

Science and Society: Summary of Consultation Responses

Introduction

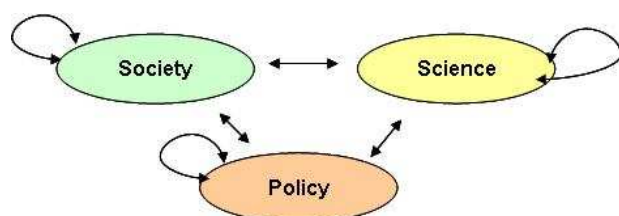
General Overview of consultation responses

The overall aim of the Science and Society (S&S) consultation was to start a discussion that will lead to a new UK vision and strategy for science and society. The consultation recognised that there is already a great deal of excellent work ongoing but presented a case for doing more and doing it better. The consultation also proposed the need for a more mature relationship between science, policy and society enabling us to look at both audiences and influencers.

The consultation was launched on 18 July 2008 and ran until 17 October 2008. It explored the following themes:

- a) A society that is excited about science and values its contribution to our social and economic wellbeing
- b) A society that feels confident in the use of science
- c) A society that supports a representative, well-qualified scientific workforce.

The consultation questions aimed to stimulate a wide-ranging and challenging debate which would not limit or constrain responses from organisations or individuals.



Approach

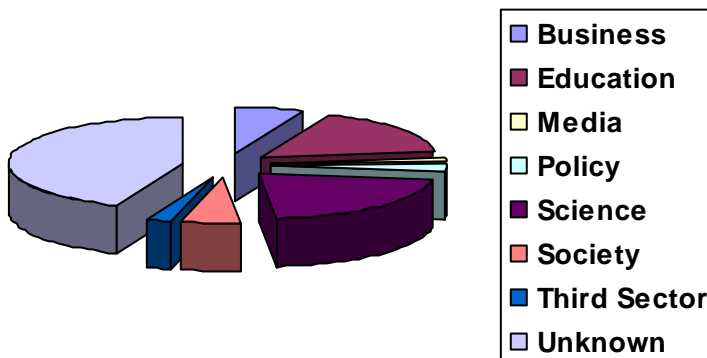
The consultation used a wide-range of evidence gathering approaches in order to reflect the diversity and complexity of the science and society landscape. They included:

- A consultation document aimed at a wide range of stakeholder organisations, who were invited to respond online (interactive.dius.gov.uk/scienceandsociety/site) or in writing
- An online hub aimed at individual scientists, industry and teaching professionals and the general public who could comment on individual aspects of the document
- A series of stakeholder round table meetings to engage a broad range of partners in fuller reflection and discussion of the issues and opportunities

- A citizen's forum (Newcastle) aimed at members of the general public spent a morning in structured discussion of the consultation issues.

In total, more than 3,200 question responses were received in a variety of forms from 400+ individuals, organisations and umbrella groups from across all sectors (see chart on right)

Consultation responses: Sector breakdown



Key Messages from the consultation

The consultation's vision and aim to develop the best possible future strategy to govern coordinate and enhance science and society activity met with wide approval. Most respondents welcomed the consultation as a timely opportunity to contribute to shaping this new vision. Established players welcomed the opportunity for a renewed discussion, while many other took part in discussions on this area for the first time and were delighted to have their say.

In their responses, individuals, businesses and scientists alike strongly emphasise the benefits to individuals, industry and wider communities arising from having a science-literate population and a skilled, representative scientific workforce. Many felt the consultation signalled a shift in government recognition of the need to incorporate scientific evidence and public engagement in policy making at all levels.

Most responders were keen to suggest ideas to help deliver the aims of a science-literate population and a well-qualified representative scientific workforce. In particular, respondents put forward propositions to:

- join up Government's activity on science and society with activities led by others
- recognise the importance of school and college science education as the underpinning of national STEM skills
- enhance Government's role as co-ordinator and enabler of science and society activities

- increase connectivity between the science community, the media, education and industry
- improve equality and diversity amongst those studying and working in science and engineering disciplines

There was a significant level of criticism that social science was given insufficient focus in the consultation document and that the discussion underplayed the essential role of social science to public engagement on STEM issues. Many also questioned the premise that we need a society merely 'excited' by science and stressed the need for critical engagement.

Some responses also inevitably reflected the immediate concerns of the individual respondent and/or were based on personal experience.

FOCUS OF RESPONSES

The most frequently answered consultation questions were on the schools science curriculum and telling young people about career opportunities. Other popular areas were ethics and the role of the media. The role of scientists in public engagement, rewards and how to make science interesting featured strongly in responses. The least discussed areas were those on interaction between policy makers and scientists and on the role of technology as an enabler in engagement.

Key Themes

Responses to the consultation questions focus on seven key areas of action. These are:

- Public Engagement
- Teaching of Science in schools and colleges
- Role of the Media
- Careers
- Technology
- Social Mobility, Social Inclusion & Diversity
- Governance, Measurement & Evaluation

Explanation of the content of this report

The following sections provide a more detailed summary of the key messages and suggestions that we received in responses to the consultation. The vision statements, perceptions and practical steps presented in the following sections are purely a reflection of the responses we received.

They do not represent the view of Government or DIUS.

The responses and suggestions have not been prioritised, nor do they necessarily reflect the actions which the Government will take forward. Where

a comment is made by only one or two respondents this has been made clear.

The next step is for DIUS and its partners to consider these views and recommendations in the wider context of other ongoing activities and planned policies, and to consider where the strategic priorities for action lie. All relevant stakeholder groups will be engaged on these proposed actions.

Public Engagement

Vision suggested by respondents:

- a scientifically literate society capable of engaging in critical debate on relevant issues
- a society which can experience science in their every day lives
- a science community that values and rewards engagement and where individual scientists seek opportunities to engage with the public

Culture

The responses indicated support for more to be done by scientists, museums and science centres to engage with society. More partnership working between the Government, Education, Business and Scientists was also a strong theme in responses, as was the possibility of the Government and universities demonstrating that they truly valued public engagement activities.

