Exploring Physics, Uncovering Choice
A CPD workshop to help staff work together to provide careers information
Acknowledgements

The workshop was written by CRAC: The Career Development Organisation and further developed by Marion Hamshere and Manchi Chung from the Institute of Physics. Editorial support was provided by Charles Tracy, Clare Thomson and Taj Bhutta from the Institute of Physics. The girls into physics information was provided by Ann Simpson from the UK Resource Centre for Women in Science, Engineering and Technology. Thanks to the Stimulating Physics Pilot regional co-ordinators – Jo Lewis, Marion Hamshere and Jon Chippindall – for trialling the workshop in schools.

If the CD that accompanies this pack is missing from this page, please contact the Institute’s education department for a replacement copy (e-mail education@iop.org).

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Aims of the workshop

1. Increase staff knowledge of physics-based career options.
2. Identify the barriers and opportunities that influence student choice at A-level.
3. Encourage teachers of physics, career co-ordinators, tutors and other staff to work together effectively within their school.
4. Help students to make better-informed career choices.

Why run a workshop in your school?

- The workshop is an opportunity for physics teachers and careers advisers to build on their knowledge of the breadth of career opportunities open to students with formal qualifications in physics (A-level or a degree).
- It will also support teachers in giving contextual examples in the classroom and to relate “How Science Works” themes to specific examples in the world of work.
- Nationally, the proportion of girls taking A-level physics has remained fixed at around 20%. This workshop might help your school to identify ways to increase this number. (If this is a key issue within your school, use the information provided in Appendix A to supplement the following notes.)

How much time will you spend in the workshop?

This workshop is scheduled to take around 90 minutes and is targeted as a twilight CPD activity or part of a full day’s INSET.

Why should you run the training session?

Running this CPD workshop could provide firm evidence for a significant part of P10 in a threshold application. This pack can be used as a working document that will help you to provide evidence of:

- **P10** Contribute to the professional development of colleagues through coaching and mentoring, demonstrating effective practice, and providing advice and feedback.
Who should be invited to attend?

Effective communication between personal tutors, subject teachers, career co-ordinators and Connexions personal advisers should ensure that all students make informed choices at each stage of their career. A key function of this workshop is to bring these members of staff together to ensure that careers awareness is an integral part of a student’s education and to decide on each person’s role within the school (i.e. which staff members should be the primary advocates for physics-based careers and which staff members should be the providers of impartial careers information and guidance).

The final action plan should include collaborative agreements and activities; for example, you could agree to meet as a group once a term to plan and review. This will aid sustainability of its implementation.

This is not a definitive list, but might help you to identify who should attend. The workshop will be most effective with at least five members of staff and to facilitate links between colleagues in different departments it should include staff from more than one category.

<table>
<thead>
<tr>
<th>Position</th>
<th>Formal or informal role in students’ decision-making process</th>
<th>Name(s) of members of staff invited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science faculty staff (non-physics specialists)</td>
<td>Teaching context-based lessons/subject-based careers information and guidance</td>
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</tr>
<tr>
<td>Physics specialist teachers</td>
<td>Specialist careers information and guidance</td>
<td></td>
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<tr>
<td>Citizenship/PSHE teachers</td>
<td>Career guidance</td>
<td></td>
</tr>
<tr>
<td>Connexions adviser</td>
<td>Careers information and guidance</td>
<td></td>
</tr>
<tr>
<td>Aimhigher co-ordinator</td>
<td>Widening participation</td>
<td></td>
</tr>
<tr>
<td>Gifted and talented co-ordinator</td>
<td>Guidance on A-level and degree choices</td>
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</tr>
<tr>
<td>Year 10 and 11 tutors</td>
<td>Guidance on A-level choices</td>
<td></td>
</tr>
<tr>
<td>Sixth-form tutors</td>
<td>Guidance on degree-course choices</td>
<td></td>
</tr>
<tr>
<td>Support staff (including technicians)</td>
<td>Informal discussions and role models</td>
<td></td>
</tr>
</tbody>
</table>
Workshop leader’s checklist

<table>
<thead>
<tr>
<th>Have you:</th>
<th>✓</th>
</tr>
</thead>
<tbody>
<tr>
<td>• read through all the notes contained in this workshop pack?</td>
<td></td>
</tr>
<tr>
<td>• booked a suitable room (around a large table works best)?</td>
<td></td>
</tr>
<tr>
<td>• booked a computer and data projector with speakers?</td>
<td></td>
</tr>
<tr>
<td>• loaded the presentation onto the computer?</td>
<td></td>
</tr>
<tr>
<td>• printed out a participant pack for each member of staff attending the workshop?</td>
<td></td>
</tr>
<tr>
<td>• printed out copies of the <em>Explore</em> postcard/pre-ordered copies, see Appendix D?</td>
<td></td>
</tr>
<tr>
<td>• printed out copies of the <em>Expand</em> leaflet/pre-ordered copies, see Appendix D?</td>
<td></td>
</tr>
<tr>
<td>• printed out copies of the <em>Experience</em> booklet/pre-ordered copies, see Appendix D?</td>
<td></td>
</tr>
<tr>
<td>• printed out enough snakes and ladders boards for use in the workshop, if needed?</td>
<td></td>
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<tr>
<td>• printed out the funnel on A3 paper for use in the workshop, if needed?</td>
<td></td>
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<tr>
<td>• printed out and prepared the job cards for use in the workshop?</td>
<td></td>
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<tr>
<td>• collected post-it notes for use in the workshop?</td>
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<tr>
<td>• collected pens for use in the workshop?</td>
<td></td>
</tr>
<tr>
<td>• collected Blu-Tack for use in the workshop?</td>
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<tr>
<td>• found out how many students take maths and physics A-level in your school?</td>
<td></td>
</tr>
<tr>
<td>• found out how many girls take physics A-level compared with boys in your school, if applicable?</td>
<td></td>
</tr>
<tr>
<td>Activity</td>
<td>Slides</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>--------</td>
</tr>
</tbody>
</table>
| **Part 1: Why are you here?**                                           | 1–4    | 6 minutes | • Computer  
• Data projector and screen  
• Participant packs              |
| Quiz, optional (discussion in pairs)                                    | 5      | 10 minutes |
| **Part 2: What are the barriers?**                                      | 6–7    | 15 minutes | • Post-it notes  
• Pens  
• Snakes and ladders boards (optional) |
| Types of barriers (leader-led discussion)                               | 8      | 10 minutes |
| **Part 3: Exploring solutions**                                         | 9–12   | 15 minutes | • Job cards  
• Blu-Tack  
• Large sheets of A3 card with the funnel drawn on (optional) |
| Resources (leader-led presentation)                                     | 13–15  | 5 minutes | • Explore postcards  
• Expand leaflets  
• Experience booklets |
| **Part 4: Action planning**                                             | 16–17  | 15 minutes |
Running the workshop
Part 1: Why are you here?

