

Audience Pre-Research

Methodology

Five focus groups were convened over school lunch times, each consisting of six students (except one where only five students were available) from one year group, covering years 7–11. The students were chosen at random from those interested in taking part by the Head of Physics at the school (David Richardson). The resulting students came from a range of backgrounds and interests. All the students attended Gordano School in North Somerset, a co-ed comprehensive school.

The sections of the focus group sessions are described below:

1. Introduction

discussion (5 mins)

- Introduce groups and names
- Explanation of session aim: audience pre-research for nationwide science show
- Rules of the focus group

2. What makes a good science show?

cards (10 mins)

Flashcards were used to rank possible 'elements' of a science show. Each element was simply introduced by the facilitator, then expanded upon if the members of the focus group did not understand what was meant.

#	Yr 7	Yr 8	Yr 9	Yr 10	Yr 11
1	'wow' science	'wow' science	'wow' science	'wow' science	'wow' science
2	electronic voting	electronic voting	electronic voting	electronic voting	electronic voting
3	demonstrations	demonstrations	demonstrations	demonstrations	demonstrations
4	'curiosities'		futuristic science	futuristic science	futuristic science
5	humour	humour	humour	humour	humour
6	stories	stories	stories	stories	stories
7	videos	videos	videos	videos	videos
8	text on slides	text on slides	text on slides	text on slides	text on slides
9	photos on slides	images on slides	images on slides	images on slides	images on slides
10	audience participation	audience volunteers	audience volunteers	audience volunteers	audience volunteers
11	personal relevance	science that affects you	everyday science	everyday science	everyday science
12	explanations of how things work	explanations of how things work	explanations of how things work	explanations of how things work	explanations of how things work
13	props & visual aids	props & visual aids	props & visual aids	props & visual aids	props & visual aids
14	vote live to influence content	choose-your-own lecture	choose-your-own lecture	choose-your-own lecture	choose-your-own lecture
15	discussion / debate	discussion / debate	discussion / debate	discussion / debate	discussion / debate

Some changes to the science show elements were made during the course of the pre-research, where it was clear that students were confused by the existing term.

3. What is sustainability?

discussion (5 mins)

Introduction to the theme of the show, discussion regarding focus group's general understanding of and interest in the topic.

4. Sustainability topics

cards (15 mins)

Flashcards were used to rank 13 different possible topics (all with a sustainability theme) to include in the show. Each topic was simply read out by the facilitator, then expanded upon if the members of the focus group did not understand what was meant. In the first two focus groups, over-arching topics were included in CAPITALS, whilst more specific topics or case studies were written in lower case. However, this approach was not easily understood by the students, so the over-arching topics were broken down into more specific topics. The flashcards evolved throughout the research, in response to the feedback gained, and how easily it was felt the students understood the terminology used. The evolution of the topics is shown below. A similar process occurred for the science show elements, although it was less pronounced.

#	Yr 7	Yr 8	Yr 9	Yr 10	Yr 11
1	carbon neutral	carbon neutral	carbon neutral	carbon neutral	carbon neutral
2	sustainable homes	sustainable homes	eco homes	eco homes	eco homes
3	nuclear power (fusion)	nuclear power (fusion)	-	-	-
4	energy efficiency	energy efficiency	energy efficiency	energy efficiency	energy efficiency
5	nuclear power (fission)	nuclear power (fission)	nuclear power	nuclear fusion	nuclear fusion
6	wind farms	wind farms	renewable energy	renewable energy	renewable energy
7	cloud seeding	cloud seeding	cloud seeding	cloud seeding	cloud seeding
8	hydrogen technologies	hydrogen technologies	hydrogen technologies	hydrogen technologies	hydrogen technologies
9	WATER	WATER	extreme weather	extreme weather	extreme weather
10	CLIMATE CHANGE	CLIMATE CHANGE	global warming	global warming	global warming
11	TRANSPORT	TRANSPORT	alternative fuels	alternative fuels	alternative fuels
12	WASTE REDUCTION	WASTE REDUCTION	-	nuclear fission	nuclear fission
13	ENERGY	ENERGY	personal choices	personal choices	personal choices

A general discussion about the reasons why / why not some of the topics were interesting to the focus group followed.

5. Who is responsible?

cards (5 mins)

Flashcards were used to rank 5 different possible groups that could take responsibility for pursuing sustainability. The focus groups were free to debate the possible merits of placing the responsibility with each group.

#	Yr 7	Yr 8	Yr 9	Yr 10	Yr 11
1	future	individuals	individuals	individuals	individuals
2	global	communities	communities	communities	communities
3	nation	nations	nations	nations	nations
4	personal	the world	the world	the world	the world
5	community	scientists	scientists	scientists	scientists
6		government	government	government	government

Results

2. What makes a good science show?

The results are presented in the table below. Low numeric scores represent highest rankings, and the range is given for each element to illustrate whether the rankings were unanimous or not:

Ranking	element	mean score	range
1	'wow' science	2.4	3
2	humour	2.6	5
3	demonstrations	3.4	5
4	audience volunteers	4.2	10
5	futuristic science	4.7	6
6	electronic voting	6.6	11
7	everyday science	7.2	12
8	props & visual aids	7.4	4
9	choose-your-own lecture	7.6	10
10	explanations of how things work	7.8	10
11	videos	9	7
12	images on slides	11	6
13	discussion / debate	11.8	4
14	stories	12.4	7
15	text on slides	14	4

Elements which have a larger range are often ones for which the wording on the flashcards changed between focus groups (see first section), most notably 'everyday science' which changed from 'personal choices' through 'science that affects you'; and 'audience volunteers' which had changed from 'audience participation'. The top 5 and bottom 5 appear to have been ranked with a greater degree of confidence than the middle 5, which generally have larger ranges. This is to be expected as different groups would have differing opinions reflected in more ambiguity over the middle ratings. The notable exception was 'visual aids', which most groups ranked in the middle.

