# Promoting the science and engineering of timber to children

Dr Dan RIDLEY-ELLIS
Principal Research Fellow
Centre for Timber Engineering, Napier University
Edinburgh, UK

**Summary**

The UK's young people are generally very poorly informed about the opportunities that exist for them in wood science and timber engineering, and commonly perceive the sector to be old-fashioned, unrewarding, environmentally damaging, and requiring of physical strength and endurance over intelligence and soft-skills. This has negative consequences for future recruitment into education, training and employment. This paper examines the attitudes school children have towards the forest and timber industries and ways in which misconceptions can be effectively challenged. Because the sector is currently male dominated, the paper looks at how recommended practice for engaging girls in science and technology can be applied to the wood chain. The paper covers the application of new media approaches for engaging with a hard-to-reach audience and presents the findings of experimental, and inexpensive, ventures of this type.

## 1 Introduction

The United Kingdom's forest and timber industries are making an increasingly vital contribution to the nation's economic, social and environmental sustainability, and enhance many aspects of daily life. However, employers are finding it difficult to recruit and retain enough staff with the right skills and qualifications. Similarly, universities and colleges are finding it difficult to recruit students into courses linked to the sector. These challenges will become more acute as the population ages [1]. There are many factors behind this situation, but two key issues that need to be recognised and addressed are:

- Not enough of the right things are being done to support career choice at critical ages
- Employers are not using the labour market to its full potential

This has been recognised by the sector and it has, particularly in recent years, been active in trying to promote itself to younger people. In December 2005 the FIRRS project (Forest Industries Recruitment and Retention Strategy) was set up at Napier University to understand the reasons why young people are not considering careers in the sector, and to discover what kinds of activity are most effective at influencing career choice. Since it is not advisable to undertake a recruitment campaign without also addressing the issues faced once in employment, the project also included an examination of the factors influencing retention. This allowed a complementary study of career choice and routes into employment for those people who currently work in the sector.

## 2 The gender dimension

More than 90% of the growth in the UK labour market over the last four decades has been down to women becoming more economically active. Despite this, the forest and timber industries, like engineering and construction, remain male dominated occupations. Statistics vary by discipline, but typically about one in ten professional and management workers are female, while the figure for craft and trade workers is less than 1% [1]. With a predicted fall in the working age population, social changes, and population movement away from forestry regions, employers are likely to find recruitment getting ever more difficult if they rely on male workers only.

Part of the reason behind the lack of women in the sector is that gender is not explicitly considered in the design of recruitment campaigns. This has the effect of unconsciously perpetuating gender segregation and, in a climate of falling numbers of economically active men, would ultimately mean failure to address the skill shortages if the situation is not rectified [2].

For this reason the FIRRS project looked at the differences between how boys and girls form career choices as well as best practice guidance for engaging girls with science and engineering.

## 3 The image of the forest and timber industries

The industry in which men and women end up working is influenced by educational choices and judgments made from a young age, a process that remains persistently gender-stereotyped. Young people have considerable awareness of equalities issues and hold the view that, generally, all occupations are 'suitable for both sexes'. However, they tend to fall into gender stereotypes when choosing the type of job and educational career they pursue [e.g. 3]. This is particularly apparent when considering the forest and timber industries.


*Fig. 1 Images of deforestation and simplistic environmental messages are common in schools. There are few images of sustainable forestry.*

Many people in the UK regard the production and usage of timber to be a traditional rustic pursuit that remains largely untouched by the modern world and that is irrelevant to most people's lives outside recreational visits to the forest, and arts and crafts woodworking. The public perception is one of an old-fashioned and environmentally damaging industry, full of grizzly old men and macho axe wielding loggers (figs. 1 to 3). This stereotypical image stems from popular culture in which the industry is tied in to ideas of nostalgia and masculinity from American as well as European influences. When asked to imagine what someone who works in the forest and timber industries is like, most people, most notably those in the media, tend to think of the masculine broad-chested 'lumberjack' archetype that is not representative of modern logging, let alone the wide range of different roles and activities in the sector. This is hardly surprising given that this image is so prevalent.

*Fig. 2 The image of the forest and timber industries seen by children is often one of nostalgia and tradition.*

Very few children know much about the forest and timber industries and many of the things they think they do know are incorrect and acting as a barrier. Crucially, the way the industry currently engages with young people reinforces some of these misconceptions.