Presentation slides and notes

Each slide has accompanying notes and a speech bubble with suggested words that you, the workshop leader, could use.

Slide 1: Welcome

Welcome to the workshop. Please introduce yourselves and state what you hope to gain from today’s training session.

Ensure that everyone has a copy of the participants’ pack. You might also want to mention any housekeeping issues if you’re working with people who are not usually in this building.

Slide 2: Timings of workshop

There will be four parts to the workshop, including this introduction.

The aim will be to spend around 20 minutes on each part and therefore the workshop should be finished in less than 90 minutes.
Running the workshop
Part 1: Why are you here?

By working together, we can: develop our own knowledge of physics-based careers; pool expertise and identify any particular areas needing attention within the school; and improve links between departments.

During the course of the workshop the advocates for physics-based careers will need to be identified. Some questions to consider:

- Whose role is it?
- How much advocacy is appropriate?
- How do we avoid over-selling the subject and consequently turning students off?

Why are we here?

Physics is highly regarded by employers and critical to the UK’s future economy. The skills and knowledge gained from a qualification in physics will instill a sense of lifelong learning. Studying the subject unlocks career choices by opening doors at university level and beyond.

Currently, students are capable of taking physics A-level but are choosing not to. Nationally there are around 72,000 A-level maths entrants compared to just 29,000 for physics* (2009 figures). Raising awareness of the benefits of studying physics will increase the number of students who will consider choosing physics A-level.

For further information about the current status of school physics, see Appendix H in your pack.

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Slide 3: Aims of the workshop

- Increase your awareness of physics-based careers
- Identify barriers and opportunities
- Build links between staff/identify roles
- Help students to make better informed choices

Slide 4a: Why are you here?

Clicking anywhere on the slide will reveal each (boxed) point.

In our school

there are [insert figure: ] maths A-level students compared with [insert figure: ] for physics.
Running the workshop
Part 1: Why are you here?

Slide 4b: Why are you here?

However, there will be certain barriers that we will have to break through. Can we identify any obstacles that students face when trying to access careers information advice and guidance in our school? Are there practices or policies that discourage certain groups of students? During the workshop we will try to identify specific reasons.

Lack of careers knowledge: would your teaching be better if you knew more about physics-related careers and how the physics taught relates to physics in the world of work?

Misinformation: are all students starting off at the same point? Are there barriers identifiable stemming from the wider community?

Lack of higher-education knowledge: if a student wants to know more about a degree course, could you answer them confidently? Could you point them towards the right member of staff within the school? Could you/do you work with other staff in the school to deliver career lessons?

Slide 4c: Why are you here?

Providing timely, accurate, consistent and up-to-date information helps knock down the barriers and allows for effective decision making.

By working together, the information and ideas outlined in this workshop will help us to develop a unified approach to raising the culture of physics within our school.
Running the workshop
Part 1: Why are you here?

Slide 5a: How well could you advise?

Are we helping students to make the right A-level decisions? Are we giving the appropriate higher-education entry information and guidance?

How well could you advise?

This optional slide has been included because some staff might be unaware of the key requirements for certain degree courses. It could be used as a mini quiz to test their knowledge. To save time, you might want to skip this activity by clicking on the skip button on the left-hand side. If you want to use this slide, click on the speech bubble to reveal each student’s interest.

Slide 5b: How well could you advise?

How do you think an adviser at this university open day would reply?

You could allow them a minute to discuss their answers. They could do this in pairs.

This type of answer would be appropriate:

Mathematics is a vital part of a physics degree and it is not possible to complete a degree in physics without a strong base in maths. This means that the majority of physics departments do specify A-level maths as an entry requirement. However, there are routes into a degree that enable students who did not take maths A-level to reach the required standard.

If you want to study physics at degree level consider foundation-year programmes run by a number of universities; these are designed to prepare students for a degree in physics. Also contact universities and ask if they offer alternative routes into their courses (for example, some might offer an intensive summer course in maths and a few have a separate route through their first year allowing students without maths to study more to catch up). As an alternative, you might want to consider an integrated or natural science degree, which would allow you to study university-level physics combined with other subjects.
Running the workshop
Part 1: Why are you here?

