



Young people's opinions of nanotechnology

**An analysis of data collected during
and after a Small Talk / Young
People's Parliament event held on
17 March 2006**

Laura Grant, May 2006

Foreword (by Adam Nieman, Small Talk project manager)

Nobody knows what impact nanotechnologies will have because it is still an open question. The impact will be determined by patterns of investment and regulation as much (if not more) than the physics and chemistry of the nanoscale. Nanoscientists can discover what is physically possible but this is just one of many questions posed by nanotechnologies, and plays a surprisingly small role in determining who they empower and how.

Developing policy for nanotechnologies is challenging because (contrary to our intuition) it is not easy to distinguish technical issues from political ones. The experience of GM technologies led many to argue that the public should be involved at an early stage of technological development, and not simply when products begin to appear (by which time opinions have become polarised and it is too late to re-focus research anyway). Nevertheless, the public's role in the process is still a matter of debate.

How can science communicators support (or precipitate) the public's active involvement? This is one of the questions addressed by Small Talk, a project that has been exploring ways to deliver dialogue on nanotechnologies. The idea is to allow publics and scientists to share their concerns and aspirations and to set an agenda for progress in partnership. It is an experiment in 'upstream engagement'. Nanotechnologies will have a major impact in the near future (downstream) but awareness of the issues they raise is still generally low. Small Talk is one of several initiatives attempting to kick-start the debate by encouraging people to inform themselves and identify key issues while there is still a chance of influencing developments.

The idea for Small Talk emerged at the Science Communication Conference in 2004. Many of the science communicators present felt that there was a role for existing science communication networks in upstream engagement alongside more focused (and expensive) initiatives such as the Nanodialogues project and the NanoJury. Ecsite-uk, The British Association, the Royal Institution and the Cheltenham Science Festival joined forces to spearhead the initiative and brought Think-Lab in to manage the project. With support from Copus, Small Talk has coordinated a variety of events – each building on insights gleaned from earlier events.

Small Talk's main objectives are:

- Facilitating dialogue on nanotechnologies
- Providing resources and support for organisations preparing such events and activities
- Building a better understanding of the public and scientists' aspirations and concerns about nanotechnologies
- Sharing our results with policymakers and the science community
- Improving our understanding and use of good practice in engaging with the public on scientific issues
- Evaluating the impact of a co-ordinated approach and sharing our findings with the wider science communication community

Laura Grant's analysis of young people's opinions of nanotechnology is based on an event organised jointly by Small Talk and the Young People's Parliament in Birmingham in collaboration with the Nanoscale Physics Research Laboratory at the University of Birmingham. Overall we were pleased with the event but it could have

been better, which is to be expected. Small Talk gives us the freedom to try new formats confident that, whatever the outcome, we can learn from it. The Young People's Parliament event was planned with the intention of learning for the future, as well as engaging with the Birmingham audience.

The freedom to learn is important, as is sharing experience, because upstream engagement is uncharted territory – and it is difficult to make it work. There is no general clamour to discuss nanotechnology; few people even know what the term means. A problem that faces all upstream interventions is how to forge an authentic forum before it is actually demanded by the public. What distinguishes Small Talk from other nanotechnology projects is its flexibility. It adopts an iterative, bottom up approach rather than following a planned trajectory.

We were keen to try three things in particular in Birmingham. Firstly, we wanted participating experts to see learn from the young people rather than just teaching them about nanotechnology. Secondly, previous events had revealed that participants (experts and non-experts alike) valued the chance to converse informally, in small groups with no particular agenda. So for the Birmingham event we tried to ensure this could happen. Thirdly, we were also keen to test the extent to which participants could set their own agenda, so we tried to allow group discussions to determine the shape of the plenary discussion at the end. The key part of the day was the group work, which involved demonstrations of equipment and explanations of scale as well as discussions aimed at planning the plenary session (to which Clare Short, MP was invited). The sessions included:

- A scanning tunnelling microscope demonstration
- A biotechnology demonstration
- A hands-on explanation of scale and the technical aspects of nanophysics
- A 'meet the professor' discussion
- A 'meet the young scientist' discussion
- A 'meet the policymaker' discussion
- A 'what shall we vote on?' discussion (led by Laura Grant)
- A 'what should we discuss / ask the experts / ask Clare Short?' discussion.

The plan was that the young people taking part should have an active rather than passive role for at least three quarters of the day, but this is harder to achieve than it sounds. As Laura Grant's analysis reveals, many participants felt that there was not enough interactivity. For reasons we are still exploring, the sessions with the scientists did not turn out to be the relaxed open forums we'd hoped they would – though they worked well otherwise and were enjoyed by most participants. Possibly there was a sense amongst the participating scientists that they did not have much to learn from the young people, along with an awareness that there was a great deal that the young people could learn from them. Such a presumption along with time pressure would have made the sessions with the scientists more didactic than we intended them to be.

Gratifyingly, our strategy for encouraging the participants to shape the plenary discussion was rather successful. The Birmingham event produced more in the way of communicable outcomes than other Small Talk events and the issues chosen for voting are as interesting the outcomes of the votes.

Laura Grant's evaluation will be useful to organisers of future events but her analysis of the data collected also provides valuable social insight and will serve as a resource for all those charged with steering the development of nanotechnologies.