Positive perceptions of current system

- An estimated 19+ million people a year already visit national and regional science and discovery centres and museums
- A network of cultural institutions (including museums, libraries and archives) already engage the public and provide informal learning opportunities
- Beacons for Public Engagement were established to build public engagement in university system
- *New Scientist* and *Horizon* were cited as examples of communicating scientific principles in an accessible way

Negative perceptions of current system

- There is a need to improve the public's scientific literacy in order for effective engagement in debate/dialogue to take place
- Scientific information / debate should be presented in more accessible language. There is a need to strike a balance: don't turn people off with technical language, but don't dumb-down the science either
- Some responses stated that when new products were launched, it was rare to learn about the innovator or scientist behind the innovation

Practical steps suggested by respondents:

For Policy Makers:

- The UK's existing network of museums, science centres, libraries and archives should be better utilised for engagement activity
E.g. develop a big UK science centre / 21st century science museum to draw together major projects from academia and industry
- Create a 'British Science' brand

- ‘Science Inside’ project where the science and research behind consumer products is revealed
- Demystify science by linking research advances to people’s everyday lives and experiences. Pay more attention to the societal dimensions of scientific applications
- Engagement activity should be disaggregated and targeted to appeal to specific groups / communities
- Draw more effectively on humanities and social science expertise to strengthen the Government’s efforts to develop “upstream” engagement with the public on scientific matters
- Encourage schemes such as Wellcome Trust/New Scientist essay competition which can help identify researchers with flair for communication

For the Media:

- YouTube-style student TV to encourage the exchange of ideas
- Produce scientific magazines which are suitable / accessible for non-scientific audiences
- Media professionals should receive training to understand science / scientists better
- Communicate underlying principles in meaningful language
- Public understanding and engagement can be developed through partnership working with Magazines and TV
- Use public role models to lead and engage

For the Science Community:

- GPs and pharmacists are an important link between science and the public. They could play an increased role in engaging individuals / families / communities with medical science
- Take science out to the public and act to demystify. Examples given include the Institute of Physics going to Butlins and including a science demonstration as part of the children's entertainment. Also country shows and cultural events

Professionalisation

Some responses indicated that public engagement should not be “professionalised”. Others felt that it was the only way to ensure engagement happened and happened effectively.

Divergent views about the role of business were expressed. Some respondents felt that public engagement was not a core function of businesses, whereas others felt that business, as part of the knowledge economy, should increase engagement with the public, the science community and policy makers.

Positive perceptions of current system

- Sciencewise and Beacons for Public Engagement were noted as a welcome step forward, but their impact needed to be measured and analysed
- Some respondents thought that the public trusted university scientists more than their counterparts in business
- The Science and Engineering Ambassadors scheme (organised by STEMNET) gets scientists into schools

Negative perceptions of current system

- Engagement which inspires visitors and classes of children was not sufficient unless it resulted in changes of behaviour
- A view was repeatedly expressed that policy makers and scientists must improve the way they work together. Comments included:
 - more scientists / academics needed in policy making in Government
 - Policy makers should be more scientifically literate, and keep up to date with developments
 - Secondments, job shadowing, consultations and workshops should be used to facilitate the transfer of people / information / ideas between the three communities of science, policy making and business
 - A few mentioned the need for better knowledge transfer/core corporate memory as a result of the regular change in policy makers roles
 - Scientists needed a better understanding of how the policy making process works
- Scientists involved in promotional activity needed to develop key communication skills
- A number of people mentioned a fragmentation of funding for public engagement activities
- Many felt that the importance of public engagement was not commonly recognised

Practical steps suggested by respondents:

General

- Need a robust system for measuring quality of engagement and a closer definition of what quality engagement actually entails

For Policy Makers:

- Encourage more scientists to be involved in policy making processes
- More public engagement training for postgraduates
- Support the Government Chief Scientific Advisor in his work to strengthen skills, and raise the profile of the science and engineering community within the civil service

- Nominate a lead Department to drive culture change in public engagement work
- Secondments, job shadowing, consultations and workshops should be used to facilitate the transfer of people / information / ideas between the three communities of science, policy making and business

For Business:

- Business should be encouraged to recognise the benefits of open engagement
- Business to have a greater contribution to public debate about potential use of science in everyday life

For the Science Community:

- Engagement training should be part of continuous professional development (CPD) for scientists
- Open up labs to the public. Have open house days so that people can meet scientists

Reward and Recognition

Most felt that public engagement wasn't given a sufficiently high priority within universities, and that more needed to be done by Government and universities to make public engagement integral to the work of many academics.

Positive perceptions of current system

- Government has shown welcome support for engagement work through the funding councils and RCUK financing of the Beacons for Public Engagement

Negative perceptions of current system

- The view was repeatedly expressed that public engagement was not given enough recognition within the academic system. Comments included:
 - Engagement was seen as an optional extra which does not contribute to the measures of professional success
 - There needed to be career credit for scientists who engage
 - RAE doesn't reward engagement

Practical steps suggested by respondents:

For Policy Makers and the Science Community:

- A system to recognise public engagement, how it contributes as a measure of success, the quality of the engagement and a clear definition of quality engagement
- Universities should have clear targets to enable many of their scientists to undertake engagement activity

- Consider whether early career researchers should have assistance to build PE work into their activities
- Consider how engagement could be incentivised in the REF

For Business:

- Business should recognise better the benefit of open and transparent engagement

Education and Funding

Positive perceptions of current system

- Science centres were thought to enhance classroom learning, and provide informal out of classroom experiences

Negative perceptions of current system

- Teachers often find it difficult and time-consuming to seek science placements for students and pursue business links
- Several mentioned that are few opportunities to obtain funding for dedicated public engagement activity
- Businesses are thought by a few to be too motivated by short term financial success to invest sufficiently in engagement

Practical steps suggested by respondents:

For Policy Makers:

- Government should send a clear message to universities (via the funding and assessment mechanisms) that it values engagement
- Undertake activity to promote engagement in science and society including an awards ceremony
- Ensure appropriate engagement is a vital part of each grant awarded
- Publicise how HEIF provides incentives for high quality engagement with the public
- Consider incentives for business to undertake engagement activity
- Include a outline engagement plan as part of grant applications

For the Science Community:

- A system for offering work experience and work placements to schools, colleges and universities for both students and teachers/lectures

For Business:

- Businesses should engage with young people via the SEA programme, extended schools network, work placements and the gifted and talented master classes

Structure

Consultation responses fell into two broad camps. Many respondents thought that engagement activities should be co-ordinated and streamlined (perhaps via an online database giving information about existing schemes, or a co-ordinating body). Others felt that any attempt to co-ordinate activity would stifle innovation, and that organisations should be left to create their own novel and bespoke programmes wherever and whenever they identified a need.

