A Guide to **Industry Visits for School Groups**

August 2010





IOP Institute of Physics

National HE STEM Programme

Contents

Preface

The Institute of Physics developed the industry visits scheme as part of the Stimulating Physics Programme, which was funded by the Higher Education Funding Council for England (HEFCE), and ran from May 2006 to July 2009.

The core aims of this programme were to increase the number of students taking physics at A-level and subsequently progressing onto a degree in physics. The programme was split into two distinct but complementary strands:

- The "Access" strand focussed on encouraging a less traditional cohort to physics-based degrees, by making undergraduate courses more appealing and accessible.
- The "Demand" strand concentrated on a cluster of schools and piloted activities designed to increase students' motivation to study physics to A-level and beyond.

One element of the Demand strand was the development of a scheme of industry visits. The key objectives of this scheme were to:

- improve students' attitudes towards physics;
- highlight the relevance of physics to everyday life;
- improve awareness of careers from physics.

Visits to local physics-based industries were facilitated through the Industrial Trust[1] to show students applications of the physics that they had encountered in the classroom. As well as enhancing the curriculum, the visits allowed the students to see a variety of different careers available through studying physics. Guides from the organisations were able to further the students' understanding of physics-based concepts in an engaging setting.

Over the course of the programme, the Industrial Trust organised 67 visits to 28 organisations in the three pilot regions of Oxfordshire, Nottinghamshire and Leeds. Many students and teachers commented that the guides were engaging and enthusiastic, and the students were able to encounter real-world examples of physics in industry. There was also much positive feedback from teachers in terms of the Industrial Trust's involvement and organisation of the visits.

Dr Saher Ahmed, Institute of Physics, August 2010

1. The Industrial Trust is a business-led, not-for-profit organisation that facilitates links between companies and schools. It works to enhance the curriculum by introducing students to a variety of exciting and interesting careers, giving students a focus for their learning and preparing them for the transition from full-time education, into work or further study. To contact the Industrial Trust visit their website, www.industrialtrust.org.uk.

1: Rationale of industry visits

In 2008, the Institute of Physics commissioned market research in order to better understand the current influences, perceptions and attitudes towards physics amongst students. This research identified two salient problems:

- Most students did not see physics as relevant to everyday life.
- Students were not aware of the career opportunities that are available after studying physics.

The industry visits scheme challenges these perceptions by allowing students to see physics in a practical context and introducing them to a wide range of career opportunities.

There are tangible benefits for the students, schools and hosting organisations involved in these visits.

Benefits for the students:

- Authenticating curriculum work, as students can see first-hand the relevance and application of the science learnt in the classroom, in the real world.
- Industry visits can showcase a variety of careers from science, allowing students to make an informed decision about which subjects to study at A-level.
- The students have the opportunity to meet enthusiastic guides within the organisation, who may change their perception of scientists and the work that they carry out.
- Students gain an appreciation of the requirements and demands of working in an industrial environment.

Benefits for the school:

- Teachers become more aware of careers available from the subject that they teach so can highlight the importance of the subject to their students.
- The school creates valuable links with local industries.
- The visit helps to fulfil the requirements of providing careers advice to their students.

Benefits for the organisations:

- Hosting an industry visit provides the opportunity to demonstrate the breadth of jobs and careers available within the organisation.
- Staff acting as guides can develop their communication and presentation skills.
- The visit may help to fulfil organisations' corporate social responsibility obligations, and help to build links with the school and community that will enhance the profile of the organisation.
- Liaising with schools can allow staff within the organisation to acquire an understanding of curriculum developments and therefore, the range of skills that new potential employees possess.
- The scheme helps to build stronger links between employers and schools.

Well run industry visits provide an excellent opportunity to see physics in the real world.

Badly run visits can confirm students' negative perceptions of physics.

2: Implementing an industry visit

2.1 Recommendations for schools and teachers

Although a school can organise an industry visit independently, working with the Industrial Trust can reduce the level of input needed in terms of organising and planning an educational visit. As well as giving recommendations on how to set up an independent visit, this guide also indicates how the Industrial Trust could assist, should the school wish to work with them.

Costs

If the school decides to arrange a visit through the Industrial Trust, there is a fee of approximately £5 per student. This fee includes establishing and matching the teaching requirements; identifying and confirming the host organisation; a pre-visit and site-suitability assessment; arrangements for the visit and providing the paperwork. A member of staff from the Industrial Trust will also accompany the students on the visit, reducing the "out-of-class" teachers burden. The school will also be required to cover any transport costs.