Contents

FOREWORD (BY ADAM NIEMAN, SMALL TALK PROJECT MANAGER) ..	2
1 INTRODUCTION	5
2 METHODOLOGY	5
3 FINDINGS.....	5
3.1 Voting at the start of the event	5
Previous knowledge of nanotechnology	5
Pre-existing attitudes to science	6
3.2 Voting at the end of the event	8
3.3 Questionnaire responses.....	10
3.4 Focus group discussion	11
Hopes and fears about nanotechnology	11
Designing a nanotechnology dialogue event	12
4 CONCLUSION.....	13
APPENDIX 1.....	14
Speech bubble questionnaire	15
Small Talk speech bubble responses – ST/YPP event 17 March 2006	16
APPENDIX 2.....	18
Small Talk focus group	19
Nano focus group flipcharts	20

1 Introduction

This report presents data collected on young people's opinions about nanotechnology and science in society. Data were collected during and after the Small Talk/Young People's Parliament (ST/YPP) nanotechnology event held on 17 March 2006.

2 Methodology

Three methods were used to collect data:

- Electronic voting during the young people's parliament event
- Questionnaires at the end of the event
- A focus group with students convened three weeks after the event

A copy of the voting questions, event questionnaires and the focus group schedule are given in Appendix 1.

3 Findings

3.1 Voting at the start of the event

At the start of the event, students were given an electronic voting exercise. This aimed to gauge how much prior knowledge of nanotechnology they had, and to explore their attitudes related to science and society. For the science and society questions, items from the Wellcome/OST (2000) study Science and the Public and the MORI (2005) Science in Society survey were used in order that results could be compared with a larger baseline. The voting system was limited to three response options, so responses were pooled where appropriate.

123 students participated in the electronic voting at the start of the event. Most (59%) were male; 41% were female. Over half of the audience were in Year 10 or 11 (57%); 22% were in Year 12 or 13 and 21% were in Year 8 or 9.

Previous knowledge of nanotechnology

Students were asked several questions about their prior knowledge of nanotechnology. Results are presented in the table below.

	Yes	No	Maybe
I had heard the term nanotechnology before I heard of this event	60%	24%	16%
I think I could explain what nanotechnology means	27%	23%	50%

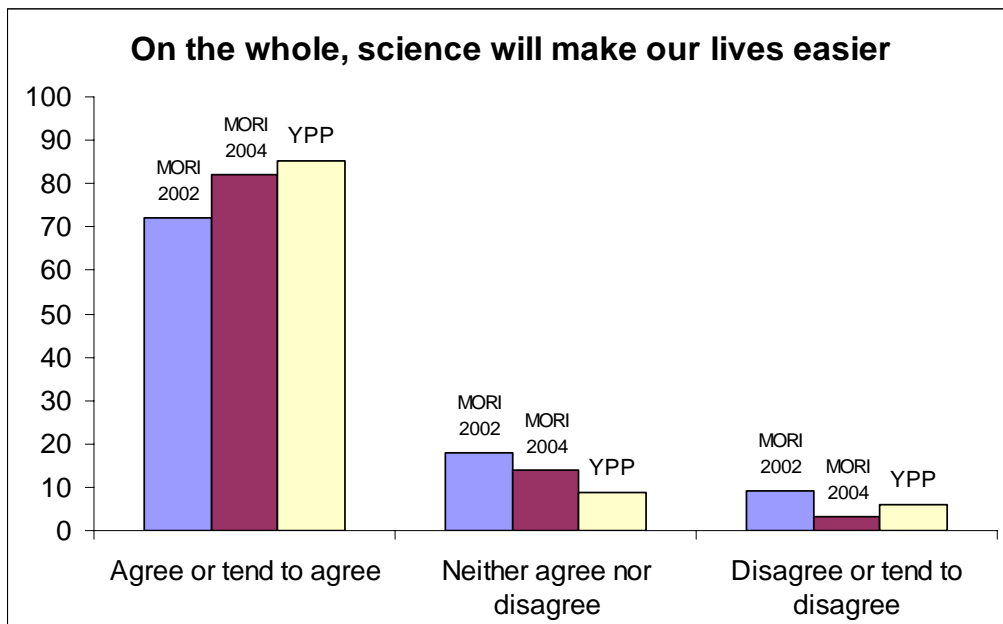
It appears that while a majority of students had heard the term 'nanotechnology', only one in four (27%) were confident that they could explain what it meant.

A small proportion of students (14%) said that they thought the iPod nano MP3 player used nanotechnology. Half of the audience (50%) knew, or correctly guessed, that a 'buckyball' is arranged in the shape of a football. Students were also asked who the Minister for Science is: votes for Lord Sainsbury, Lloyd George and Charles

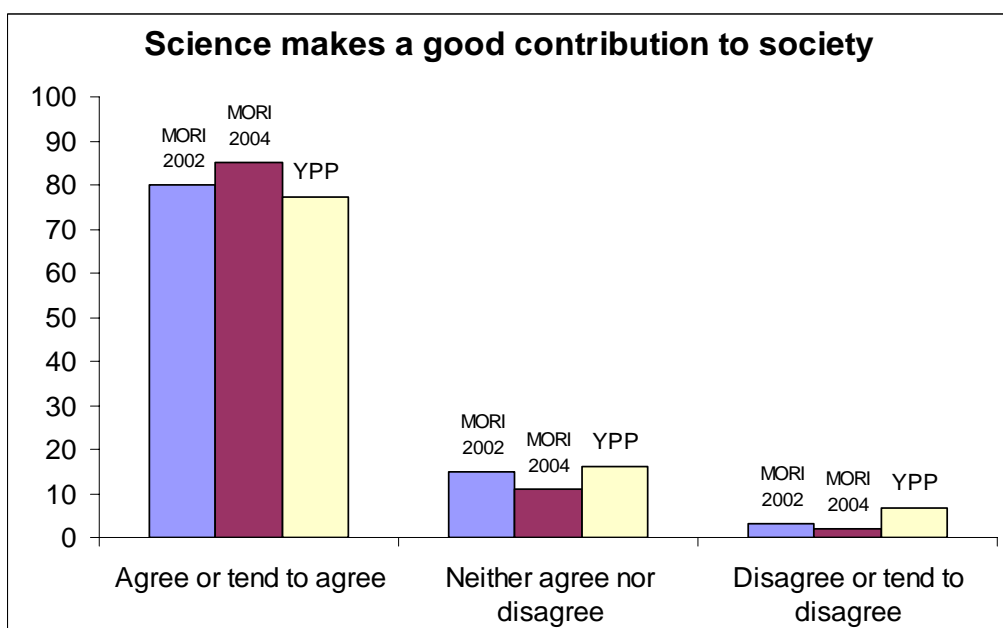
Clarke were split almost equally (36%, 30%, 34% respectively) indicating that most students had voted at random.