Positive perceptions of current system

- An example was cited of the Russell Group of universities at which a bottom up culture has developed with enthused academics carrying out PE without other institutional restrictions

Negative perceptions of current system

- Several respondents felt engagement happened in a piecemeal way. Scientists, business and policy makers can be unsure when to engage with each other or the public
- A few said there was not enough evaluation / impact assessment of engagement activity

Practical steps suggested by respondents

For Policy Makers:

- Create facilitated public engagement spaces and forums, both virtual and physical i.e. museums and libraries
- Link up current schemes
- Resist the temptation to co-ordinate and streamline engagement activity – this would stifle innovation and diversity

For the Science Community:

- Consider a single portal for scientists to communicate the latest information to the public with clear signposts to other areas

For Business:

- Businesses should be encouraged to engage more via existing intermediary organisations such as professional bodies, Science Cities, STEMNET, SCORE, SSAT, LEAs and Learned Societies
- Create a forum for businesses to share best practice in engagement activity, possibly via the CBI or Confederation of Small Businesses

Teaching of Science

Vision suggested by respondents:

- Science education which produces scientifically literate and critically-engaged citizens, and an inclusive, national workforce of critical thinkers able to adapt their skills to a changing society.
- Skilled, enthusiastic, well-resourced and well-rewarded teachers.
- A practical-based science curriculum which places science in social, historical and global context.

Culture

Responses focussed on teaching in schools and the importance of science teaching from a very early age as the underpinning of science for life. Responses requested both the promotion of excitement for science alongside scientific rigour to create a population able to evaluate scientific issues critically.

Positive perceptions of current systems

- None noted in responses

Negative perceptions of current system

- Many individual respondents believed that science has an image problem (geeks!) and mentioned a lack of inspiring role models & engineering projects
- The crucial nature of early years (primary) exposure to interesting science was raised often
- Many respondents mentioned the lack of public awareness of the contribution of science to advancement of society
- Decisions at KS3 can restrict lifetime chances, especially where the opportunity to mix science / non-science subjects at university is limited
- Individuals and organisations raised concerns of a cultural acceptance of a fear of maths. There is concern that this is leading to maths being lost from the science curriculum
- Teaching needs to make greater provision for different levels of ability – we need both experts and laypeople
- Communication skills and tools needed by scientists are not included in the curriculum
- Several mentioned that our culture/systems don't reward the choice of science over other subjects

Practical steps suggested by respondents:

For Policy Makers:

- European dimension – disseminate and learn from best practice across Europe

- Recognise and provide more resources for parents/carers as key influencers
- Provide summer placements/schools for more able and for general interest
- All students to visit the Houses of Parliament or have visit from MP during education to understand how the policy/political context of science works
- Look at opportunities for informal adult learning in science subjects.
- Consider ways to encourage the wider appreciation and use of science toys
- Financial incentives for students to continue in STEM subjects
- Appoint a science laureate like the Poet and Children's Laureate

For the Media:

- Support messaging of the relevance of STEM subjects to the way we live
- Commission and publish science related creative arts – poems & stories, science fiction, art. Prizes and competitions
- Provide debating forum for kids (issues relevant to youngsters)

For Business:

- Encourage taking science/R&D module in MBA courses undertaken by staff
- Support provision of guidance/information on relevance of STEM subjects to everyday lives

For the Science Community:

- Consider opportunities to set up pre-school science activities for children in nursery education
- Routine production of written materials explaining results of research aimed at range of audiences

For the Education Community:

- Teach societal engagement skills at a young age

Teaching

Support for continuous professional development and the provision of facilities and resources for practical science lessons featured strongly in responses in this area. The need to match ambitions on the cultural standing of science with the rewards for teachers was a common theme.

Positive perceptions of current system

- Positive perceptions of existing schemes to stretch more able students although these are not universal
- Science and Engineering Ambassadors (SEAs) are good model with potential to be developed further

- Visiting scientists and engineers to schools give a reality check and raise awareness of possibilities. They could have greater role in teaching. The opportunity is not universally available/taken up
- Examples of excellent practice abound. Many schools involved in Teacher-Scientist Networks and Researcher in Residence (RinR) schemes

Negative perceptions of current system

- A common concern was that teachers, pupils and parents do not feel empowered to use locally available or topical resources or develop local partnerships
- Some responses stated that in some areas there was a recruitment problem to science teaching posts
- Concern was raised that not all teachers have knowledge/confidence needed in their subject. This was seen as more acute in primary schools. There were mixed views on whether a degree in the subject being taught was always necessary
- Continuous professional development was a very common theme in responses. It was seen as crucial to maintain currency of science knowledge, but a few mentioned schools reluctant to release teachers and the limited in-school training available
- A common comment was that teaching must involve enthusing pupils as well as promoting knowledge
- Several individuals mentioned the confusing array of schemes such as SEAs, RinR. Some schools are unaware of possibilities open to them
- Several mentioned the lack of opportunities for pupils to see business or university labs in action. Pupils needed direct contact with science professionals (home or away)
- Few benefits/rewards were recognised for scientists who engaged with schools/public
- One respondent from the FE sector commented on the importance of industrial experience by FE teachers. The respondent felt this was a issue that could be addressed

Practical steps suggested by respondents

For Policy makers:

- Support for retraining – Transition to teaching scheme
- Extend Centres for Excellence in Teaching and Learning (CETL) to all levels of education
- Whole system approach to continuous professional development (CPD)
- Maintain support for SEAs. Expand SEAs from health, social science, and minority areas

For Business:

- Open up labs to visits (real or virtual). Release staff to support schools teaching. Join SEAs scheme