Ideally, the bottom 5 elements would be dropped (or not used as a standalone part of the lecture), the top 5 would be retained and the middle 5 would be used with care to ensure the audience remain engaged in the presentation.

Emergent themes

During conversations with students of all year groups, a number of themes emerged regarding what would make a good or a bad lecture. Criteria for definition as a theme were that it must have been raised by more than two year groups, and it must have been raised for more than two science show elements. Quotes are given to illustrate each theme, but do not represent an exhaustive list of occasions that theme was raised.

Visually stimulating

Many students referred to how it was more interesting to be able to see something, and that an actual object was more interesting than a video or picture, which in turn was better than reading text

“you want to see it for yourself” (Year 7, wow science)

“you see it for real; not on a film or a screen” (Year 8, demonstrations)

“showing rather than telling” (Year 10, demonstrations)

How things work

The groups were generally interested in how things worked, especially when thinking about demonstrations and experiments. This also came out in the discussions of the sustainability topics, for example with the cloud seeding topic the initial response was often along the lines of ‘how does that work?’ or ‘how do they do that?’ The proviso with this as an area of interest was that the demonstration or experiment must be interesting enough to warrant the ‘how does it work?’ question.

“how things work are interesting” (Year 8, explanations)

“good to see how it’s done” (Year 10, demonstrations)

“people see things work but don’t know how” (Year 11, everyday science)

Interaction

Students were very keen on interaction with the lecture, or having an opportunity to voice their opinions. They had mixed feelings about levels of interaction, e.g. discussions and debates were not always popular in this context. Many of the students’ positive comments included references to interaction or audience involvement, although potential negatives were also identified; these included drifting off the topic of discussion or people not getting involved. The electronic voting system was seen as a good way to encourage interaction from audience members who may be too shy to raise their hands.

“you’re actually taking part; everyone can join in” (Year 8, e-voting)

“good because you get involved with it” (Year 9, volunteers)

“you’re actually expressing an opinion” (Year 11, e-voting)

Attention-grabbing/memorable

There were very positive responses to the topics that included demonstrations or topics the students found exciting. Students seemed to find things exciting for a number of reasons; that they were new or not seen in school, they were fun, they were attention grabbing, and they were memorable. The opposite was also true – students tended to reject an idea or element if they felt it was familiar.

“if it’s good it will get people’s attention” (Year 8, ‘wow’ science)

“interesting because [it] gets people looking and wanting to see it” (Year 9, demonstrations)

“interaction is good to make you remember it” (Year 10, volunteers)

Don't overdo it

While the students were largely positive about the science show elements, there was a sense that if any section or activity continued beyond their attention spans they would switch off. Even some activities at the bottom of the rankings were rated as positive so long as one 'didn't overdo it' or 'didn't go on too long'. Similarly, it was felt that more positive elements could be ruined by overkill.

“can't start going off on a tangent” (Year 7, stories)

“if [it's] something quick then alright” (Year 9, explanations)

“little and not too much; if you try and overdo it, it won't be as good” (Year 8, humour)

Other comments

The following points were raised by students, but weren't strong enough to be considered themes:

- offering choice is good but may be bad for those whose choice is rejected
- audience volunteers are more fun for the actual volunteer or their friends, may be boring otherwise
- students seemed to be enthusiastic about 'blowing things up'
- people may not participate in a discussion or debate, which would make it less interesting

3 & 4 Sustainability topics

Students were generally unfamiliar with the term 'sustainability', but grasped the concept quickly when it was explained to them. Most of the year 11 group were familiar with the term, and one member of the year 10 group, although they had come across it in geography rather than science.

The results are presented in the table below, low numeric scores represent highest rankings, and the range is given for each topic to illustrate whether the rankings were unanimous or not:

Ranking	topic	mean score	range
1	Cloud seeding	1.2	1
2	Extreme weather	3	6
3	Hydrogen technologies	4	4
4	Nuclear fusion	4.8	5
5	Eco homes	5.6	7
6	Alternative fuels	5.7	3
7	Nuclear fission	7.8	6
8	Energy efficiency	8.2	11
9	Personal choices	8.3	7
10	Renewables/wind power	8.6	3
10	Carbon neutral	8.6	11

Cloud seeding came out as the most popular topic in all but one of the groups. Extreme weather and hydrogen technologies were also popular. There appears to be a separation in popularity between topics 1-6 and topics 7-10 with a large gap in popularity between the two groups. There is very little in the rankings between the least popular 6 items, indicating that there are no topics that students rejected significantly more strongly than the others. Of course these data must be interpreted alongside the science show elements data, so a story about cloud seeding accompanied by text on some slides would kill the topic, equally a good demonstration on renewables may make that topic entertaining.