Slide 5c: How well could you advise?

How do you think an adviser at this university open day would reply?

This type of answer would be appropriate:
Consider courses such as physics with environmental science or environmental engineering.

Slide 5d: How well could you advise?

How do you think an adviser at this university open day would reply?

This type of answer would be appropriate:
Very few people will have the opportunity to become astronauts because the criteria are very stringent, but there are a number of routes to a space-related career. You could pursue becoming a cosmologist, astrophysicist or engineer (who specialises in projects based in outer space). A physics degree would be a good foundation for all of these career choices and there are a number of physics degrees that allow you to combine studying physics with astronomy and astrophysics.
Running the workshop
Part 1: Why are you here?

Slide 5e: How well could you advise?

How do you think an adviser at this university open day would reply?

This type of answer would be appropriate:
Physics and languages are a good combination and would make you very employable. Many universities offer courses in physics with a modern language and this might include the opportunity to study abroad.

Slide 5f: How well could you advise?

How do you think an adviser at this university open day would reply?

This type of answer would be appropriate:
Chemistry is needed. Physics is also useful at AS or A2 level (because medicine is very competitive). You might want to consider studying an extra year and try to do both of these A-levels in one year. Even if you decide not to study physics, you will need a good grade in chemistry. However, studying physics will keep your options open as you might want to also consider a career as a medical physicist.

At the end of this session, ask if they have any questions before the rest of the workshop begins.
Running the workshop
Part 2: What are the barriers?

Slide 6: Aim of part two
This section aims to identify the barriers to students accessing consistent and accurate information about careers and higher education (not physics uptake in general). The first activity will use a snakes and ladders game to identify – through discussion between colleagues – potential barriers and opportunities in relation to informing students about physics-based careers. These issues will be probed further during the course of the session.

Slide 7: Snakes and ladders game
Hand out the snakes and ladders boards, pens and post-it notes. Alternatively, the board on the screen could be used by the whole group.

Brainstorm the issues to students being made aware of physics-based careers specific in our school. Write each one down on a post-it note.
Each statement will need to be arranged on the board, placing the biggest potential opportunity on the longest ladder and the biggest barrier on the largest snake.

Collect all of the post-it notes and divide them up between the staff to give “ownership” of the barriers or opportunities to individuals. Participants should stick these into their own packs. These will form part of their action planning in the final session.

Slide 8: Barriers
So far we have collected a few post-it notes each that identify key issues within the school. We will now look to probe further to see if there are any barriers that we might have missed out.

Click on the slide to reveal each point. This will hopefully prompt further in-depth discussion in the group.
Running the workshop
Part 2: What are the barriers?

The following is by no means an exhaustive list and some of these barriers might not apply to your school. However, there might be issues that have yet to appear in the discussion. Take this opportunity to prompt the group if you feel that they are important considerations and jot down any comments made by the group in the right-hand column to feed into the action-planning stage.

<table>
<thead>
<tr>
<th>Possible barriers for our school</th>
<th>Comments to feed into action plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is there enough curriculum time and resource given to providing careers information and guidance to students?</td>
<td></td>
</tr>
<tr>
<td>Are there opportunities for staff to share ideas and best practice between departments?</td>
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<tr>
<td>Who delivers careers advice to high achievers?</td>
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<tr>
<td>Are science specialists confident that they can give accurate careers information? Would you benefit from further professional development, such as an industrial placement?</td>
<td></td>
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<tr>
<td>Are careers advisers confident that they can advise about appropriate choices for specialist degrees?</td>
<td></td>
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<tr>
<td>What could be done to help staff work together more effectively to deliver high-quality careers advice?</td>
<td></td>
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<tr>
<td>Who is going to lead and provide the driving force for this programme?</td>
<td></td>
</tr>
<tr>
<td>Does the senior leadership team see the importance of physics-based careers information and guidance?</td>
<td></td>
</tr>
<tr>
<td>Who should be the advocates of physics-based careers within the school? Who should be the providers of impartial careers information and guidance?</td>
<td></td>
</tr>
<tr>
<td>Do the means of promoting physics need reviewing?</td>
<td></td>
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</tbody>
</table>
Running the workshop
Part 2: What are the barriers?

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do more students go on to choose maths A-level compared with physics?</td>
<td></td>
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<tr>
<td>Do students perceive physics as difficult?</td>
<td></td>
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<tr>
<td>How could you combat this?</td>
<td></td>
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<tr>
<td>Do you challenge stereotyping in your lessons? Do schemes of work use</td>
<td></td>
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<tr>
<td>examples and role models that are appropriate and relevant to all</td>
<td></td>
</tr>
<tr>
<td>groups of students?</td>
<td></td>
</tr>
<tr>
<td>Are your lessons context- or concept-based?</td>
<td></td>
</tr>
<tr>
<td>Are there faculty policies for questioning techniques and group</td>
<td></td>
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<tr>
<td>activities? Are all learning styles catered for?</td>
<td></td>
</tr>
<tr>
<td>Is the subject promoted positively to parents and carers, as well as</td>
<td></td>
</tr>
<tr>
<td>to students? Do parents and carers have a poor perception of physics?</td>
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<tr>
<td>Is their influence based on outdated information?</td>
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</tr>
<tr>
<td>Are there other parent- or carer-related issues?</td>
<td></td>
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<tr>
<td>Do your students’ backgrounds affect their subject choice?</td>
<td></td>
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<tr>
<td>How does the structure of the school or community affect their careers</td>
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<tr>
<td>awareness?</td>
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<tr>
<td>Are there work-related learning opportunities for your students?</td>
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<tr>
<td>Could you engage the help of external organisations?</td>
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<tr>
<td>Does peer pressure in the school affect student choice?</td>
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</tbody>
</table>
Running the workshop
Part 3: Exploring solutions

Slide 9: Aim of part three
To enable us to develop the knowledge to help students to consider physics at post-16 level we need to have a good idea of the career options that are available.
This session aims to increase our understanding of the large number of career options available to students with physics qualifications.