Pre-existing attitudes to science

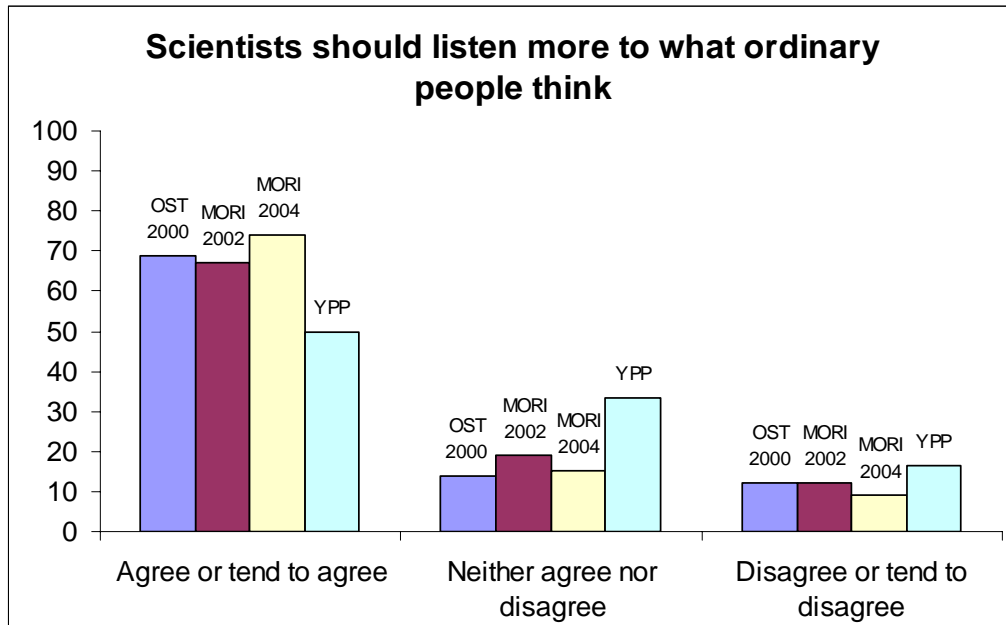
Students were asked to register whether they agreed or disagreed with four statements taken from research conducted by OST and MORI. It is important to note that the baseline data were collected using a five-point scale, and an additional 'not sure' option was available. This was not the case at the ST/YPP event due to the limitations of the voting system available. So while the results are presented alongside the baseline data, a true comparison is not possible. Results are presented in the graphs below:



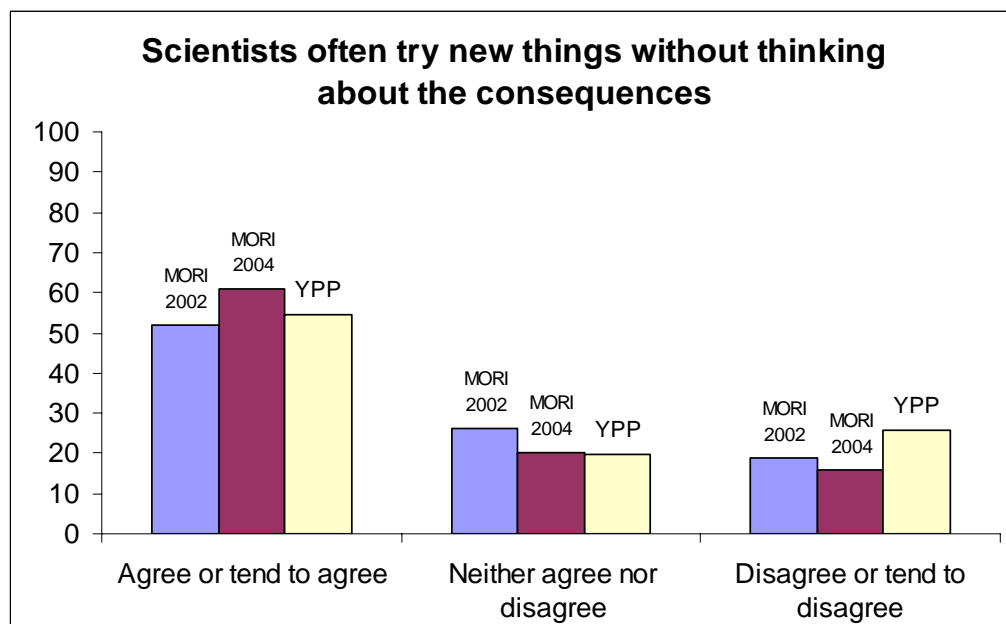
Responses were very similar to opinions expressed by the UK adult population in 2004. Most students (85%) agreed with the statement.