Emergent themes

Themes were less clear for this exercise, as many students appeared to simply find the topics inherently interesting or boring. The same criteria were used for the definition of themes as in the previous exercise.

Relevance

Students felt that a topic that was relevant to them or the world in which they live, provided interest:

"it relates to all of our lives so it should be really interesting"
(Year 8, energy efficiency)

"we will have to know how to use these cars etc. when all the fuel runs out" (Year 10, hydrogen technologies)

"useful in the real world, could help in Africa" (Year 11, cloud seeding)

Responsibility

Comments from students indicated that there were some topics included in the list that people ought to know about, reflecting a sense of social responsibility. Sometimes it was unclear whether or not the topic was interesting, but simply that it should be in the lecture, as 'people should know':

"people should know, they should recycle" (Year 8, waste reduction)

"something that's happening everyday; people might want to know about it so they stop polluting" (Year 9, global warming)

"put something back to the environment, helping out" (Year 11, carbon neutral)

Futuristic

Although 'futuristic science' was not at the top of the ranking for science show elements, it was mentioned many times as the reason why specific sustainability topics would be interesting. Perhaps this links in with the science show theme that something futuristic is new and attention grabbing:

"It's about the future and I find all that sort of stuff interesting" (Year 8, nuclear fusion)

"more science fiction so more interesting [than fission]" (Year 8, nuclear fusion)

"futuristic and interesting" (Year 11, hydrogen technologies)

Heard it before

Students were more likely to rank a topic lower if they felt it was not new or they had learned about it in school. This theme also showed the flipside of the responsibility theme, with students feeling they had been lectured or preached to many times regarding topics such as energy efficiency:

"heard about it before – boring" (Year 9, global warming)

"doing that in physics, not interesting" (Year 10, nuclear fission)

"it's like what your parents tell you – 'switch the lights off!'" (Year 11, personal choices)

Other comments

The following comments were of interest, but were not considered themes in the same way as the above:

- 'The Day After Tomorrow' is a film about the potentially catastrophic implications of climate change. It was recognised in all of the groups, and some students suggested that clips from the film be used throughout the lecture.
- During the nuclear fission topic discussions, most groups mentioned that cartoon character Homer Simpson works in a nuclear power plant.
- A minority of students mentioned that some of the topics might be depressing, or that the science might alarm members of the audience.
- In the year 9 group there was a pronounced difference in the opinions of males and females on the hydrogen technologies topic; boys were

considerably more interested in the topic than girls were. When probed as to whether the name of the topic was an issue, the girls commented that the term 'hydrogen technologies' was off-putting, as it sounded difficult and complicated.

5. Who is responsible?

This exercise generated the most interest and heated debate from students, partly because of the challenging nature of the discussion topic, but also because the format of the discussion was left more open than in the previous exercises. Students were asked to discuss the rankings amongst themselves, and the facilitator interjected with additional points the students could consider. In several of the groups a complete consensus was not reached due to lack of time to discuss the issues in enough depth. It should also be acknowledged that there is an inherent difficulty in reaching an agreed consensus on this topic, due to the complexity of the issues involved and their relevance to personal attitudes.

The results have been presented in a similar way to the previous two exercises:

Ranking	group	mean score	range
1	Individuals	1.6	3
2	Government	2.5	3
3	Communities	2.6	4
4	Scientists	3.2	5
5	The world	3.6	5
6	Nations	4	2

Most groups felt that much of the responsibility lay with individuals to live in a sustainable manner, although the role of government was also seen as important. Scientists were slightly further down the rankings, as one astute Year 8 student pointed out 'scientists can't do anything without government funding – how would they buy their equipment?' Many students also expressed a distrust that the government would take effective action, and one year 10 student pointed out that they are the voice of the majority, not everyone, so it was important that individuals took responsibility also.

The year 10 group were particularly socially aware; as well as questioning the government's use of taxpayers' money to address sustainability issues, when the topic turned to whether one should be made to cycle to work it was pointed out that this would be difficult for disabled people.

The year 7 group spent a long time debating whether individuals, communities or scientists should take the greatest responsibility. Eventually they ranked all three at the top, commenting 'a person could be a scientist'

Scientists should take most responsibility according to the perhaps slightly naïve year 9 group; they felt that scientists can 'tell us the right thing to do'. The group attitude was upbeat; they felt 'if you work together you can do anything'.

The year 11 group felt that education was an important part of the responsibility debate, and that business or industry should be added to the cards. They felt that although the government had more power than scientists, it was still up to the individuals and the world to work together for a sustainable future.

Appendix

Focus group transcripts and rankings

Yr 7: 3 male, 3 female

What makes a good science show?

