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## Executive summary

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# Tomorrow's Engineers evaluation of careers materials

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## Background and rationale

The Tomorrow's Engineers programme distributes careers materials to help engage pupils and teachers with engineering, increase their understanding of engineering careers opportunities (and the academic and vocational routes into those careers) and help reinforce the relationship between science and mathematics subjects and engineering careers. The careers materials which are currently aimed at 11-14 year old pupils have been developed collaboratively between EngineeringUK, the Institution of Engineering and Technology, the Institution of Mechanical Engineers and the Institute of Physics.

The Tomorrow's Engineers careers materials are an element of the Tomorrow's Engineers programme, which delivers (via a number of partners) extra-curricular engineering activities for school children, giving them the opportunity to undertake hands-on engineering tasks and ask questions about what engineering jobs entail. NFER's 2011/12 qualitative case-study evaluation of Tomorrow's Engineers identified that the careers materials were viewed positively by teachers but that they were, in the main, only distributed to the teacher at the end of an activity, and recommended that careers materials should instead be embedded into the delivery of the activity.

This research explored the usage, perceptions and impact of the careers materials with a view to determining recommendations to increase their impact.

The key research questions addressed by the evaluation were:

### Use of the careers materials

- How have teachers and pupils engaged with and used the careers materials prior to the Tomorrow's Engineers activity?
- How are the careers materials used during the Tomorrow's Engineers activities?

### Perceptions of the careers materials

- What are teachers' and pupils' perceptions of the careers materials (including overall appeal, design, format, content, and usability)?
- What changes would teachers and pupils make to the careers materials?

### Impact of the careers materials

- What messages do the careers materials convey about engineering, qualification routes and current engineering career opportunities? Are these messages positive or negative?
- Are the careers materials positively changing attitudes towards engineering?
- Do the careers materials motivate pupils to seek out further information?

### Future use of careers materials

- How do teachers anticipate using the careers materials?
- What further support (e.g. CPD) do teachers need to use the careers materials effectively?

The evidence in this report is drawn primarily from eleven pupil focus groups (pupils aged 12-15) and nine teacher interviews. Consultees came from nine schools located across England and Northern Ireland. Focus groups with pupils and interviews with teachers included both those who had been involved with a Tomorrow's Engineers activity and those who had not (see Appendix 2 for details). In the analysis, responses from participants and non-participants (in a Tomorrow's Engineers activity) were compared and differences in those groups' responses (in terms of perceptions and impact) are highlighted in the report.

In addition, pupils and teachers interviewed for the qualitative case-study evaluation of Tomorrow's Engineers' activities were asked some questions on the careers materials. Evidence from these case-study interviews is also drawn on in this report.

# Executive summary

Thematic analysis of the qualitative evidence gathered from pupils (11 focus groups) and teachers (nine interviews) on the Tomorrow's Engineers careers materials addresses the following research areas:

1. pupils' views on engineering
2. teachers' familiarity with the careers materials, and how these were used during the case study activities
3. pupils' and teachers' perceptions of the careers materials, as well as the key messages about engineering that were conveyed by the materials
4. the impact of the careers materials on pupils' perceptions of engineering and interest in an engineering career
5. how teachers anticipated using the careers materials in the future and the support they needed to use them effectively
6. recommendations for Tomorrow's Engineers delivery partners
7. recommendations for the Tomorrow's Engineers Careers Project Group.

## 1. Pupils' views on engineering

**Whilst pupils generally had very limited knowledge of what constitutes engineering, they nevertheless associated engineering with positive personal qualities.**

Pupils generally had a very limited knowledge of what engineering is or the range of engineering sectors that exist. However, on the whole pupils associated engineering with positive personal qualities such as being hardworking, educated and determined. Some students however expressed negative attitudes towards engineering as a career choice, based on their perception of it as 'dirty/greasy/messy' work mainly in relation to cars.

## 2. Use of Tomorrow's Engineers careers materials

### 2.1 Use of Tomorrow's Engineers careers materials during the activities

**The careers materials were sometimes available during the event, but were not used as an integral part of delivering the activities.**

In two case studies, the careers materials were available (though not the current 2013 pack) and pupils were to some extent encouraged to engage with them. In another two case studies, delivery partners had laid out the careers materials but pupils were not prompted to look at them. Occasionally, where the careers materials were not used, images from the

careers materials and the Tomorrow's Engineers logo and web address featured on presentation slides used during the activity.

**Most teachers thought that it would not have been helpful to introduce and/or use the careers materials during the activities.**

Most teachers felt that using the careers materials during the activities would have distracted pupils from the activity. Some teachers suggested that, instead of using the careers materials as part of the practical activities, it would be better to introduce the careers materials afterwards (in a careers session), to reinforce positive messages about engineering and as a reminder of what they had learned during the practical part of the day.

