Going Public
1. Talks and presentations to 5 - 12 year olds

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Giving a science presentation to the 5 - 12 years age group can be a very challenging experience and requires a very different approach to lecturing undergraduate students. However, a successful presentation to this (receptive and knowledge-hungry) audience brings immense satisfaction. This information sheet provides a check list of handy hints, based on the personal experience of Liz Sockett (SGM Education Officer), for any scientist thinking of promoting microbiology to young children.

The event and its venue

Typical venues include school halls/classrooms, public libraries, community halls or at specialist events such as British Association workshops, Royal Institution schools programme lectures or National Science Week. If you are responding to an invitation it is very important to find out what your audience will be like, and what they already know about your topic. A very small but accurate “abstract” explaining in child-friendly terms what you will be talking about or doing can be very helpful to a teacher who may then spend a little time beforehand priming pupils. If you are organising the event "blind", it is fairly safe to assume that knowledge of microbiology among 5 - 12 year olds is minimal.

Preparation of learning aids

◊ Many venues (such as primary schools and community halls) will have no basic equipment such as a slide-projector or OHP or even the means to darken the room. In this situation the options are as follows:

- Take your own equipment
- Use enlarged colour photocopied diagrams on card or photos to hold up and show
- Use the TVs and videos which are present in most schools

If you need tables, chairs and electrical points it is important to let people know in advance.

◊ Use of models or demonstrations is an excellent way to make explanations work, for example to get across the size of bacteria, use the **“giant full stop".**

- Show the children a full stop on a printed page and tell them that although it is quite small, each bacterium is even smaller.
- Ask the children to imagine that they could magically make one bacterium as big as a Smartie and if they did that same magic to the full stop, how big would it be? The answer is a circle of black cloth a couple of metres across.
- In a school hall setting one can spread that on the floor and measure it in a line across the centre with Smarties. (Give each child 10 Smarties to add and count the children).
- It will take 200 - 400 Smarties to cover the diameter of the full stop.

◊ Avoid the use of research data slides. If you have a few beautiful molecular models, or micrographs do show them, but explain how tiny they are in real life.

◊ For the 9 -12 age group simplify slides with a few key written ideas or questions (e.g. “How did Mr van Leeuwenhoek discover bacteria?”). For the younger age group you can only really use slides as a “gee whiz” lantern show, you might put up a few single word slides for them to learn a new name.

◊ For the 9 -12 age group a slide that sums up “what we have learned today”, in simple accessible terms, can be very useful. For example, "Today we have seen that there are many different sorts of tiny microbes called bacteria. Bacteria don’t just make you sick, some of them are very useful like the ones that recycle the leaves in autumn, and like the ones in bio-yoghurts that are good for your insides".

Presentation structure

◊ Aim for a very short talk punctuated by activities (or activities preceded by a brief introduction to the subject - see *Going Public 2. Workshop activities for 5 - 12 year olds*). Children have a short attention span and 9 - 12 year olds cannot tolerate a talk longer than 30 minutes . The 5 - 8 year olds will need a series of short periods of listening alternated with “doing”. This technique also works well for older children.

◊ Before you start, check the acoustics and that the audience can see your visual aids with a simple “raise your hand if you can hear me at the back/see this picture”.

◊ Introduce yourself and say where you are from. Your audience want to know your credentials in a form they can understand. If you have a local connection, explain it and they will warm to you.

◊ Explain that you’ll talk and show them things while they listen then you’d like them to ask questions. Tell them that you’ll try to answer all their questions but as science is very big and difficult, not all the answers are known yet.

◊ Try to involve the audience by asking for shows of hands as you go along, for example “In a minute I’ll be asking you to put up your hands, you’ll have 2 choices: who thinks that all bacteria are bad for us? Who thinks that some are good and some are bad?”

◊ Don’t expect total silence, if small children are interested they’ll whisper to each other. If noise builds up they might be getting bored, try asking them a “show of hands question” to regain control.