Final Ranking:

most interesting 😊			
	humour		
	'wow' science		
explanations	demonstrations	audience participation	
	curiosities		
	props & visual aids		
videos	photos on slides	stories	
	electronic voting		
	vote on content		
	discussion / debate		
	personal relevance		
	text on slides		
least interesting ☹️			

Specific Comments:

wow science	<ul style="list-style-type: none"> ✓ exciting: you don't just want to get told stuff, you want to see it for yourself ✗ some people might think science is rubbish
explanation	<ul style="list-style-type: none"> ✗ boring ✓ good if you've just done something interesting and we want to know more e.g. how to do it ourselves
demonstration	<ul style="list-style-type: none"> ✓ more exciting (than on video)
videos	<ul style="list-style-type: none"> ✓ I don't think you should have videos because it will make us think you don't want to talk about it yourself
photos on slides	<ul style="list-style-type: none"> ✗ boring ✓ good while talking
stories	<ul style="list-style-type: none"> ✗ how do you know they're not lying? ✗ need to be short ✗ can't start going off on a tangent
e-voting	<ul style="list-style-type: none"> ✓ more interesting than raising your hand ✓ "woah – what's this" – many children haven't seen it ✓ good for people who are scared of showing opinions openly
discussion / debate	<ul style="list-style-type: none"> ✗ it's rubbish ✗ people just wanna watch you two do something interesting
personal relevance	<ul style="list-style-type: none"> ✗ can't be relevant to everyone
text on slides	<ul style="list-style-type: none"> ✗ really boring

What is sustainability?

None of the students recognised the term or the concept of “sustainability”.

Day after tomorrow – 2 of 6 members of the focus group had seen it. The focus group pointed out that they are currently not old enough to have seen it at the cinema due to the classification.

Global warming – “I’ll be dead by then”; generally not concerned. Commented more on frivolous advantages such as more sunshine, better suntans and warmer climate.

Sustainability topics

Final ranking:

most interesting ☺
cloud seeding ENERGY hydrogen technologies sustainable homes WATER WASTE REDUCTION wind farms nuclear power (fusion) carbon neutral CLIMATE CHANGE nuclear power (fission) energy efficiency TRANSPORT
least interesting ☹

Specific comments:

- cloud seeding** ✓ WOW – can they really do that?
strong interest shown in the science behind the process
- energy** ✗ I think we all know about energy
 ✓ general decision that it was still fairly interesting
- hydrogen tech.** *big confusion as to what this meant / involved... the students became confused between liquid nitrogen, nitrous oxide and many other gases they’d heard of, and completely missed the point.*
- sustainable homes** *still confusion about the word “sustainable”*
students have seen stuff previously on this topic
- waste reduction** ✓ find out what happens to your rubbish and what cool things it gets turned into
- wind farms** ✓ Oh yeah, I’ve seen them!
- nuclear power** *Homer Simpson reference brought up*
very confused over fusion / fission, not interested in the difference between the terms
 ✓ most people know about fission... not many people know about this (fusion)
- carbon neutral** ✗ people could get worried about it
 ✓ interesting fact

none of the students recognised the term or the concept "carbon neutral"

climate change ✓ could have interesting things like whirlwinds, tornadoes and hurricanes
interest was in extreme events rather than long-term issues

transport ✗ noone really cares about how people go on buses or whatever

General features that make a topic interesting:

futuristic

something you wouldn't have thought of

Who is responsible?

most responsible ☺		
community	scientists nation global	personal
least responsible ☹		

- Very animated discussion about this topic, with no final agreement reached between all members of the focus group.
- FUTURE replaced by SCIENTISTS part way through this activity as the focus group believed the latter was much more pertinent.
- Generally positive attitudes expressed e.g. "it will be sorted out"
- Major confusion over which end responsibility should start at: personal or global. "It's like a timeline".
- Lots of disagreement re community / scientists / personal.
- Major misunderstanding between "fossils" and "fossil fuels".

Community do things as a group

Scientists a person could be a scientist

Personal yes it's us that's doing it
you can do your little bit
turn lights off in your house

Nation it's down to us but it's also down to the nation to do it as a group
if you're talking about nation then it's everyone
some confusion re 'everyone' meaning national or global

Yr 8: 2 male, 4 female

What makes a good science show?

most interesting ☺		
‘wow’ science		electronic voting
	humour demonstrations	
science that affects you		audience volunteers
	props & visual aids choose-your-own lecture explanations of how things work videos	
text on slides		images on slides
	discussion / debate stories	
least interesting ☹		

- you could do something about... burning things because people like that
- general agreement that all of the above were relatively interesting; there was a “big gap” between stories and least interesting...

‘wow’ science	<ul style="list-style-type: none"> ✓ if it's good it will get people's attention ✓ if it's exciting it's better than reading ✓ most people would rather do experiments ✓ gives people a chance to see something they wouldn't do every day
e-voting	<ul style="list-style-type: none"> ✓ really cool ✓ hands on: they see it but also get to do it ✓ you're actually taking part; everyone can join in
humour	<ul style="list-style-type: none"> ✓ you need humour otherwise people get bored ✓ everyone likes funny ✗ little and not too much; if you try and overdo it it won't be as good
demonstrations	<ul style="list-style-type: none"> ✓ you see it for real; not on a film or a screen
science affects you	<i>general difficulty in recognising what this means</i>
audience volunteers	✗ people get left out
choose your own	<ul style="list-style-type: none"> ✗ pretty hard ✓ good idea because people can choose what they're interested in ✗ people might get upset if they wanted to listen to something else ✓ more exciting than videos
explanations	<ul style="list-style-type: none"> ✓ how things work are interesting
videos	<ul style="list-style-type: none"> ✗ depends what kind of video it is ✓ you don't have to hurt your brain

