

Walking with Robots

Visions conference evaluation report



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1 Introduction

On December 4th and 5th 2007, Walking with Robots, in partnership with the Royal Academy of Engineering and the London Engineering Project, hosted a Young Peoples' Vision Conference. The conference provided 22 post-16 students from schools and colleges in the London area with a unique opportunity to explore visions of their future and the part robots will play.

This event was the flagship activity for the 'People' theme of the Walking with Robots network.

This report summarises the findings from the evaluation of the event.

2 The event

The conference ran over two days on 4 and 5 December 2007. Twenty-two young people participated over the two days. The Academy recruited the young people from the London Engineering Project (LEP), a pilot project that aims to engage young people from groups traditionally under-represented in higher education.

The event had the following aims for participants:

1. Learn about the relevant science and engineering and be introduced to the issues raised;
2. Communicate their visions to each other and the wider community (including policy makers);
3. Learn to work creatively, collectively and purposefully.

As with similar events of this type, the conference had two phases. The first, the divergent phase, took place on the afternoon of 4 December. Participants came up with as many visions and ideas as possible in a combination of plenary and breakout sessions.

The roboticists joined the discussion on the second day, during the convergent phase. Plenary and breakout sessions focused on the most promising / realistic / important issue that the group identified the previous day.

After the end of the conference the facilitators produced a report that will be circulated to all participants for comment. This report will go back to the Academy's public engagement and policy teams.

3 The evaluation

3.1 Evaluation overview

The evaluation focused on the impacts on the young people involved.

Several strands were involved:

- Comparison of roboticists' and young people's response to the question: *Which area/s of society do you see robotics having the biggest impact on in the future?*
- Students' responses to a ten-point attitude scale about robotics at three stages throughout the conference;
- An evaluation questionnaire for students.

The evaluator also attended both days of the event to observe the sessions and commented on the report on outcomes for the conference. This evaluation report is designed to complement the document that summarises young people's opinions on robotics as discussed over the two days.

3.2 Writing the conference report

The process of creating the conference report was not straightforward, and it is worth identifying a few lessons here. The visions conference was a partnership between Walking with Robots, the Royal Academy of Engineering and the London Engineering Project. In addition, external facilitators were brought on board to run the sessions and the external evaluator was also present. As this was the first event of its kind that any of the partners had run, it was more complicated than anticipated to prepare the report. This had a knock on effect and meant that it was not possible to consult the participants on the final report, which had been the original intention. It also meant that a planned focus group with some participants to discuss the event and feed back on the report did not happen.

It is difficult to see how this could have been avoided the first time. However for future such events a clearer identification of responsibilities for writing up between facilitators, partners and the evaluator would have been helpful, along with some planning about how the participants would be consulted. Constructing a timeline for the production of the report including who would have input at what time would be a useful exercise next time.

The remainder of this report details the feedback gained from audiences about the event.

4 Opinions about how robotics might influence society

Both students and roboticists were asked to list the three areas where they felt robotics was likely to have the greatest impact on society prior to the conference.

Students had a wide range of ideas about where robotics could impact society. A summary of their responses is given in the table below:

Young people's visions for the areas where robots would have the largest impact in future, before the event:

Category	No. of responses
Work (e.g. production, manufacturing, work)	12
Environment (e.g. climate change, pollution, environment)	6
Crime	6
Technology (e.g. technology, engineering, research)	6
Healthcare	5
Home (e.g. home life, cooking, cleaning)	4
Defence / War	3
Security (incl. national security)	3
Exploration (incl. inhospitable environments such as space, underwater)	3
Difficult / dangerous tasks	2
Education	2
Transport	2
Other	4

The largest number of responses related to using robots at work in some way, most popularly for manufacturing or production (although one respondent suggested 'hospitality'). However many of these responses simply said 'work', which indicates that respondents were unsure exactly how the robots would be used.

The environment category was interesting as it had several comments about negative impacts on society, where robots might create more pollution for example. From some of the other responses in this category it was not clear whether the impact was felt to be positive or negative.

There were few responses in the categories for exploration and using robots for difficult and dangerous tasks; either students' awareness of these applications was low or they didn't feel they would have a great impact on society.

Four of the participating roboticists completed the same task. The main differences in the responses were the way in which they were explained: the

roboticists used broader categories to describe societal impacts. Responses are summarised below:

Roboticists' visions for the areas where robots would have the largest impact in future:

Category	No. of responses
Domestic (e.g. cleaning, leisure, entertainment)	4
Healthcare	3
Exploration and work in hazardous environments	2
Defence / security	2
Interpersonal relationships	1

Interestingly, none of the roboticists highlighted the students' most popular responses about work and manufacturing, crime or the environment (although two respondents included environmental benefits as a reason for robots to explore hazardous explorations). Healthcare was mentioned several times by both groups, as was defence or security: included in the same category by roboticists but mentioned as one or the other by the young people.

Young people were asked the same question in the questionnaire at the end of the event, to explore whether their views had changed. Responses are summarised in the table below:

Young people's visions for the areas where robots would have the largest impact in future, after the event:

Category	No. of responses
Healthcare	16
Industry (e.g. manufacturing, production, labour)	15
Exploration	7
Security / Warfare	6
Domestic	5
Transport	3
Engineering / Research	2

The responses were focused on a smaller number of applications than those collected prior to the event, with the most popular being those that were discussed during the conference. The exception, to some extent, is the use of domestic robots. These were seen as being highly influential on society by the roboticists and were included in some of the discussion materials. However the young people felt that other applications would have greater (or perhaps more immediate) impacts.

Another interesting distinction between the 'before' and 'after' responses was the level of detail the young people went into with their responses. At the later stage, they were much more likely to go into detail about the nature of he

impact, or express an opinion on the application than at the start when most applications were simply listed. Examples include:

Manufacturing robots can assist in performing tasks with greater accuracy and improve products

Explorations, humans love to explore and this can be achieved by the robotic systems available today

Healthcare - helping with mobility of patients and diagnostics

Healthcare, because without a good health life is worthless, so helping improve medical applications has and will benefit humans.

