STEM
AMBASSADORS

Powerful Practicals - Workbook

Contents

At the end of the workshop you will have:

4.45pm	**Welcome / refreshments**
5.00pm	**Introductions and aims**
5.10pm	**The power of practicals and STEM Ambassadors**
5.25pm	**Having a go at a powerful practical**
6.25pm	**Translating a great idea into reality**
6.40pm	**Responding to challenges**
6.50pm	**What's next? Review and evaluation**
7.00pm	**Close of workshop and start of optional networking/peer learning**
7.30pm	**Close of networking**

STEM AMBASSADORS

Powerful Practicals

Powerful Practicals

At the end of the pre-course task and workshop you will have:

- developed skills in planning and delivering practicals
- delivered a short practical and given/received feedback
- identified useful resources
- identified strategies for developing positive relationships with schools
- identified strategies to deal with challenges in the classroom

The power of practicals

What's so great about doing things?

Backed up by research –
we remember more when we do, rather than see, read

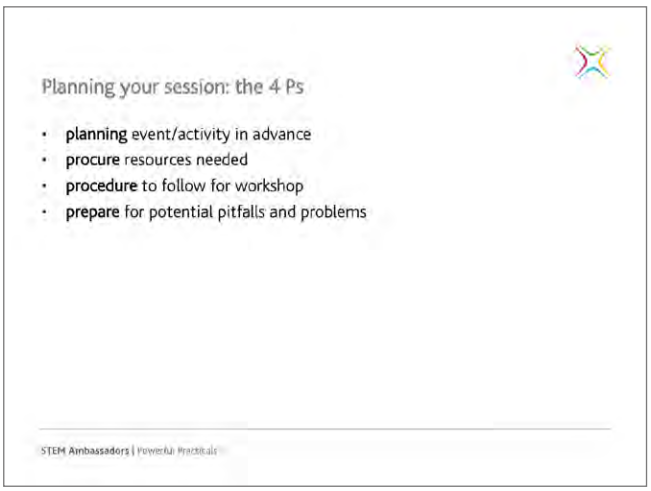
And the power of a STEM Ambassador

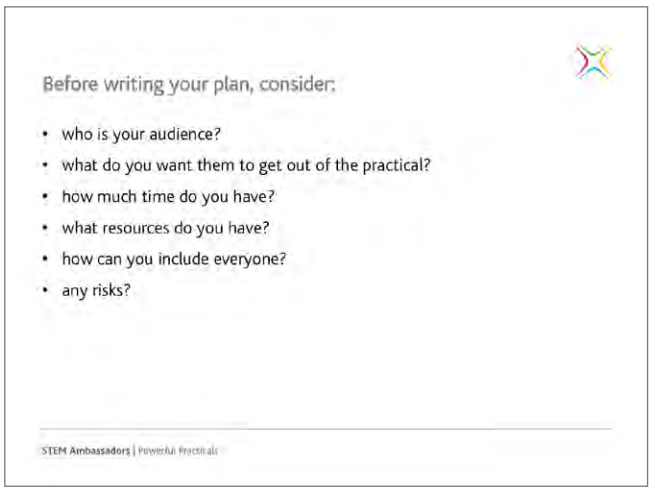
Meeting an engineer at my school was enough to make me realise it was the career I wanted to pursue – I want to do that for the next generation.

Ranna Patel – Biochemical Engineer and STEM Ambassador

Try out your activity!

- five minutes for activity
- five minutes for feedback
- STEM Ambassador: how did you feel it went?
- young people: What was good about it?
- what could be developed/improved?


Planning your session: the 4 Ps
• planning event/activity in advance
• procure resources needed
• procedure to follow for workshop
• prepare for potential pitfalls and problems
STEM Ambassadors | Powerful Practicals