- text on slides**
 - ✓ quite interesting
 - ✓ you can actually see it so you remember
 - ✓ easier to see it rather than just talking about it
- images on slides** *confusion about whether it is separate to text on slides*
- discussion / debate**
 - ✓ you could involve the audience (e.g. you could involve e-voting with discussion and debate)
 - ✓ people can actually get involved
 - ✗ people might get noisy and not listen
 - ✗ people might discuss something completely different
 - ✗ some debates can be really boring
 - involve some of the audience
- stories**
 - ✓ makes people understand it a lot easier than if you just told them
 - ✓ if you just tell people something then they just get bored
 - ✓ if there's no humour about it then you get bored

What is sustainability?

- noone recognised the term but did get concept quickly
- “balancing the system”
- “enough to keep it natural but keep modern life going”
- “we need to find ways of balancing things out”

Sustainability topics

Final ranking:

most interesting ☺	
cloud seeding	
hydrogen technologies	TRANSPORT
nuclear power (fusion)	
WASTE REDUCTION	
CLIMATE CHANGE	WATER
sustainable homes	wind farms
nuclear power (fission)	
ENERGY	energy efficiency
carbon neutral	
least interesting ☹	

- keen to link certain topics esp. energy / efficiency / fusion / fission
- keener to hear about futuristic stuff
- suggest shorter sections on recycling etc.
- futuristic things are more interesting
- You don't know what's going to happen
- some people think why should I worry about the future because I'm going to be dead.

cloud seeding	<ul style="list-style-type: none"> ✓ WOW ✓ cloud in a bottle would be interesting; coloured would be cool
hydrogen tech.	<ul style="list-style-type: none"> ✓ interesting because we're wasting loads of fuel and people would want to know there's an alternative
transport	<ul style="list-style-type: none"> ✗ flying cars (<i>confusion re link to sustainability!</i>) ✗ <i>confusion re separation from hydrogen technologies</i>
nuclear (fusion)	<ul style="list-style-type: none"> ✓ it's about the future and I find all that sort of stuff interesting <i>confusion re Homer Simpson nuclear suggestion to use cartoons to maintain interest</i> ✓ more science fiction so more interesting (than fission)
waste reduction	<ul style="list-style-type: none"> ✗ it's not that interesting but not too bad ✓ people should know, they should recycle
climate change	<ul style="list-style-type: none"> <i>recognition of relevance to weather</i> ✓ we've done this in geography ✓ can you make a tornado on stage? It would be cool ✓ depends what weather: hurricanes etc. would be good use clips from movies e.g. Day After Tomorrow
water	<ul style="list-style-type: none"> ✗ people already know a lot about water
sustainable homes	<ul style="list-style-type: none"> ✗ people don't need to know about these kinds of things but still interesting ✓ sounds different, unusual
nuclear (fission)	<ul style="list-style-type: none"> they're dangerous
energy efficiency	<ul style="list-style-type: none"> quite interesting but not that interesting ✓ you could do something about circuits that would be interesting ✗ that's what the news always goes on about (boring) ✓ it relates to all of our lives so it should be really interesting
carbon neutral	<ul style="list-style-type: none"> ✓ quite interesting because a lot of people won't know about it at all ✗ could be difficult; could lose the plot ✓ it's something that relates to all of us ✗ bit boring

Who is responsible?

- Free-for-all format instead of individual cards due to time constraints
- fairly politically astute
- vague agreement on final result

most responsible ☺		
individuals	nations	communities
scientists	the world	government
least responsible ☹		

individuals	everything starts from here this is saving our world some people are horrible it's their world they're destroying
community	if community does but some individuals don't then better than only some individuals doing it
scientists	it's going to be up to them to find the solution. Someone with a brain. everyone expects the scientists to do it for them but they can't do everything scientists can't do anything without government funding
government	they have made really wrong decisions government should be higher because they have the power
the world	can't only be individuals. Has to be whole world no point if England reduces emissions but US doesn't some people in the world wouldn't join in

Yr 9: 3 male, 3 female

What makes a good science show?

most interesting ☺	
audience volunteers demonstrations videos	humour 'wow' science electronic voting
props & visual aids	
everyday science images on slides	futuristic science choose-your-own lecture discussion / debate
explanations of how things work text on slides	
stories	
least interesting ☹	

This group divided the elements into four distinct groups (indicated by boxes above). Reading from top to bottom the groupings were described as:

1. Really really interesting.
2. Could be good, depends on what is included. Better if also linked to one element from the top box.
3. Don't really care about these ones.
4. Rubbish

volunteers	✓ good because get involved with it ✓ more fun than just sitting here
humour	✓ gets people listening
demonstrations	✓ interesting because gets people looking and wanting to see it
wow science	✓ gets people watching and interested ✓ want to know what happens
videos	✓ remember that smoking video... now you know what's wrong with smoking
e-voting	✓ it's fun instead of putting your hand up
futuristic science	✓ interesting to see different gadgets and stuff
everyday science	✓ if we didn't have it our lives would be different ✓ we know about it
choose your own	✗ people won't vote so there would be no lecture
images on slides	depends what's on them
discussion / debate	✓ good to hear what people think intermediate because sometimes people think boring things; sometimes interesting

- explanations** ✓ if something quick then alright
 ✗ generally boring
- text on slides** depends what text is about
 ✗ boring because you have to read it

- stories** ✗ boring because you want to be there doing it not listening to boring stories

General:

- students keen to combine images & text on slides
- generally fairly ego-centric; spoke very much from a personal point of view rather than considering general audiences their age (c.f. Yr 7 & 8)

What is sustainability?

