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Citation: Davenport, Carol (2019) Using career contexts to teach science. *School Science Review*, 100 (373). pp. 19-21. ISSN 0036-6811

Published by: Association for Science Education

URL: <https://www.ase.org.uk/resources/school-science-re...>
<<https://www.ase.org.uk/resources/school-science-review/issue-373>>

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Using career contexts to teach science

Carol Davenport

Abstract Following the most recent statutory guidance on careers published by the government, science teachers in England will be expected to embed careers advice in the curriculum. This presentation at the 2019 ASE Annual Conference outlined the benefits to teachers and their students of this approach, and gave some suggestions on how to include careers guidance in teaching.

Careers information, advice and guidance (CIAG) in England has been through quite a rocky time in the past 5 years. The Connexions service was effectively disbanded as a national service around 2011, and careers advice was devolved to each individual school. However, school funding did not include any ring-fenced portion for careers advice. As a consequence, CIAG became even more patchy and of poorer quality than it had been, with a number of reports highlighting this, including Ofsted's *Going in the Right Direction?* (Ofsted, 2013).

In 2013, the Gatsby Charitable Foundation commissioned Sir John Holman to investigate what could be done to improve careers guidance (Holman, 2014). This included looking at best practice in both England and six other countries: the Netherlands, Germany, Hong Kong, Ireland, Finland, and Canada (Ontario). Sir John identified eight benchmarks that were indicative of good careers provision (Box 1).

The Gatsby benchmarks were included in the government's 2017 careers strategy (Department for Education, 2017) and it is the expectation that all schools now have a named careers leader and will be working towards achieving the Gatsby benchmarks by 2020.

The benchmark that is particularly relevant for subject teachers, particularly in science, is benchmark 4:

All teachers should link curriculum learning with careers. STEM subject teachers should highlight the relevance of STEM subjects for a wide range of future career paths. (Holman, 2014)

In other words, all teachers will be expected to link what they are teaching in the classroom with careers that students might experience when they leave education. When the Gatsby benchmarks were piloted in the north-east England, benchmark 4 was the one that most schools and colleges found hardest to achieve. It is easy to see why this should be. Most of the other benchmarks are under the control of the careers lead, and so can be centrally managed. However, benchmark 4 relies on the cooperation of subject teachers, many of whom

Box 1 The eight Gatsby career benchmarks

- 1 A stable careers programme
- 2 Learning from career and labour market information
- 3 Addressing the needs of each pupil
- 4 Linking curriculum learning to careers
- 5 Encounters with employers and employees
- 6 Experiences of workplaces
- 7 Encounters with further and higher education
- 8 Personal guidance

already feel that the curriculum is over-full and there isn't enough time to teach subject content, never mind 'extra' careers information.

Why should teachers put careers in their curriculum?

In my session at the ASE Annual Conference in January 2019, I outlined two very good reasons why subject teachers should include careers in their subject teaching.

The first reason is that many students cite their teachers as the second most common source of careers information and advice that they use (Wellcome Trust, 2013). So even if teachers don't realise it, students will be taking careers advice from what is said in the classroom and included in their teaching. I believe that science teachers should therefore take the opportunity to widen the contexts that they use to illustrate subject contents to include careers. In that way, students will be exposed to a wider range of possible jobs that they might want to do. After all, if students don't know about a job, it's unlikely that they will think about it as being a possibility for them.

The second reason to include careers contexts in subject teaching is linked to the recent changes in GCSE examination specifications, particularly to the weighting given to the different assessment objectives (Box 2).

The old AO1 '*Recall, select and communicate their knowledge and understanding of science*' gave examiners more opportunity to ask students to recall information

Box 2 Assessment objectives for GCSEs (Ofqual, 2017)

Objective	Requirements	Weighting
AO1	Demonstrate knowledge and understanding of: <ul style="list-style-type: none"> • scientific ideas • scientific techniques and procedures 	40%
AO2	Apply knowledge and understanding of: <ul style="list-style-type: none"> • scientific ideas • scientific enquiry, techniques and procedures 	40%
AO3	Analyse information and ideas to: <ul style="list-style-type: none"> • interpret and evaluate • make judgements and draw conclusions • develop and improve experimental procedures 	20%

and contexts that they had been taught. The change of focus of the assessment objectives from 2016, along with the removal of controlled assessment, means that there are now more questions where students are presented with a new context and expected to apply what they have learnt. In the social media age, this inevitably leads to *Twitter* storms about 'unfair' questions about science that students think that they haven't been taught, which this year included osmosis in boiled carrots and banana equivalent dose (as an alternative way of measuring radiation dose). Of course, the vast majority of students will have been taught the underlying science concept, but the context has confused them because they are not used to responding to science concepts in a range of different contexts.