Building a relationship with the organisation

Communication with the organisation may start via e-mail to a senior director or a member of human resources, but it is usually beneficial for a face-to-face meeting to be arranged, attended by teachers and representatives of the host organisation.

Senior management in the school should be fully involved in the process from the start, as their co-operation will be essential in ensuring that staff have adequate time to prepare for the trip and to arrange cover for teachers who will be accompanying the students.

Industrial Trust's input

A regional officer at the Industrial Trust can carry out all initial communication with the organisation, should this be required. They can also recommend organisations that run industry visits in the area.

Lots of preparation and planning beforehand is essential in order to make the most of the visit.

Pre-visit arrangements

Organisational meetings should take place before the start of the academic year, as this will allow the organisation enough time to fully understand the needs of the students and allow the school to develop a relationship with the host organisation. The timing of the visit is crucial and should be carefully considered, as visits are most beneficial when students have recently encountered in the classroom the science that they will be seeing in action. Early organisation of the visit will also allow enough time for the school to arrange cover for attending teachers.

Industrial Trust's input

The Industrial Trust can liaise with the organisation to ensure that it fully understands the needs of the students.

A mutual understanding of official procedures and priority areas for schools and businesses is helpful.

2: Implementing an industry visit

Defining clear learning objectives
It is essential that the school has a clear idea of the learning objectives of the visit and communicates these clearly to the organisation before the day is planned, as organisations may not know the specifications of the curriculum. The finer details of the plan for the day, and the level at which scientific theory is discussed with the students, should be finalised with direct contact between the company and the teacher to ensure that all learning objectives will be met during the visit. Teachers should also discuss the learning objectives with the students so that they are better prepared for the visit. Background research into the organisation and preliminary teaching will help to focus the students and make the learning objectives more attainable. Following up the visit with a de-briefing session to discuss the science encountered will help students to retain what they learnt during the trip.

Gender equality
When organising visits, schools should be conscious of the gender balance. Girls are less likely than boys to consider physics as a subject to study at A-level, and seeing physics in action can be particularly beneficial for girls. The school should ensure an equal mix of gender, and consider all-girl groups, where appropriate.

Documentation
Teachers involved in planning the visit should consider relevant risk assessments and parental consent forms that need to be completed before the visit. The health and safety procedures of the school and company should be discussed with the students in advance of the visit.

Industrial Trust's input

The Industrial Trust can ensure that all documentation is completed and they can carry out a site-suitability assessment.

Small group visits could have advantages in terms of better student engagement.

Getting pupils out in large numbers can be difficult.

Group size
The group size should take into account timetabling issues, supply cover, transport and any limits that the company may have on capacity. Taking large groups out of school can have disadvantages; if students from a teaching group are accompanied by their own teacher then they can ensure integration of the visit into the lessons. If a whole year group attends the visit, students may not be accompanied by their own teachers so this integration will not be as well rounded. A recurring comment from teachers suggests that students are most engaged when they are personally involved in interactive activities. In a larger group, some children may not have the opportunity to be hands-on and could become bored. The group size should take into consideration the space and activities available at the organisation, in order to ensure optimum engagement of the pupils.

Target students
Once the group size has been decided, teachers can think about which specific students to involve in the visit. This very much depends on the host organisation and the science that the children will encounter. If the science is at a level that the children cannot access then they will become disengaged and the perception that science is too difficult will be reinforced. The organisation should be made fully aware of the level of ability and age of the students beforehand, so that presentations and activities can be prepared appropriately.

2: Implementing an industry visit

Integration with the curriculum
Integrating the visit with the curriculum is important; if students have a clearer understanding of the science they encounter in the organisation, they will be able to ask intelligent questions and benefit more from the visit.

Tips for integration into the curriculum

- The visit must be arranged well in advance so that teachers have adequate time to plan lessons and resources.
- The teacher should meet with the organisation's staff beforehand to discuss in detail the science that the students will encounter.
- The organisation may have prepared some pre-reading or worksheets for pupils. Teachers should give students enough time to go through these before the visit so that they have an idea of the background of the organisation and what it does.
- The plan of the day and learning objectives should be discussed with the students so that they know what they will encounter and possibly pre-plan questions that they might want to ask (Appendix 2 lists some prompts for the pupils).
- A debrief session should be held soon after the visit. This will give the students an opportunity to ask any additional questions and give the teachers an opportunity to ascertain how beneficial the visit was to the students. During the session the teacher should reiterate the scientific theories encountered during the visit and highlight how these match the curriculum.