◊ Small children become bored very easily and you may find that you need a massive armoury of simple facts to tell them at quite a quick pace. Weaving in everyday experience helps to keep their attention, for example “Who eats bioyoghurts? Do you know that they’ve got friendly bacteria in them?”. It doesn’t matter if you’re talking about *Bacillus subtilis* rather than *Bifidobacterium*. If you can make a link to something they know about then they’ll remember, for example “The bacterium that I work on is a sort of cousin to those bacteria”.

◊ As in all lectures, sum up simply at the end. Tell the audience what you think you’ve shown them and especially what there is still to find out. Encourage them to become scientists by speculating on what types of science they might be able to take part in when they are older.

Presentation style

◊ A memorable and accessible opening statement will get you off to a strong start. If it's funny or fascinating, all the better.

◊ To capture the imagination and attention of young children, you need to use an intonation and approach almost like a children’s entertainer or storyteller. Lead the audience through your talk: “First of all we’re going to see…”/ “Once we’d found that out we were on to the next mystery” etc. It may be helpful to video and watch some children’s TV programmes to see how the presenters emphasise facts and point things out.

◊ Be very careful in giving gruesome facts. We do this to delight undergraduates, and it does thrill the majority of children, but it may terrify the timid. If you talk about a pathogen and what it can do, try to stress how rare it is and that they won’t get it. Remember also that children can ask questions very candidly wanting to find out about a disease that someone in their family has. 10 year olds will ask whether the “nice bacteria” in your gut might turn nasty and make you sick if you’re HIV positive. Try to give an answer that won’t scare them in case they do have an HIV positive relative at home.

◊ It is worth bearing in mind that children watch lots of TV adverts and they remember the jingles. There is no need to labour through explaining that there are many friendly bacteria in some foods, if children have seen the recent advert for Yakult where the little girl says “hallo” to each of them in her drink! Use anything that you can from recent adverts.

◊ Aim to show how scientists used a particular experiment to find something out and explain the reasoning. Teachers will find this very useful as they have to teach pupils about designing fair tests with controls.

◊ Volunteers from the audience will readily come up to the front and help with your demonstrations. Many children will have seen the RI Christmas Lectures on TV and they will expect you to ask their names as they come up. Try to think of explanations that you can give using children e.g. bacterial attachment via pili can be illustrated by 2 children and a metre ruler in between.

◊ If you're game for a laugh then use your bodily movements to give demonstrations, for example: a receptor binding and un-binding a football, a small particle doing Brownian motion or a bacterium doing random motility. This will show you're a good sport.

◊ Children love art and will have pencils and paper to draw on if you ask in advance. You can use an **art activity** in a presentation. You could take some nicely coloured prints of micro-organisms from EMs and let them draw a few.

- To explain that a colony is a pile of many bacteria on a petri dish, show some pictures of real colonies,
- Give each child a "Post It note" on which to draw a bacterium in pencil.
- Put a circular card petri dish on the floor or a table and ask the children to pile up their drawings on top of each other to represent the colony.

◊ Avoid using any acronyms e.g. FRS, BBSRC; they are not relevant to the lives of small children.

◊ Imaginative analogies are very useful. Can your structure or activity be compared to anything from everyday life? Many people use clockwork mice with rotating tails to represent swimming bacteria with flagella - not totally accurate but a useful analogy and memorable to demonstrate.

◊ Avoid obscure terminology or long words unless you want to make understanding the words part of your message. In this situation, a **"name the bacteria"** game can work quite successfully with 6-8 year olds.

- Make a large flip chart list of "the secret naming code for bacteria" which lists words & definitions e.g. coccus = round, photo = glows in the dark, rhodo = red, spirillum = spiral shaped.
- Give out coloured or luminous painted cardboard bacteria in many different shapes.
- Ask the audience to look at the list and work out the name of the bacterium.
- The children will invent some fictional combinations but it is a good learning experience.
- This activity can work with large numbers of pupils if you give a group a bacterium to share.