Before writing your plan, consider:
• who is your audience?
• what do you want them to get out of the practical?
• how much time do you have?
• what resources do you have?
• how can you include everyone?
• any risks?
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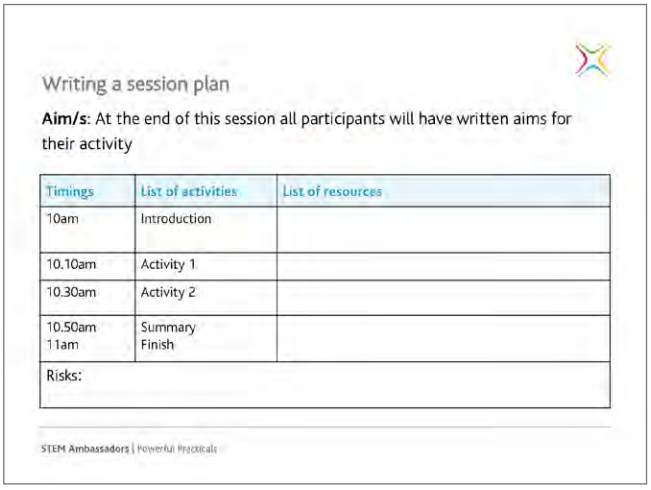
Writing a session plan
Aim/s: At the end of this session all participants will have written aims for their activity
Timings
List of activities
List of resources
10am
Introduction
10.10am
Activity 1
10.30am
Activity 2
10.50am
11am
Summary
Finish
Risks:
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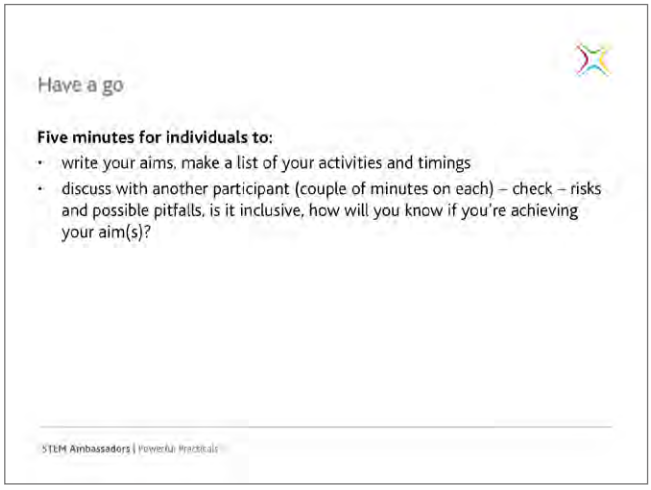
Have a go
Five minutes for individuals to:
• write your aims, make a list of your activities and timings
• discuss with another participant (couple of minutes on each) – check – risks and possible pitfalls, is it inclusive, how will you know if you're achieving your aim(s)?
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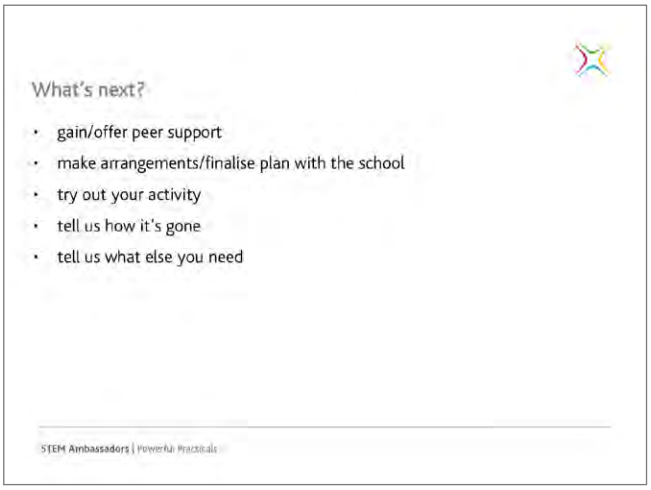

What's next?
• gain/offer peer support
• make arrangements/finalise plan with the school
• try out your activity
• tell us how it's gone
• tell us what else you need
STEM Ambassadors | Powerful Practicals

What's so great about doing things?

They offer a wide range of benefits – to 'hook' young people; to engage young people; to enable them to see STEM as fun; to motivate them; to help them see the relevance of STEM (to day-to-day life; meeting global challenges; young people's individual aspirations); to demonstrate what scientists and engineers actually do; to demonstrate the difference that we make to the world; to enable young people to produce something to take home and show their parents that may encourage discussion.

There's all sorts of ways that you can include practical activities in your role as a STEM Ambassador. It's for you to choose whatever suits you. It may be as a quick hands-on activity on a careers stall to attract young people; as a fun part of a careers talk; as a longer activity as part of a lesson or STEM event; or as a project or challenge in a STEM club. This workbook is written primarily for STEM Ambassadors working in schools but practical activities can work very well in other environments and lots of the information applies to STEM Ambassadors working in other community organisations too, eg youth clubs, guides, scouts.

Having a go at a Powerful Practical

Brief

1. In your small group, in turn, you will have a go at leading your group in doing a five-minute practical activity and getting constructive feedback. Your group will act as your young people.

2. To ensure that each of you has time to lead your activity, please keep a note of time and ensure that you keep on track. Each of you will have:

- **5 minutes to lead your activity**
- **5 minutes to gain structured feedback**
    - First, the 'STEM Ambassador' says how he or she feels it went
    - Then, the 'young people' say what was positive about the session
    - Finally, make suggestions of how it could be improved

The aim of feedback is to motivate and help someone to improve delivery – to enable this, do your best to give honest, constructive, specific feedback.

Writing a Standard Session Plan

Aim/s:		
Timings	**List of activities**	**List of resources**
	Introduction	
	Plenary	
Risks:		

Please note not all sections are mandatory, it is a working document to be adapted to suit your own needs.

STEM Ambassador: Date: Duration: Venue: Class/Club:		No. of students: Age group: Teacher/Group organiser: School/Venue contact:	
Overall aim(s):			
What I want young people to learn from my session (learning outcomes):			

Time		Activity	Resources	Risks (if any)
	WOW	Introduction		
	IMMERSION			
	HAVE A GO			

Please note not all sections are mandatory, it is a working document to be adapted to suit your own needs.

Time		Activity	Resources	Risks (if any)
	CHALLENGE			
	PLENARY			

Ways of checking whether learning has taken place:	
Ways of including all young people:	
Curriculum links (if known/relevant):	
Evaluation plans (if any):	
Other considerations:	

Activity description: 'pitch'

Switch your students on to SMART technology. An exciting, interactive one-hour session looking at SMART material applications, delivered by a qualified engineer, in your classroom. Students will have the opportunity to take part in manufacturing their own fabric switches using one of the new SMART materials available to engineers. They will have the opportunity to look at innovative uses for their switches and to design and discuss their own ideas for use in sports, medicine and space technology.

