

## Engineer's Challenge

### Engineering Liaison Service, West Midlands Engineering Centre, Birmingham

An 'Engineer's Challenge' is an event, jointly planned and run by teachers and neighbourhood engineers, in which teams of pupils use a kit of construction materials to design and build solutions to an engineering-related problem

#### ■ Using Engineer's Challenge in the Development of Personal and Group Skills

The experience of Engineer's Challenge can help in the development of personal skills (appreciation of own strengths and weaknesses, ability to co-operate with others and to give and receive feedback) and group skills (planning, decision-making, negotiating, tolerating and supporting others, understanding the nature of leadership).

This kind of development is most likely to come through the pupils reviewing the experience. In the excitement of judging and the hurry of clearing away, the opportunity for this kind of review tends to be lost. Therefore, it can be valuable to follow up the event with a review session which could be based on the questionnaire reproduced below.

As skills development is a progressive process, schools may wish the pupils to undertake activities for developing group and personal skills, before and/or after the Engineer's Challenge event. In this way the event becomes part of an overall programme and pupils have the opportunity to put into practice the results of their review. A good source of activities of this kind is 'Learning in Action' by Roger Kirk (Basil Blackwell).

Engineers may wish to be involved in the review session. They may want simply to observe, or to contribute their own observations of the event or their own experience of the importance of teamwork.

#### ■ Using the Questionnaire

The questionnaire is intended to help pupils to reflect on their experience. This reflection should then be developed through discussion.

If pupils are still in the teams in which they worked on the challenge, the discussion could be in groups, comparing their responses to the questionnaire and identifying areas of agreement and disagreement within the team. Alternatively, a whole class discussion could develop from the responses, using questions such as: 'how did you achieve that?' and 'why do you think that happened — or didn't happen?' Discussion might lead to some agreement on what makes a good team.

#### ■ How a school can make use of an Engineer's Challenge Event

##### ■ The experience

Engineer's Challenge provides the experience of working together in a team to solve problems that call upon pupils' imagination, ingenuity, perseverance and practical, social and communication skills, as well as their ability to work within constraints of time and materials.

The Challenge makes use of their existing knowledge and provides an experience that can subsequently be drawn upon in a variety of subject areas.

Trials show that pupils find the experience enjoyable, challenging and ultimately very satisfying as they discover that they can produce an artefact that successfully performs its required function.

##### ■ How the experience could be used

The school might wish simply to treat this experience as an end in itself, or it might wish to consider one or more of the many ways in which it can link it with other aspects of its work.

##### ■ 1. Specific subject areas

Challenges link with the programmes of study for a range of subjects

###### Technology

Depending on the particular challenge, pupils will: select and use mechanisms to control movement, design and make structures to take stationary and moving loads. They will need to organise themselves to work in effective teams, plan, and take account of material constraints. A cost factor can easily be introduced into any of the challenges to help pupils to realise that economic factors can influence design and technology activity. Through the activity, pupils will be demonstrating their ability in AT2, AT3, AT4.

###### Science

Challenges give pupils an opportunity to use electric motors and mechanically driven models. They link with work on: investigating the effects of forces in relation to the design and evaluation of structures, friction, measurement of speed, law of moments, turning force, centre of mass, effectiveness of simple machines such as pulleys (AT4).

**English**

The Challenge itself is a group discussion activity. It also provides a possible stimulus for further discussion work such as that arising from the use of the questionnaire Fig.1 (AT1).

A school might involve pupils from a different year in reporting on the event, interviewing pupils, teachers, engineers, and writing a report for the school newsletter, or presenting it as a radio or TV report (AT1, AT3).

**Mathematics**

Challenges can be linked with work on AT2, 'Number' (e.g. scale, gear ratios) or might be used to provide a starting point for projects that use and apply mathematics (AT1).

**History and Geography**

The bridge building challenges could be linked with the study of transport systems (Geography AT4) or of the significance of roads and bridges in expansion, trade and industry (History KS3 Core Study Unit 4). The water tower challenge might be linked with study of water supply (Geography AT5).

The Challenge might be the culmination of a scheme of work or an injection of practical experience part way through. Alternatively, it could be the starting point so that topics touched upon in the Challenge are investigated further in subsequent lessons.

■ **2. Social education**

An important strand of the Engineer's Challenge experience that can be picked up in lessons such as PSE, Guidance, etc., is that of teamwork.

