Promotion of the Large Hadron Collider project in the UK: Summary report of formative evaluation research

Background

PPARC wants to use the opportunity provided by the Large Hadron Collider (LHC) project to promote particle physics. It is developing a four-year programme with the twin aims of increasing public knowledge of, and support for, particle physic and inspiring young people to choose physics courses at post 16 and subsequent decision points. The principal messages that PPARC wishes to communicate about the project are:

1. This facility – one of the biggest in the history of science – seeks to shed light on some of the most fundamental questions in science
2. It is an exciting international venture that involves thousands of people from dozens of countries collaborating harmoniously; the UK has a leading role
3. There are valuable technological spin-offs from this type of work
4. Scientists want the public to share the excitement of this project
5. All young people, whatever their background can be part of scientific activities
6. British industry benefits considerably from this project
7. The project will tell us fundamental things about the way the universe works at a reasonable cost

The three main target audiences for the programme are the public, policy makers and opinion formers and students aged 14-18. PPARC intends the strategy to make a national impact with these three groups and intends the legacy to be:

- greater awareness in the media of the excitement of particle physics
- a higher level of skill among particle physicists in dealing with the media
- increased awareness in UK industry of the commercial opportunities at CERN
- substantially increased political support for particle physics.

The proposed promotion programme includes TV and radio coverage, a national schools programme, a national touring exhibition, public events across the UK, receptions for VIPs and opinion formers, updating meetings for journalists and a continually updated website.

PSP was commissioned to undertake formative evaluation with adults, teachers and young people to inform the development of the communication strategy.

The Public

Openness

There was strong support for openness. Participants felt that as this is tax payers' money they have a right to know about the work. The need to communicate that the work is being done before there are significant findings was spontaneously emphasised. The rationale for the experiments is also important to engender understanding.

Recommendation: On-going communications about the development and work of the LHC should be a priority.

Recommendation: All communications activity must emphasise the rationale for the experiments.

Physics

Physics is seen in the context of school and remembered as a difficult and abstract subject for people who are 'really clever'. Men tend to be more interested than women. As the discussions progressed participants tended to become more interested, the difficulty in real life is to attract the public's attention in the first place.

Recommendation: Avoid using the word 'physics' in titles or early in communications.

Topics of interest

The main topics of interest were the Big Bang and the origins of the universe. The term 'Big Bang' was familiar to all participants.

"I think it's fantastic. Why wouldn't we want to know where we've come from and why we're here?" Older C2DE Woman

In general participants did not know what antimatter or dark matter are (although they may have heard the terms) and they assumed that scientists already knew about matter, mass and how gravity works.

Recommendation: General communications should focus on the origins of the universe and what happened immediately after the Big Bang.

Research

There is support for blue skies research and participants recognised that it is not always possible to predict benefits. However, there is usually some utilitarian drive behind support. OST/Wellcome Trust (2000) work supports this link between utility and interest.

Recommendation: Communications should, where possible, highlight the potential utility of the project. This may be done by referring to past spin-offs.

Spin-offs

Medical spin-offs and others that will directly affect people were seen to be the most relevant outputs to the public. Interest in other spin-offs is more specific. For example, participants struggled to see how the GRID would be useful to them personally, although they did voice concerns about security when sharing computing power.

Recommendation: When highlighting utility communications should refer to past medical spin-offs.
Recommendation: Communications about other spin-offs should be targeted at specialist media or explicitly set out how 'ordinary' people will be affected.

Concerns

There was a fear of the unknown and of the term 'nuclear'. A few participants were concerned about the safety of the experiments. The phrase 'recreating the Big Bang' caused some concern and led to some confusion with recreating the conditions immediately after the

Big Bang. There was also some concern about the potential for the development of weapons and environmental damage. Mention was also made of possible terrorist attacks.

The tunnel being underground aroused suspicion and some felt that research generally is a rather secretive endeavour. Some participants also commented that that the way in which science is controlled and used is 'intimidating'. Some participants suggested that those with religious beliefs may be offended by the work.

Recommendation: Communications must emphasise that similar work has been done safely before.
Recommendation: Communications should avoid the phrase 'recreating the Big Bang'.
Recommendation: Communications must take into account that not everyone interested in science is unreservedly pro-science.

CERN and the LHC

Few participants were aware of CERN but even those who were did not necessarily know about the technological spin-offs. The UK was presented as a partner in an international collaboration and participants expected that it would be involved in such an endeavour.

Recommendation: Communications should include in notes to editors some background on CERN and the UK's involvement.

Funding

Initially £48 million for the UK's contribution seemed like a lot of money to most participants but put in context it did not. There is an opportunity cost issue for some on how else the money might be spent and for some this is an ethical question.

Recommendation: Communications should include information on the funding and examples of how this compares to other public sector spending in notes to editors.

Communication

Hargreaves, Lewis and Speers (2003) found that the media can be used to get the main themes of scientific topics across but communicating any detail is unlikely. However, we found evidence that documentaries will be watched if marketed/trailed appropriately and this provides an opportunity to explore topics in more depth. Participants expected that a range of media will be used and emphasised that headlines, pictures and human interest capture attention.