LG introduced the topic from the OPOF point of view instead of Sustainability

- got concept immediately (mentioned global warming)
- maybe heard Sustainability term before; not sure

Sustainability topics

most interesting ☺		
extreme weather	cloud seeding	eco homes
personal choices global warming		
hydrogen technologies	alternative fuels	
nuclear power	energy efficiency	
carbon neutral	renewable energy	
least interesting ☹		

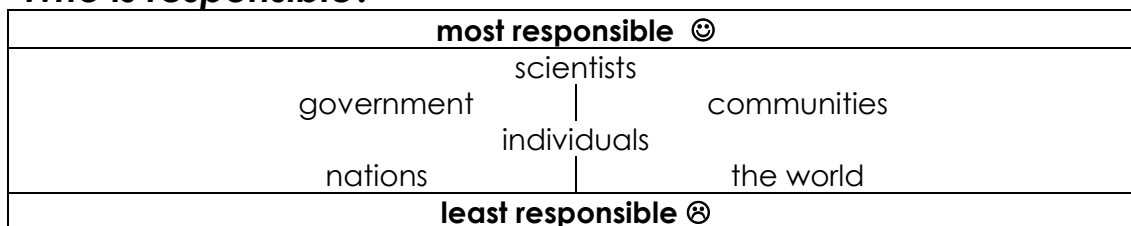
General comments:

- girls rather negative about everything
- boys interested in 'big' stuff only
- have to link with good demos etc.
- divided into categories again (5). The focus group agreed that the topics in the bottom category would still be dull whatever show elements were used, whereas the penultimate category 'could be improved with good demos'.
- Day After Tomorrow: keen to include clips in the show; majority of students in the focus group have already seen the movie; they had all heard of it and seen the trailer even if they hadn't seen the movie.

- extreme weather** ✓ carnage
 ✓ people will wanna hear why it happens
- cloud seeding** ✓ that's cool
 ✓ wicked
 ✓ sounds impossible but wow you can actually do it
- eco homes** *mentioned solar power reference quickly*
 ✓ it sounds cool

personal choices	<ul style="list-style-type: none"> ✓ directed at you (good) <i>got recycling link quickly</i> ✓ could be interesting to see what affects the planet ✗ but not that interesting
global warming	<ul style="list-style-type: none"> ✓ need to know about it ✗ depressing; world's gonna end ✓ something that's happening everyday; people might want to know about it so they stop polluting ✗ heard about it before (boring)
hydrogen tech	<ul style="list-style-type: none"> ✗ I think boys are interested; girls aren't ✗ haven't really heard of them before ✗ boring because doesn't appeal to me ✗ sounds complicated ✗ name is boring / difficult
alternative fuels	<ul style="list-style-type: none"> ✗ we learn about it quite a bit in schools some of it is interesting but can't go on about ✓ lipstick / cosmetic link is interesting
nuclear power	<ul style="list-style-type: none"> ✗ think about the Simpsons and doze off ✗ good in one way but could blow up the earth ✗ the USA can use it for bombs <i>not familiar with fusion</i> ✗ too complicated and boring
energy efficiency	<ul style="list-style-type: none"> ✗ sounds boring; everyone's heard it before ✗ no depth to it
carbon neutral	<ul style="list-style-type: none"> ✗ kind of boring ✓ if you're a member of Greenpeace it would be more interesting ✗ I'm not that interested in planting trees etc.
renewable energy	<ul style="list-style-type: none"> ✗ doesn't sound very interesting ✗ seems dull

Who is responsible?



- very keen to put scientists at the top
- generally happy with the final ranking

scientists	<ul style="list-style-type: none"> they can create it they can tell us the right thing to do they can tell us what we're doing wrong no definite way they can stop people from doing things
government	<ul style="list-style-type: none"> politics comes into everything

communities	can set up recycling
individuals	<i>boys convinced you could never get everyone to do the right thing</i> if you're one person at least you can do something individual won't be able to change it it should happen; would be a good thing, but reality is different
nations	if you work together you can do anything <i>brought up examples of Singapore and Holland</i>
the world	all the nations have to be committed

Yr 10: 2 male, 3 female

What makes a good science show?

most interesting ☺	
audience volunteers	
choose-your-own lecture	humour
futuristic science	'wow' science
explanations	props & visual demonstrations
	everyday science
	videos
	images on slides
	electronic voting
discussion / debate	stories
	text on slides
least interesting ☹	

- interaction is important to maintain enjoyment and interest
- concerned with logistical issues e.g. size of audience
- some focus group members clearly wanted to link related elements rather than consider them separately