The session will be delivered by a dynamic, highly qualified female electronics engineer, with a wealth of experience in design engineering that she can impart to young people to help inspire them to study STEM topics and consider a STEM career.

a) The Right Switch standard session plan

Aims:

- To explain the 'exciting' applications of SMART materials (using Quantum Tunnelling Composite (QTC))
- To give a glimpse of what an engineer does

Timings	List of activities	List of resources
10.00am	**Introduction** • What you're going to do and find out • What's my role? How did I get here? • What do design engineers do? • How can we make life better? "No more bulky pockets and heavy handbags"	Notes
10.10am	**Introduction to SMART materials** • What's QTC? • What does it do?	The Right Switch resource sheet Images on ppt

Timings	List of activities	List of resources
10.15am	**Activity – Make a textile switch** • Demonstrate activity in stages • Students have a go, in small groups, and each build a switch. Get the bulb to light. • Why does this happen? • Give prize for teamwork - Allocate students to a group, eg by numbers - Emphasise teamwork and need for everyone to have input - Observe/support to encourage everyone to be 'hands-on'	Circuit diagram General circuits equipment including: 1. crocodile clips, leads, PSU (6v), buzzers, bulbs (20) 2. some fabric, eg old clothes and some foam, eg a sponge that you can cut up 3. a conducting material, such as aluminium foil 4. scissors and glue 5. QTC pills (these are available at www.mutr.co.uk stock code QTC 001) Prizes, eg stickers/certificates
10.40am	**What else is QTC used for?** • Run through some examples and give students in their group a few minutes to think of others. Get an idea from each group, eg NASA spacesuits, fans in helmets, buggy control… Snowboarding jackets… Sensor acting as skin (touch) in robotic or prosthetic hand (everyday activities… exciting activities) • Give prizes for good ideas/imagination/creativity	Images on ppt of female and male engineers and a wide range of applications www.peratech.com/qtcapplications.php www.engineeringuk.com/viewitem.cfm?cit_id=383661 for a mobile phone dress
10.50am	Engineers developed these materials, engineers designed uses for these materials and methods/ machines to make it happen. Any questions: - about being smart? - about being an engineer?	
11.00am	Finish	

Risks:

- Care with scissors, glue (count them in and out)
- Non-toxic glue
- Glass bulbs, care needed

STEM Ambassador:	Fay Best	No. of students:	16
Date:	10.01.13	Age group:	11-14
Duration:	1 hr 30 mins	Teacher/Group organiser:	Mr Green
Venue:	MP School, Leeds	School/Venue contact:	Alice Black
Class/Club:	JPP		

Overall aim(s):	To explain the 'exciting' applications of SMART materials in engineering using Quantum Tunnelling Composite (QTC) as the example. • To show what engineers do • To inspire students to consider a STEM career
What I want young people to learn from my session (learning outcomes):	Students will be able to: • describe what a SMART material is • explain how they would demonstrate the properties of QTC • describe some applications of QTC • explain the role of engineers in creating and using SMART materials

Time		Activity	Resources	Risks (if any)
5 mins	WOW	**Introduction** • What you're going to do and find out • What's my role? How did I get here? • What do design engineers do? • How can we make life better? "No more bulky pockets and heavy handbags"	PowerPoint Notes	

Time		Activity	Resources	Risks (if any)
5 mins 10 mins	IMMERSION	**Introduction** to SMART materials • What's QTC? • What does it do? • Why does this happen? **Demonstration** using watch battery, LED. Then using QTC. **Students to try out** **Extension** Make into a switch using card sleeve	The Right Switch resource sheet SMART U-tube clip Short talk Images of SMART materials in use 3 sets – watch/LED/ QTC Sleeve (spares)	Discussion Q&A
40 mins	HAVE A GO	**Activity – Make a textile switch** **Demonstrate** activity in stages **Students to have a go** and each build a switch. Get the bulb to light. **Extension**: what happens when you press the switch harder? Can you get the bulb to half light? Does it flicker?	Circuit diagram General circuits equipment including: 1. crocodile clips, leads, PSU (6v), buzzers, bulbs (20) 2. some fabric (any fabric should be okay, eg old clothes or cotton) and some foam, eg a sponge that you can cut up 3. a conducting material, such as aluminium foil 4. scissors and glue 5. QTC pills (these are available at www.mutr.co.uk stock code QTC 001)	Care with scissors, glue Non-toxic glue Glass bulbs, care needed

Time		Activity	Resources	Risks (if any)
10 mins 10 mins	CHALLENGE	**What else could QTC be used for?** Team activity – students to discuss in groups **What else is QTC used for?** NASA spacesuits, fans in helmets, buggy control… Snowboarding jackets… Sensor acting as skin (touch) in robotic or prosthetic hand (everyday activities…exciting activities) **How important are engineers in this?** Discussion	Prompt cards Industry Awards info www.peratech.com/qtcapplications.php www.engineeringuk.com/viewitem.cfm?cit_id=383661 for a mobile phone dress	
10 mins	PLENARY	Engineers developed these materials, engineers designed uses for these materials and methods/machines to make it happen. This is engineering… Opportunity to ask questions	Slides of engineers, applications, designs Further info and resource sheet	

Ways of checking whether learning has taken place:	• Q&A/discussions • Getting the bulb to light
Ways of including all young people:	• Tom has co-ordination difficulties and will require LSA support to cut out and build. • Only two girls in the group, may prefer to work together; emphasise importance of everyone's input in science and engineering. • Observe/support groups so each learner has a go at hands-on activity. • Include examples of modern-day women in high profile engineering roles. • Slides with diverse engineers that show a wide range of engineering applications.