Recommendation: The development of a documentary should be pursued.
Recommendation: Communications must tell real stories, include photos and feature real scientists.

Teachers

Physics students

Physics was seen as a male subject, using a male lexicon that is off-putting to many women and reinforces stereotypes. Teachers said that it tends to attract those who like to think rather than be active. Some had examples of how non-stereotypical groups could be drawn-in to physics but emphasised that it is difficult.

CERN

Not all teachers were familiar with CERN, those who taught A level were more likely to be aware of it.

Recommendation: During development of materials about the LHC PPARC will need to establish how much background on CERN teachers require.

A Level

Particle physics is covered in the AS and A2 curricula but not all teachers, even those with physics degrees, have expertise in particle physics. Relevant material would be welcome, including results data from the LHC experiments.

Teachers said that many students study physics at A level as a means to an end rather than because they have a specific interest in the subject. They suggested that the topics covered by the A level curricula could be modified to make the course more engaging.

Recommendation: PPARC should work with the exam boards on syllabus coverage
Recommendation: PPARC should work with the exam boards to identify ways of making LHC resources preferred examples/case studies.

GCSE

The Big Bang is briefly covered at GCSE and is interesting to students.

Recommendation: LHC experiments can be used as extension activities for the more able/gifted and talented or for summer school activities.

It is important but difficult for teachers to be able to explain to students 'how scientists know about the origins of the universe'.

Recommendation: LHC could provide a useful case study for the 'how science works' element of the new curriculum.

Teaching support

Teachers are quite individual in their likes and dislikes but we were able to deduce some general guidelines for LHC school materials. Peer recommendation is a very important dissemination mechanism.

Recommendation: Materials and promotions must make clear where and how they fit within the curriculum.
Recommendation: Materials for students must be available in class sets.
Recommendation: Revision aids and self-learning can be supported by quiz formats.
Recommendation: Posters are valued but should not have too much information, be readable from a distance and be targeted appropriately. Importantly, design and content must both match the target age group.
Recommendation: The development of materials must include market research of prototypes with teachers to ensure that format, design/style and content are appropriate.

Increasingly teachers are searching the internet for material and welcome multimedia approaches but text books and worksheets remain important.

Recommendation: Web-based materials must include tools and images that teachers can manipulate themselves.

The Attoworld theatrical production was felt to be more suitable for the less able students. The more able who are likely to continue with physics are better served by a demonstration lecture, especially if it is presented by a working scientist.

Recommendation: PPARC should not pursue Attoworld. A demonstration lecture should be developed for in-school delivery using the LHC as a means of providing students with access to real scientists.

Careers

Teachers admitted that they were generally poorly informed about the options available to those who study physics at university and said that they would welcome more support.

Recommendation: PPARC should produce careers material targeted at physics teachers rather than at careers teachers for introduction in physics lessons. The LHC project provides a platform for this.

Role models and scientists

Teachers were very keen on being able to access role models, either on paper or the Web but especially in person and said that it is important for students to see 'people like them' portrayed. PPARC has an important role to play in encouraging particle physicists to take on this role.

Recommendation: PPARC should encourage scientists to join the Science and Engineering Ambassadors (SEAs) and the Researchers in Residence (RinR) schemes.
Recommendation: PPARC should developing a kit or pack, possibly based on the demonstration lecture, which can be used by particle physicists to assist them in presentations/demonstrations at schools.

CPD

There was some interest from teachers in learning more about the LHC work for their own CPD but further research is needed on whether there is sufficient demand for a CPD course.

Reaching teachers

Websites and the post are the best way to reach teachers. Individual schools have bottlenecks in their communications but in the absence of full lists of physics teachers, targeting the Head of Science (ideally with their name) is the most effective channel.

Recommendation: There should be a good and easily found website plus direct marketing of free materials to Heads of Physics or Heads of Science.

Students

Physics

Students' views of physics mirrored those of adults. They highlighted that the experiments are less exciting than in other sciences and that they needed something to stimulate their

interest at Key Stage 4. Many questioned the relevance of physics and we found that teachers were challenged in addressing this.

Recommendation: The LHC should be used to show students that physics is not just about learning facts but that there is still a lot to discover.

Careers

The students found the timescales involved in research off-putting when considering careers. They sought careers where they could make an immediate impact. *'…waiting for years and years and doing repeated tests isn't my idea of a job.'*

Some young people had very low aspirations and could not believe that research jobs were within their reach.

Funding

Students were more concerned than adults about the LHC being a waste of money.

Recommendation: LHC project could be used as a case study in debates about spending priorities in the context of science and society or citizenship.

Communication

Young people saw science centres as interesting but educational and they would be unlikely to visit outside of an educational or family trip. Some of the older students said that there is nothing in these venues for their age group.

Recommendation: Any investment in science centres should be targeted at school and family groups, bearing in mind that it is the origins of the universe that will draw in parents and possibly young adults.

Methodology

Eight focus groups were held with a cross-section of the public. All expressed an interest in science but some were concerned about scientific developments. 30 teachers were interviewed either individually or in pairs. All taught physics at either GCSE or A level. Four focus groups with students aged 14 to 18 interested in science were conducted. Fieldwork took place in August and September 2006.