Children from two schools in Edinburgh were asked if they would consider a career in the timber industry and to give a reason for their answer [4,5,6]. Their responses revealed that a quarter of children seem to be discounting a possible career in the industry because they consider it to be too dirty, dangerous, bad for the environment or for men only (fig. 4). Many children regarded it as boring, largely because of an inaccurate idea of what it involved.

*Fig. 3 Representations of workers in the sector tend to be linked to ideas of masculinity. (A typical image from the Microsoft clipart gallery)*

The lack of accurate information about jobs in the sector seems to be an important issue, and is tied into lack of knowledge about science and engineering careers in general. Once given a short presentation about timber engineering and sustainable forestry 30% of boys and 10% of girls said it made them think about a career in the industry and that they would like to find out more [7]. Three quarters of the children agreed with the statement that working with wood could be more scientific and high-tech than they had thought.

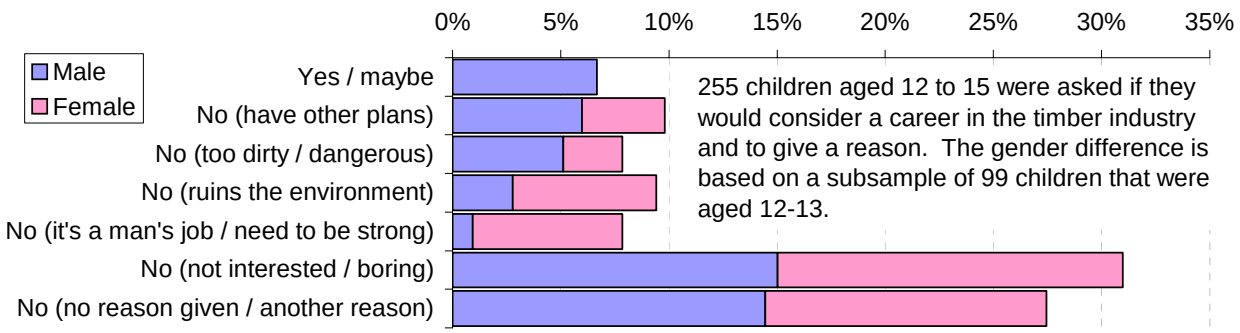


*Fig. 4 Results of a survey asking children if they would consider a career in the timber industry*

## 4 The creative brief

The FIRRS project included an element of experimental outreach work, the intention being to give children enough information that they can make informed subject and career choices. It was as much about getting them to engage with science and engineering, as it was to give specific information about jobs in the forest and timber industries. The target audience was children aged 12 and 13, just before they make their subject choices in secondary school.

The name firrs, which was originally an acronym for the parent project, was adopted as a name for the engagement work when it was noticed that it was very rare on the Internet. In this context, it is not intended to stand for anything in particular and is always written in lower case as a stylistic decision intended to make it more female friendly.

From the outset it was decided that gender should be a core consideration of all the work, with the intention of ensuring that everything that was produced would be equally effective for both boys and girls. Various strategies for ensuring the engagement of girls in science and engineering have been extensively researched worldwide in recent years [e.g. 8] and most specialists agree on a simple set of recommendations. However, these are not often put into practice because people tend to assume what works for them works for everyone. A creative brief was drawn up for the engagement work, which incorporated these recommendations:

- To show the whole wood products value chain so that the connection can be made between sustainable forestry and timber as a construction material.
- To show a range of role models with an equal number of men and women in each type of job.
- To show the importance of soft skills in all types of job (especially oral communication and team working).
- To show how people manage their work-life balance and to show that they are not just people defined by their jobs.
- To focus on the skills, aptitudes, interests and motivations of people and how they had a bearing on the career they ended up working in.
- To cover routes into the jobs and the subjects needed at school.
- To show how the jobs (and the science) benefit society and the environment.
- To explicitly challenge and dispel misconceptions about the forest and timber industries.
- To avoid playing to stereotypes of jobs and stereotypes of gender.
- To be balanced and trustworthy.