Again, a large majority of the audience (77%) agreed with this statement. This was slightly lower than the proportion of the population who gave the same answer in 2004 (85%). The larger proportion of students responding 'neither agree nor disagree' may be due to the absence of a 'don't know' response, which would usually be available in research of this sort.



This result was interesting, with the young people more ambivalent than the adult population. The OST and MORI research highlights the link between attitudes towards science and scientific controversies, perhaps the young people were less aware of issues such as GM crops and MMR, or felt that they were not empowered to affect such issues.



Results here are not dissimilar to MORI results, although more young people disagreed with the statement than adults.

Overall, the results from the initial voting questions indicate that students had limited prior knowledge of nanotechnology, and that their attitudes towards science were roughly typical of the adult UK population. However, responses to the questions about the science minister and the involvement of citizens in science policy decisions may indicate a level of naïveté, perhaps not surprisingly, compared to the adult samples.

3.2 Voting at the end of the event

One of the sessions in which students participated involved them devising, in groups, questions for themselves and the other audience members to vote on at the end of the day. It was explained that the responses should be useful to science policymakers. Eight questions were devised in total.

A maximum of 136 students voted during this session. The number is larger than that for the pre-event voting due to the late arrival of some audience members. The questions and their responses are presented below:

Do you think that nanotechnology is hazardous to the environment or our health?

Yes	21%
No	14%
Maybe	65%

The group who designed this question were interested in how the risks from nanotechnology were perceived. The results show that two-thirds of the audience (65%) were unsure of the risks after learning about nanotechnology during the event.

Government should fund more research into health and safety for new technologies and advances

Agree	86%
Neither agree nor disagree	5%
Disagree	10%

This group acknowledged the uncertainty regarding the risks of nanotechnology, and thought it would be useful for policymakers to know how many people were keen for more research to be done. From the results it is clear that a large majority of the audience (86%) felt Government should fund more research.

How much do you think the media affects people's opinions?

Greatly	78%
Slightly	14%
Not at all	8%

This group felt that the impact of the media on public opinions should be an important consideration when developing a new technology. Most students (78%) voted that the media greatly affects people's opinions, and only 8% said they didn't think people's opinions were affected at all by the media.

In the next generation (your children) everyone will use nanotechnology

Agree	47%
Nether agree nor disagree	29%
Disagree	24%

This group were interested in the future of nanotechnology, and were careful to define their future as 'the next generation'. Half of respondents (47%) thought that nanotechnology would be ubiquitous within 30 years, although a significant proportion were unsure.

How much do you think you learned about nanotechnology today?

A lot	30%
A little	38%
Nothing	32%

An interesting group discussion led to the formulation of this question. The group were frustrated at the lack of clear information available about nanotechnology – not unusual for the development of any new technology. There could be a number of factors affecting this particular result. It may reflect weaknesses in the event design, or highlight the difference between the discussion of new science at a Small Talk event and the way in which science is taught in school, or other unknown factors.

What do you think is the biggest potential risk from nanotechnology?

Environmental implications	26%
Military implications	49%
Other implications	25%

This group focused on potential risks related to nanotechnology. Unfortunately, the limitations of the voting system meant that it was only possible to identify two specific risks. Of these two, around half (49%) of students said they thought that the biggest potential risk was military.

What do you think is the biggest potential gain from nanotechnology?

Health	51%
Social (e.g. reducing crime)	20%
Other	29%

The next group decided that it would be useful to ask a question with a similar format to the previous question, as this would provide a balance of views. Just over half of the audience (51%) felt that the greatest potential benefits from nanotechnology were health-related.

Do the advantages of nanotechnology outweigh the disadvantages?

Yes	36%
No	35%
Maybe	30%

The final group decided on a summarising question that would find out whether, on the whole, the audience felt nanotechnology to be advantageous or not. The results showed an almost even split between the three responses, indicating that the audience were far from decided on the issue.

3.3 Questionnaire responses

At the end of the ST/YPP event, young people were asked to complete a two-sided questionnaire. One side provided evaluation data (available in the separate evaluation snapshot), and the other asked students to make comments or recommendations to scientists and the science minister about nanotechnology. The comments were collected and a category analysis was performed, where responses were grouped into themes. Some responses were coded more than once if they included comments related to more than one theme.

The results of the analysis are presented below. A copy of the questionnaire items and a list of all the responses are available in Appendix 1.

If you could say or recommend anything to the following people about nanotechnology, what would it be? Scientist	
Category	No. of responses
Research the potential risks of nanotechnology	16
Do more research (unspecified)	14
Research the potential benefits of nanotechnology	4
Consider ethics	4
Inform/engage the public	3

Most respondents were keen for more research, with a large proportion specifying that research should be directed towards potential risks. Some students said that research into both risks and benefits should be conducted. Example comments included:

“Do more research into the possible risks of using nanotechnology”

“Do as much research as possible on it. Look at benefits and disadvantages”

A smaller proportion of students asked scientists to consider the ethics of their work, and three asked that scientists keep the public informed or engaged with the latest findings. Responses included:

“How far will you go with this technology before you decide it’s time to stop?”

“Let the public know about your research and findings through TV/newspapers /magazines”

If you could say or recommend anything to the following people about nanotechnology, what would it be? Science Minister	
Category	No. of responses
Test risks and safety	9
Keep the public informed/engaged	8
Provide more funding for research	7
More regulation	3
Less regulation	1

Again, it was clear that there was a strong concern regarding the risks of nanotechnology. Respondents felt that it was Government's responsibility to test safety, keep the public informed and provide adequate funding for research. Some students recommended using regulation to limit the use of untested technology, but one student felt that regulations should be reduced, and that more research should be funded. Comments included:

"Give more funding to scientists to test the risks of nanotech"

"What measures are going to be put in place to safeguard nanotechnology?"