Slide 10: Simon Singh’s quote
This is what Simon says; let’s see if he’s right...
Let’s start off with a discussion activity to explore current knowledge...

Part 1: Why are you here?
Part 2: What are the barriers?
Part 3: Exploring solutions
Part 4: Action planning

“I think that physicists can do pretty much anything. Our training can be applied to almost any activity....”
- Simon Singh
Slide 11: Funnel activity

There are two options for carrying out this funnel activity depending on the number of people at the workshop. The group could use the funnel on the screen and attach the job cards straight onto the board or wall. Alternatively the funnel could be printed on A3 sheets of paper and the cards stuck in place.

The group should place each job within the funnel. Once the group has carried out the activity, you might want to debrief them by saying:

The qualifications found on the right-hand side of the funnel refer to the level being applied to the job. Where would you place each job within the funnel?

These job titles have been chosen to promote discussion. There is no definite answer to where each job should be positioned on the funnel.

However, some of you might be surprised to find that many meteorologists (weather forecasters) have a physics or maths degree, which would place them very much at the narrow end of the funnel. Electricians are probably nearer to the wide end because they do not require a detailed understanding of the theories of physics to carry out their jobs.

A copy of the job cards can be found in Appendix B if you want to use this activity with your own students.
Slide 12: Transferable skills

Why does the funnel encompass so many jobs? Because of the wide range of transferable skills gained through studying physics.

Slide 13: Printed Institute of Physics career resources

You will now use slides 13 to 15 to introduce them to some career resources and information. Start by handing out copies of the Institute of Physics career publications (for more detailed information about these leaflets go to www.iop.org/education and click on “Careers”).

Explore is a postcard that illustrates the relevance of studying physics and can also be used as a teaching aid.

Expand is a leaflet that promotes studying physics at A-level. There is also an accompanying student quiz that students could complete using the Expand leaflet (all of the answers to the quiz are given on the leaflet). A copy of the quiz can be found in Appendix C.

Experience is a booklet that is appropriate for students considering studying physics at university.

Extra copies of these publications can be ordered by sending your request to this e-mail address.
Running the workshop
Part 3: Exploring solutions

**Slide 14: Online career resources**

The careers section of the physics.org website details various physics-related careers.

Future Morph is a more generic career website but does feature video clips of career profiles.

If you have internet access, clicking on the links or images will take you to the relevant websites. The second image is of Chris Fawkes (a meteorologist) and clicking on his image will take you to his online video profile on the Future Morph website.

**Slide 15: Further career resources and information**

Other sources of information can be found in your participant packs:

- Appendix D lists the entire Institute of Physics catalogue of newly updated career publications, which can be ordered free of charge for the school.
- Appendix E is mainly targeted at subject teachers and gives an overview of careers education and guidance in the UK.
- Appendix F lists a number of other helpful organisations and programmes that will provide physics-based careers information and resources.
- Appendix G will help any staff members tasked with finding physics-related placements for the students in the school.
Part 4: Action planning

Slide 16: Aim of the final session

This session consists of two parts:

- To identify at least one action point for each participant and to detail a timetable for implementation.
- To create a brief outline of an action plan for a whole-school approach to raising awareness of physics-based careers.

Slide 17a: Action planning

Rewriting schemes of work or developing a whole new school policy on inclusivity can’t possibly be achieved in the remaining time that has been set aside for this final stage of the workshop. Instead we should try to address the barriers and take forward the opportunities that were identified earlier in the workshop when we carried out the snakes and ladders game (refer back to your post-it notes).

Ensure that you have at least one individualised SMART objective identified (with the emphasis on "achievable").

For example:

- do you need to consider being better briefed on “career” issues?
- how could you support and work more effectively with colleagues?
- how could physics-based careers be promoted in non-science lessons?

SMART objectives

Specific – be precise about what you are going to do
Measurable – quantify your objective
Achievable – are you attempting too much?
Realistic – do you have the resources to make the objective happen
Timed – the date the objective will be achieved by
Slide 17b: Action planning

Pinpoint specific priorities that would feed into a whole school improvement plan. Remember, cross-curricular working is vital for an effective programme of action.

Develop timelines for performance management targets.

<table>
<thead>
<tr>
<th>Individual targets</th>
<th>Whole-school priorities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ?</td>
<td>1. ?</td>
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<tr>
<td>2. ?</td>
<td>2. ?</td>
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<tr>
<td>3. ?</td>
<td>3. ?</td>
</tr>
</tbody>
</table>

Use a timeline:

- Action 1
- Action 2
- Action 3

Slide 18: Overall aims revisited

Let’s revisit the overall aims of this workshop. Hopefully we have met them all.

Thank you for your time.

Aims of workshop (revisited)

Have you:
- Increased your awareness of physics-based careers?
- Identified barriers and opportunities?
- Built links between staff?
- To be able to help students to make better informed choices...
# Girls into physics – additional workshop notes

Nationally, the proportion of girls taking A-level physics has remained fixed at around 20%. This workshop might help your school to identify ways to increase this number. If this is a key issue within your school, use the information provided in the following pages to supplement the more general presentation and workshop notes.