Transport used in trains planes and cars - could potentially make them safer

Security - robots can keep the environment safe and reduce crime

Unfortunately so much money is being put into military research!

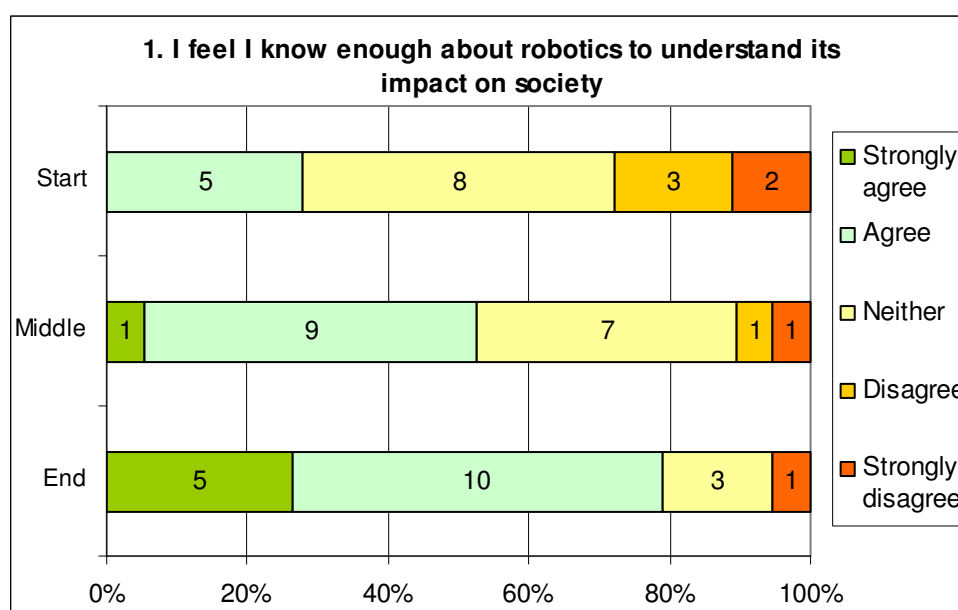
Domestics - such as household help

It is clear from this evidence that respondents became significantly more informed about robotics over the conference and this led to more focused and better articulated opinions.

5 Attitude scale findings

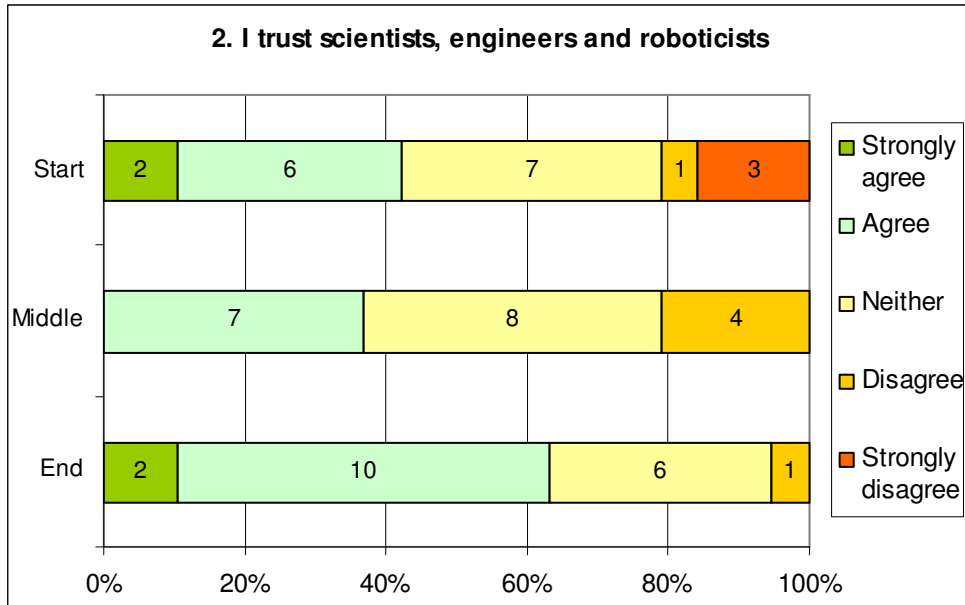
Throughout the conference, the young people were asked to complete a ten-point attitude scale related to robotics research. The scale was administered at the very start of the conference, before the young people had started discussing the issues. It was then repeated prior to discussions on the second day, and a third time at the end of the conference.

Unfortunately, the electronic voting system we planned to use to collect this data failed on the second day of the conference. Paper questionnaires were used instead. Results are presented here by question.



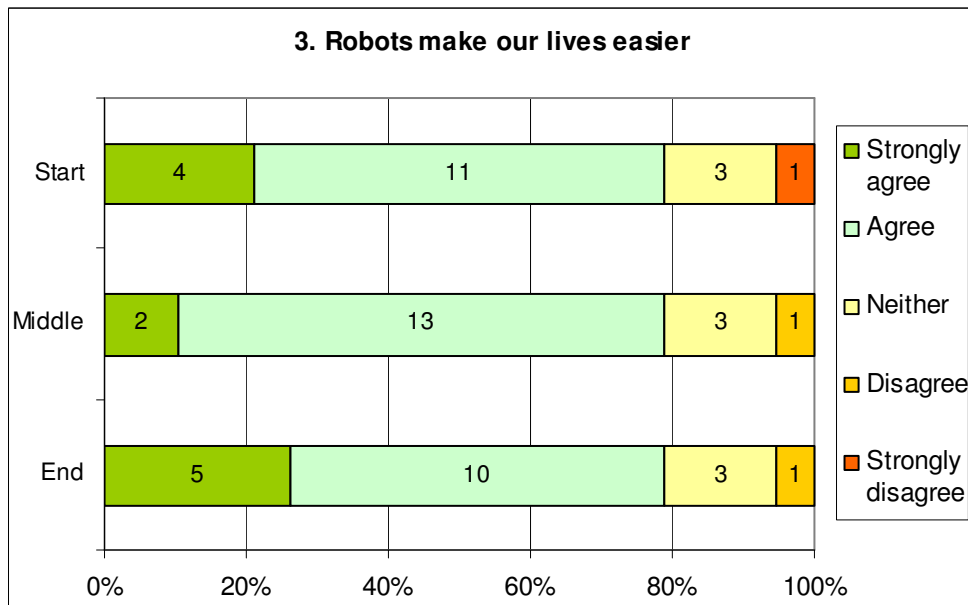
The responses to this question are predictable in that we would expect more people to agree with this statement as they learned more about robotics through the course of the conference.