"Get the public more involved"

Overall, it appears that the group of young people were concerned about the risks that nanotechnology may pose, and were keen for more research to be conducted and shared with the public. These findings are in keeping with the responses to the voting questions that the students set at the end of the event.

3.4 Focus group discussion

At the event, teachers were asked whether their students would be able to take part in a focus group discussion. One school was able to take part, and a focus group was conducted during April 2006. The group consisted of eight students, three males and five females, from Years 11 and 12. The discussion was recorded and a transcript is available in Appendix 2. Students were also asked to make notes on a flipchart during the discussion.

Students were asked about their hopes and fears to allow them to reflect on what they had found out at the event. The discussion then moved on to the organisation of a hypothetical nanotechnology dialogue event. Students were asked who they would invite, what topics they would discuss and what would happen with the outcomes. A copy of the focus group schedule is given in Appendix 2.

Hopes and fears about nanotechnology

Students' hopes included medical uses and communications/computing. The fears listed were weapons, health hazards and threats to privacy, which was discussed as a disadvantage of improved communications. Students felt that medical applications were the most promising aspect of the new technology, and were keen for research in this area to be funded by Government. One participant felt that there was likely to be *'more money in the development'* of improved communications than medicines, and that this was *'not really right'*. In terms of risks, there was an interesting discussion about whether weapons or health hazards posed the biggest risk. One student said that improved technology would *'make it easier to kill people'*, while

another felt that *'health hazards can harm everybody irrelevant of who they are or the situation around the world'*.

Designing a nanotechnology dialogue event

Students were asked to reflect on their experiences of the ST/YPP event when describing their ideas for a nanotechnology dialogue event. The first issue raised was who should be invited. The group were keen that the public participants should be representative of the population, one student said *'different ages, different social classes, males and females, people in different professions, that sort of thing'*, and another added *'there could be different races'*. One student felt that the public audiences should include *'people who haven't formed an opinion'*. Another student said that specialists working on nanotechnology in different fields should be invited: *'the corporate half and the medical half of the sort of people working on it'*. Inviting a toxicologist was also suggested, as one of the scientists at the ST/YPP event had commented that a toxicologist would be able to answer questions about some of the dangers of nanoparticles. The group agreed that Government representatives should be invited, especially from the relevant department. When NGOs such as Greenpeace were mentioned, some group members felt that they shouldn't be invited. When probed, one respondent said *'I think they're a bit too extreme'*. This reflected the group's wish for a balanced discussion. A counter view expressed was that it would be good to invite them. The student commented:

'I doubt they know very much about nanotechnology so it might be better if they were actually there so they can get educated before they go off and blow up a lab or something... I don't know if they'd do that'.

The group did not reach a consensus on inviting NGOs.

The discussion then moved on to the event content. Students agreed that having a talk at the start of the day, like at the ST/YPP event, was a good idea. It was felt that everyone should hear the talk – one of the students pointed out that, because the politician who attended the ST/YPP event had missed the talk, *'the politician didn't know so she couldn't comment on it'*. Much of the discussion seemed to focus on what information participants should be provided with, rather than which issues should be discussed. This may have been linked to students' feelings about the way the science was presented at ST/YPP; one said *'they need to explain it better, I think it was too technical before'*. The need for balanced information was highlighted with reference to the socks containing silver nanoparticles that were discussed at the event:

'with the socks, that was just a scenario we were given, told about the effects when there was no proof they were even bad, and most people took it as fact, when it wasn't'

It was acknowledged that *'if you want to get people interested you need to speculate a bit about the future'*, but the group felt that speculation should not be too *'star trekky'*, and that a best case and a worst case scenario should be presented.

Students felt that the voting was a good way to capture the opinions of all participants, even those who do not wish to speak in front of everyone. This was related to the way in which students thought the outcomes from the event should be presented. It was felt that the voting system could be a useful way of presenting opinions about nanotechnology.

4 Conclusion

If one of the aims of running dialogue events is to allow citizens to feel more comfortable with the development of new technologies, the ST/YPP event appears to have had the opposite effect. While students were, on the whole, in favour of science (as judged by the attitude scale items used at the start of the event), they appeared to have a high level of concern about the development of nanotechnology. Of course it is difficult to ascertain whether this is a normal level of concern without repeating the event with a different issue, but it appears that some aspects of the ST/YPP event contributed to the young people's apprehension.

The main issue appeared to be the provision of accurate and balanced information which the students felt they needed in order to decide whether nanotechnologies constituted a significant risk. However, an underlying issue may be a lack of knowledge about the processes of conducting scientific research and developing new technologies, and a naïve understanding of how risk is assessed and regulations constructed. Repeatedly the young people asked for more research and clearer information, and one even commented that testing should ensure that *'nanotechnology poses no risk to the health of the consumer at all'*. It is doubtful that any product can offer such a guarantee, especially a technology in a relatively early phase of its development, such as nanotechnology.

Clearer framing of the issues and explanation of the purpose of the event may have reduced the frustration of some of the audience members, although it appears unlikely that it would ease their concerns. As it was, much effort had been made to explain the Small Talk project, and the reasons for discussing such issues in the Young People's Parliament.