**Slide 4a: Why are you here?**

If applicable, [insert figure] girls study physics A-level compared with [insert figure] boys.

**Slide 7: Snakes and ladders activity**

Any girl-specific influences could be placed on post-it notes of a different colour.

**Slide 8: Barriers**

Here are some additional girl-specific scenarios that you might need to address within your school.

**Do these barriers exist for the girls within our school?**

<table>
<thead>
<tr>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>“I went to talk to a careers adviser and I only really found out about the sort of jobs that girls do, like teaching and nursing.”</td>
</tr>
<tr>
<td>“Our school took us on a visit to a big company. Until I went there I was quite interested in going into engineering but I didn’t see a single woman doing that type of work there and it put me off.”</td>
</tr>
<tr>
<td>“My friend and I went on a work placement at a bridge construction firm. We thought that we would learn a bit about how bridges are designed, but we had to work in the office doing filing and word processing.”</td>
</tr>
<tr>
<td>“At school they organised for us to do a practical project where we had to make a loudspeaker. We were placed into different groups. In my group the boys got to do all of the exciting practical things. I ended up making notes and finding things on the internet.”</td>
</tr>
</tbody>
</table>
“My parents are usually very supportive. I want to go into space research but they are farmers and they can’t really help me to decide what to do about it.”

“My physics teacher just assumes that I want to go into some kind of medical profession. I really like physics but I don’t fancy medicine. I’m more interested in the environment and the music industry.”

“We had a morning of learning about careers in physics in our school. It was arranged like a competition and the person who knew the most got a prize. I didn’t think it was fair as the boys who shouted the loudest ended up winning. I like it when we work together in teams.”

“I’ve got a very nice adviser; he’s a student at the local university. I told him the other day that some employers treat girls differently, he just said that he didn’t think that himself but that some older employers do and you just have to live with it.”

“I’d quite like to do physics at A-level because I want to go into mechanical engineering. But all of my friends are doing English and history and I don’t like the idea of being the only girl doing physics.”

“I want to go into law. I don’t see what a physics A-level has got to do with that.”

“Our physics teacher told us that we were likely to earn more money if we had a physics qualification, but I don’t find physics lessons very interesting. It’s just a load of equations and I don’t really know what they are for.”
Please note: this workshop cannot go into the full details of best teaching practices to encourage girls into physics (there are some brief notes given below). A separate CPD session should be arranged if this is thought to be a key issue within the school.

**Actions to help girls and to make a more gender-inclusive environment in physics lessons**

Consider the following potential forms of action that you might take and identify ways in which you could integrate these into your whole-school plan. These ideas only give an outline of the kind of interventions that you might want to consider.

**Challenge stereotypes**
- Use a variety of role models, both male and female and from a variety of ethnic backgrounds, both in teaching and when providing careers information.
- Make use of STEM ambassadors to provide these role models.

**Provide encouragement**
- Make sure that you use contexts in your teaching that are engaging and familiar to both boys and girls. Girls are typically more interested in the environment and health and medicine than boys, but don’t assume that you know – ask your students.
- Use industrial visits to encourage girls to explore areas outside of their normal range of interests.

**Improve motivation**
- Establish the relevance of physics to everyday life issues e.g. medical diagnostics, mobile-phone technology, weather forecasting and safety in the Sun.
- Provide information about earning power for people with physics qualifications.

**Build confidence**
- Create gender-inclusive learning environments, for example: structuring groups and assigning roles for group work; allowing non-technical talk about concepts as a way of demonstrating understanding; changing questioning styles and allowing more “wait time” before asking for answers.
- Provide girls-only physics sessions, for example: industrial visits, careers sessions and after-school clubs.

**Change perceptions**
- Via marketing, for example, industrial visits can be used to show how physics helps you to get a job in the health, environmental or financial sectors.
- Integrate questions demonstrating gender awareness into mentoring application forms.

**Develop skills**
- Rotate roles when girls participate in practical group work with boys.
- Promote skills in addressing sexist behaviour and knowing their rights.
- Develop the skills and confidence to interact in male-dominated environments.

For more details of effective practice, visit [www.iop.org/education](http://www.iop.org/education) and click on “Girls in Physics”.
Appendices
Appendix A

Slide 15: Further career resources and information

Resources to encourage girls into physics-related careers

The Institute of Physics commissioned a review in 2006 to try and understand the causes of under representation of girls in physics post-16. Drawing on this review, a teachers’ guide and two videos were also produced to help teachers find ways of encouraging more girls to study physics:

- Girls in the Physics Classroom: A Review of Research on Girls’ Participation in Physics
- Girls in the Physics Classroom: A Teachers’ Guide for Action
- Engaging with Girls – Increasing the participation of girls in physics – an action pack for teachers

For electronic copies of these three resources and information on the Institute of Physics’ current work in this area, go to: www.iop.org/education and click on “Girls in Physics”.

Insight at Headstart is a programme developed by Women into Science, Engineering and Construction (WISE) for young women interested in mathematics and/or science:

- It provides opportunities for 16–17-year-olds to spend a week in the engineering department of a university prior to making their UCAS application.
- The course examines several different aspects of science and engineering including problem solving, teamwork exercises, practical activities and a company visit.
- It is an introduction to university life as well as helping them to make informed decisions.
- Participants meet women who are undergraduates at the university or beginning their career.
- Information is provided regarding work experience, industrial placement and company bursary schemes.
- It is designed for girls who prefer to study in an all-female environment.