- volunteers**
 - ✓ interaction is good to make you remember it
 - ✓ people really enjoy it if they get to have a go
 - ✓ even if it was you're friends, they could tell you about it
- choose-your-own**
 - ✓ don't get bored listening to stuff you don't want to hear about
 - ✓ you're showing people stuff they like so they'll be more interested
 - ✗ might get other people wanting different stuff to you
- humour**
 - ✓ definitely top
 - ✓ makes it more enjoyable
- futuristic science**
 - ✓ pretty cool
 - how hi-tech it would be
 - ✓ interesting: what's gonna be in the future
- 'wow' science**
 - ✓ that's really good
 - ✓ is that like blowing up things?
 - ✓ when people are speaking about science it's more interesting to find out something you wouldn't otherwise know about yourself
- explanations**
 - ✓ you want to know how not just why
 - ✓ no good watching a demonstration and not knowing how it works ("magic")
- props**
 - ✓ help you remember
 - ✓ easier to understand
 - ✓ good for people who don't like listening
- demonstrations**
 - ✓ good to see how it's done
 - ✗ could demonstrate something people aren't interested in

- ✓ hands-on; better than just seeing a video
- everyday science** *not sure what it is*
 - ✓ helps it be more interesting
 - ✓ help me remember certain facts
 - ✓ show people how science works; what we use it for
- videos**
 - ✓ not just talking about things
 - ✓ easier to understand
- images on slides**
 - ✓ you can see what happened
- e-voting**
 - ✗ we do that in school
 - ✓ easier: some people might be shy and not want to tell their opinion
 - ✓ keep the audience's attention
 - could apply to choose-your-own lecture
 - ✗ can distract some people; you talk to your mates

- discussion / debate**
 - ✓ good to get everyone's opinions
 - ✗ maybe everyone would shout out
 - ✗ depends how big the crowd is; difficult with expected audiences for this talk
 - ✗ people would get bored
 - covered by choose-your-own format
- stories**
 - ✓ good because gets everyone's attention
 - ✗ stories can get a bit rambling
- text on slides**
 - ✗ nothing amazing
 - ✓ easier to see from distance
 - ✓ more interesting than just talking

What is sustainability?

- we done it in geography
- can't remember what it is
- sustainable tourism recognised
- familiar with concept especially greenhouse effect, climate change, running out of fuel

Sustainability topics

most interesting ☺		
cloud seeding hydrogen technologies	energy efficiency nuclear fusion extreme weather eco homes renewable energy personal choices carbon neutral nuclear fission	global warming alternative fuels
least interesting ☹		

- “I think none of them are actually boring”
- Students all seemed generally keen to know about the science behind each of the topics

- cloud seeding** why? what for?
 - ✓ cool
 - ✓ really interesting
 - ✓ that’s what people wanna do
- energy efficiency** ✓ if we can get more out of the energy we have it will be much better
- global warming**
 - ✗ not sure what that is
 - Day After Tomorrow reference: 4 out of 5 students have seen it*
 - interested in details and science*
- hydrogen tech**
 - title is familiar with boys; concept not*
 - ✓ we will have to know about how to use these cars etc. when all the fuel runs out
- alternative fuels** ✓ better things: kids would wanna know
- nuclear fusion**
 - interested in the science behind it*
 - ✗ noone wants to know because they will think you can't get a sun inside a building (!)
- extreme weather** ✓ interesting to know
- personal choices** ✗ still important but not as interesting
- nuclear fission**
 - ✗ doing that in physics; not interesting
 - ✗ it's factories
 - ✗ bit technical
 - ✗ don't find power or nuclear interesting

Who is responsible?

most responsible ☺		
individuals	government	the world
nations communities scientists		
least responsible ☹		

- immediate response: US (before cards even displayed)
- major confusion over the difference between individuals and the world; “everyone needs to work together”
- got concepts and big picture quickly
- top 3 are major issues; difficulty reaching consensus between them

- scientists** they've done their bit
- individuals** it's our responsibility now
- government** got concepts and bigger picture quickly

they know all the higher up people – they can make the difference

reference to German recycling laws

if we're paying tax then why can't they pay to sort out problems?

government only hear the voice of the majority so that's

why individuals need to also be at the top

individuals

some people don't want to cycle to work

what about disabled people?

Yr 11: 3 male, 3 female

What makes a good science show?

most interesting ☺		
futuristic science	demonstrations everyday science electronic voting humour choose-your-own-lecture explanations of how things work discussion/debate props & visual aids audience volunteers	'wow' science
videos	images on slides text on slides	stories
least interesting ☹		

- stuff that they see every week in assembly is boring, would switch off quite easily
- the worst possible thing would be an old man talking to you!
- Seemed keen on elements that would allow for interaction or let them express their opinions