### **3. Pupils' and teachers' perceptions of the Tomorrow's Engineers careers materials**

#### **3.1 Overall perceptions of the Tomorrow's Engineers careers materials**

**Pupils and teachers were predominantly positive about the overall package of careers materials.**

Pupils and teachers were generally positive about the careers materials as a package; pupils were particularly enthusiastic about the visual appeal of all the careers materials (discussed below in more detail).

**Pupils and teachers thought that the careers materials portrayed a positive, modern impression of engineering and showed that there are opportunities for both boys and girls.**

Pupils and teachers thought that the types and range of engineering sectors featured in the careers materials helped demonstrate the diversity and accessibility of engineering, and that it could be exciting and relevant to their lives. Pupils and teachers thought there was information of interest to both boys and girls, and only one item (the 'Bad hair day' postcard) was considered to be solely of interest to girls and not gender neutral.

**Pupils and teachers had mixed views as to the age range to which each element of the careers materials was most suited.**

Amongst the pupils and teachers there were differing opinions on which age range of pupils would find each element most useful or appealing. Overall, pupils and teachers felt that the postcards and posters were suitable for Key Stage 3 and Key Stage 4, but that the leaflet was aimed at Key Stage 4 to Key Stage 5 pupils seeking careers information or interested in engineering careers (an older age group than the materials had been originally designed for).

**Pupils found the postcards most useful and appealing, while teachers were most likely to value the themed posters.**

The postcards were the element of the careers materials which appealed most to pupils, and teachers independently corroborated this. However several teachers found it difficult to think of ways they could use them pro-actively. The themed posters were generally liked by pupils

and teachers, although several pupils reported that the short biographies were unnecessary additional information.

#### **Pupils and teachers were less enthusiastic about the routes poster and the leaflet.**

Pupils were not very interested in the routes poster. A few teachers felt the routes poster was too simplistic and less attractive than the themed posters. The leaflet attracted least interest from pupils, particularly younger groups of pupils. Pupils and teachers felt the content was useful for older pupils.

### **3.2 Perceptions of the design and format of the Tomorrow's Engineers careers materials**

#### **Most pupils and teachers were positive about the overall design of the careers materials.**

Most pupils and teachers expressed positive reactions to the 'eye-catching' design of the careers materials, including the layout, colours, themes and format. Pupils felt that the postcards and posters appealed to people of their age (interviewees ranged from Year 7 to Year 10).

#### **Pupils and teachers suggested some improvements to the design of the careers materials.**

Some pupils and teachers felt the relevance of the images used could be improved, for instance by using more images of 11-14 year old children, and more images of engineers at work. A few teachers suggested that the Engineering Fashion poster should use more appealing high fashion images rather than jeans. Some pupils and teachers felt that the routes poster could be more colourful and include more images. They also felt the layout and colour scheme of the leaflet was unclear and one teacher commented that children with reading difficulties would struggle to access it.

### **3.3 Perceptions of the content of the Tomorrow's Engineers careers materials**

#### **The amount of information provided by the postcards was considered appropriate, however the leaflet and posters were perceived to contain too much text, particularly for 11-14 year olds**

There were mixed views on the amount of information provided by the careers materials. Most pupils and teachers thought the amount of text on the postcards was appropriate and well balanced with the images. Several pupils and some teachers commented that there was a lot of text in the leaflet and on the posters. A few teachers stated that the amount of information on the leaflet would be fine for older students who were already considering engineering, but would not appeal to younger students or those who had as yet given no thought to engineering as a career option.

#### **Most pupils and teachers were positive about the content of, and topics covered by, the careers materials.**

Most pupils and teachers were positive about the content of the careers materials, reporting that they worked well as a package. They also considered that the range of topics covered by the postcards and posters was a very good feature, and they found the language and tone of the text to be easy to understand.

#### **Pupils found the postcards were the most appealing element of the careers materials.**

Most pupils felt the postcards were the element of the careers materials with which they were most likely to engage. Three postcard topics were very popular among pupils: 'Cash in your pocket', 'Songs in your pocket' (these two were liked by boys and girls) and 'Bad hair day' (this was liked by girls).

### **3.4 Perceptions of the suitability of the Tomorrow's Engineers careers materials for different pupil groups**

#### **Teachers and pupils had mixed views on the suitability of the careers materials for different age ranges, identifying different elements as suitable for different age groups.**

Teachers had mixed views on the suitability of the careers materials for different age ranges. About two thirds of the teachers thought the postcards were suitable for Key Stage 3 pupils (and older). However, about a third of the teachers indicated they would not expect Key Stage 3 pupils to be ready to engage with careers materials. Many teachers felt that the posters were more suitable for Key Stage 4 pupils. In contrast, pupils tended to think the themed posters were suitable for all ages while the routes poster would be appropriate for Key Stage 4 pupils. Pupils and teachers both thought that the leaflet was most appropriate for Key Stage 4 and Key Stage 5 pupils.