Application information can be accessed from the Headstart website at www.headstartcourses.org.uk/courses.php.

The aim of the UK Resource Centre for Women in Science, Engineering & Technology (UKRC) is to increase the participation of women in science, engineering and technology. Its mission is to establish a dynamic centre that provides accessible, high-quality information and as an advisory service (www.setwomenresource.org.uk).

The GetSETWomen database provides schools with access to hundreds of women at various stages of their SET careers and can be approached for talks and work-related opportunities. For further information visit www.getsetwomen.org.

Women into Science, Engineering and Construction (WISE) is a campaign targeting girls, their teachers and careers advisers. WISE promotes science, engineering and construction as valuable and interesting career options for women. It also provides resources for teachers and careers advisers including ideas for lessons, career information, courses and publications, which aim to demonstrate that a career in science, engineering or construction can be very interesting and does not necessarily involve the usual stereotypes (www.wisecampaign.org.uk).

Let’s Talk is a careers resource for girls in science, engineering and technology (www.letstalkset.org.uk).
Job cards for funnel activity

These cards can also be used in the classroom to explore the use of physics qualifications in the wider world of work.

<table>
<thead>
<tr>
<th>radiographer</th>
<th>electrician</th>
<th>optometrist</th>
</tr>
</thead>
<tbody>
<tr>
<td>cartographer</td>
<td>meteorologist</td>
<td>trading standards officer</td>
</tr>
<tr>
<td>surgeon</td>
<td>architect</td>
<td>astrophysicist</td>
</tr>
<tr>
<td>sound engineer</td>
<td>patent attorney</td>
<td>civil engineer</td>
</tr>
<tr>
<td>heating engineer</td>
<td>computer games designer</td>
<td>science teacher</td>
</tr>
<tr>
<td>pilot</td>
<td>financial analyst</td>
<td>electrical engineer</td>
</tr>
</tbody>
</table>
Expand leaflet quiz

Expand: Physics at A-level – the logical choice

You will find the answers to all of these questions by reading the leaflet.

1. Name three modern gadgets that would not have been invented without a knowledge of physics.

2. How has a physicist revolutionised the way that the world communicates?

3. Why does an astrophysicist have to travel to other parts of the world as part of their work?

4. How does a physics background help when studying law?

5. As well as problem-solving, what other transferable skills can you gain from learning physics?

6. How does a clinical scientist help with finding ways to diagnose and treat heart disease?

7. Why is it important for a sound engineer to have an understanding of physics?

8. David says that studying physics at A-level helps you to keep your options open; explain why?

9. What other subject is the most important to study at A-level if you have already chosen physics?
Career resources from the Institute of Physics

The PDF files of the following three publications can be found on the workshop leader’s CD and from the Institute’s website at www.iop.org/education by clicking on “Careers”. Printed copies can be ordered by e-mailing your request to education@iop.org.

Explore: Physics at the heart of everything
This postcard illustrates the relevance of studying physics to 11–14-year-olds and can also be used as a teaching aid.

Expand: Physics at A-level – the logical choice
This leaflet for 14–16-year-olds promotes studying physics at A-level. It tackles common questions and profiles people and their careers. There is also a student quiz to accompany this leaflet, see Appendix D.

Experience: Physics at university
This booklet for students aged 16 to 19 gives a brief introduction to the benefits of choosing to study physics at university. It also includes further guidance on choosing a degree and lists the variety of degrees in physics that are available.

The following two career resources are available free of charge from the Institute of Physics. Copies can be ordered by e-mailing your request to education@iop.org.

Physics on Course: Physics courses in Higher Education
An annually updated directory of physics courses in higher education. It details all university departments and physics-based degree courses in the UK and Republic of Ireland, including typical grade offers. It is designed to help sixth-formers and college students who want to study physics to make the all-important decision regarding their particular choice of course and university.

Ashfield Music Festival Activity Resource Pack
Developed by the Institute of Physics and the Career Development Organisation (CRAC), Ashfield Music Festival is an activity designed to develop skills in work-related learning and inspire more students to study physics post-16. The activity is a simulation, based on the scenario that a council (Ashfield) wants to create a new music festival.

Students develop skills in enterprise and learn how physics applies in this context by taking on one of six roles: project manager, health and safety adviser, construction manager, electrical engineer, sound engineer and lighting engineer. They are supported by real-life scientists – referred to as “experts” – and students use a mixture of physics-based knowledge, creativity and skills associated with enterprise in order to win the contract to build the main stage.

With a theme chosen to engage students and illustrate the broad relevance and potential application of physics, Ashfield Music Festival is a one-day, off-timetable activity that has been fully trialled in schools. The activity pack comes complete with videos, PowerPoint presentation, expert briefing sheets and student documents.
General information about career education and guidance (CEG) for subject teachers

The information given here is intended for subject teachers. The most informed source of general CEG will be the careers staff at your school or college; however, teachers nowadays will frequently be involved in giving CEG to students. How the disciplines of career co-ordinator, subject teacher and Connexions personal adviser (or equivalent) will work together is a key theme of the workshop and particularly at the action-planning stage.

What is career education and guidance?

- CEG is a wide-ranging term that includes career education, work experience and the direct help that young people can ask for from trained careers advisers, careers teachers and others school staff.

- However, many career guidance professionals use the term “career” to mean a general pathway through life and “career guidance” refers to the process where individuals are helped to review their options and to decide the most appropriate course of action at that time.

Why provide career education and guidance?