However around a fifth of participants still did not feel confident enough to agree with this statement at the end of the event.

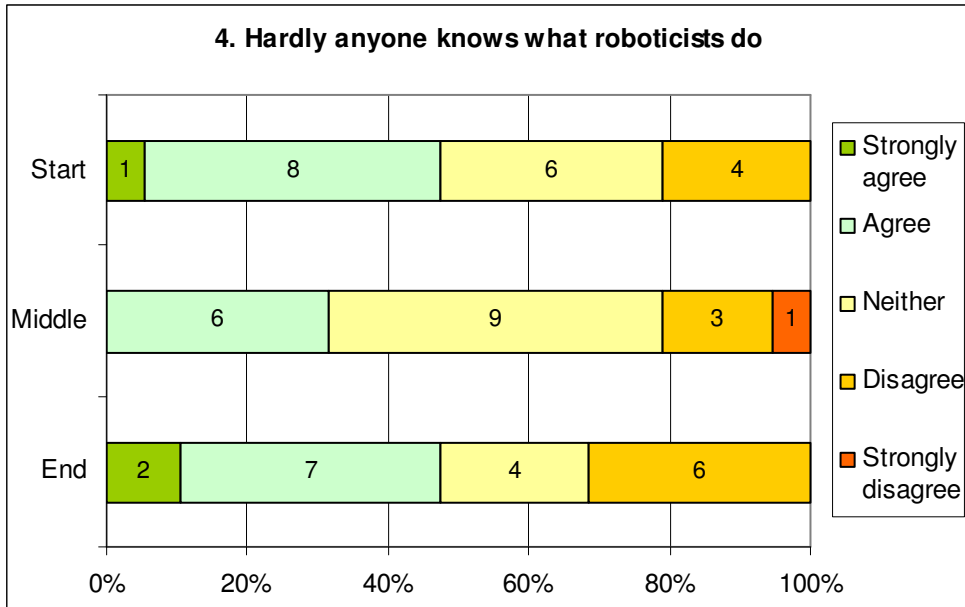


The responses to this question are interesting and reflect the different stages within the conference. At the very start, opinions on trust are polarised. After the first day's discussions, opinions were less polarised, but fewer than 40% of participants agreed that they trusted scientists, engineers and roboticists.

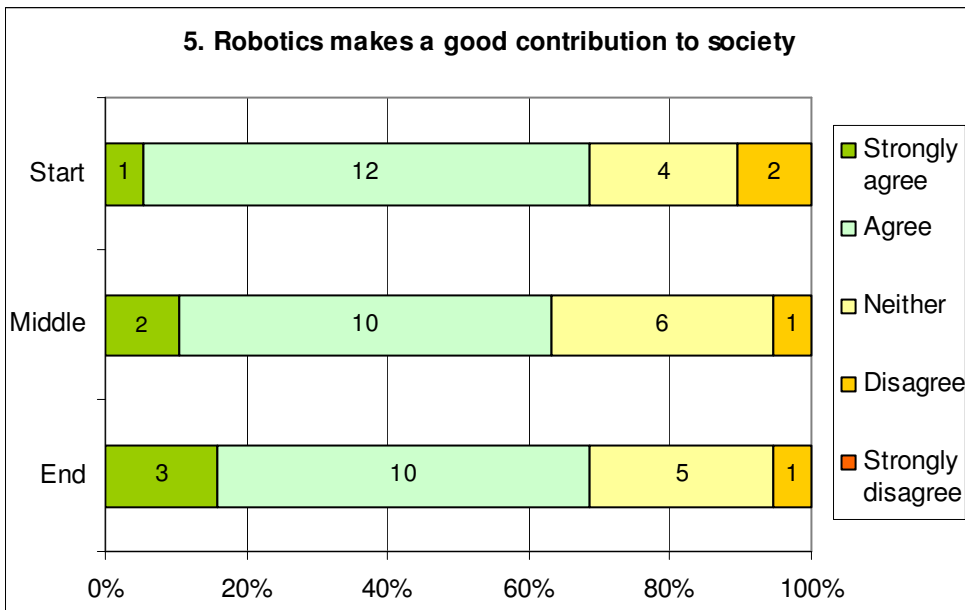
The third and final poll was the only one that took place after the students and roboticists had met. At this stage, over 60% of students agreed (some strongly) that they trusted them, so the opportunity to discuss the issues with people working in the field appears to have built trust.