Curriculum links (if known/relevant):	• Science: Unit 7J: Electrical circuits; Unit 9I: Energy and electricity • PSHE: Looking at real-life situations, personal preferences and priorities • D&T: Unit 08aii: Exploring materials focus: resistant materials; Unit 09bii: Designing for markets focus: resistant materials
Evaluation plans (if any):	• Use whiteboard to get individual feedback to quick final question.
Other considerations:	• Opportunity to incorporate buzzer, also to develop design idea. • Age and Learning projects.hestem-sw.org.uk/.../PE_Guide_-_Final_draft_NG_1509117 Page 14

Aims: For students to:

- make a chemical indicator using red cabbage
- have fun
- find out what a chemist does

Timings	List of activities	List of resources
10.00am	**Introduction** • Introduce myself and talk about my role as a food scientist • Eat acid drops and then neutralise the taste with half an indigestion tablet	Acid drops Indigestion tablets
10.05am	• **Introduction** to acids and bases and indicators • **Demonstration** – make an indicator solution out of red cabbage • **Students to try out**	ppt slides Red cabbage – pre-shredded Hot water Jam jar Kitchen towel Jug
10.15am	• **Activity** – test household solutions • **Demonstrate** activity • **Students have a go**, work together and record results • **Extension activity if needed**: Order results in terms of pH. Can you neutralise two solutions? - Emphasise teamwork and that everyone needs to have a go at testing and recording results - Encourage quieter students to have a go	Plastic cups – white Vinegar Lemon juice Salt solution Sugar solution Soap Bath salts Bicarbonate of soda Pipettes and stirrers Results sheet

Timings	List of activities	List of resources
10.40am	**What's the point of this? How's it useful to us?** • Quick quiz that includes wide range of examples • Give students a few minutes to think of other examples in their group. Get an idea from each group.	Quiz sheets Prizes
10.50am	**How important are chemists in this?** Discussion of the role of chemists in food science Challenge typical stereotypes of a chemist The best things about being a chemist for me are... Any questions? Mix of techniques to encourage everyone to get involved, eg give students a minute to think in pairs and jot down a question.	Slides of diverse chemists and their contribution to food science
11.00am	Thanks and finish	

Managing risks:

- Check out allergies/diabetics with teacher re acid drops/indigestion tablets
- Goggles
- Hot water, solutions, red cabbage stains, care needed

Activity description: 'pitch'

Help your students to understand the geometry in the products and packages around them, and the importance of a good knowledge of maths in a design career. A STEM Ambassador will provide an exciting, interactive 1½ hour session which will engage your students in a fun, practical activity making bubble geometric shapes in the classroom/STEM club and will demonstrate the science and maths behind this activity and its real world applications.

The session will be delivered by a dynamic, highly qualified female product designer with a wealth of experience that she can impart to young people to help inspire them to study STEM topics and consider a STEM career. It will develop their understanding of 3D shapes, increase their awareness of geometry in the world around them, increase their understanding of the work and role of a designer and the importance of mathematics in future career choices.

Aims: For students to:

- think about the importance of shapes (3D) in relation to packaging
- make geometric 3D shapes with bubble mix
- have fun
- find out what a product designer does

Timings	List of activities	List of resources
10.00am	**Introduction** • Introduce myself and talk about my role as a product designer • Discuss some product designs I have been involved with • Computer modelling and CAM visuals demonstration	Sample products that I have worked with
10.10am	• **Introduction** to shapes and geometry • **Demonstration** of products, packages and their shapes • **Students to give some examples**	Examples young people will be familiar with… Pringles packs, POM, Toblerone Cereal boxes Complex shapes… Easter egg packaging

Timings	List of activities	List of resources
10.40am	• Activity – Bubble making and geometric shapes • Demonstrate activity 1. Pour the bubble mix down the sides of the bucket to avoid making small bubbles. 2. Connect pipe cleaners together to form a cube... ie 6 sides. 3. Dip the cube into the bubble mix and carefully withdraw it... is there a cube-shaped bubble inside? Students have a go, work together, make their own cube forms, try them out, record and discuss results. Why does the bubble retain this shape? • Extension: (time dependant for students to make shapes or Ambassador to demonstrate with pre-prepared shapes). - Try making a tetrahedron (4 sides), an octahedron (8 sides) and a dodecahedron (12 sides)! Does the bubble shape match the shape of each frame...?	Pipe cleaners Strong bubble mix Deep bucket Cloths, waterproof sheeting Pre-prepared cubes and other shapes
11.00am	**The learning** **The maths** 3D geometrical shapes. Surface areas, surface area of a sphere, minimum surface area for that volume, containers and costs of packaging by surface area. **The science** Bubble films are stretchy and this stretch is called surface tension. As bubbles are stretchy, they always try to shrink into a sphere shape to minimise surface area. Dipping the frame into the bubble mix traps air inside the frame and this tries to form a sphere but the bubble films connecting to the frames pull on the bubble on the inside. This creates a bubble with the same shape as the frame. **Activity** Quiz – students to match packaging shapes and sizes	Quiz sheets/answers Prizes

Timings	List of activities	List of resources
11.15am	**What might product designers do?** Discussion of the role of product designers in society and what qualifications they will need, why they need maths. Challenge typical stereotypes of a designer. The best things about being a designer for me are... Any questions? Mix of techniques to encourage everyone to get involved, eg give students a minute to think in pairs and jot down a question.	Slides of diverse product designs, particularly considering young people's interests/audience age group www.designcouncil.org.uk design and shape www.packagingdesignarchive.org
11.15am	Thanks and finish	

Managing risks:

- Check out allergies to bubble mix solution with teacher
- Suitable area for wet demonstration/activity
- Ability of students to make frames and to work in groups with water (dexterity, behaviour etc.)

Activity description: 'pitch'

Have your students noticed those funny looking black and white mosaic squares on adverts? Do they want to know what they are, how they work?