◊ Consider using a video microscope. Children love simple things like seeing protozoa and algae in samples of pond water. You could compare toy microscopes to the real thing.

Question Sessions

◊ Leave plenty of time for questions and answers at the end of your talk and make it clear to the teachers how long you wish to allow for this session.

◊ Explain to the children that they should put their hands up and keep quiet while each question is asked and answered.

◊ Usually this age group is brimming over with questions but you may need to get the session going, by asking a few questions yourself.

◊ By praising the first question you will encourage others to join in.

◊ Be prepared for "shock" questions such as "Do bacteria go to the toilet?" (a simple explanation that they have pores and sort of "sweat" out their waste soon deals with that). Expect plenty of the "Are there boy and girl bacteria?", or "Do bacteria die of old age?" type of question. It is useful to prepare a few answers in advance. If you don't know an answer, a useful reply is "That is one thing that scientists are still trying to find out".

◊ Walking among the audience will help you hear the child with the excellent question but the tiny voice.

◊ Try to be fair and check that you're taking questions from all areas of the room.

◊ If you are prepared to answer written queries after your talk, take some A4 SAEs with you since many teachers appreciate new "expert" contacts!

◊ To draw the questioning to a close thank the children for being a good audience (if they were!) and remind them that if they've enjoyed themselves they might want to be scientists when they grow up.

◊ Many children feel inhibited about asking a question in front of others so it is helpful to leave some "lingering time" to answer any questions in private.

Safety Issues

◊ Avoid taking cultures in with you as in a sea of children you may not be able to make sure they are safe and untouched by little fingers. If you do take a sealed culture, check that it is safe for use in schools (see references at the end), under no circumstances allow it to be opened and make sure that it returns to your lab for safe disposal.

◊ Do not take glass items with you unless they are under your strict control, glass is not allowed in many schools.

◊ To illustrate safety to the audience take a clean, scientist's "uniform" in with you and wear it for a while. Children love to see lab coats, goggles, gloves, masks. Be careful about letting them wear these items as allergies to latex or powder in gloves can be a problem.

Other handy hints

◊ When preparing for your event, you could try out the talk on some volunteer children - probably not your own as they'll respond in a different way. However bear in mind that a large class of children may respond very differently from a small group in the home.

◊ Some teachers may ask if you'd be willing to get some letters/art/poetry from the children relating to your talk. If you're willing then you'll get an insight into what the children thought about your presentation but remember that the correspondence will require a reply.

◊ You may wish to assess the event by a simple questionnaire that you give to each teacher. Give them an SAE to return it. Stress that if you get feedback from them then you'll be more likely to say yes to another invitation.

◊ Recruit some helpers (your students or teachers at the venue) to protect any demonstrations from pilfering or breakage as the kids leave (and you're occupied answering questions). This happens at the most august venues, and you need to protect any models you have made!

◊ See if you can take a few "freebies" from your friendly Research Council or Learned Society! Children love to have a small postcard of a bug or a leaflet to take home with them. Make sure these are kept well away from precious demonstration items that you don't want broken!

◊ Teachers appreciate materials that they can use for display or classroom work and they may not know what is available. Often organizations produce quite useful material that you can link to your talk. Do check what it says first though in case it contradicts your message! The SGM has a range of material for use in schools (see below)

◊ If you have time to prepare a very brief "reading list" of web sites and popular journal articles (e.g. *New Scientist*/*Scientific American*) for the teachers, they will find it useful.

Sources of further information and resources

BBSRC and MRC web sites have details of their publications on linking with primary & secondary schools **(www.bbsrc.ac.uk, www.mrc.ac.uk)**

The Association of Science Education Website lists science resources for teachers **(www.ase.org.uk)**

SGM Education Department can give advice and also provide copies of MISAC guidelines for microbiology activities in schools (E-mail: education@socgenmicrobiol.org.uk or telephone 0118 9881835). Some of this material is available on the SGM website **(http://www.socgenmicrobiol.org.uk)**.