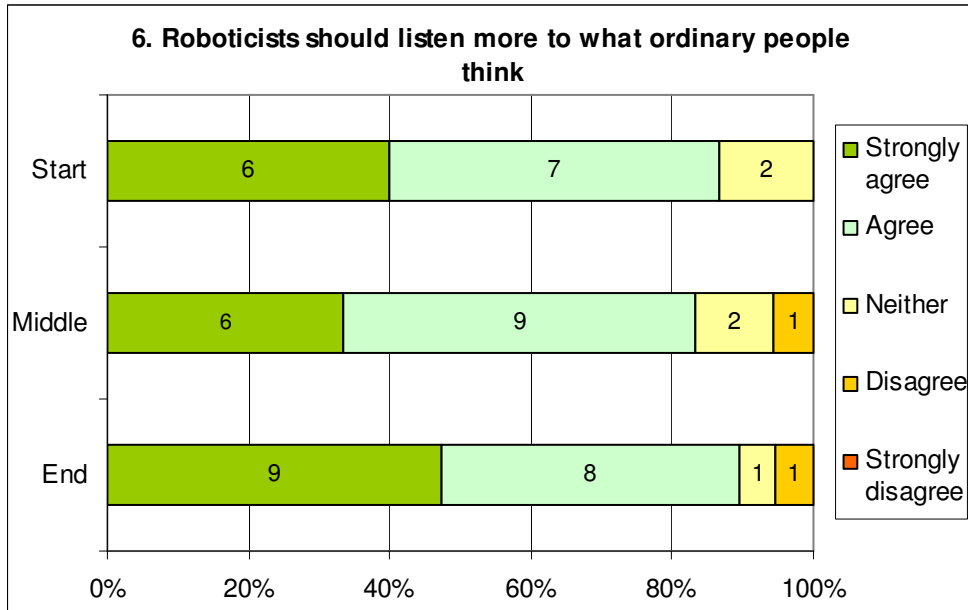
There was little shift in the overall large proportion of participants that agreed with the notion that robots make our lives easier.



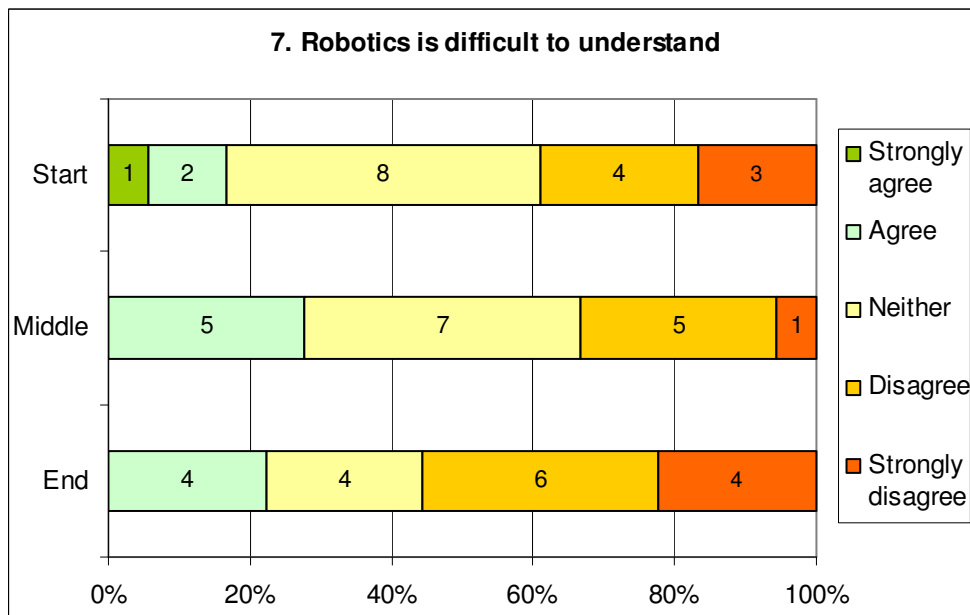
The shift in attitudes over the course of the conference was also interesting for this item. Initially, around half of the participants agreed that hardly anyone knows what roboticists do. After the first day's discussions, this proportion had dropped to a little over a third. However at the end of the conference, after meeting the roboticists, there was a mix of responses. Half agreed (some strongly) with the idea, and a third disagreed.



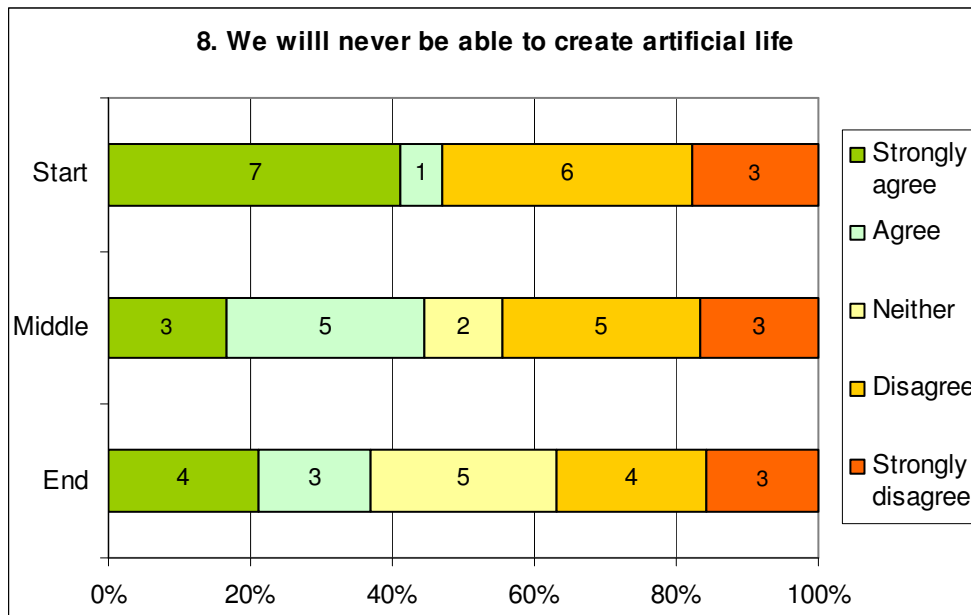
Similarly to the responses to the statement about robots making our lives easier, there was little change in the responses to this question over the course of the event.