The project was designed to be experimental with the intention of trying a range of approaches and evaluating how effective each one was. A key aspect of this was involvement of young people themselves in the whole process, with the most significant contributions coming through summer placements for three high school students (aged 16-17) organised through the Nuffield Science Bursary scheme [4,5,6]. The students were asked to help:

- Understand what influences career choice for young people
- Discover and understand misconceptions about the forest and timber industries
- Decide on the best media with which to tackle these misconceptions
- Design, create and evaluate media

The involvement of the high school students proved so fruitful that the original plan to commission work from professionals based on what the students had produced was abandoned. Not only was this ‘do-it-yourself’ approach a fraction of the cost of professional work (estimated to be between 5 to 10%), children seemed to relate better to the students’ work than they did to the more slick ‘corporate’ productions. It also allowed greater creative freedom and imposed fewer restrictions on how the work could be distributed and built-upon.

It was the misconceptions around the environment that were considered most important [6]. Children are very aware of environmental issues like climate change and deforestation because they hear so much about them in schools and in the media. Almost 8% of boys and 19% of girls cite environmental responsibility as the reason they would not want to work in the timber industry (fig. 4) and the majority believe that the use of wood and paper is reducing the size of the UK’s forests. Once given information about sustainable forestry, most children quickly make the connection with what they know about renewable resources and change their minds about its impact on the environment. Some become quite passionate about the need to spread the word.

# 5 Engagement media

The firrs project was not intended to duplicate or replace anything that was already being done by the forest and timber industries and all the materials that were produced were designed so that they could be used by others as easily as possible. This is partly a matter of distribution in the right formats, but is also one of licensing.

Careers engagement materials often carry copyright statements forbidding people to make copies and distribute the materials themselves. This is sometimes necessary because of the intellectual property rights and restrictions of third party content, but is paradoxical when the actual intention is to disseminate the materials as widely as possible.

There are several ways of licensing materials internationally that allow people the freedom to share, but that also impose certain restrictions to protect the materials from misuse. One example of these 'copyleft' schemes that is becoming popular for creative works is Creative Commons [9]. Most of the engagement materials created under the firrs project have been given a Creative Commons license that allows non-commercial use, so long as the work remains unaltered and is attributed to the original creators.

## 5.1 DVD

Short videos can be used in many ways to support engagement activity. They can be used to illustrate face-to-face presentations, and, if entertaining enough, be watched by children through their own choice. DVDs are cheap to duplicate and the equipment required to view them is now almost ubiquitous. They still have a high perceived value, and are therefore good items to give away at events or through the post.

Videos can be easily made with affordable consumer level equipment and software. They are best made with the help of young people from the target audience, not least because it helps ensure the language used is understandable. Almost all the videos on the firrs DVD (fig. 6) were made with substantial assistance from two Nuffield Science Bursary students [4,5].

Twenty thousand copies of the DVD were produced in November 2007, and approximately 17,000 have been distributed so far (mainly through science teachers in secondary schools in Scotland). No attempt has been made yet to evaluate how it is actually being received by the target audience, but a few teachers have contacted the project to say that it will be useful in teaching different parts of the curriculum. Feedback from industry has been positive and it is hoped that production of more copies can be funded.

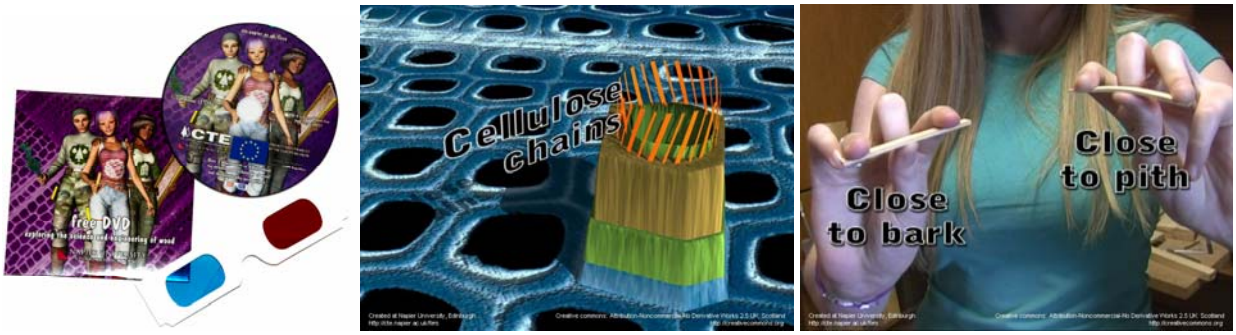


*Fig. 5 The firrs DVD and stills from one of the videos (The Chemistry of Wood [10])*