Collaboration with other departments
It is often difficult for a school department to justify funding for such activities. If this is the case, then it can be beneficial and more cost-effective to make the visit a cross-departmental activity.

The role of the teacher
The students remain under the teachers' duty of care throughout the visit. While the students should be allowed to be hands-on, the teachers should ensure that this happens in a reasonable and safe manner by setting clear boundaries. To ensure the safety of students and staff, the students should be advised of the organisation's health and safety policy before the visit. During the visit, the guides should be made aware of the support of the teachers as they might not be used to working with children and it is not their responsibility to discipline or reprimand the students.

A pre- and post-visit checklist can be found in Appendix 1.

2.2 Recommendations for organisations

Initial contact
If an organisation wishes to host an industry visit, contact should be made with the appropriate head of department within a local school. The Industrial Trust can facilitate this relationship and approach the school on behalf of the organisation. Representatives from the organisation may be asked to attend a meeting with teachers to discuss the feasibility of a visit and possible learning outcomes.

Industrial Trust's input

If the organisation has no links with local schools, the Industrial Trust can suggest schools in the area that would benefit from an industry visit.

Guides

During the visit the school group should be assigned guides who work in the organisation. These guides should be enthusiastic about their work and position within the organisation.

Tips to engage students

- Take into account the gender balance of the group. For example, if there are female students attending ensure that the group encounters female guides.
- The enthusiasm of the guides is of key importance to the students' enjoyment of the visit. They must be inspiring, engaging and ready to answer questions.
- The age of the guides will also partially determine how well the students can identify with them. If a guide is just a few years older than the student, then their position within the organisation will seem more achievable.
- The guide should have a thorough knowledge of the organisation and the activities that they are demonstrating. The students will become disengaged if they detect uncertainty. The guide should also encourage students to ask questions; it is useful for the guide to prepare answers by pre-empting some of the questions before the visit.

Make sure that the talks are delivered by young graduates so that the pupils can identify with them.

A boring talk could turn pupils off of studying science!

The guide's job on the day is to accompany and aid the students and teachers on their visit, but they are not responsible for the students' behaviour. It is important that guides are not left alone with any student under the age of 18 at any time.

Presentations should be given and these should be interactive and concise; the visit should not be a replication of a lesson in a different environment. The company should organise some hands-on activities for the students and the guides should give students a tour of the organisation and demonstrate these specific activities, but whenever possible, allow the students to explore for themselves.

The guide will need to have a CRB check. CRB requests must come from the organisation; if the organisation is not CRB registered, it can be requested through an umbrella organisation. More information regarding CRB checks can be found at **www.crb.homeoffice.gov.uk**.

Appendix 3 details advice and information for guides.

Timetabling the day

When planning the day, the learning outcomes should not be forgotten. The students will respond well when they are involved in activities and learning through exploring. With this in mind, the presentations should be fun and interactive, and the main focus of the day should be the site tour and any activities that the students can undertake themselves. In a successfully planned visit, the students will have prepared questions to ask and there should be plenty of time after the tour for all of the students to ask and discuss their questions. However, the guides should have some extra activities prepared in case the question and answer session does not fill the allotted time.

There should be a fairly firm structure and timing for each section of the visit to ensure that the students do not become bored during the presentations, have enough time to engage in activities during the site tour and ask all of their questions during the question and answer session. The agenda for the day (including timings) should be confirmed with the school before the visit, allowing time for any adjustments that may need to be made.

2: Implementing an industry visit

Example plan of the day

1. Briefing on health and safety and housekeeping.
2. Setting the context of the organisation: history, background and a brief overview.
3. Explanation of the organisational structure and different functional areas.
4. Explanation of how work within the organisation links to the science curriculum.
5. Site tour of the working environment and activities based on the science used in the organisation.
6. Outline of the career opportunities that are available within the organisation.
7. Profile of a member of staff within the organisation.
8. Question and answer session followed by evaluation and feedback.

Show and explain to the students how things work.

Make sure that there are not too many talks and that there is enough time for the tour.

Tailoring the visit

The timetable for the visit may vary depending on the particular group of students and the learning outcomes for those students. The organisation should be fairly open to reasonable alterations suggested by the teachers as they will know their students well and will have a better understanding of the students' capabilities.