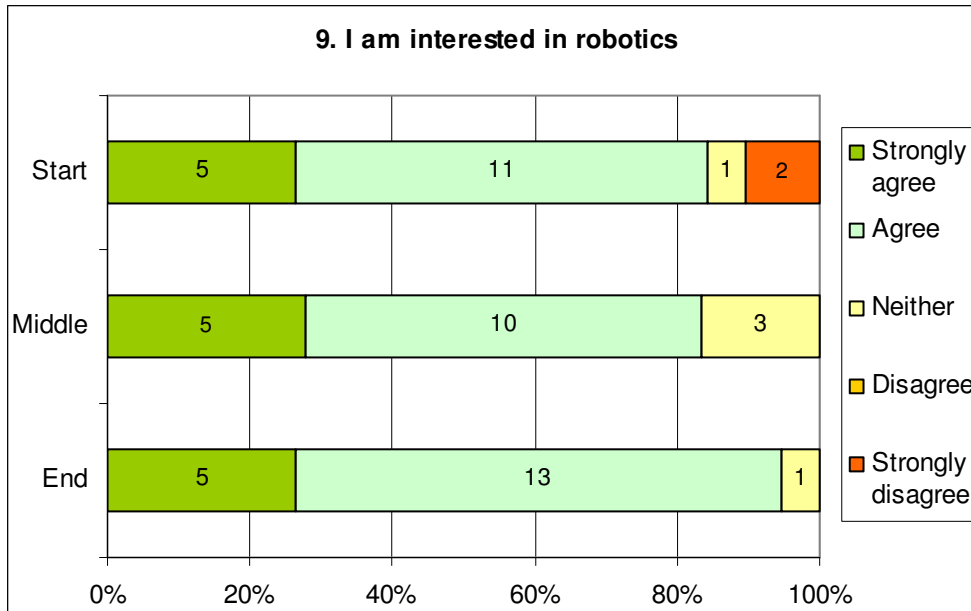
A large majority of respondents agreed with the idea that roboticians should listen more to what ordinary people think. The proportion that strongly agreed with this statement was highest at the end of the conference.



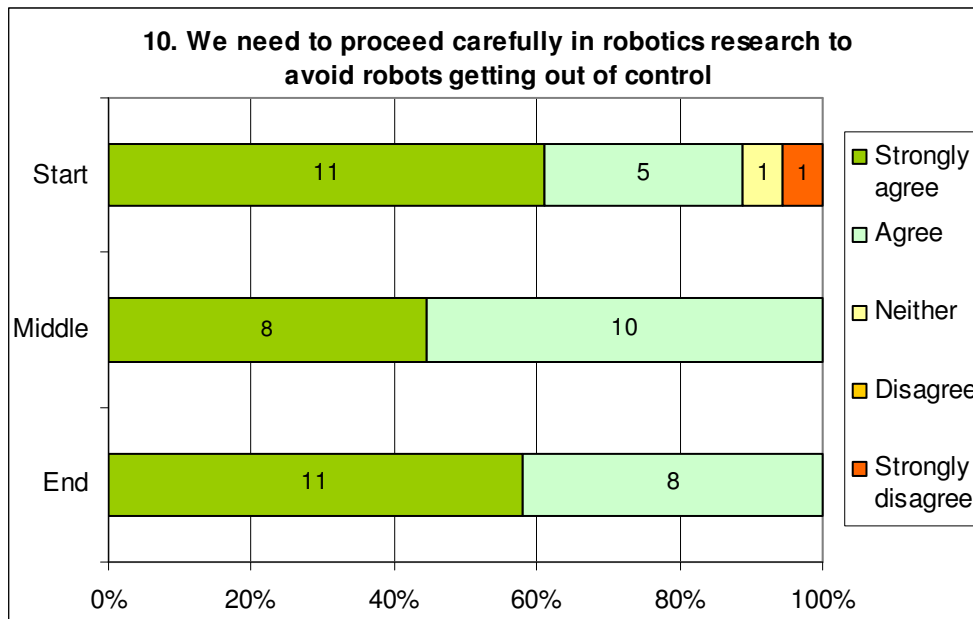
Interestingly, the highest proportion of participants that agreed with the notion that robotics is difficult to understand was seen at the mid-point of the conference. This could be related to some of the unresolved discussions about what a robot is or is not. At the end of the conference, one more person agreed with this statement, and three more disagreed.



The responses to this statement were interesting. At the start of the conference, 40% of respondents strongly agreed with the statement, but as the conference continued, the number that strongly agreed (and that disagreed) decreased, and the number that neither agreed or disagreed increased.



Most (over 80%) of respondents agreed that they were interested in robotics at all stages of the survey. However two respondents that strongly disagreed they were interested at the start of the conference had changed their minds by the end, saying they agreed and neither agreed nor disagreed by the end of the event.



All of the participants agreed with this idea at the mid-point and end of the conference. This is interesting, especially because most of them said that they trusted roboticists. It could be that the presentation highlighting potential human/robot interfaces influenced this recommendation for caution.