## 5.2 Video streaming on the Internet

Video streaming services such as Google video and YouTube are an excellent way of maximising the audience of videos. As well as hosting the file, they allow videos to be easily embedded in to other websites and for captions to be added. These services allow users to rate and comment on videos, but most allow this to be disabled if this is not desired. Some of the videos made for the DVD have been placed on Google's streaming video service.

The four most popular videos ('The chemistry of wood' [10], 'Using video in the classroom' [11], 'Strength and stiffness' [12] and 'Measuring stiffness with sound' [13]) each receive an average of about two views per day. This is not particularly remarkable by Internet standards and although the videos have been made available for placing on other websites, this has, so far, not happened.

However, the statistics suggest that for every 15 views a video is downloaded so that it can viewed offline. Unfortunately, it is not possible, at present, to gain any more information about what kinds of people are viewing the videos online and what effect is being achieved.

Some networks block video streaming services and they are therefore not ideal as a mechanism of getting information into schools. For this reason videos were also made available on a website in an alternative format.

### 5.3 Websites

Several studies [e.g. 14] indicate that people prefer to use the Internet when they want to find out information about a subject. However, this first requires people to want that information and so websites generally do not work as a way of stimulating a new interest in a subject [e.g. 15].

Website design is just as crucial as content, but this should not be confused with simple novelty or attractiveness. Although they have different aesthetic sensibilities, children look for the same usability in a website that adults do. This includes getting a good idea of what a website is about when arriving at it for the first time, and being able to quickly see how to get to the desired information.

The high school students on Nuffield placements were asked to review any careers websites they could find about the forest and timber industries [4,5,6]. They found it quite difficult to find websites, partly because they did not know what words to search for, and partly because the websites do not have particularly high rankings with search engines.

Once they found websites, they tended to prefer those that allowed them to quickly assimilate information. They did not like to feel patronised by overly childish design or language, but equally did not like websites with sober colour schemes and lots of text. This emphasises the need for carefully pitching at a specific target audience, and one of the points the students made was that often the language and the design did not seem to fit the same age group. The students did not like jokes or puns where they felt it was patronising, or prevented them from actually understanding what was meant. They liked case studies that came across as having been written by real people, and preferred those that followed a standard format (e.g. question and answer) so that they could readily compare between them. The students were particularly keen to see information about typical earnings in different jobs, and liked websites with links to other websites, especially those where they could find out more about education and training.

When designing websites for children, it is a common mistake to employ a novel navigation technique (e.g. images, Javascript or Flash) without also offering a standard text-based hyperlink navigation method as an alternative. Not only does this make the website less accessible, it prevents search engines from properly crawling and indexing the site.