- Consider how better partnership working between businesses and schools could, in the longer term, improve access to equipment
- Deliver section of curriculum centred on their own operations & staff

For the Science Community:

- Give schools access to HE/FE facilities (especially laboratories)
- Support for teachers for teaching uncertainty and complexities and risk
- HE sector provide teacher briefing material to maintain currency of knowledge

For the Education Community:

- Develop and support culture to embrace whole-system approach to CPD
- Embrace new ways of teaching – e.g. peripatetic teachers, practising research scientists from universities and businesses teaching part-time in schools, secondments to/from science industry and teaching.
- Consider flexibility in school timetabling with the aim of creating more possibilities for school science trips / practical lab work
- National network to coordinate and consolidate CPD and access to scientists/business
- Online collaboration tools to share best practice from specialist schools to all schools
- Develop Researchers in Residence programme

Curriculum content

Responses revealed support for greater flexibility and relevance in the curriculum to reflect current national and local issues. The provision of good practical experience and exposure (in-school or on visits) to real life science were also frequently mentioned.

Positive perceptions of current system

- Recent changes to GCSE curriculum need time to bed in
- Triple science GCSE seen as best grounding for further science study
- Secondary National Strategy offers good support for 'How Science Works'
- "Learning outside the classroom" was mentioned as a positive policy by a few respondents

Negative perceptions of current system

- Curriculum was seen as inflexible by some, making it difficult to incorporate locally relevant material and opportunities
- A common concern was the difficulties in arranging external visits (health & safety issues, funding issues, knowledge of opportunities,)
- Poor facilities and opportunities for practical experimentation was frequently mentioned. Science should be more 'fun', especially at primary level and that it needs to be big, bold and messy

- Some felt that the curriculum needed to allow more time for ‘how science works’ and to teach science process. Also science as a creative pursuit, highlighting creative, personal and emotional aspects
- A number of responses mentioned the need for creative links with arts, social sciences, humanities, business, global and the temporal context of science
- Poor gender awareness in the curriculum was raised in a few responses
- Communication skills and tools needed by scientists were not included in curriculum
- There was strong criticism in a small number of responses concerning the quality and quantity of resources in schools (including primary schools) and the schools engagement with parents in maximising value

Practical steps suggested by respondents:

For Policy Makers:

- Give sufficient recognition to the role that humanities and social science disciplines have in contributing to scientific understanding
- Build in independence and empowerment into the science education system
- Build flexibility into curriculum
- Maintain support for STEMNET
- A fluorescence microscope in every 6th form college.
- Recognise that literacy and numeracy underpin scientific standards.
- Develop wiki-powered virtual Centre for Excellence in Teaching and Learning (CETL) to ensure accessible and current information

For Business:

- Get engaged in developing school, FE and HE curricula

For the Science Community:

- Local organisations manage funding for ‘excitement’ (e.g. Science discovery centres). Develop long term links between museums, science centres, & libraries and schools
- Courses provided outside school – Science Learning Centres & National Centre for Excellence in Teaching of Mathematics provide courses, linking up industry, media, research, govt perspectives on science in society

For the Education Community:

- Automatic opt-in to triple science GCSE for Level 6 achievers at KS3
- Teaching qualifications need to reflect skills requirements

Structure and Governance

The synergy between research groups, business and schools was discussed. Responses indicated that all sectors needed to spend time in each other's worlds for mutual understanding. Many responses also focussed on mechanisms for sharing knowledge and on equality of opportunity for all.

Positive perceptions of current system

- STEMNET and action programmes were highly regarded by a range of respondents
- Science Learning Centres were mentioned many times and were generally well regarded. One respondent stated they reached too few teachers. More links with business and universities in developing and delivering courses were recommended by some

Negative perceptions of current system

- Inflexibility of requirements for teaching qualifications was raised by a few respondents
- Technology (e.g. web delivery of info) was mentioned by a few as not always up to latest standards
- Knowledge and capacity in universities was thought by a range of respondents to be currently under-utilised in schools

Practical Steps suggested by respondents:

For Policy makers:

- Build science & social science dimension into many diplomas (e.g. finance and business)
- Build in independence and empowerment into the science education system
- Maintain support for STEMNET
- More coordination of business engagement with schools.
- Regional Development Agencies to support & encourage employer interaction with FE colleges
- System for auditing employer/FE College links

For the Science Community:

- Local organisations manage funding for 'excitement' (e.g. Science discovery centres). Develop long term links between museums, science centres, & libraries and schools
- Courses provided outside school – Science Learning Centres & National Centre for Excellence in Teaching Mathematics (NCETM) provide courses, linking up industry, media, research and government perspectives on science in society

Media

Vision suggested by respondents:

- a science-literate media working in partnership with the science, business and policy communities to report responsibly on new and emerging issues
- a media-literate science community working in partnership with the media and business to design, commission and broadcast across a variety of media
- a co-ordinated governance mechanism to hold erroneous communicators to account

Expertise

Responses indicated that a more scientifically literate media, and a more media literate science community, would be welcomed: with better partnership working between the two groups.

The quality of TV science programming, with the majority of respondents wanting to see more science of every-day relevance included in TV programmes, was also a common theme. However, some respondees asked whether an information deficit was really the issue and whether audiences should be better targeted with specific programmes.

Positive perceptions of current system

- Several praised the independence of the media
- Many strongly supported the Science Media Centre: creation of science literate journalists and promotion of partnership working between journalists and scientists
- Many noted that there had been an improvement in the status and quality of science reporting in recent years

Negative perceptions of current system

- Many felt strongly that there was a lack of scientific literacy in the non-specialist media
- Equally strong was a feeling of a lack of media awareness in the science community
- Almost all respondents felt that the media often presented a polarised view of an argument
- There were few, if any, forums for scientists to engage with TV producers, directors or programme commissioners. Partnership working was a common thread in responses
- Many felt that good scientists and science communicators could be better used by the media, and that a closer working relationship between these two groups would breed greater understanding of each group's skills.