6 Questionnaire and interview findings

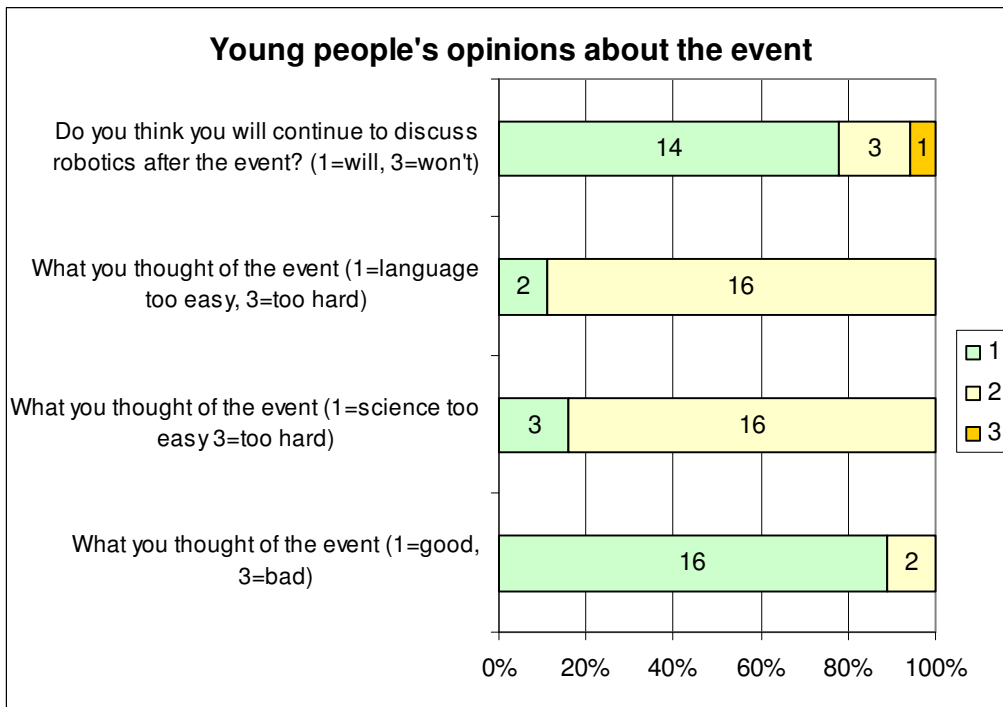
6.1 Experiences

Students were asked to sum up their experiences of the event in three words. The words were grouped into the categories below:

Category	No. of responses
Interesting (incl. stimulating, eye-opening etc)	15
Positive (incl. great, fantastic etc)	10
Informative (incl. educational, useful etc)	10
Enjoyable (incl. fun)	7
Interactive (incl. expressive, insightful, socialising)	5
Encouraging (incl. motivating)	3
New / Different	2
Short	1
Time consuming	1
Alright	1
Other (neutral)	3

Participants were most likely to describe the event as 'interesting'. Many also described it as positive, informative and enjoyable. Almost all of the responses were positive; the only ones that were less so were those that said 'short', 'time consuming' and 'alright'. These results are a strong indication of the success of the event.

Young people were also asked to rate various aspects of the event on three-point smiley face scales. Results are summarised in the graph below:



Most respondents (78%) said they were likely to continue to discuss robotics after the event. Two respondents were unsure whether they would, and one was unlikely to.

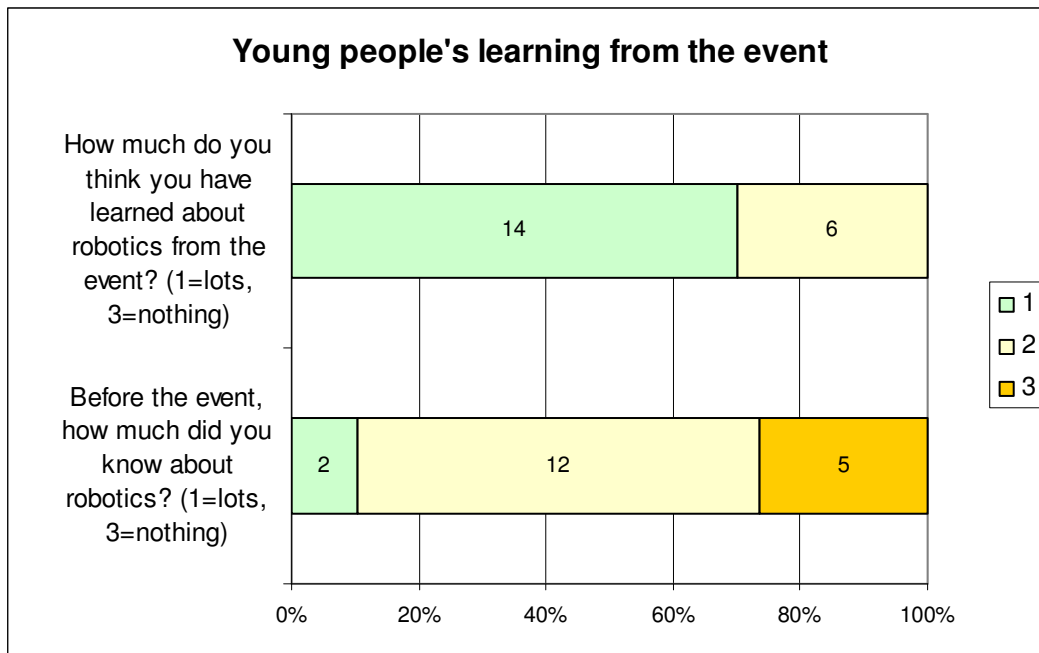
Most respondents felt that the science and language of the event was pitched at about the right level (89% and 84% respectively). A minority of respondents felt the science / language was too easy.

A large majority of respondents (89%) rated the event as good, with two rating in neither good nor bad.

These results indicate that the event was well received and appropriately pitched.

6.2 Learning

The questionnaire asked the young people to rate their level of knowledge about robotics before the event, and to rate how much they felt they had learned. Results are presented below:



Only two respondents claimed to know 'lots' about robotics prior to the event, however two-thirds (70%) said they had learned 'lots' from the event.