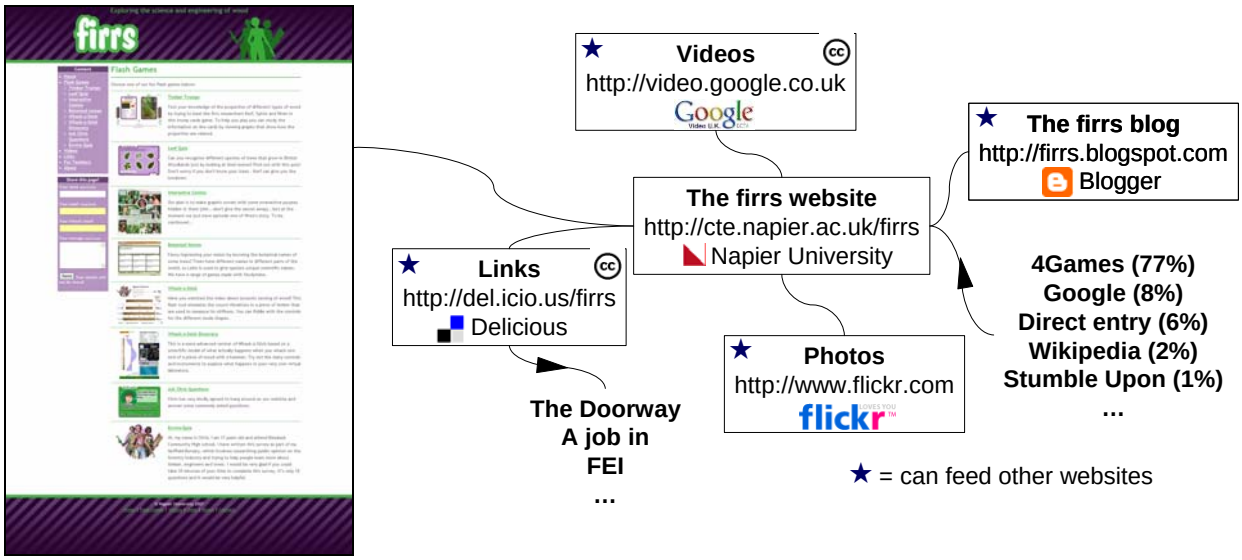


*Fig. 6 The firrs Internet presence as a website fitting in to a network of Web2.0 services*

Search engines are an important route of casual traffic to a website and are the principal way people access a website if they do not know the address (and often even if they do). Search engines use a combination of factors to determine where in the search list a website will be ranked. One of the most important is how many pages link to the website and what ranking they have. This means that a website should be linked by as many other relevant websites as possible. Another important factor is how frequently the content of the website changes.

The firrs website was created, first and foremost, as a hub to link children up with the various sources of information on the Internet. It consists of a main site, hosted on a university server, that is fed by several 'Web2.0' services to provide additional functionality, and to allow frequent refreshing of content without incurring significant maintenance costs (fig. 6). This approach also allows content created for the firrs website to be easily embedded into other websites. Figure 6 shows a breakdown of entry sources since the website was launched in April 2007 (excluding traffic from within Napier University). Four in five visitors are from the UK.

### 5.4 Online games

Online games, and downloadable games for portable devices, are hugely popular among children and young adults. Many companies use them to advertise products, and their potential as joint promotional and dissemination tools is enormous. To be successful, games need creativity and imagination in their design, although there are plenty of existing game types that can be adapted. Their creation is not necessarily an expensive process, but it is better if in-house expertise can be used rather than a contractor. Fortunately, most online games use the same technologies as computer aided learning (Adobe Flash, Shockwave, Java etc).

Many educational websites aimed at children feature online games of one sort or another, but only a few give enough thought to the design to make the games playable and entertaining. For this reason, game players, preferably from the target audience, should be involved in the design. The educational component of the game should not, however, be overlooked. Most online game players come to a website to play a game, but will not look at the rest of the site, so it is important to include the message to be communicated within the game itself.


*Fig. 7 The Timber Trumps Flash game*

The first game to be created for the firrs website was a card game based on wood properties called 'Timber Trumps' [16]. The game, which was created in Adobe Flash, is a variation on a type of card game that most people in the UK know through the commercial 'Top Trumps' brand and which has its roots in traditional pedagogic games like quartets and happy families. The application of this type of game was not, in itself, novel. Indeed, as it transpired the Forestry Commission had, only recently, produced a card game about trees called 'Tree Trumps'.

However, where the game distinguished itself was in attention given to the game-play. The species and statistics chosen for the cards were selected so that they were both educationally relevant and resulted in a balanced game. Careful consideration was also given to the interface to allow quick and simple play. The game was play-tested by two high school students on summer internships (and their friends) prior to its official launch in June 2007.

The educational aim of the game was: to show the range of different wood species and how varied their properties can be; to show that science can be applied to wood; and to show that there is a difference between the environmental credentials of different species.

The students who play-tested Timber Trumps helped submit the game to the games website of Channel 4, one of the main UK television broadcasters. The game was surprisingly successful and

within 24 hours of appearing on the Channel 4 website it had been viewed 1800 times (fig. 8). Users of the channel 4 website can award a score to a game and it rose as high as two in the overall rankings. It is currently placed 17th best game out of more than a thousand games listed.

The channel 4 games website is atypical as a website for online games in that it links to games on other websites rather than hosting the games itself. This was extremely useful as it meant that the traffic could be directed to the firrs website and the behaviour of the game players monitored. Only about one in 8 players of the game went on to look at another part of the firrs website.