- Providing CEG is a statutory responsibility for schools and colleges. These institutions are required to provide impartial careers education for their students from the age of 11 onwards.

- Career education is essentially about helping young people to become effective managers of their own career. This might include: using and assessing sources of information; evaluating work experiences and other opportunities; and making decisions on their own future career choices.

- Careers can often develop in unexpected ways. Effective career managers can deal with a developing career and will know how and when to seek advice from friends, family and professional acquaintances (including teachers, lecturers and career experts, such as personal advisers).

What are the career-guidance services in the UK?

- Career-guidance services in the UK have all been substantially revised in the past few years. The careers services in Northern Ireland, Scotland and Wales have common features – all provide services to adults as well as young people. The approach in England is fundamentally different.

- The Connexions Service (in England) brings together the careers service and elements of social services and the Youth Service to deliver an integrated information, advice and guidance (IAG) service to young people between the ages of 14 and 19. All four services provide support for young people as they develop their career plans. This support includes individual advice and guidance as well as providing information online and within school and college careers libraries.

- In Northern Ireland, Wales and Scotland, the careers services also organise work experience and other education/business links. In England these links are handled by local education/business partnerships.

How can Connexions staff help students?

- Connexions frontline workers are called personal advisers and are trained to deal with any problem that a young person may have whether it be family related, drugs, housing or about career planning.

- The Connexions service aims to help young people find learning, work and/or training opportunities. It has a particular remit to support disaffected young people and will work with employers to identify opportunities that can meet the needs of this group.
• Connexions personal advisers work with the whole ability range and therefore are involved with students who may go on to higher education and be potential graduate recruits.

• Out-of-school access to Connexions services varies from area to area; many have retained high-street Connexions centres, while others now use existing council premises such as youth centres or schools. Some personal advisers undertake outreach work, meeting young people where they congregate.

• Connexions staff also support their career co-ordinator colleagues in planning and delivering CEG programmes in schools and colleges.

How is career education and guidance delivered in schools?

• CEG is usually delivered as part of the school’s personal, social and health education (PSHE) or Citizenship programmes. Career guidance, work-related learning and enterprise education now sits in the new economic wellbeing strand of PSHE.

• In 2003 the National Framework for CEG was published, which provides a framework of activities and learning outcomes for use in schools.

• Most careers co-ordinators within schools are not trained specifically for the role (although training programmes do exist and it is expected that CPD for careers co-ordinators may become more structured and prevalent in future). An increasing number of careers co-ordinators come from a non-teaching background.

• Organising work experience might either be the responsibility of the careers co-ordinator or other staff within the school.

How is career education and guidance delivered in further-education institutions?

• A CEG programme does not usually feature in most further-education institutions. However, many do have careers co-ordinators who will oversee the CEG process and liaise with Connexions’ personal advisers (who will provide one-to-one guidance) and the local education/business partnership (which support schools and colleges in preparing young people for the world of work and supporting the work-related curriculum including work experience).

• There are opportunities for CEG at careers conventions and fairs, which are often held on an annual basis. These events provide an opportunity for students to find out about opportunities within the business sector and to assess the training and progression routes on offer.
Physics-related career resources

This section highlights various organisations, programmes and resources that will provide information about physics-related career pathways.

The Institute of Physics can provide a range of posters and career publications. Visit www.iop.org/education and click on “Careers”.

FutureMorph is a national website that seeks to encourage young people to appreciate why they study science in school and to understand the breadth of opportunities that are available from studying STEM subjects: www.futuremorph.org.uk.

Enginuity is an online resource from the Engineering and Technology Board; it provides career pathway information as well as a range of career-related resources: www.enginuity.org.uk.

Scenta (the other online resource from the Engineering and Technology Board) contains more specific job information: www.scenta.co.uk.

Other engineering bodies, such as The IET with its Faraday campaign, have their own career resources: www.theiet.org/faraday.

The STEM Ambassadors Programme currently has more than 18 000 registered individuals from a wide variety of STEM careers who can offer their time, enthusiasm and expertise to help schools inspire young people. All are CRB-checked and undergo a certain amount of training before they enter schools. You can find ambassadors through the STEMNET website at www.stemnet.org.uk.

Jobs4u is a national website of job descriptions provided by the Connexions service. It contains a variety of jobs for which physics is a particularly useful qualification: www.connexions-direct.com/jobs4u.

icould is a website produced by CRAC (a career-development organisation) and contains videos of career stories from a range of people – some of whom have studied physics and have related qualifications: www.icould.com.

NOISE stands for New Outlooks in Science and Engineering, a campaign that aims to engage 14–19-year-olds with science and engineering. The campaign is fronted by early-career scientists and engineers, all working in wide-ranging research and industry roles: www.noisemakers.org.uk.

Researchers in Residence facilitates a mutually beneficial relationship between researchers and secondary-school students by placing researchers (PhD and postdoctoral) in secondary schools across the UK: www.researchersinresidence.ac.uk.
Organising physics-based work experience placements

These guidance notes are for staff hoping to identify new work experience placements for their physics students.

Key organisations

Educational Business Partnerships (EBP) provides work experience and enterprise activities for pupils in England and Wales: www.iebe.org.uk.

Trident also offers a range of similar services but focuses mainly on work experience: www.trident-edexcel.co.uk.