#### **Pupils and teachers considered that the overall package of careers materials appealed to boys and girls, with a slight bias toward girls.**

In general, pupils and teachers felt the careers materials appealed to boys and girls, perceiving that some items (such as the 'bad hair day' postcard and Engineering Fashion poster) were deliberately targeted toward girls. Overall, teachers perceived a slight bias toward girls, and thought this was appropriate.

### **3.5 Perceptions of the key messages conveyed by the Tomorrow's Engineers careers materials**

#### **Pupils and teachers were almost unanimous in their view that the careers materials conveyed a positive, modern and inclusive impression of engineering.**

Almost all pupils and teachers felt that the careers materials gave a modern, positive and inclusive impression of engineering. Pupils perceived that the careers materials demonstrated the relevance of engineering to everyday life and familiar products, and highlighted the diversity of areas in which engineers are involved. A few pupils, however, felt that the postcards were all about aspects of engineering which had been successfully accomplished, which made it more difficult to see a role for themselves in that area in future.



**Pupils rarely linked the topics featured in the postcards and posters with STEM subjects and teachers identified this as an area for improvement.**

Pupils did not often make a connection between the engineering activities featured in the postcards and posters with STEM subjects. Some teachers indicated that the careers materials did not make explicit connections with STEM subjects, and that it was important that they did in order to reinforce these links in pupils' minds.

## **4. Impact of the Tomorrow's Engineers careers materials**

### **4.1 Impact of the Tomorrow's Engineers careers materials on pupils' perceptions of engineering**

**Pupils and teachers agreed that the careers materials helped to broaden pupils' perceptions of engineering as a sector.**

In response to the careers materials, many pupils said that they were surprised by the range of areas in which engineers worked, and appeared to have a broader impression of engineering careers than they had prior to looking at the careers materials. Some teachers commented that the careers materials helped to challenge gender stereotypes by including images of female engineers.

**Some pupils and teachers consider the different types of materials work well in the current package as each item offers progressively more detailed information about engineering**

Some pupils and teachers reported that the different types of materials complement each other well and provide a coherent package of information which provides progressively more detailed information about engineering. In essence, the postcards act as the 'hook' which attract pupils' attention, the posters explore an engineering sector in more depth and then the leaflets provide more specific answers on the routes into different engineering careers and the salaries to which young people can aspire in these engineering roles.

### **4.2 Impact of the Tomorrow's Engineers careers materials on pupils' interest in an engineering career**

**Some pupils said the careers materials had slightly increased their interest in engineering.**

Some pupils said that, having seen the careers materials, they were slightly more interested in engineering because the careers materials featured a product or topic of interest to them, which they had not realised was related to engineering. A few pupils reported that the careers materials could help them make decisions about GCSE subject choices.

## **5. Future use of the Tomorrow's Engineers careers materials**

### **5.1 Teachers' anticipated use of the Tomorrow's Engineers careers materials**

**Overall, teachers had mixed views on the future usefulness of the careers materials in school.**

Around half the teachers did not feel strongly one way or the other about the future usefulness of the careers materials in school. A few teachers were very positive, commenting that they valued having plenty of these kinds of careers materials in school. In contrast, two teachers stated that careers materials were not a useful way to inspire young people to take up particular subjects or engineering, and that it was more important to engage pupils in hands-on activities such as Tomorrow's Engineers.

**Most teachers indicated that they would display the posters around their school. The leaflets were most likely to be passed on to the school's careers adviser.**

Most teachers found the themed posters the most useful element of the careers materials pack. Several teachers indicated that they would pass the leaflets on to the school careers adviser or put them in the careers resource area.

**Some teachers found it difficult to identify a use for the postcards.**

Some teachers could not think of a use for the postcards and were concerned that pupils would discard them. However, a number of teachers gave some examples of how they might use the postcards in a relevant lesson or tutorial.

**Delivery partners commonly reported that the careers materials packs were well received. In contrast, many teachers indicated it was likely that they would use only the themed posters.**

A few delivery partners commented that the careers materials packs were well received by teachers and that they appeared to fill a gap in the engineering careers information available. Teachers themselves indicated that they were most likely to only use the themed posters from the pack.

### **5.2 Teachers' need for support to use the Tomorrow's Engineers careers materials**

**Most teachers did not see a need for support in using the careers materials.**

Most teachers did not see the benefit of support from a delivery partner or the Tomorrow's Engineers programme to make use of the careers materials. Some felt that support with other activities would be more valuable.

**Some teachers stated that they would prefer to have ready-made resources that they could use in the classroom.**

Some teachers expressed a preference for support in terms of access to resources other than careers materials. These included 'ready-to-use' tools such as video clips, 'apps',

activity sheets and lesson plans. This, in part, suggests a lack of awareness of the range of resources available on the Tomorrow's Engineers' and related websites.

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