A professional and highly experienced IT developer will come into your classroom as a STEM Ambassador and will deliver a 30-minute, exciting and interactive session. Students will have the opportunity to access these codes to view information and take part in a quiz. The STEM Ambassador will prompt them to consider innovative uses for this form of technology, and to consider a STEM career and understand the importance of studying STEM subjects on future career choices.

Aims: For students to:

- find out what an IT developer does
- use a QR code
- have fun

Timings	List of activities	List of resources
1.00pm	**Introduction** • Introduce myself and talk about my role as an IT developer • What I love about my job • Explain how my work supports my company	Internet access, projector Site links
1.10pm	**Preparation** Students to divide into two or three teams each with a tablet or smartphone with QR droid loaded. Show students how to switch reader on and get them to try out on a sample code. Point and click. **Demonstration** Students will 'read' QR codes in teams and answer questions. First team to complete correctly gets a prize. **Discussion: What is the point of this? How is it useful to us?** How do you make a QR code? How could you use a QR code – students' ideas. Prompts – access adverts, information, treasure hunt, games, instructions... guides	Six QR codes copied onto sheets and linked to questions Team answer forms Answers, prizes

Timings	List of activities	List of resources
1.20pm	**What do IT developers do?** • Discussion of the IT developer's role in society and what qualifications they will need, importance for businesses, rapidly changing role, constantly learning... • Challenge typical stereotypes of an IT developer • The best things about being an IT developer for me are... • Any questions? Mix of techniques to encourage everyone to get involved, eg give students a minute to think in pairs and jot down a question.	Slides of inspirational IT developments... Apple, Microsoft, Google Earth etc. Communications technology
1.30pm	Thanks and finish	

Managing risks:

- Check out any health issues with computer use (epileptic, dexterity, visual impairment etc.)
- If using school tablets, check QR droid installed and permissions
- Ability of students to work at this level

Drafting a 'pitch':

It can be very useful to have a prepared description of what you can offer to a school that you can provide in response to a school request. It can help teachers understand what it is that you will be delivering and help you to focus on key elements.

The following points may help to draft your pitch:

- **Keep it brief** – about 100–150 words
- **Make it personal** – What's your role? What are you studying? Why have you chosen this activity? Why do you think it's great?
- **Highlight what students will get out of it** – Having fun? Having a go at hands-on science? Learning a specific STEM aspect? Finding out what an engineer does? Seeing how exciting technology is? Glimpsing how engineering can help the environment? Seeing the point of maths? Inspiration to consider a career in STEM?
- **Outline the activity**
- **Use your own unique style** – our examples are just that; feel free to write your pitch below in a way that suits you

My pitch:

1. Overall, how did it go?
2. Did the session meet its aims? Did young people learn what I hoped they would?
3. What was the feedback like from young people and teachers/group organisers?
4. What would I do differently next time?
5. Is there any action needed following the session?

- Risk assessment is sometimes perceived by both STEM Ambassadors and teachers as a barrier to engaging in practical activities within the classroom, but with a sensible approach and clear communication this need not be the case.

- The classroom teacher is responsible for the health and safety of the class and for completing any risk assessment on behalf of the school, but you can assist the school by planning appropriate activities and by talking your plan through with the teacher beforehand. Use any written session plan to record any possible risks and the steps you will take to minimise these. This will remind you to discuss these with the teacher.

- When thinking about risk use your professional judgement and common sense – it is possible to carry out exciting demonstrations and practicals provided you've thought through all the hazards and minimised any possible risks. Think about the less obvious risks, as well as those arising from any chemicals and processes, for example think about how you would reduce the following risks:
    - Students with extreme allergies (such as peanuts and latex)
    - Trips, spills etc. resulting from students moving around a busy classroom
    - Students taking equipment away or leaving it lying around for other classes to pick up

- If you are considering a new or high-risk activity, and want to take advice yourself first, then CLEAPSS – http://www.cleapss.org.uk/ – is brilliant. It is an advisory service that provides support in science and technology for the majority of schools and colleges in England, Wales and Northern Ireland. They have a telephone helpline – 01895 251496 – but the school you are working with will need to be a member (if you are not a member through your employment). To access online resources you need a login – your school or lab technician should be able to help you with this. CLEAPSS resources include Hazcards and recipe sheets that will help with model risk assessments.

- Remember that as a STEM Ambassador you may be in an unfamiliar environment and may be feeling nervous about the activity – it is therefore important that you have a clear note of any hazards and the action you are planning to take to reduce the risk. If you are delivering an activity for the first time let the teacher know so they can be extra vigilant on the day.

- Practicals, which have been described and published by scientific associations (see the taster of resources), come with their risk assessments already written and this will help you in discussions with the teacher. Remember, however, that in schools that are members of CLEAPSS, the employer will have instructed the teachers and technicians to follow CLEAPSS' guidance – you should ensure that the risk assessment supplied with your activity follows this advice.

- You are likely to be well informed about risks within your workplace, however, you may find that schools take a different approach so it is important that you work with the teacher to meet their requirements.

- However, don't become too focused on risk – you are not meant to be an expert in school-based risks but being informed about the risks associated with your activity will help you communicate with teachers and this will help you get your sessions off the ground.

- When writing your pitch to schools make sure you keep it interesting, short and to the point. Try and think through any risks beforehand so that you are proposing activities that are easy for a school to say yes to.

- Email is often the best way of communicating with teachers as they are usually in the classroom or in meetings/on duty during lunchtimes and after school. Teachers may only get chance to check emails once or twice a day so don't expect an immediate response.