Other helpful organisations

The Industrial Trust provides structured visits to help students understand business and enterprise. Their work includes:

- Open Apprenticeships – allows Key Stage 3 pupils to explore apprenticeships.
- Open Horizons – gives students the opportunity to visit an employer and/or higher-education institution to help them understand the benefits of further study.
- Open Industry – comprises visits to companies for pupils up to Key Stage 3 and looks at STEM curriculum topics in a business setting.
- Open Enterprise – designed for Key Stage 3 and 4 students to develop their economic, business, financial and enterprise capabilities.
- Teachers’ CPD – catered through in-company programmes.

For more information, visit www.industrialtrust.org.uk.

The Nuffield Science Bursaries Scheme is a nationwide initiative that offers around 600 sixth-formers and college students each year the chance to take part in science-based projects in universities, industry or research centres. For further information visit www.nuffieldfoundation.org/go/grants/nsbsc/page_394.html.

The Year in Industry (YINI) programme finds gap-year placements for students with one of their 250 UK companies. A new scheme has been launched called YINI Combo that aims to combine a work placement with other gap-year activities. For more information visit www.yini.org.uk.

Arranging work experience placements

Given the potential number of requests that businesses receive for work experience or other work-related activities from schools and colleges, it follows that staff should contact the key organisations given above first. Contacting the key organisations will provide background information and local intelligence. This may include:

- existing processes; and
- employers already committed to providing work placements in the local area.

However, in the event that you are being asked to plan work experience, or similar employer-based experiences for students, and have to approach employers directly, here is a checklist of things that should be considered.
<table>
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<tr>
<th>Have you:</th>
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<tr>
<td>• ensured that you have enough time scheduled to concentrate on this (planning and arranging work experience is a time-consuming process)?</td>
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<tr>
<td>• looked at online resources focused on work experience (for example, the TeacherNet website provides general advice on work experience, including guides for schools and employer: <a href="http://www.teachernet.gov.uk">www.teachernet.gov.uk</a>)?</td>
</tr>
<tr>
<td>• spoken with your local EBP and Trident either to work through them or to make them aware of your objectives (they may already have contacts in place and/or up-to-date resources that you could use)?</td>
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<tr>
<td>• ensured that all staff within the school are aware of your objectives?</td>
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<tr>
<td>• ensured that there is a whole-school co-ordinated programme in place supported by your senior management?</td>
</tr>
<tr>
<td>• contacted your local STEMpoint (some may also be the area’s EBP and have a role to promote STEM-related education activities)?</td>
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<tr>
<td>• gathered examples of good practice, through leaflets produced by the National Support Group for Work Experience?</td>
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<tr>
<td>• explored other national guidance material (including resources on the Teaching Expertise website at <a href="http://www.teachingexpertise.com/articles/providing-effective-work-experience-406">www.teachingexpertise.com/articles/providing-effective-work-experience-406</a>)?</td>
</tr>
<tr>
<td>• agreed the learning outcomes – with both the employers and students – and thought through the kind of experiences that will produce them? (This should result in more productive project-based experience rather than poor-quality routine jobs during the placement. Help with this can be found on the Qualifications and Curriculum Development Agency (QCDA) website at <a href="http://www.qcda.gov.uk">www.qcda.gov.uk</a>.)</td>
</tr>
<tr>
<td>• identified supporting documents including pre-briefing and pupil/employer reports to be used during the placement (EBPs, Careers Scotland and Trident will have these already)?</td>
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<tr>
<td>• planned your pitch to employers, including how to deal with issues such as health and safety and equal opportunities (evidence shows that the vast majority of employers are positive towards the idea of work experience)?</td>
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<tr>
<td>• planned how students will be matched to placements?</td>
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<tr>
<td>• organised the appropriate session if some employers want to conduct a (mock) selection interview beforehand?</td>
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<tr>
<td>• supported pupils’ preparation for interviews?</td>
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<tr>
<td>• decided on the level of support to be provided to pupils while on their placements (ideally, support will include a mentor available to talk the student through any challenges and to keep them focused on their learning outcomes)?</td>
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<tr>
<td>• made pupils and parents aware of their legal as well as educational responsibilities (if the briefing is via an event, involving employer representatives may be beneficial at this point)?</td>
</tr>
<tr>
<td>• debriefed pupils and employers? (This is vital to ensure that individual learning outcomes have been achieved and that practical issues have been dealt with satisfactorily – or if not, remedial action will ensure that the problem is not repeated.)</td>
</tr>
<tr>
<td>• evaluated the scheme?</td>
</tr>
<tr>
<td>• reported on the scheme to appropriate school or college managers?</td>
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</table>
Background information

Following a request from the then Secretary of State in 2004 the Higher Education Funding Council in England (HEFCE) convened an advisory group that identified a number of subjects as being strategically important and vulnerable, one of which was physics.

HEFCE has since provided funding for projects to help address this (in a number of subjects: chemistry, engineering, maths and physics). This workshop is an output of one the funded projects: the Stimulating Physics Pilot Programme.

Why focus on physics?

- The number of physics A-level entrants increased by 4.8% in 2009 bringing the total to around 29 000. The government’s target is 35 000 by 2014.
- In 2009 there were 29 000 entries for A-level physics compared with around 72 000 entries for maths.
- Physics has significantly fewer A-level entrants compared with the other major sciences – chemistry and biology.
- There is a gender divide in the physics classroom with a ratio of three to four boys to every girl. Overall, physics is the sixth choice for boys (behind maths, general studies, English, history and biology) and the 16th for girls.
- Physics undergraduate numbers have not increased with expansion of higher education; numbers fell by 1% in 2008. The lack of demand for undergraduate places has resulted in the closure of physics departments despite funding being available to sustain departments until student numbers rise.