Appendix 1

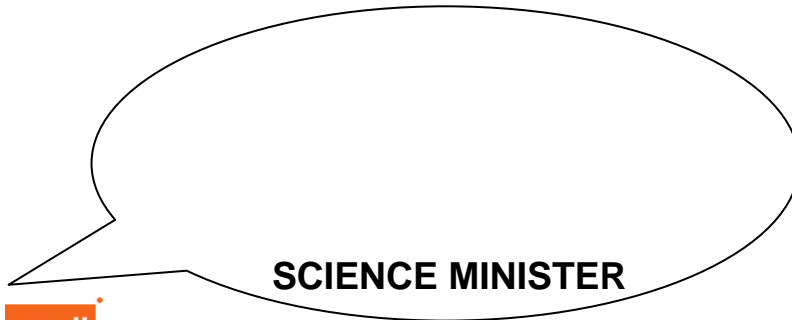
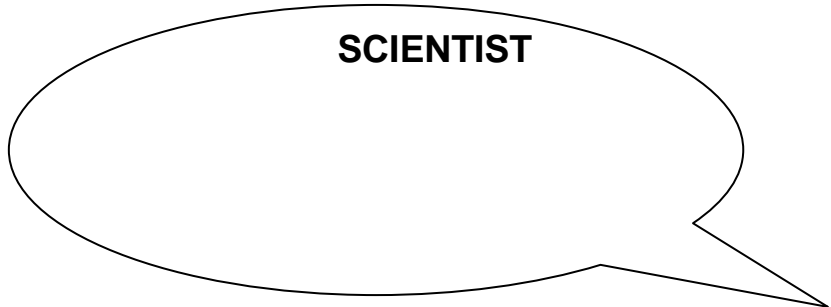
- Copy of speech bubble questionnaire
- List of students reponses

Speech bubble questionnaire

If you could say or recommend **ANYTHING** to the following people about nanotechnology, what would it be?



SCIENTIST



SCIENCE MINISTER



Please turn over to give us your feedback on today's event

Small Talk speech bubble responses – ST/YPP event 17 March 2006

If you could say or recommend anything to the following people about nanotechnology, what would it be? Scientist

- How far will you go with this technology before you decide its time to stop?
- How realistic are the ideas of using nanotechnology in medicine in the future and how helpful can it be?
- How can nanotechnology assist in medical developments and can it be the future of medical science?
- Deeper thought/consideration on morals/ethics
- Can you get smaller than nano technology?
- Research further into this area!!!
- Keep going
- No
- Try and be more safe with some of the nano technology
- No comment
- Research and be open with nano technology, but be aware of the complications and dangers you may face
- Boring
- Is nano technology safe
- Find out more uses for nano technology
- Do as much research as possible on it. Look at benefits & disadvantages
- That you should research all the factors involving nano technology and how you should find a cure if there are any risks before releasing it to the market
- Do more research into the possible risks of using nano technology
- More research
- Tracy, I love you
- Is nano technology dangerous
- To love & love alone
- Buy better cars
- Risks, hazards of use?
- Keep on progressing
- Let the public know about your researches and findings through TV/ newspapers, magazines
- Whatever you do please inform us before hand (the funny marks and spencers socks)
- Do we know enough about nano science to use it
- Test anything you have discovered on animals first before humans
- Always ask youngsters for opinions & views on your projects
- Check the health and environment effects first before introducing them to the public
- Investigate all the advantages or disadvantages of all types of technology before you give them go ahead for them to be used!
- To test the risks of nano tech before it goes to shops or to the public
- Research as much into the health issues of the technology as the technology itself
- Ensure that nano technology poses no risk to the health of the consumer at all
- To take care in how you test for risks to ensure no problems in an imperfect world
- More information, explore health risks
- Do we know enough about nano science to use it
- Research more about the health side

- Negative health implications
- Yeah

If you could say or recommend anything to the following people about nanotechnology, what would it be? Science Minister

- Soo... you're bald?
- Will you make more funding available for research towards the risks of nanotechnology, and other aspects of technology before it is put on the market or into use
- Is there more funding going into research of nano particles on products & clothing & its risks before being put onto the market?
- Greater government funding for research into effects of new technology. Speed up rate of research into H&S/Risk assessment
- What's the point of going so small when it won't be ergonomic
- Increase funding, keep regulation minimal
- No
- Get the public more involved
- No comment
- Allow the public to be more involved with the project
- Boring
- Does it affect the environment
- Inform the general more on the advantages & disadvantages of nano technology
- You should let the general public know about nano - all the facts & info about it. Try not to do it through the media who tend to tell lies or make silly stories up & names
- You shouldn't decide anything unless you know all the risks involved and how you can find a cure. You shouldn't decide anything unless you have a cure
- Don't develop things unless you know the risks
- Bring me some confetti! Or failing that some jam as I am late for mass
- How old are you?
- Organised crime
- Military uses, criminal uses
- Its not worth doing surveys to the public about nano technology when they know little about it and a day can't give them level of understanding to comment
- What measure are going to be put in place to safe-guard nan-technology
- To make rules and regulations on how far you can use nano technology (limit)
- Do not use new technologies until they have been thoroughly investigated
- Give more funding to scientists testing the risks of nano tech
- Fund the health of the technology as much as the development of it
- Inform the public more about the usage of nano technology before it comes onto the market, whether to use it or not
- To fund safety and research facilities
- Need to catch up on information
- What measures are going to be put into practice to safe-guard nano technology
- Tell us more about the uses & risks

Appendix 2

- Focus group schedule
- Focus group flipchart notes
- Focus group transcript

Small Talk focus group

1 Introduction (~ 5 mins)

- Confidentiality
- Ground Rules
- Does everybody know each other?