■ **3. Cross-curricular themes**

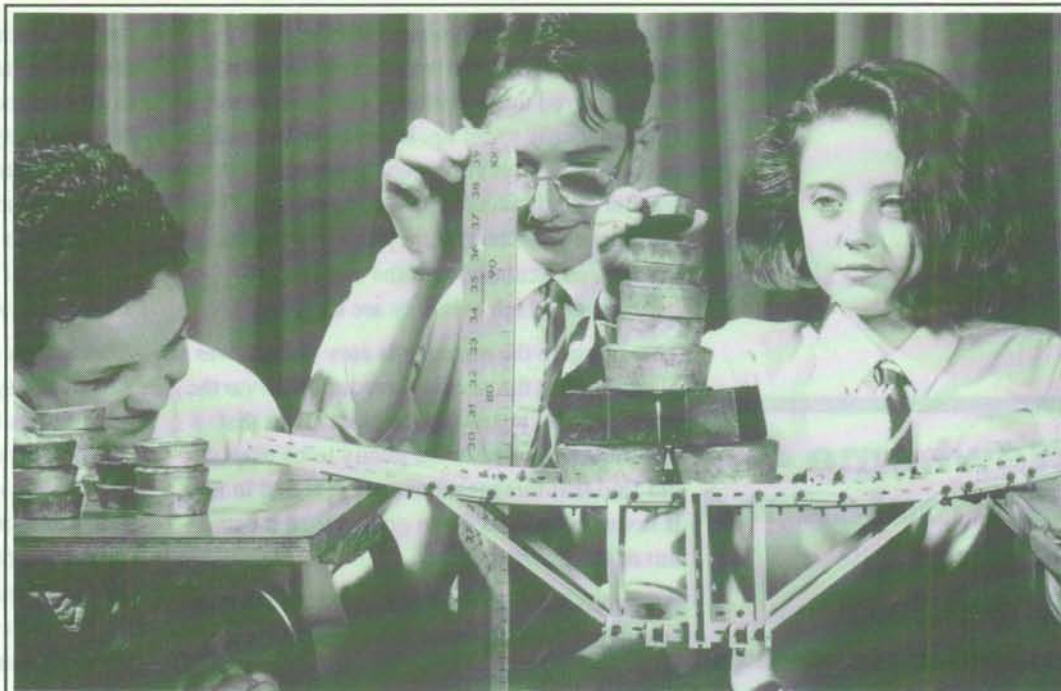
An Engineer's Challenge event can play a useful role in the delivery of the theme of Economic and Industrial Awareness, in that it provides a focus for bringing together engineers from local companies with pupils and staff of the school in a purposeful and practical situation from which can develop the range of contacts and exchanges required for successful school-industry links.

The planning of the event provides a good opportunity to bring together teachers with a

## Teamwork Questionnaire

Put a tick in one of the five columns for each one of these statements.

	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
1. We spent time planning before we started to build.					
2. We shared the building equally.					
3. Our ideas changed as we worked.					
4. We didn't disagree at all.					
5. We had disagreements but we worked them out.					
6. The team was dominated by some people.					
7. We had a clear idea of what we wanted to do.					
8. Everybody in the team helped to make decisions.					
9. I listened to what other people had to say.					
10. Other people in the team listened to what I had to say.					
11. I was a useful member of the team.					
12. We used the kit well.					
13. The team encouraged all its members to contribute.					
14. I could have helped the team more.					
15. We made the best use of our time.					



range of specialisms, to discuss how the pupils' experience can feed into work in their particular part of the curriculum. In this way, the event can act as a catalyst for the inter-departmental communication that is necessary for the delivery of cross-curricular themes.

From this point of view, a curriculum co-ordinator is an appropriate contact for planning a Challenge event.

#### ■ 4. Public relations

The event itself can of course be publicised through a school newsletter or the local press.

However, because it brings visitors into the school and fosters relationships with companies, Engineer's Challenge also provides a more wide ranging opportunity to raise awareness in the local business and industry community, of what the school is aiming to achieve, and how it goes about doing it.

The Engineer's Challenge Kit has been developed and trialled jointly by EEF West Midlands and Economatics (Education) Ltd, specifically for use in these events.

Each kit is packed in a sturdy carrying case with inner sorting tray. It contains over 400 Fischertechnik components including an electric motor with gear box, mechanisms, wheels, axles and a wide range of structural elements.

Kits are supplied with an accompanying booklet containing: guidelines for organising the event, information about using the kit and 5 suggested challenges which have been trialled in schools.

Engineer's Challenge Kits can be ordered from Economatics (Education) Ltd.

ECON 2333 *Individual Kit* £115.00  
 ECON 2333/15 *Set of 15 kits* £1425.00  
 (Prices include carriage and packing, and exclude VAT)

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