- If you telephone a teacher don't be disheartened if your message is not responded to straight away. Teachers are notoriously hard to get hold of and school receptionists can be effective gatekeepers. Be polite and persistent; ask for the best time to speak to someone.

- Visit the school before your session and take a look at the room where you'll run your session. This will be useful when you plan your session as you'll be able to visualise the space you'll be working in and you will be able to double-check the equipment and resources the school can provide.

- Take time to talk to the teacher about the sort of pupils to expect. You might be working with students who have special educational needs, English as a second language, physical difficulties, allergies or young people who are gifted and talented.

- Run through your activity with the teacher. Listen to their comments and take on board any advice. They are responsible for the class and the health and safety of their students.

- Things change quickly in schools and sometimes planned activities need to be rescheduled at short notice. Make sure you contact the teacher a day or two before your session to check it is still going ahead.

- Make sure you have all the resources and equipment you need with you unless the school has promised to provide things for you. Remind them what you need from them in an email a few days before the session. Don't turn up for a session without adequate resources or with a big batch of photocopying to be done.

- Using photos in displays of students' work is really engaging, however, parents must have given their permission. Ask the teacher in advance if you would like them to take photos of students.

- Make friends with the lab technician – talk through your plan with them. The lab technician is often the expert when it comes to health and safety. They will have access to CLEAPSS and Hazcards. Laboratory technicians can be really supportive and will sometimes stay to help out in your session and help clear away at the end.

- Try to send a follow-up email to the school to say how much you enjoyed working with them and if you are keen to return you can use this as a chance to suggest other related or follow-up activities.

- Discuss your introduction with your teacher. Would you like the students to address you by your first name or as Mr or Ms? Ask for a seating plan or see if students can make name or desk badges beforehand. Addressing them by their name can make a big difference to the atmosphere of a session.

- Greet the students at the door and use them as a resource during the session (by handing things out, being assistants in demonstrations, holding up pictures and reading the whiteboard) this engages the rest of the class and takes the focus off you for a little while.

- Smile and make eye contact.

- Use inclusive language, eg "morning all" rather than "morning lads"; use she and he; avoid non-essential technical language.

- Think about the things that might grip, intrigue and delight students about your activity and build these into your session. It might be your enthusiasm, your experience, your expertise, your everyday examples, your life-changing examples...It might be a key starter question that acts as a 'hook'.

- Try different ways of asking questions to encourage all students to join in. Asking students questions by name is simple and effective, alternating boys and girls. Alternatively, try coloured dots: "I wonder if anyone with a blue dot could have a go at answering?" Or see if the school uses individual whiteboards and then each student can jot down their answer and hold it up.

- Challenge stereotypes of who is an engineer or scientist and what they do – use examples of women and men and include examples and applications that are likely to appeal to students with diverse interests and aspirations.

- Try using questions to introduce the different sections of your session – it can work well to engage and stimulate students. Start with 'what' questions and move to trickier 'how' and 'why' ones.

- Ask for a show of thumbs to see who understands: thumbs up = yes; thumbs down = no; thumbs to the side = unsure.

- Use pair work to give students a chance to think and share ideas before answering. Asking them to turn and talk to their partner for a few minutes often gets them talking right away and is particularly good for students with low levels of literacy.

- Try different ways of allocating roles in team challenges, eg randomly, have single sex groups, have job-share roles. Observe: Who is leading activities? Who is note-taking? Who is most active in the hands-on activities?

- Ask students to place themselves along an imaginary line in response to a statement – one end is strongly agree and the other is strongly disagree – to promote engagement or gauge understanding, eg When I connect this the buzzer will sound; We could have a volcano in Liverpool; We will soon have driverless cars; I've learned something in this session. (Better with smaller groups!)

- Bring prizes/rewards – these don't have to be big or expensive. Stickers and certificates of participation work just as well.

- Leave time at the end for questions. If you prefer you can have a question box and collect questions anonymously then address them at the end.

- Ask the teacher what works well for them in maintaining students' attention – this may give you food for thought, however, you don't have to use the same strategies, as drawing on your individual approach and personality is a key strength.

What is a peer learning group?

It is a chance for you to meet with a small group of STEM Ambassadors to practise your activities, discuss the ideas you have generated as part of the Powerful Practicals workshop or indeed discuss any recent sessions you have delivered. Participation at a peer learning group is not mandatory but may be an effective way of building your confidence. First meetings should take place after the workshop and before your first school-based session and should be arranged by STEM Ambassadors at a mutually convenient time and place. Trainers are not involved in the sessions but are available via email to give advice before and after peer learning group meetings take place.

What are the benefits of participating in a peer learning group?

- You will get the chance to:
- share experiences and receive feedback from other STEM Ambassadors
- come up with ways of overcoming any challenges in your STEM Ambassador work
- practise any activities you are planning and get feedback from other STEM Ambassadors
- learn in a non-judgemental atmosphere

How will a peer learning group work in practice?

Those interested in taking part in a peer learning group will be put in contact with each other at, or following, workshop sessions. Groups of between three and five STEM Ambassadors will then be expected to arrange a time and a place to meet (for example at a workplace). We recommend that peer learning group meetings last between one and two hours depending on the size of the group (allow around 20 minutes per group member). We recommend that meetings are arranged promptly following a workshop session, this is to ensure that you start to build upon the workshop as soon as possible and to ensure that you have enough time to deliver a practical session in a school before the end of the academic year. Each member of the peer learning group is expected to prepare for the meeting so that they get the most out of the opportunity. Although trainers are not involved in the peer learning group meetings we do expect someone from the group to confirm that the meeting has taken place and to feed back any issues identified.