2 Warm-up: What are your hopes and fears for nanotechnologies? (~ 5 mins)

- Students to write on flipcharts

3 Main exercise: Planning a public engagement event on nanotechnologies (~ 20 mins)

Students can reflect on their experiences of the ST/YPP event during this exercise

- Who would you invite? Why?
- What would you need to include, e.g. introduction to the science, voting, discussions
- What are the main questions you would ask?
- What would you do with the information afterwards?
- How would you make sure the process was fair?

4 Any other comments (~ 5 mins)

5 Thank and close

Nano focus group flipcharts

Hopes and fears about nanotechnology

Hopes

- Medical uses
- Convenience
 - Data - communications

Fears

- Weapons
- Health hazards
- Spyware
 - Privacy

Who would you invite to the nano event?

- Population
 - Different ages
 - Different professions
 - Male/female
 - Races
- Biologist/doctors (medical groups)
- Commercial groups
- Not linked to nanotechnology
- Government - in charge of spending money
- Toxicologist
- Environmental groups
 - DEFRA
 - Government
- Not extreme groups e.g. Greenpeace?

Content of the nano event

- What's toxic/harmful at the nano level?
- Talk about with specialists what is nano? Especially for politicians etc
- Voting system -> views
- Why the people with knowledge of nano would be for/against it, considering their views
- Explanation
 - needs to all be easily understood
- Speculate about future
 - Worst case}
 - Best case } what will happen?
- Health risks - effects to people

Small Talk focus group

P = participant, F = facilitator

1 Hopes and fears about nanotechnology

If you write down one hope or fear relating to nanotechnology...

P (writes weapons)

P they could be used to kill people more effectively

P (writes medical uses)

F ok so tell us a bit about that

p well we don't really know a whole lot about it but the guy said some stuff that sounded pretty cool like some stuff that could cure and ... yeah just sounded like it had some potential to be used

F ok

P (writes convenience) it could make things easier in our lives and more convenient

P (writes spyware) finding out information with small cameras and stuff might... [Indecipherable]

F pass the pen around - it's harder for the people at the end; also if you want to add something to the comments that are already there then you can also do that. Well which one of these do you think is your biggest hope or your biggest fear?

P medical uses

F ok why's that?

P saying that they could be very useful for medical uses or medicines

F ok that's fine lets move on, just think back to the other week - this is hopefully refreshing your memory about nanotechnology

P I don't know what to write, all the ones i thought of are already down there

F OK so which one would you focus on then?

P medical uses

F ok and whys that?

P because one of the men was saying that he had something wrong with his head or something and they were able to sort it out... [Indecipherable]

p (adds privacy) because they could use really tiny cameras to spy on people and see how they're acting like terrorists and stuff like that... that would help though!

F so is that a good thing or a bad thing?

P it's good and bad!

F well would you like to write it on the other side as well? Or do you think it's more bad than good at the moment? Maybe we could write it in the middle?

P (shrugs) i don't know

P (writes health hazards) - they were talking about like we don't know what health hazards it holds if we use it in stuff like we don't know if it will cause us any problems

f and there was also an interesting discussion about some Marks and Spencer's socks if I remember correctly... ok has anyone got anything else they'd like to add to this

p yeah man (adds data) one of the guys said that u could make an optical computer so you could have a bit of memory being a few atoms big so you could have really large disks in the future

F cool

P (writes communications) like communications in general, it will make things quicker and stuff

F ok so let's talk about the hopes - medical uses and this idea of convenience, faster and more powerful gadgets. Which one of these do you think more effort should be spent in development

P medical uses

F ok whys that

P well they could find a cure for cancer or aids or something

P I think it should be medical but in reality it will probably be the convenience, there's more money in its development, it's not really right

F well do you think there are any ways that we, or maybe not us personally but the Government could do something about that

P well the Government could lead the research as they provide the funding to make it possible

F and what do others think about that?

P more money is definitely going to be in the communications rather than the medical, its just where the money is and the companies

p I think there'll be a lot of demand for medical uses as well so I think that might get done as well

F and what about the fears then? Health hazards, this spying and privacy issue and then weapons of course, an important one. Which one do you think is the biggest fear?

p weapons, there's a lot of war going on at the moment with Iraq and stuff and so it will probably just make things worse, make it easier to kill people, that sort of stuff

P I'd say health hazards cos with weapons that's only an issue if there's a war but health hazards can harm everybody irrelevant of who they are or the situation around the world

P I think it would be the privacy because that would tie in with the communications part which is going to be big, apparently

P I'd still say health hazards cos it could be the same sort of thing as what happened with radioactivity when they started messing with it they didn't know what it could do and they figured out too late it could cause cancer and screw you up so you want to sort of avoid that

2 Designing a nanotechnology discussion event

F ok right we've had a good refresher about some of the issues that were raised at the YPP event a couple of weeks ago. For our next discussion I'm going to ask you to imagine that you were asked by the government, as if you were a think tank or something like that, to plan an event a bit like the YPP event. The aim is to capture public opinions so Government know what to concentrate on in terms of funding or extra research. We're going to think about how we might plan an event like that. So I've got a few questions to lead` this discussion. The first one is if you were going to have an event like this, who would you invite? Which different groups do you think need to know about people's concerns about nanotechnology?

P you're gonna want a cross-section of the population

F so who would you need to include then to have a good cross section?

P different ages, dif social classes, males and females, people in different professions, that sort of thing

F anyone else add to that?

p you could have like the corporate half and the medical half of the sort of people working on it, so some kind of doctor biologist working on nanotechnology or health, and you could have someone from a company, they're the person who makes the socks. Or the company, maybe not one person.

F so that's kind of two groups really, so how would you describe them?