With this background, the more that students can get used to applying science concepts in unusual contexts, the more confident they will feel in an exam when faced with a 'new' context. Rather than looking at the surface features of the question context, they will more easily be able to think 'What do I know about the science involved?' because they will have had practice doing that in the classroom. One excellent source of contexts are careers and companies that use science, and so by including career contexts in classroom learning, teachers will be helping students to cope better with their exams as well as showing them possible career opportunities.

Planning for careers in the classroom

As with all good teaching, including career contexts in the classroom needs planning. Teaching, and managing a classroom, is such a complicated task that trying to include career contexts on the spur of the moment is likely to lead to them either being left out or to teachers relying

on stereotypical or easily recalled careers. It is therefore wise to use departmental planning time to review medium-term plans and then to put careers prompts and basic information into schemes of work and lesson plans. The first step is to identify 'real-life' applications of topics, and then to include a career context to support that topic.

Shared planning will also allow the shared expertise and knowledge of the whole department to influence the types of careers that are included. Teachers will have different contacts – either professionally (perhaps university colleagues who have gone on to jobs within your subject) or personally. Make use of these to include as wide a range of jobs as possible.

Many teachers may feel that their knowledge of career options is not up to date, or that they don't know the breadth of possibilities. There are a number of sources of careers information that are available for use during this planning. Many schools will have access to careers websites or will have a library of printed materials. Careers leaders can work with science departments to identify the resources that are available within the school. In addition, there are two very useful websites that provide insights into a wide range of jobs. The first of these is *Health Careers* (www.healthcareers.nhs.uk/explore-roles), which showcases the huge number of different job roles within the NHS. It's perfect for supporting those students who aspire to be a doctor but whose achievement makes that unlikely. The second website is the *National Careers Service* (<https://nationalcareers.service.gov.uk>), which has an 'Explore careers' section with information about what different careers involve, what qualifications or training are required, and the salary. Using these two websites, teachers can identify a whole host of possible careers linked to science topics.

Beware stereotypes

The statutory guidance for schools states:

Schools should consciously work to prevent all forms of stereotyping in the advice and guidance they provide, to ensure that young people from all backgrounds, gender and diversity groups, including those with special educational needs and disabilities, consider the widest possible range of careers. (Department for Education, 2018: 19)

As mentioned earlier, there is a tendency for the busy teacher to fall back on easily accessible stereotypes when thinking and talking about careers. Care should be taken, particularly when using images, to use counter-stereotypical examples. For instance, if you are thinking about 'nurse' and 'astrophysicist' what sort of person do you imagine? It is likely that your first fleeting thought was of a female nurse and a male astrophysicist. However, nearly 10% of the nursing workforce



Figure 1 Two nurses administering a drug treatment to a patient

are male, and around 15% of astrophysicists publishing research papers in 2016 were female. So for either career you should use both ‘she’ and ‘he’ when talking about them, and look for non-stereotypical pictures of people in those roles. It is also helpful to use more than one image, because then it becomes easier to show that there isn’t one ‘type’ of person that does that career.

Questions, questions

In my session at the ASE Annual Conference, we looked at a number of simple things that teachers can plan into their lesson. This included using simple lesson starters (Davenport, 2018), making displays out of *Twitter* hashtags such as #actuallylivingscientist or materials from organisations such as the Royal Society of Chemistry, the Institute of Physics and the Biochemical Society, and asking students to research local companies (through family connections or online) to find out what science they use.

However, in order to bring together the career context and science concept, it can be very helpful to set

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Figure 2 Karen Masters, astrophysicist; reproduced under a Creative Commons Attribution-ShareAlike 4.0 Licence

questions into the career context. At NUSTEM (<https://nustem.uk/careers/>) we have been developing ‘review’ worksheets for teachers to use at the end of a topic which provide a range of questions in the context of a company and its work. Teachers can use this idea when writing their own questions for their students. By using a range of different companies, students will become more comfortable with finding the science within the context.

Conclusion

The inclusion of the Gatsby benchmarks into schools’ statutory careers guidance means that subject teachers will be asked to include careers in their curriculum learning. This article has shown that there are two benefits of this to students: providing a greater breadth of career possibilities for them, and supporting their understanding of the application of science concepts in unusual contexts.

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