Respondents were also asked to write down one thing they had learned. Some respondents said they had learned about the **definition of a robot**, robotics **applications** or the current state of **development of robot technology**. Responses included:

I learned to define a robot as more than a mechanical, human shaped object

The stage we are at with robot technology

I learnt that robots can be used to do difficult jobs such as going to other planets in space

I learnt that robots can be used for many things as well as doing house work and that things in our house such as a washing machine is like a robot because its design to do one job like a robot

However the largest number of responses described learning about the **impact of robotics on society**. Some responses included:

That robotics is widespread and will 'touch' on many aspects of human activity

I learn the contribution robots and robotics research can make to life

That robots can help us as humans develop in some areas. They can assist us with things we may not be so good at

Yes robots might be an advantage for us but it can always have some down sides

Other peoples views on where robotics may go

This is perhaps unsurprising given that robotics and society was the theme of the conference; however this is strong evidence of the success of the 'science in society' message.

6.3 Attitude change

As well as the attitude scale questions which were administered at different points throughout the conference, students were asked whether the event had changed their attitude towards robotics and towards science and engineering more generally.

6.3.1 Attitudes towards robotics and its impact on society

Seventeen of the twenty respondents said that the way they feel about robotics had changed. Some said that they had **learned more** about robotics, and a few went on to describe how this had affected their feelings towards them:

It has in that I feel that they are more involved in present day than I thought but at a lower level of intelligence than I'd thought. I feel I'm in a better position to now observe future progress of robots

Yes. It has made me understand more about robots e.g. the way they communicate

Some respondents described an **increase in interest**:

Yes! In a good way

Yes. I am more interested

Some respondents described how they felt **more positively** about robots, or had a greater degree of trust:

It has changed my feeling about robotics in a way that I trust in them more because I have learnt so much more about them

Yes, to be able to trust them

Yes it has, my understanding of robotics have developed and I have realised the benefits. I feel that robots can help us.

However some respondents felt they were more aware of **negative aspects**, or the balance between risks and rewards:

Yes I now know many more positive AND negative aspects that robotics can create

Yes, made me realise that robotics could have emotions, which is a bad thing to me.

There are many ethical/ moral aspects to the development of Robotics in addition to the technological challenges.

Finally, some respondents reported **no change** or reinforcement of existing beliefs:

No, it has reinforced my belief & ideas regarding this area

Not really I feel about the same

To explore this further, the questionnaire asked whether respondents' opinions about the way that robotics fits in with society had changed over the course of the event. Ten of the sixteen respondents said their opinions had changed. Their responses echoed those from the previous question in that some felt **more positive** or trusting towards robotics, while some felt **greater levels of concern**:

Yes! There is no need to fear robots taking over the world and thinking in more working with robots

Yes I feel it's a positive and brighter future

Yes, I believe now that robotics are for the good of the society and has already changed many lives and will in the future.

Yes, it could be dangerous having robots to live normally or/and slaves in our community.

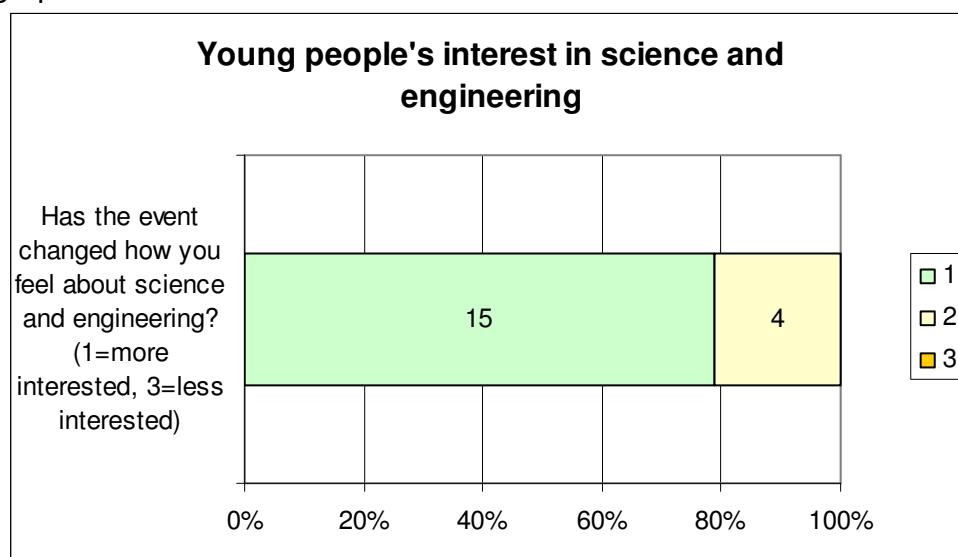
One respondent specifically mentioned the **format of the event** as the key factor in changing their opinion:

Yes my opinion has changed. It has been changed because of the contribution of others around me in group discussions. I listened to the opinions of others

These findings are very interesting. It is difficult to draw conclusions from a relatively small sample, but the link between learning and trust or distrust exposed here appears to be an important feature of the event's impact.

6.3.2 Opinions about science and engineering

Young people were also asked whether the event had changed the way they feel about science and engineering more generally. Results are presented in the graph below:



A large majority of young people (79%) said that the event had made them more interested in science and engineering, while four respondents reported no change. They were also asked to expand on this in an open question.

Some felt more interested because they had **learned more** about the field:

Because robots can be used during a dangerous event instead of risking human lives

I found out more about robotics and was able to share / listen to others opinions and points of view

Some felt that it exposed them to science and engineering in a **wider context** (including a societal context):

Science doesn't just cover over one thing but many things you wouldn't have thought of

Because it just shows me there is so much more I could be learning and the whole idea pulls me in because I want to learn more

I can learn a lot more and do something that will contribute to society

I think it is more interested because we gain different kinds of other knowledge which was not in our expectations

It has a huge impact on people's lives in the world for time to come.

Broadened my understanding of Robotics

It makes me think about the world around us

Some related the event to **careers** in robotics:

Simply because I know more about the nature of robots, their limits and capabilities, so if I work in the field in the future I'll have an idea of where I want to help develop them

I am currently applying for an engineering degree, the event has shown me areas in engineering I can see myself specialising in in the future

Because this event helped me to think more about what degree I may want to do or one of my choices

The comments related to the wider context of science and engineering are particularly interesting, this appears to be a key factor in increasing interest in the subjects.