P commercials group and the medical group, although medical's commercial as well so... there are pharmaceutical companies, I don't know

f well that's kind of two sides of the medical, medical research and kind of drug development... that could be an interesting group to have... sub groups of sub groups. Who else?

P you would have to have people who hadn't formed an opinion

F ok so who might they be

P people that aren't linked with it in any way

F would they be members of the general public? Any other ideas?

P people from the government

f yes absolutely, actually while we're talking about this it might help to reflect on your feelings from the event the other week, and were there any other groups - some really interesting questions came out about how this question is and should be developed - if there were any groups that weren't at that event that you thought it might have been useful to hear that discussion then perhaps we could put them on this list

p with the silver sock thing - I keep coming back to the socks but anyway - they kept asking questions like when it goes down to nano particles it changes properties cos of quantum physics or whatever and nobody really knew what happened when it went down to that level, not even the sort of professor guy, so he said that a toxicologist might be handy to have around for telling you what happens

F right well maybe we should invite a toxicologist. Its quite difficult to discuss something when you don't have the facts, isn't it

P isn't the whole thing with quantum physics that it is uncertain, i don't understand it but isn't that what its all about?

f I think that it is when you get down to the really quantum level but on the nanoscale you can be certain about how those things behave, i think a toxicologist or someone would know more about that, i don't think you'd need a quantum physicist... i don't know. Ok are there any other groups or is this our invite list?

P there could be different races I suppose

F yes

P did anyone mention environmental groups

F like who would we have for environmental groups?

P um is there a government department in the government?

F yes there is there's DEFRA which is the dept for environment food and rural affairs, what about other environmental groups that aren't within the government, do you think we should invite them? Maybe Greenpeace?

P no we shouldn't invite them

F no? Why not?

P they do terrorist kind of stuff

F ok, that's interesting

P I think they're a bit too extreme

F well that reflects on the kind of discussion we want to have at this event doesn't it? if we don't want people shouting and being extreme

P it would be against the whole thing most likely

F if we say 'not extreme groups' or something like that would that sum up your feeling about that? Is everyone in agreement about that? Does anyone disagree and think that we should have people like Greenpeace there?

p their focus is more oil and stuff like that, not really... I doubt they know very much about nanotechnology so it might be better if they were actually there so they can get educated before they go off and blow up a lab or something... I don't know if they'd do that

F well maybe we should put a question mark next to there (the relevant part of the flipchart). well we've got a couple more minutes left are there any more groups that we think. lets go on to the next bit and think about some questions or topics for discussion, now that we've got all of these people from different backgrounds in the room, with all kinds of different opinions, what would you like them to talk about?

P well you've got your toxicologist so you can ask them what's toxic at the nano level, what element, or elements or chemicals are toxic or harmful at that level

f so do you think it would be useful to... in ThinkTank we had a session at the start that just explained 'what is nanotech' and stuff like that, would it be helpful to have some of the nano specialists talk about some of that at the start or do you think we should just get straight down to the discussion

P we'd need a talk about it first

F ok, because there was a bit of a feeling at that event that perhaps some of the info was not sufficient on that day

P the politician didn't know so she couldn't comment on it

f need to make a note that's especially for politicians! And what about the voting, what did we think of the voting? ... You haven't said anything for a minute what did you think of the voting? Good? Bad? OK?

p it was good, because you could see what everyone thinks of what they said, and even if you don't want to say like on the mike

F so do you think we should include something like that in the event that we have?

P (nods)

f well that's quite important, not everyone wants to talk in front of a whole roomful of people, its a good way of making sure that everyone gets a chance to have their say. Ok so what other questions would we get people to discuss?

P like do they know any of the facts on the environment, like if you could have someone their from the environment [indecipherable] like why they would be against it and for it

p you need to have someone there also saying how it could be good for the environment, cos its like with the socks that was just like a scenario we were given told about effects when there was no proof they were even bad, and most people took it as fact, when it wasn't

P they said you can use it to purify water as well

F making sure that its balanced then really so that it's coming back a bit to what ... said before, about not having anything too extreme. Would you agree with that?

P what was the question again?

F about making sure that we've got people talking about the good effects and the bad effects

P yeah i think there needs to be a lot... they need to explain it better. I think it's was too technical before

F ok, so which parts particularly do you think could have been explained better

p the opening presentation, i think parts of that most people were able to understand but after that it went into stuff that I think you had to get a degree in it to understand it, and then there was other workshops where I didn't have a clue what they were talking about at all

P I think they were trying to explain the methods that they use to...

F what other questions would we like to ask? Now that we've covered a lot of the facts side of it, what questions would we like to discuss?

p what's actually physically possible - because there were some people that were talking about stuff that was really sort of star trekky and wasn't gonna happen, well it might happen but it was unlikely, so if you have like loads of members of the public you don't want them to go away with stories

P say if you want to get people interested you got to speculate a bit about the future

P you should come up with like a worst case and best case scenario and present that and say if it all goes wrong this is what would happen, and we need to make sure it doesn't, and if we invest money and it goes well, this is what might be possible

F ok, I like that idea. Girls, any other ideas?

P they need to say what the health risks are to the people, and how they might be affected by it

F ok I want to ask you one more thing but if you do think of anymore questions please throw them in. So after the event we're going to have all of this information, what do you think the people who took notes to do with that information? Or do you think it would be enough for the politicians and the scientists to be there on the day and hear what people said?

p need to take the information and split it into sub categories like saying some people feel this, its like there was a question on the day about do you feel nanotechnology is

harmful? And there was 3 categories and if you split it down into that you'll be able to see which way's best to satisfy all these groups

F any other ideas about that? Any last comments before we finish? OK thank you so much...

(Bell rings)