Practical steps suggested by respondents:

For Policy Makers:

- Desirable to examine whether science broadcasting has reduced in quality, as many contended
- More funding for bringing policy makers, media and scientists together

For the Media:

- More direct contact between scientists and journalists / broadcasters and more opportunities to do so
- More regular science programming rather than irregular major documentaries
- Show the variety of science disciplines
- Create debate shows – a Question Time for scientists
- Use latest science in programming
- More opportunities for scientists to undertake secondments / work placements / attachments
- Use people with a science background to make science programmes
- Make use of celebrities with an interest in science e.g. Richard Hammond
- Use companion programmes and websites to give behind the scenes information

For the Science Community:

- More direct contact between scientists and journalists / broadcasters
- More academics should write for the general public
- Need to identify charismatic industry role models
- Take time to give the media accurate information

Audience

There were many comments about the quality of current science programming, with many respondents giving examples of previous TV programmes considered both appropriate and successful, such as *Horizon* and *Tomorrow's World*.

Positive perceptions of current system

- A respondent suggested that scientific ideas were often more suited to explanation in media other than TV where there was room for greater complexity and discussion
- In response to a discussion thread, one respondent suggested that the main purpose of TV programmes was to entertain and that entertainment should be a key consideration in all future science programming

Negative perceptions of current system

Content

- Many of you commented on a lack of quality scientific documentaries & flagship TV shows
- Several felt there was a lack of education content in TV programming compared to the past
- Another strong theme was a lack of charismatic science presenters and role models
- Lack of accurate, factual, but still entertaining, reporting of science
- Several respondents noted a lack of diversity in programme commissioning – too much Natural World and Engineering in the current schedules compared to other areas of science

General

- A frequent comment was that science is assumed by media communicators to be difficult. It was asserted that audiences can deal with complex material
- Communication wasn't always thought-through and succinct
- Strong view that little was known about the job of a modern scientist and current portrayal drew heavily on images of men in white coats
- Seemingly little thought was given to alternative programming opportunities / use of new media where the role of scientists could be portrayed in a more interesting and realistic way

Practical steps suggested by respondents:

For Policy Makers:

- Government scientists should speak out more often publicly
- Raise awareness of the Science Media Centre
- More research into how to reach specific audiences

For the Media:

- Give the public access to channels to share their views
- Explore potential to use innovative media as a priority – use of interactive media supports discovery, experimentation and discussion
- Contact audiences in the way most appropriate to them
- Give the scientists behind a new product a public profile when reporting on the launch / announcement of that product
- Make greater use of alternatives e.g Facebook, a Student You Tube science channel

For the Science Community:

- Engage a broader range of journalists and broadcast media in the scientific agenda
- Explain scientific processes better to the non-specialist media

Training

The training of both the media and the science community was a strong theme in responses. Many felt that scientists should be able to engage with programme makers direct and others felt there was a role for universities and / or government.

Positive perception of current system

- Several respondents commented on the excellence of existing journalism skills

Negative perception of current system

- Several respondents felt science was often 'dumbed down'
- There was a feeling that too much was presented in a 'bite-sized' format that failed to recognised the audience's ability to absorb longer/more detailed information
- Some scientists felt there was a lack of media support for communicating their work
- A very strong theme in almost all responses was the lack of partnership working across all sectors
- Several also noted that greater understanding of, and enthusiasm for, science at a senior level in the media would be welcomed
- Another strong feeling was that media reporting of science was often ill-informed and based on "pseudo-science"

Practical steps suggested by respondents:

For the Media:

- Training for journalists in maths, statistics, risk and scientific method should be included as part of their journalism training
- Journalists reporting on scientific issues needed to have scientific training

For the Science Community:

- Recurring training for scientists at all stages of their careers on why and how to talk to the media, the public and children
- Scientists should make their science accessible to the media, to support the media role in informing the public
- Free training on current scientific issues should be offered to the media on a regular basis

Accountability / Responsibility

The appropriate balance of opinion in a debate was mentioned in almost all responses. Many felt that the media were often right to portray all sides of an debate but should distinguish their sources more carefully. Many others felt on many issues there was a broad scientific consensus and this should be clearly depicted.

Positive perception of current system

- None noted

Negative perception of current system

- By far the strongest theme of responses was the need for the press to represent the balance of views accurately
- Several respondees mentioned the poor representation and portrayal of women scientists
- Many respondents felt that current reporting was poorly balanced, too negative and too focussed on the quirky
- Need to ensure science careers were realistically represented
- A couple of individual respondents noted that it was unclear who had responsibility to rebut misleading / erroneous representation of science
- Many commented that the media should be more open about the consequences of science

Practical steps suggested by respondents:

For Policy Makers:

- Scientists should be able to take steps against media / broadcasters when their work is misrepresented. One organisational response suggested that Ofcom should be the enforcement body
- Attach conditions to the licence fee to ensure adequate specialist coverage
- Commission a review to identify how to fund science programmes with links to vocational training and learning opportunities

For the Media:

- Use TV programmes to deconstruct stereotypes about scientists – current portrayal was only when things go wrong
- Women scientists needed to be better represented in the media
- Don't publish on scientific issues until peer reviews have taken place
- Be prepared to offer instant rebuttal of misleading / wrong media representations of science
- Better mix of programming generally balancing popular and specialist content.

For Business:

- More openness about the consequences of science

For the Science Community:

- More openness about the consequences of science

Careers

Vision suggested by respondents:

- where the scientific workforce represents the diversity of modern society
- where the choice to study science is based on the best possible information about the range of careers on offer
- where scientists and businesses interact with school children to change the culture of science in society

Culture

The responses focussed on teaching in schools and the importance of learning science from a very early age. The comments stressed the importance of a curriculum that was flexible enough to help teachers create excitement around science but also provide a sound underpinning for future study.