The game remains a popular item on the firrs website, accounting for about a third of the daily page views. The Channel 4 games website currently provides about 40% of the daily visitors.

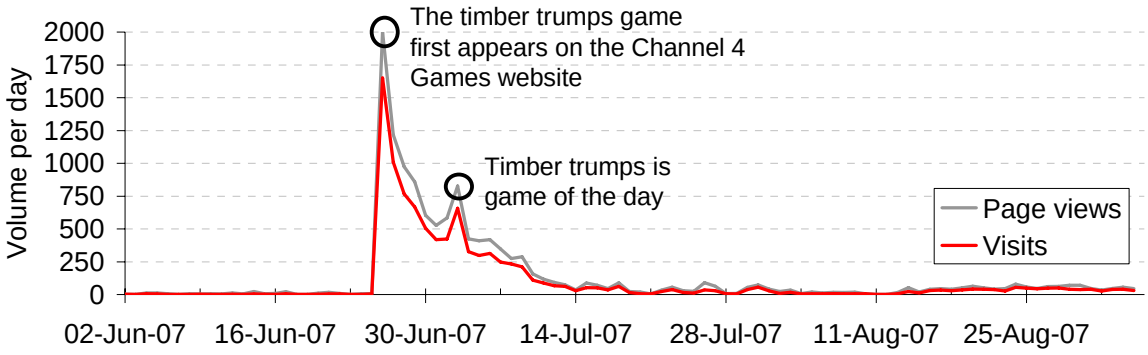


*Fig. 8 Traffic on the firrs website due to the timber trumps game (excluding traffic from within Napier University).*

### 5.5 Events

Events remain the best method for reaching a specific audience, engaging with them, and getting detailed feedback.

Due to conditions of the funding, the firrs project needed to collect some anonymous equalities data about some of the children it engaged with. This was difficult given the short amount of time typically available at events, the tedium of form filling for the children, and the extreme wariness of adults around data protection.

The problem was partially overcome by giving children 'freebies' as an incentive for completion of the forms. As well as the DVD, children were given cardboard framed 3D glasses and visibility vests printed with a firrs logo (fig. 9). The glasses and the vests proved to be very popular with the children and adults alike. Several requests were received from teachers to send packs of vests to schools for use on field trips.

*Fig. 9 'Freebie' visibility vests*

Despite the difficulties in obtaining it, the equalities data was useful and allows a note of caution to be raised. For the events outside schools, such as science festivals and competitions, the general feeling of all involved was that there had been a more or less equal mix of boys and girls. However, this turned out not to be the case with events typically involving twice as many boys as girls.

## 6 Concluding remarks

Young people and their teachers have a very poor awareness of the forest and timber industries in the UK and are likely to associate them with macho physical work and environmental damage. This is acting as a major barrier to recruitment into the industry and into associated courses. However, this need not continue as forestry and timber can relate to many parts of curriculum including science, geography and technical subjects. Many schools are keen to give children a better awareness of environmental issues and raise interest in science generally.

When undertaking outreach work or recruitment campaigns it is vital to make gender a core consideration from the outset to avoid perpetuating the gender imbalance in the industry, and to

give it a more modern, more realistic, image. By adopting some simple precepts it is possible to make the industry more appealing to a wider group of youngsters: more boys as well as more girls.

It is very important to select a specific target audience rather than attempt to appeal to all ages. Engagement materials should be piloted with that target audience, and if possible, they should be involved in the creative process. Ideas should not be limited to the standard 'corporate' approach as do-it-yourself approaches can be more effective as well as cheaper. So called 'viral' methods, such as online games and streaming videos offer much potential, but it should be borne in mind that it is very difficult to evaluate their effectiveness.

Websites allow easy access to information, but they do not work on their own as a mechanism for engaging with a new audience. Websites must be regularly updated if they are to work, but this need not be an onerous or costly task if Web2.0 technologies are integrated into the design. A good way of raising the visibility of websites is to work together. Relevant websites should be interconnected by links and content shared by as many means as possible. This is easily facilitated by Internet technologies and by licences such as Creative Commons, but requires parties to overcome any territorial attitudes and understand the benefits of cooperation.

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