- demonstrations**
 - ✓ you can actually see it happen
 - ✓ getting people to take part
 - ✓ showing rather than telling
- futuristic science**
 - ✓ interesting because it shows what could happen, you get a look at something you might never see
 - * might feel that it doesn't appeal to you directly
- everyday science**
 - not entirely sure of definition*
 - ✓ people see things work but don't know how
 - ✓ it's appropriate to you so quite interesting
 - * perhaps not as exciting as something else
- 'wow' science**
 - not entirely sure of definition*
 - ✓ quite interesting to see stuff you wouldn't in a normal environment
 - ✓ once in a lifetime opportunity
- e-voting**
 - ✓ quite different
 - ✓ quite fun
 - ✓ you're actually expressing an opinion
- humour**
 - ✓ better than just watching people
 - ✓ jokes make people more at ease
- choose-your-own**
 - ✓ you can listen to what you're interested in
- explanations**
 - ✓ show you how it works, e.g. in an experiment
 - ✓ more interesting than just discussion

- discussion / debate** *unsure of how this would be used at first*
 - ✓ some people would get into it
 - ✗ some would not participate
 - ✓ gets people thinking about the science
 - ✗ could get dull if people don't get involved
- props**
 - ✓ quite interesting
 - ✓ it's not on a screen it's actually there
 - ✓ can show you what it is
- volunteers**
 - ✓ good if it's you or a mate
 - ✓ good to involve audience, e.g. in lessons when you are the particles
 - ✗ if you're not picked its just the same as watching a lecture
- videos**
 - ✗ you're not exactly taking part
 - ✓ alright though
- stories**
 - ✗ being told to you – it's not interactive
 - ✗ agreed they shouldn't go on too long
- images on slides**
 - ✗ just like reading you're not taking part
 - ✓ more interesting than text, see/explain better
- text on slides**
 - ✗ boring
 - ✗ you're just kind of reading like a book

What is sustainability?

- Most students had encountered it in geography, apart from Abby who doesn't do geography
- Might have a different meaning in science (Corinne)
- It's when you 'preserve stuff for the future' (Corinne)
- Generally aware of the concept if not fully comfortable with the term

Sustainability topics

most interesting ☺		
cloud seeding	extreme weather carbon neutral hydrogen technologies nuclear fission	nuclear fusion
alternative fuels renewable energy	personal choices global warming	eco homes energy efficiency
least interesting ☹		

- Thought that most could be 'saved' by good experiments except renewable energy, energy efficiency and personal choices
- Felt that things that have been covered at school are generally boring

- Also didn't like topics that they felt people nagged them about

extreme weather	<ul style="list-style-type: none"> ✓ find it quite interesting ✓ cool! ✓ it's exciting
cloud seeding	<ul style="list-style-type: none"> ✓ 'wow!' ✓ useful in the real world, could help in Africa (Adam)
carbon neutral	<ul style="list-style-type: none"> ✓ quite interesting to find out or talk about ✓ put something back to the environment, helping out
nuclear fusion	<ul style="list-style-type: none"> ✓ futuristic ✓ a bit more interesting than fission
hydrogen tech	<ul style="list-style-type: none"> <i>concept and title not familiar</i> ✓ new innovation and stuff ✓ futuristic and interesting
nuclear fission	<ul style="list-style-type: none"> ✓ not a lot of people would know about it – quite interesting
alternative fuels	<ul style="list-style-type: none"> ✓ quite interesting ✓ a bit like personal advice – 'you can do this' ✗ not for too long
eco homes	<ul style="list-style-type: none"> ✓ alternative way of living (Abbie)
renewable energy	<ul style="list-style-type: none"> ✓ can be quite interesting ✓ topical ✗ do it quite a bit in lessons, familiar
energy efficiency	<ul style="list-style-type: none"> ✗ people know quite a lot about it already, from the government and stuff (Abby) ✓ could still talk about it to remind people
personal choices	<ul style="list-style-type: none"> ✗ hear it a lot all the time ✗ not too interesting – only go on for a short time – sometimes people go on and on about it! ✗ it's like what your parents tell you – switch the lights off!
global warming	<ul style="list-style-type: none"> ✗ all familiar with the idea ✗ do it all the time at school ✗ hear about it too much ✗ it's dull unless you do something new

Day After Tomorrow reference: 5 out of 6 students had seen it. Thought adding clips to the lecture would be interesting but said that it would be more interesting with an experiment than the video.

Who is responsible?

most responsible ☺		
Individuals	Government	The world

Scientists	Nations	communities
least responsible ☹		

- again confusion over the difference between individuals and the world
- seemed to take a while to grasp concepts
- confusion over responsibility
- difficulty reaching consensus between scientists and government
- felt that education (for adults as well as at school) and business should be included

individuals

- 'you have got to take responsibility yourself' (Abbie)
- 'it's your job to commit to it'

the world

- had to be explained with ref to Kyoto, they all seemed familiar with it except Abby
- if you're gonna vote someone in to sort it out we all need to do it

government

- people can vote – if they're not happy they can have someone else
- they have money they can do it (Corinne)
- they can say to do it but its still up to the individuals to do it (James)
- They run the power stations which are the worst polluters – they should switch like they tell us to! More interested in making money (Adam)

scientists

- have all the knowledge about improvements (Corinne)
- no-one listens to them! Like smoking (Rob)
- they'd know what to do (Corinne)
- can say what to do but the government must put it in action
- can say something, but won't matter if no-one follows it through
- generally seen as providing ideas and solutions e.g. energy saving light bulb

communities

- got to act together
- if they can put together an effort that can help, but don't have the widespread power of government to put it into action (Adam)