Positive perceptions

- Science Centres already do a lot of work giving people the opportunity to meet scientists. These encounters can have a positive impact on students, demonstrating that science-based careers can be for “people like me”

Negative perceptions

- Science careers are not always seen to be rewarding enough, or sufficiently valued by society, to attract enough high-quality graduates into the scientific workforce
- There was greater public confidence in academic research rather than research funded by others
- A frequent comment made was that professional scientists were insufficiently aware of the opportunities that existed to act as role models and engage with young people to promote a positive image of science. Some thought that professional bodies could have a role in supporting this
- Scientific workforce was not thought to reflect sufficiently the diversity of society. Role models would help attract and retain underrepresented groups
- The opportunities for applying STEM skills in creative industries/ jobs were not broadly recognised
- Some thought that business could do more to help raise the profile of science and scientific careers and celebrate the importance of science to the success of their business

Practical steps suggested by respondents:

For All:

- Mentoring schemes

For Policy Makers:

- Government should lead by example and be an early supporter of innovation at grass roots to capture what works
- One organisation suggested the need for a ready supply of scientists with the creative and business skills (in addition to science skills) demanded of the innovative global businesses

For Education Community:

- Provision of more (after-school/ lunchtime/ holiday) science clubs
- Adopt a more co-ordinated approach to engaging school children and sharing what works with others

For Business:

- Run school/college tours/ science road shows to demonstrate how science is used in a business environment
- More integration of business leaders in local communities
- Provide recent science graduate recruits as role models in schools to promote a positive image of science and careers

For the Science Community:

- Host regular open days and careers fairs (in partnership with Business and relevant others) for young people to get the best possible information, advice and guidance
- Provide science champions to visit every primary school to capture the interest of young people as early as possible

Structure

A high number of responses suggested that respondents across the sectors were aware of numerous initiatives in place to promote science but felt a co-ordinated approach was necessary to maximise the impact of messages. Many respondents indicated that it would be better if the scientific workforce reflected more accurately the diversity of our society.

Positive perceptions of current system

- Outreach activity exists and works well
- One respondent thought that STEM directories were key to effective co-ordination

Negative perceptions of current system

- Several people raised the need to make better use of existing mechanisms such as Connexions (a service offering advice to young people). The need was also mentioned for coherence in careers advice throughout the education system to raise awareness of scientific careers
- Work experience offered doesn't always provide a realistic and practical experience of science careers

Practical steps suggested by respondents:

For Policy Makers:

- A co-ordinated approach to improve careers advice across the education system
- A long term strategy for science and society across all sectors of government which promotes investment in science and science based businesses in the UK
- Look beyond those already involved to spread the word of the value of scientific careers
- **For the Science Community:**
- Working practices and workplace culture should support the attraction and progression of women and other groups

Education and Training

There was a strong feeling among respondents that education, training and awareness needed to start as early as possible.

Positive perceptions of current system

- It was noted that grants/bursaries for science students were given by some businesses, and more could be encouraged to do so.

Negative perceptions of current system

- A few individuals thought more support could be provided for teachers to give advice on the range of career opportunities available to young people who study science
- STEM careers awareness needs to start earlier – Key Stage 3 (11-14)
- Professional bodies could give greater priority to raising awareness of opportunities
- A few people thought that Business should take more responsibility for training potential scientists to match their business needs
- The general (graduate and non-graduate) workforce lack basic STEM skills – the basics need to be recognised as compulsory skills like literacy and numeracy

Practical steps suggested by respondents:

For Policy Makers:

- Stress the need for wide ranging skills and pathways into science related careers. Promote and recognise technical qualifications.
- Government and business should work together to make sure there was an adequate supply of apprentices
- Create progression routes into science for adult returners
- One respondent suggested the creation of specialist institutions 'Advanced Technical Colleges' to act as high quality science, engineering and business training establishments

- A couple of responses suggested reduced fees for science courses (recognising the fuller timetables on these courses leaving less time for part time work)

For Business:

- Encourage business to provide more quality work experience opportunities to students and sponsor vocational courses
- Lead the way in offering careers advice in schools suited to individuals' circumstances
- Apprenticeships – good vehicle for business engagement and promotion of opportunities for working in applied technology careers
- Expansion of work based and professional learning
- Provision of sandwich courses for students to get exposure to working in a real science job
- Give young scientists the opportunity to develop business and creative skills to apply their science know-how in a working environment

For the Science Community:

- Science Centres should support business in careers advisory service in schools

Communication and Awareness

There was a strong sense from respondents that current communication activity by scientists was not sufficiently recognised or rewarded. More could be done to brand science careers as exciting, relevant and “heroes saving the world”.

Positive perceptions

- There were some long standing excellent examples of engaging schools and other groups to raise awareness of the realities of science careers (e.g. NHS choices website and Healthtec initiative in Birmingham)

Negative perceptions

- A couple of respondents felt that information about STEM careers was inadequate – they wanted better quality and a wider range of resources and information for students
- A few comments were made suggesting that work experience for school pupils could provide better practical experience of science related jobs
- Level of interaction currently between science teachers and careers advisors was low but there was thought to be a willingness to engage
- Several respondents thought that parents, as main influencers of young people, should be encouraged to have a more positive image of science careers

- Some felt it important to encourage more female scientists to be prominent communicators

Practical steps suggested by respondents:

All

- Support provision of authentic insights into working lives and activities of scientists
- Should make it well known if public figures i.e. world leaders, actors, etc have a science degree

For the Media:

- Encourage reporting of science success stories more often accompanied by the personal stories behind them (i.e. real people), so young people link scientists to the positive outcomes and more likely to be inspired by them

For Business:

- Advertise their science and how valuable science is to the success of their business
- Encourage large/ well known companies to demonstrate what science has done and how it is relevant to society

For the Science Community:

- Immersion visits for school children to a range of science related venues
- Make public engagement practice more central to the job of research scientists and provide adequate training for them to do this well

Social Mobility, Inclusion and Diversity

Vision suggested by respondents:

- Scientific careers open to all depending only on inclination and ability.
- High quality science education available to all, leading to a scientifically literate public.

Social Mobility

Positive perceptions of current system

- Science is not under-performing in this area compared to other career paths

Negative perceptions of current system

- There was a strong view expressed that socioeconomic status affects chances of having a scientific career (The Royal Society mentioned their recent report which found that white boys from lower socioeconomic status are the most under-represented group)
- Some respondents felt that poverty is a key factor in exclusion, and that this issue is not confined to STEM, but mirrors the problems in society at large

Diversity

Responses suggested that action was needed to enable equality of men and women solely on the grounds of merit. Some advocated positive action, whereas others argued that merit alone would deliver equality.

