- Reciprocal school and university visits highlighted changes in student's knowledge entering university.
- Review of content and pedagogy in university Years 1 and 2.
- Reward and/or recognition for university staff is an issue.

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- Embedding engineering in curriculum policy.
- Promoting curricular continuity from school to university.
- **Working with local and national policy makers to ensure the sustainability of any developments.**

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Working with local and national policy makers to ensure the sustainability of any developments.

- Engagement with:
  - Curriculum for Excellence
    - sought formal inclusion of engineering in the emerging reformed curriculum
    - engineering exemplars
  - Industry
    - seeking to identify features sought in employment of high quality graduates
    - Bio-Dome game
  - Professional Bodies
    - seminars and engineering event

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Engineer the Future

- Evidence that young people want to be informed about engineering.
- Developed 25+ engineering activities of varying lengths for science and physics programmes (S1 to S6).
- Greater understanding of school-university partnerships including the benefits of participating.
- Engineering activities successfully trialled by schools within and out with the project.
- Very positive reactions from both the pupils and teachers to the engineering activities. "they made you think", "challenge but achievable", "hard but enjoyable"
- Raised profile for engineering in Curriculum for Excellence science and technology documents.