What will a peer learning group meeting involve?

Each member of the group will be allocated 20 minutes of time that is theirs to bring a problem or challenge that they would like others to help them solve. You may wish to:

- bring your pitch for others to read and comment on
- bring a short practical activity to try out with others
- share your session plan and ask for ideas on how it can be improved
- practise your session introduction and take feedback on your style and content

It is recommended that each peer learning group work through the following process:

A STEM Ambassador will be given five minutes to introduce their issue, ensuring they are clear on what they would like feedback on. During this time other STEM Ambassadors within the group should be encouraged to ask questions to help the STEM Ambassador fully express the issue to be resolved. Ten minutes should then be allocated to a group discussion where ideas and experiences are shared. The last five minutes of a STEM Ambassador's 'slot' will be for the STEM Ambassador to summarise what they have learned and describe what action they will take. This process will be repeated until all STEM Ambassadors have had their allocated time.

STEM Ambassador peer learning groups – things to consider

- Peer learning groups work if everyone involved is able to participate fully – only commit to the peer learning group if you can find the time to prepare and attend.
- It will help if the group can agree a lead member who takes responsibility for setting up an email list and for making sure everyone knows times and venues of meetings.
- When planning your meeting allocate enough time for at least 20 minutes per person, plus an additional five minutes for you to re-introduce yourselves.
- You will need to agree a place to meet and may need to check with your employer before inviting others to your workplace.
- Make sure you prepare for your slot so that you get the most out of the meeting, but remember you will learn from thinking about the issues that other STEM Ambassadors bring to the meeting.
- When it is your turn to listen and provide feedback make your comments specific and constructive. Always comment on the positive as well as making suggestions for improvements.
- If you cannot make the meeting let all members know in advance; avoid withdrawing at the last minute as this will affect the experience for other Ambassadors.
- Consider any risks, if you intend to bring along any practical activities.
- If meeting after work, agree to bring some snacks and drinks to share to keep you going.

If you would like a little inspiration, these links for useful ideas and resources may help. The majority take you directly to practical ideas and demonstrations you can use. They have been written by teachers and educators and will have been tried and tested on numerous young people before being published. When looking for inspiration off-list (and on YouTube) please be aware that the ideas may not have been quality assured to the same standard.

https://www.stem.org.uk/resources

This is the STEM Learning resource bank and holds the UK's largest collection of STEM teaching and learning resources, in order to provide teachers of STEM subjects and STEM Ambassadors with the ability to access a wide range of high-quality support materials. There are plenty of ideas and resources to work with. You can filter your search by subject, type of resource and audience.

http://www.raeng.org.uk/education/eenp/engineering_resources/default.htm

Developed with teachers, The Royal Academy of Engineering and STEM Learning have produced a suite of engineering-based resources for teachers and STEM Ambassadors.

http://www.whynotchemeng.com/

The Institution of Chemical Engineers brings you the Top 10 Flash Bang Demos...instruction sheets plus important health and safety information – what more could you want?

http://www.nuffieldfoundation.org/practical-physics

The Nuffield Foundation and the Institute of Physics have produced this website. It is a collection of experiments that demonstrate a range of physical concepts and processes. Some can be used as starting points for investigations or for enhancement activities. Many have links to further reading and all include information and guidance for technicians.

http://www.nuffieldfoundation.org/practical-biology

The Society of Biology, in conjunction with CLEAPSS and other biological associations, has provided this collection of experiments. The practicals demonstrate a wide range of biological concepts and processes. Experiments are placed within real-life contexts and have links to carefully selected further reading.

http://www.nuffieldfoundation.org/practical-chemistry

This website, developed by the Nuffield Foundation and the Royal Society of Chemistry, is a collection of experiments that demonstrate a wide range of chemical concepts and processes. Some of the experiments can be used as starting points for investigations or for enhancement activities.

http://www.rsc.org/learn-chemistry/resource/

The Royal Society of Chemistry's own website has over 3,000 teaching resources available online. Your search can be refined by subject, context and age group.

http://www.bbsrc.ac.uk/society/schools/schools-index.aspx

The Biotechnology and Biological Sciences Research Council is a government-funded organisation to lead world-class 21st century bioscience, promote innovation and realise benefits for society within and beyond the UK. They have created a number of teaching resources to download for primary and secondary school science education and information on school-scientist links.

http://www.thenakedscientists.com/HTML/content/kitchenscience/

The Naked Scientists are a media-savvy group of physicians and researchers from Cambridge University who use radio, live lectures and the internet to strip science down to its bare essentials, and promote it to the general public. This is the link to 239 tried and tested experiments which would engage and inspire any audience.

http://www.youtube.com

YouTube is a brilliant resource used by lots of schools (although it's worth checking as some schools don't allow it through their filters). You can find a demonstration of pretty much anything you want; just make sure the clips are short, relevant and fun. Put 'science education' in the search box on the site.

http://www.ocr.org.uk/qualifications/by-subject/science/gcse-experiment-cards/

Other exam boards are available...but this one has produced some free GCSE sciences experiment cards – these handy cards include practical experiments that you can recreate along with suggested questions, extensions and stretch and challenge options.

http://www.mindsetsonline.co.uk/index.php

A shop, where you can buy cool science/engineering practical things. Mindsets is a not-for-profit company that reinvests surplus funds in education. Mindsets is wholly owned by Middlesex University and works with a number of design and technology and science specialists to inspire and make learning fun through their low-cost resources, many of which are made in the UK.