Positive perceptions of current system

- One respondent noted that skills and thought processes gained in STEM careers could be translated to other sectors – not necessarily lost to the workforce
- Two respondents noted that significant culture change has occurred in the fields of medicine and veterinary science – women now very well represented

Negative perceptions of current system

- Many noted that greater effort was needed to market STEM to all groups, especially women
- One organisation suggested that, in the western world, the contribution that non-western cultures and countries make to science was insufficiently acknowledged
- Media presented ethnic minorities as working in medicine, more than other science roles
- Many respondents felt that science subjects were perceived and presented as hard

- A few respondents said that girls were not encouraged sufficiently to take up science
- Cars and rockets dominate extra-curricular science materials: more consideration of what works for each gender should be undertaken

Practical steps suggested by respondents:

General:

- Annual prize for STEM project, with teams reflecting diversity.
- STEM diversity bursary
- More visible, diverse role models needed to demonstrate that all kinds of people work in science jobs
- More consultation/engagement needed with women/under represented groups (possibly online)

For Policy Makers:

- Accessible training or informal adult learning in science & technology subjects
- Help equip disadvantaged parents with the skills to support their children's study of science
- UKRC Women in SET model extended to other under-represented groups.
- Continuous professional development for teachers to promote encouragement of diversity
- Renew all relevant policies affecting women in STEM. Gain a strategic overview, identify gaps / overlaps / contradictions / lack of co-ordination
- Look for opportunities to empower local communities to support/create enrichment activities
- Consider how to encourage and incentivise more women into science, particularly in those disciplines traditionally underrepresented

For the Media:

- Avoid reinforcing negative stereotypes of scientists

For Business:

- Review diversity within STEM workforce and commit to continuous improvement
- Establish support networks for female entrepreneurs

For the Science Community:

- Promote opportunities for the creation of a more representative workforce

Inclusion

Positive perceptions of current system

- Many people with a STEM background worked for non-STEM organisations where the conditions were more flexible

- Some suggested that retention was not a problem: it was only natural that not all people who train in STEM will work in science throughout their careers
- Science funding model was based on excellence
- **Negative perceptions of current system**
- Many respondents thought that retention was more of a problem than recruitment
- Gender stereotyping, and out of date images of scientific careers, were thought by many to be common in the media
- Some respondents felt it could be a false assumption that there should be equal representation of all groups: it may be certain groups of people do not want to be involved so much in science
- One respondent said that when new methods to reach new groups of learners were found, which differed from traditional methods, there was often debate about whether they lacked rigour

Practical steps suggested by respondents:

General:

- Internships/work-placements extended to returners/career-changers, not just youngsters
- Better links between the scientific community and employers
- National database for under-represented groups to provide role-models, mentors, speakers and a support network
- Use a variety of methods of promotion / engagement. Not everyone one owns a computer and therefore not everyone can access online sites / web content

For Policy Makers:

- The sector is not short of successful initiatives. Consideration should be given to the appropriate balance of sustaining successful existing initiatives against further fresh initiatives
- The proposed REF should not penalise part-time workers or those who take a career break
- Targeted adult learning campaigns on science, similar to those seen for literacy/numeracy
- Talk to grandparents, parents and community leaders about what they want for their youngsters. Influence those who steer young people's choices
- Make better use of all available technologies to reach people. Use all available means – not just technology
- E-mentoring with a student and a STEM professional
- On-line careers repository
- Promote partnerships: women's groups, community centres, local libraries

For the Science Community:

- Year long maternity and paternity positions where an individual (male or female) does not have any lab-time, but spends a year writing reports and grant proposals, and reviewing literature. Allowing them to keep up to date, and spend time with a new baby
- Less focus on up-to-the-minute scientific knowledge, and more weight given to skills such as collaboration, confidence and experience
- Make it fun – large public events and digital quizzes, interactive lecture theatres
- Science Centres should become cross-discipline community centres of culture, with science at the heart

For the Education Community:

- Strengthen triple science entitlement
- Extend golden hello to primary PGCE candidates
- Target specialist science teachers where they are most needed: schools in deprived areas with persistent vacancies
- Personalisation of learning
- Use local knowledge and expertise. More use of specialist colleges to widen participation
- Look for further opportunities for universities to open their doors and have an active role in national and local debates on issues

Health Check

We received a wide range of responses about diversity and inclusion, and respondents expressed a variety of opposing views.

Many said that they would like to see a more diverse and inclusive scientific workforce, and that certain actions should be pursued to achieve this. However, others felt that such action was not necessary. Some said it was natural that not all groups of people would be equally interested in science, and that the science community should only concern itself with the recruitment of the most able.

Some said that the under representation of some groups could be a consequence of the far wider range of subjects now available to young people, and that any under-representation mirrored wider issues in society.

Some also made the point that issues of representation vary by scientific discipline and career stages.

Technology

Vision suggested by respondents:

- To use new emerging forms of both real world and online technology to enable more of the population to participate actively in science, and for them to be more aware of science in everyday life.

Expertise

- Britain had a large percentage of computer and internet-aware citizens, who communicated through new technologies such as mobile phones, internet, blogs, websites, Facebook etc. as opposed to traditional communication systems. Whilst face-to-face would always be a vital means of communication, society was now content to speak through a multitude of technological means and policy makers, industry and other sources are having to adapt to web 2.0 technologies
- Respondents thought that the internet was part of everyday life now, with youngsters adapting to a multitude of new forms of social communication and contact with an ease and speed that government, industry and traditional media communication systems find difficult to keep up with

Partnership working

- For Government to get the best out of discourse with the public it would need to update technology on existing well-established sources of information
- Government needed to adapt as public communication and engagement moved to online sources and away from traditional media sources

Positive perception of current system

- Due to the internet, and TV voting shows, the public were at ease with voicing their opinions online, and voting on their mobiles. We could expect these expressions of communication could be expected to expand over the next few years as Web 2.0 technologies allowed for direct speedy two-way communication, and allowed anyone to contribute ideas via blogs and websites thus leading to swift uptake on any original story of interest