6.4 Other impacts

Students were also asked to comment on whether the event had any other impacts on them. Most of the comments echoed the findings from the earlier questions, although a few highlighted some other impacts:

I met a lot of people / friends. I saw professionals that I thought I would only read about

Made more confident and I can express my ideas more openly.

I am proud of myself that I had the chance to meet the Royal Academy of Engineering

Improving the event and other comments

Students had several ideas about how to improve the event. The most popular suggestion was to bring some examples of real robots:

Have more displays of actual robots here to show us. Some cutting edge robot technology maybe

Show displays/videos of uses of robots

by using more technology

Bring/ show us a real, sample robot on just only pictures

Bring robots

In addition, there were some suggestions for more or longer events and one suggestion for a shorter and more focused event:

We can improve the event by making more events held. Meet more experts than you expect

Make it more practical by using model/real robots and experiencing it for ourselves

Make in longer - more than 2 days.

Make it longer and more open Q & A sections with experts and other students.

Focus the point of view and short time

Few students left 'other' comments. Those that were left included:

I hope I can have more events, so that our voices are heard to the experts

I enjoyed the session, thanks for inviting me.

I would like to hear more about like this event and I think this was an excellent event.

7 Conclusions

The evaluation revealed a range of impacts on the students that were involved. They also appear to have found the event interesting and enjoyable. The table below relates the project aims to the evaluation findings detailed in this report.

7.1 Evaluation against project aims

Aim	Conclusion
1. Learn about the relevant science and engineering and be introduced to the issues raised;	The young people involved certainly felt that this aim had been met. Most felt they had learned more about robotics and in many cases the learning was related to the societal impacts as well as the engineering. Most respondents felt that they knew enough about robotics to understand its impact on society by the end of the conference, compared with a much smaller proportion near the start.
2. Communicate their visions to each other and the wider community (including policy makers);	Young people communicated their visions clearly to each other, although some voices were more dominant than others. The evaluation shows that the involvement of the roboticists did not necessarily change the young people's visions, but acted to focus and inform them. However, whether or not the views will influence policy is difficult to measure at this time.
3. Learn to work creatively, collectively and purposefully.	The young people took the conference very seriously and commented that they valued the opportunity to have their voices heard. Some commented that the conference had helped them learn to share their opinions and listen to the opinions of others. The clear aspirations and concerns raised in the conference report also provide evidence that this aim was met.

7.2 General conclusions

The aim to inform participants about robotics was an important one as many of the young people related their increased knowledge about robotics

with a change or reinforcement of their opinions on the subject. This was particularly striking in the exercise that asked the young people to list three areas where they felt robotics would have the greatest impact on society. Initially, there was a wide range of ideas and little detail about what exactly the impacts might be. By the end of the conference the young people's opinions were much more focused and they were able to articulate the reasons behind their opinions.

Interestingly, **the visions put forward by the young people were not the same as the areas where roboticists felt their work would have the greatest impact.** This is a positive finding, as it indicates that the 'power relationships' between participants and specialists was appropriately balanced: the roboticists provided information but did not lead the opinions. In addition, the fact that the 'public' aspirations and concerns (especially in areas such as manufacturing) did not match those of the specialists highlights the importance of engaging the public in these types of discussions.

Encouraging the discussion around the societal implications of robotics also seems to have **increased students' interest in science and engineering by placing it in a wider context.** Admittedly, all the students were already interested in science and engineering, but many linked their increased interest with seeing how engineering could directly relate to society, or be used for 'social good'.

The **students' perceptions of robotics changed throughout the event.** Trust in scientists and engineers wavered towards the middle of the conference, but meeting people working in the field appears to have had a positive impact on some students' trust, a finding borne out in the attitude scale data and the open questionnaire responses. For some more critical young people, the event highlighted both the risks and rewards of future robotics research, which they felt better equipped to negotiate following the event.

Overall, **the event was very well received by the young people,** who valued their opportunity to contribute and expressed an interest in further events. However there were some shortcomings; the innovative nature of and resulting interest in the event meant that there were probably too many observers present during the discussions. In addition, a clearer plan for the production of the report (to include the involvement of participants) would have improved these aspects. Involving some real robots would also have helped stimulate an even greater level of discussion.

The visions conference was a valuable and enjoyable way to engage young people with the societal issues surrounding robotics.

Appendix

- Participant questionnaire

What do you think about robots?

Please take a few moments to tell us your thoughts on today's event. Your comments will help us improve future activities. Thanks!

1. Please write down **three words** that describe the event

--	--	--

2. Please circle the face that describes what you thought of the event:

Event was **good** 😊



Event was **bad** 😞

Science was **too easy** 😞



Science was **too hard**

Language was **too easy** 😞



Language was **too hard**

3. Do you think you will **continue to discuss** robotics after the event?

Definitely will 😊



Definitely won't 😞

4. Before the event, **how much did you know about robotics?**

I knew lots 😊



I knew nothing 😞

5. How much do you think you have **learned about robotics** from the event?

I learned lots 😊



I learned nothing 😞

6. Please write down **one thing you learned** from the event

--

7. Has the event changed how you **feel about robotics**? In what way?

--

8. Has the event changed how you **feel about science and engineering**?

More interested 😊



less interested 😞

9. Please tell us why you think this.

--

10. What **three areas of society** do you think robotics could have the greatest impact?

-
-
-

11. Have you **changed your opinion about how robotics fits in with society** over the course of the event? If so, please describe how.

12. Has the event had **any other impacts** on you? If so, please describe them here.

13. How could we **improve** the event?

14. If you have **any other comments**, please leave them here.

15. Your **name**:.....

16. What is **your age**?.....

17. What is **your gender**?

Male

Female

18. What **subjects** are you currently studying at college/school?

Thanks!