The presentations and activities may also have to vary depending on the ability of the group. Realising the level of the students' understanding through liaising with the school will ensure that the presentations and activities are tailored towards the specific audience. Discuss with the school the depth to which the topics have been covered during lessons, as this will give an idea of how much detail to go into during the visit. While it will be beneficial to stretch the students' understanding slightly, if the science covered is inaccessible, they will become disengaged and the idea that science is too difficult will be confirmed.

Health and safety

A risk assessment should be carried out before the visit. During the visit, the duty of care of the students will remain with school staff, however, the organisation's staff do have an obligation to fulfil duties under health and safety legislation that are applicable to any site visitor.

2.3 Making industry visits "girl-friendly"

Girls are under-represented in physics post-16, making up only 22% of students studying physics at A-level. For the gender balance to be readdressed, it is crucial that girls are exposed to the creative and relevant nature of physics and meet inspiring female physicists who can show them first-hand that physics does not have a gender barrier. Visits to industry can provide an invaluable opportunity for this, especially if good "girl-friendly" practice is observed by the school and host organisation.

The school should consider the benefits of an all-girl group of students. If it is not practical to take a single-gender group on the visit, the students could be split into single-sex groups for certain activities. This will allow girls to take part in activities that boys might otherwise dominate. In a single-sex group, girls can engage in activities and ask questions in a more secure environment. If single-sex groups are not feasible then the school should ensure that the gender balance is not biased towards boys and the teacher should encourage the girls to participate as much as the boys in activities, and during the question and answer sessions.

During the visit, if the group is mixed, both genders should be introduced to female role models who are enthusiastic about their work with physics. It is important that all students meet female role models who can challenge stereotypes. Similarly, the students' preconceptions of traditionally male and female occupations should be challenged during the visit through the people that they meet.

In addition to meeting female role models, the fact that girls can succeed in physics should be reinforced by encouraging the girls to participate in activities that portray the creative, forward-thinking nature of physics. It is these aspects of physics that can engage girls, and success in these types of activities will allow both genders to recognise that girls can have as much aptitude for science as boys.

Throughout the day, male and female guides should emphasise the fact that all jobs in the organisation can be performed by both genders and any illustrations or analogies used during the visit should be gender-neutral (for example, references to music would interest both boys and girls, whereas references to football or fashion are fairly gender-specific).

Ensure that the guides include young female scientists.

As part of a presentation about the organisation, the company's gender equality or equal opportunities policy should be explicitly discussed with the students; the reasons for its importance to the progression of the company and STEM community as a whole should be mentioned. The students should be told about the specific actions that the organisation has taken to ensure gender equality.

3: Case studies

3.1 Visit to Fylingdales

RAF Fylingdales is situated on the North Yorkshire moors and its main function is to track and catalogue objects in space.

The visit was designed to support a group of learners taking Key Stage 4 double-award science who were about to carry out a project on space, focussing on tracking objects in space using radar.

The learners were selected so as to ensure an equal gender balance and the visit was a direct contribution to a project that the students were working on in class.

Participants had an opportunity to experience the tight security operated by the base, see the 360° radar tracking device, enter the radar housing itself and observe the control room and cataloguing processes in operation. Alongside this, they were made aware of the history of the base, how it had been established in the early years of the cold war, but also how its function has changed as a result of political change. They were also alerted to the environmental problems facing the space industry and the need for shared international responsibility for tackling the issue.

Not only were the students able to find out more about the physics behind radar and its operation, but there was also an opportunity to further their understanding of electricity on account of the fact that the base uses US voltage.

They were shown around by a female wing commander and made aware of the proportions of male and female staff, and the changes that are in place to recruit increased numbers of women.

3.2 Visit to the Confetti sound-recording studio

Year 9 girls in the top science set at a school in Nottingham participated in a visit to the Confetti sound-recording studio. This was considered to be especially appealing on account of it being the venue where the Arctic Monkeys recently recorded. The girls were split into two groups: one went on a tour of the studio and learnt about sound insulation, recording equipment and mixing tracks; the second group wrote a song and found some music to go with it. After an hour, the two groups swapped. Later, they all worked with a sound engineer to finalise the song and to record it by laying down the single tracks one at a time. They all came away with a CD that they had made themselves.

The students' science teacher helped them to link what the sound engineer does in the recording studio to concepts that they had learnt in their science lessons, such as frequencies, echoes and the acoustic qualities of the room.