http://nrich.maths.org/public/leg.php?code=-339

University of Cambridge supported website, part of the Millennium maths project, NRICH provides practical mathematics resources for teachers and students conveniently divided up into age groupings. Extensive lists of topic-based activities.

www.murderousmaths.co.uk

A website promoting the author, Kjartan Poskitt, who wrote the Murderous Maths series of books. The website contains some excellent ideas, resources and videos to support innovative and practical maths demonstrations in the classroom.

www.schoolscience.co.uk

A Research Council UK supported website providing science resources for teachers. A wide range of industrially related science resources and ideas for practical activities, age related.

http://www.bpf.co.uk/polymer-zone/polymer-ambassadors/default.aspx

The British Plastics Federation has a number of experiments for primary school age children and a box can be sent free to BPF members.

http://www.boxoftricks.net/internet-resouces-for-education/

Tried and tested educational resources with a comprehensive A–Z of internet resources to make use of the latest technology in software and websites for the classroom. The resources can be used to support the delivery of your demonstration if you want to add a quiz, a graphic etc.

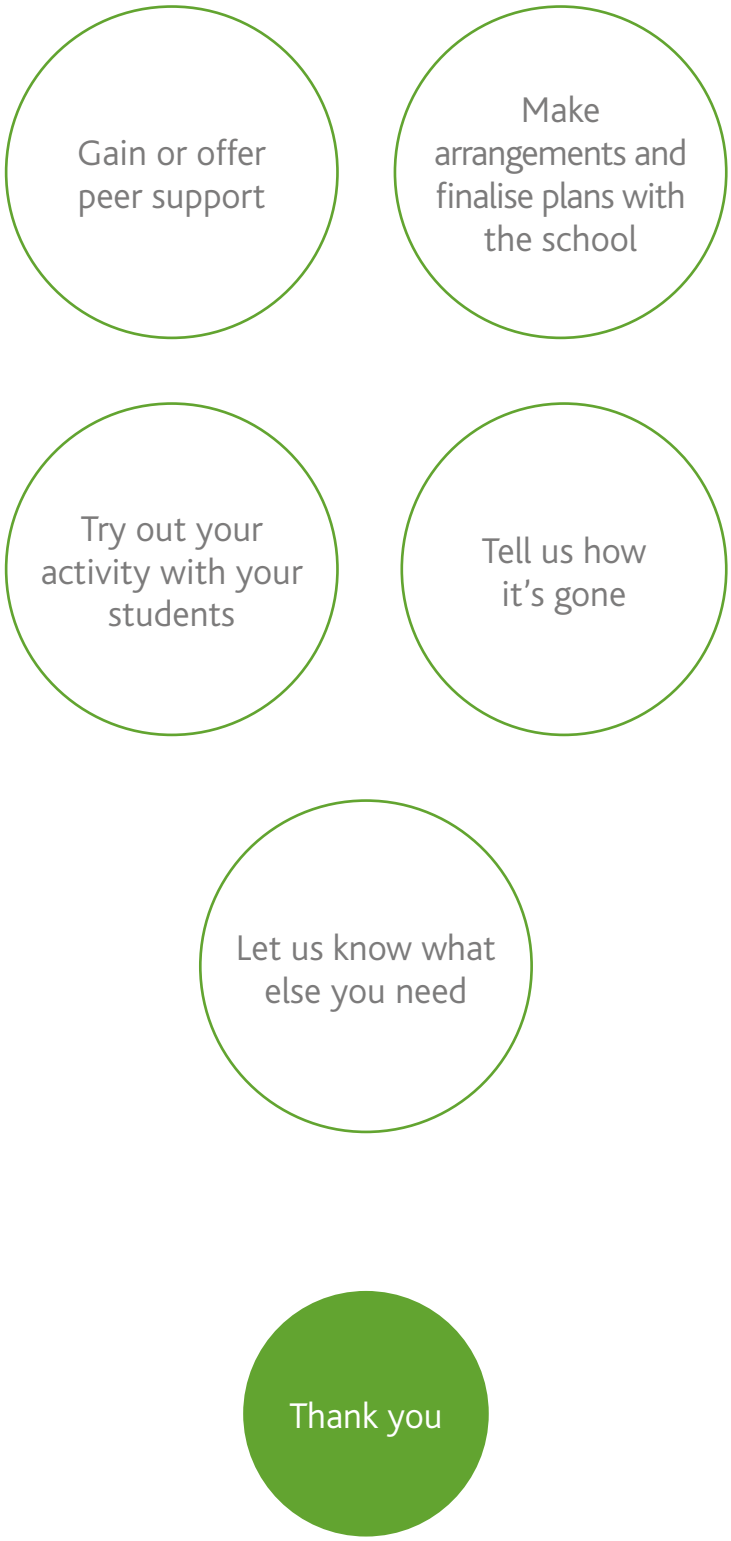
The following sites are foreign-based and may not be regulated. They do, however, offer ideas and inspiration for fun, educational and practical activities.

http://www.fizzicseducation.com.au/experiments/free_experiments.html

An Australian developed website to promote science in schools. The FREE section offers topic-based ideas for practical demonstrations.

www.sciencekids.co.nz/lessonplans/technology/webdesign.html

A New Zealand-based science and technology site to support science to young people. The experiments section offers a comprehensive list of simple, cheap and engaging practicals to support the delivery of science, technology and mathematical concepts.


Gain or offer peer support
Make arrangements and finalise plans with the school
Try out your activity with your students
Tell us how it's gone
Let us know what else you need
Thank you

Notes