Negative perceptions of current system

- Limited face-to-face communication
- Government needed to be realistic on what technology could or could not do, and that the internet would not reach those who did not want to be reached, technology should not be used to avoid planning context and design
- It was not always clear how Government had listened and acted on surveys and public comments, which risked a loss of trust

Practical steps suggested by respondents:

For Policy Makers:

- Consider how best to raise the level of 'discoverability' of science sites online given the growing size of the internet
- Use the internet, blogs and chat forums to provide a forum for people to put forward ideas
- Listen to communities, identify them and utilise appropriate technology to empower them
- Full use of pod casts, plus transcripts, for communicating science
- Kite marking for approved sites

For the Media:

- Distribute web-based technologies more widely to widen access and increase democratic participation in debates, dialogues and surveys
- More use of the internet and other new technologies to build on/feed back on showings of science-based programmes

For Business:

- Consider ways to build science and technology awareness into computer games design and marketing

For the Science Community:

- more direct contact between scientists and journalists / broadcasters
- Use emerging technologies to enable scientific debates to include large-scale national public, teachers and students input from a very early stage

For the Education Community:

- Consider online collaboration of internet for schools and universities to remote-participate in large-scale experiments e.g. National Schools Observatory project, Open Air Labs
- Provide online CPD (Continuing Professional Development) and teaching resources
- Utilise central resource linking external websites e.g. online video careers stories, National Museum of Wales Snail Search project and other examples of projects

Governance

Vision suggested by respondents:

- a structure that creates places for sharing best practice, facilitating collaboration across sector boundaries and that allows space for innovation
- an independent evaluation of Science and Society activities ensuring societal issues are reflected in transparent decision making
- a culture change amongst scientific organisations, government departments and public bodies placing responsibility and ethics at the heart of scientific practice

Behaviours

Respondents thought that Science and Society activity needed to have a strong ethical governance framework. However, few specific suggestions of appropriate mechanisms were received.

Positive perceptions of current system

- There were several positive mentions of STEM directories
- Governance systems were considered well developed in academia. Learned societies and research councils had, and followed, the ethical code
- Some considered that the public had a satisfactory degree of confidence in science, but several respondents thought more needed to be done to explain the scientific method if trust were to improve
- Affiliation of scientists was less important than time in developing trust. Trust must be qualified by a questioning attitude

Negative perceptions of current system

- There was currently no universal set of ethical standards and regulations supported by industry
- Lack of consequence for unethical behaviour
- Lack of teaching of ethics as part of all science courses and across all ages/stages.
- Need to make better use of experts

Practical steps suggested by respondents:

For Policy Makers:

- Promote case studies demonstrating good ethical behaviour

For Business:

- Be more transparent about scientific practices used in business

For the Science Community:

- Include ethical behaviour in vocational skills training for scientists.

- Sign up to and monitor performance of ethical code of practice
- Engage openly at an early stage when developing new technology

For the Education Community:

- Develop a science MBA or science R&D module in standard MBA courses to improve awareness of scientific process and value at executive levels
- Include ethics in science as well as humanities courses. Teach ethics as early as possible and at all stages of education.

Structure

Positive perception of current system

- Universal Ethical Code was strongly supported, although one respondent felt its scope and influence needed to be strengthened. Several thought continued debate was needed about the content and implementation of the code

Negative perceptions of current system

- There were a number of responses which mentioned concerns about the science advice to politicians and the scientific literacy of the civil service. The involvement of academia and business in political/policy process could be enhanced
- Lack of credible institutions for ethical governance of science
- Lack of public involvement in setting science priorities

Practical steps suggested by respondents:

For Policy Makers:

- Consider developing a 'Science and Society Framework' which gives more opportunities to raise strategic issues with Ministers
- Have science advisers to local MPs and Local Authorities
- Develop universal ethical code to cover all scientists, incl private sector
- Listen to minority views
- More partnership working

For the Science Community:

- More partnership working – a willingness to engage with all parties
- More effective coordination and formalisation of trade associations

Scrutiny & Oversight

Positive perceptions of current system

- Reasonable recognition by the public of the principles of peer review.

Negative perceptions of current system

- Lack of sanctions for unethical behaviour and practice

- There should be more scope to allow societal concerns to be reflected in science research priority setting and evaluation

Practical steps suggested by respondents:

For Policy Makers:

- Better dialogue between research funding bodies and research users

Communication

Responses indicated that greater openness and transparency and better communication of science could lead to better understanding of the scientific process, which in turn would underpin trust. Several people commented that better recognition and awareness of the wide relevance of science to everyday life would also build trust in science and break down its elitist image.

Positive perceptions of current system

- Science Media Centre approach as ‘honest and intelligent brokers’ was applauded.

Negative perceptions of current system

- Do more to make science results publicly available in an accessible format
- There was often little or no communication to the public at early stages of scientific research
- Limited public profile of leading scientists, particularly in business

Practical steps suggested by respondents:

For Policy Makers:

- Raise public awareness of ethical code of practice
- Continue to support Sciencewise
- Look for ways to enhance informal contact between scientists and the public

For Business:

- Be more open about decisions
- Consider how corporate social responsibility initiatives can be better publicised
- Share best practice

For the Science Community:

- Support and value public communication/engagement activity by the science experts at the forefront of scientific advances
- Give the public and media more information
- Be more open about decisions
- Improve public profile
- Democratise science debates – allow the public to feed in their views

- More informal contact to understand policy makers views better
- Share best practice

Measurement and Evaluation

Responses indicated limited awareness of how current success in Science and Society was measured or evaluated. Any system operating across the UK needed to be coherent and internally consistent.

A scientifically literate population was clearly desirable, but few suitable measurement mechanisms were proposed. Likewise, the need for more graduates with STEM skills was recognised, but no proposals were submitted of how future demand could be accurately measured or anticipated.

Responses also highlighted a general lack of awareness of existing evaluation of:

- The quality control mechanisms for resources, courses, in-school engagement activities etc.
- Current science and society initiatives
- How bibliometric indicators could be built into a more sophisticated and broader approach to measuring science quality
- How to capture fully the depth and quality of engagement in different sectors.
- How to reflect local and regional context

Discussions on possible indicators stressed the value of involvement of the public, the use of international comparators and the benefits of greater collaborative working with social scientists.