4: Appendices

Appendix 1: Checklist for teachers	
Before the visit	**Tick**
• Have you given the students some background to the organisation?	
• Have you clearly defined the learning objectives to the organisation and the students?	
• Has the organisation agreed the plan for the day (including timings) with you?	
• Have you carried out a risk assessment?	
• Have you written to parents or guardians to ask for permission to take their children out of school?	
• Have your students thought about personal objectives?	
• Have you helped students form questions to ask the guides (see Appendix 2)?	
• Have you briefed the students on the school's health and safety procedure, the organisation's health and safety procedure and the behaviour expected of them?	
• Have you introduced the students to the scientific topics that they will encounter on the visit?	
• Have the students carried out any preliminary work or reading provided by the organisation?	
After the visit	
• Conduct a briefing session where students can ask any further questions and discuss the relevance of the trip.	
• Assess the benefits of the visit with the students and ask them to write up a mini report.	
• Ask the students to write a thank you letter to the organisation.	

Appendix 2: Prompts for students
A successful visit will include a substantial question and answer session. Without planning, this session could dry up and if students are not confident about the questions that they are asking, they might be too embarrassed to take part. To avoid this happening the teacher could discuss the following prompts with the students before the visit:
Working environment
• Is this an environment that the students would like to work in?
• How are the desks arranged?
• Is it an open-plan office?
• Where is the workplace?
• What is the noise level like?
• Are there opportunities to work outdoors?
• Are there any staff benefits (gym or a subsidised café)?
People
• Do the people appear happy and engaged?
• What is the general age and gender balance?
• Is there the opportunity to work from home?
• How long do people commute?
• Are the employees challenged by their work?
Company culture
• How do people dress in this workplace?
• Are office hours set or flexible?
• Is there opportunity to travel?
• What benefits are available to employees?
• What training opportunities are available?
• Are there any mentoring schemes?
Conclusion
• Could you see yourself working for this company?

Appendix 3: Advice and checklist for the guides

Careers advice

It may be the case that during the visit the students will ask you questions about your career as they will have been told that learning about career opportunities from STEM is part of the focus of the trip. It might, therefore, be helpful to have an idea of the careers advice that they have received in school.

From Years 7–11, schools provide careers guidance as part of the personal, social and health education curriculum. Additional support may also be offered by the local authority who sometimes works in partnership with the Connexions service. The students will probably not have had individual careers sessions with a careers advisor by the time that you meet them.

Your role on the day should not be to give them specific careers advice, but to tell them what it is like in the working world, your career path and experiences. Should the students require more specific advice, you could tell them to speak to their careers advisor, or direct them to:

- **www.connexions-direct.com/jobs4u/**
- **www.icould.com**
- **www.physics.org**
- **www.futuremorph.org**

Working with young people

It can sometimes be daunting to be faced with a group of young people, but you should remember that the duty of care during the visit lies with the teacher. The behaviour of the students is also the teachers' responsibility. However, you should be aware of setting an appropriate tone and maintaining a professional approach (this includes calling the teacher by their title and surname in front of the students). You should not be left alone with any student under the age of 18 under any circumstances and should any problems arise with any of the students you should let the teacher know as soon as possible.

The question and answer sessions provide a really good opportunity for you to engage with the students. However, if a student is being disruptive or dominating the discussion you can be firm and let them know that their behaviour is not appropriate. Try to engage the rest of the class by addressing certain questions to specific students, taking the focus away from the disruptive student. If the student continues to behave in an unacceptable manner, make the teacher aware of the problem and they will deal with it appropriately. Alternatively, you may have a student in the group who appears quiet and shy. Don't bring attention to them but try to engage all of the students by asking for opinions in turn.

If you are regularly working as a guide to groups of schoolchildren you might want to become a STEM ambassador for STEMNET, the Science Technology Engineering and Maths Network. As an ambassador you can apply for a CRB check through STEMNET and receive support regarding working with children. More information can be found at **www.stemnet.org.uk**.

Checklist for guides

Before the visit	**Tick**
• Have you carried out some research into the visiting school?	
• Do you know the number and ages of the visiting students?	
• Do you understand the learning outcomes for the students and have a clear idea of how the visit will meet these?	
• Do you know the name(s) of the teachers and any other school personnel attending?	
• Have you carried out a risk assessment and undertaken any other health and safety responsibilities?	
• Have you got a clear understanding of the plan for the day and the timings of activities?	
• Have you arranged any freebies that you could give to the students?	
• Have you thought about how you are publicising the visit?	
After the visit	
• Have you recorded the visit in your appraisal or personal development plan?	
• Have you produced a report of the visit for your line manager?	

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