

National Space Academy

Case for Support

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“This year, 100% of our girls achieved C to A with 63% achieving an A or A* [in GCSE physics] which is absolutely exceptional. In the past I asked students at the end of Year 11 if any of them were going to take physics A-level and you’d be lucky to get one. Now, at least a third to a half of those students raise their hands and say, ‘yes, we’re going to take physics post-16’. It is absolutely incredible”.*

Teacher in charge of Enrichment Opportunities, Sir Jonathan North Community College

Executive Summary

Mission Statement

The National Space Academy will:

- produce 18 Space Engineering apprentices per annum from 2014 onward, and multiples of this figure when & where the delivery model with Loughborough College can be replicated
- materially improve student attainment in GCSE, A-level and BTEC science subjects
- materially increase the number of young people choosing science subjects for further study and career progression

1. Space Academy – Précis of Regional Pilot Programme, 2008-11

- 1.1 The Space Academy is run by the National Space Centre in partnership with the Universities of Leicester and Nottingham, and the regional STEMNET and Science Learning Centre. It has a grant of £1m from the East Midlands Development Agency for programme delivery in the three academic years from September 2008 to August 2011.
- 1.2 It supports GCSE, A-level and vocational students and their teachers in their physics, chemistry, biology, geography and applied science coursework using space as an inspirational learning context.
- 1.3 Core annual programming includes the delivery of full day master classes for students and their teachers, teacher Continuing Professional Development (CPD) courses, a Teacher Conference and two Careers Fairs.
- 1.4 It has exceeded all of its volume targets. In three years over 3,000 young people will have taken part in master classes, 225 teachers will have attended CPD courses and conferences and 970 young people will have attended careers events.
- 1.5 The National Space Centre intends to extend its service throughout England from September 2011. **Appendix 1** summarises The Plan, which includes the expansion of Head Office operations in Leicester to serve the Midlands and North of England and the launch of a satellite office in Harwell, Oxfordshire to serve the South.

2. National Space Academy: Core Outputs 2011-15

2.1 In four years the National Space Academy will:

- Produce 18 well-rounded apprentices per annum with an *advanced diploma* BTEC in Space Engineering via a two year course that balances formal learning and work experience

- Deliver master classes in physics, chemistry, biology, geography and applied science to 22,000 GCSE, A-level and BTEC students
- Deliver CPD courses in these subjects to 2,500 teachers
- Organise careers fairs for 2,500 young people
- Increase the awareness of UK space activity amongst 250,000 young people

3. **Evidence of Impact**

- 3.1 The Space Academy team is aware of the need to present quantifiable evidence that it makes a material difference to the size and quality of the UK science & engineering skills pool.
- 3.2 The evidence from the first two years of the pilot programme is hereby presented at four levels in order to distinguish that which is most easily quantifiable from that which may be less quantifiable but no less significant.

Level 1 evidence quantifies the direct output of the National Space Academy in terms of the number of people prepared for employment or higher education in science and engineering via an appropriate, accredited qualification

Level 2 evidence quantifies the number of people whose attainment and/or course/career choice is directly influenced by participation in a National Space Academy course

Level 3 evidence provides testimonies from teachers and students that participation in a National Space Academy course has directly and materially influenced their attainment and/or course/career choice

Level 4 evidence presents external evaluation of the quality of Space Academy programmes and their ability to influence student and teacher attitudes towards, and interest in, science and engineering

- 3.3 In addition, **letters of support and endorsement** are provided by organisations and businesses that have either already benefited from Space Academy output or that anticipate benefiting from it in the future.

4. **Level 1 Evidence**

- 4.1 In September 2012 the National Space Academy will begin the delivery of a two year *advanced diploma* BTEC course in Space Engineering in partnership with the widely-acclaimed engineering department at Loughborough College and with industrial partners. The objective is to launch a course that produces 18 well-rounded engineers per annum fit for apprenticeships or Higher Education.

- 4.2 The course starts in September 2012. The first students will leave in July 2014. From that point forth it will be possible to measure the number and performance of alumni that progress a career in science and engineering.
- 4.3 One apprentice has been put through a Space Academy pilot programme in association with the University of Leicester and a company called Magna Parva. This pilot has been a success. In early dialogue Avanti Communications Group plc, Inmarsat, Zeeko and the University of Leicester have all expressed interest in offering apprenticeships to National Space Academy space engineering students.

5. Level 2 evidence

- 5.1 In order to provide an immediate assessment of impact, six teachers have been asked to quantify any change in attainment and the choice of science subjects by their students as a consequence of participation in Space Academy programmes.

Appendix 2 presents the six responses. It incorporates the following information:

- 95% of students gained the higher Level diploma at Grade C or above. 90% gained an A* or A for their projects, with the remaining 10% gaining a B Grade. In other ICT courses which did not use the Space Academy, 35% of students gained A – C grades
Core Curriculum Team Leader ICT Gleed Girls' CAL & Technology School & Principal Examiner (IT Advanced Diploma) for Exexcel.
- A near tripling of numbers of students gaining the highest grades (A-A*) in Additional Science since support through masterclass programmes began (7% in 2008 to 20% in 2010). An increase in attainment in physics modules since masterclass support commenced, with mean scores increasing from 63 (low C) to 70 (low B) in external assessment
Head of Science, Crown Hills Community College
- A 100% A*-C GCSE attainment for masterclass-supported physics students, with 63% attaining the highest grades (A*-A). Interview evidence shows that prior to masterclass support the general levels of student engagement with, and attainment in, physics was much lower. Interest in post-16 physics uptake has multiplied several-fold (from one student per class to one third of all students)
Teacher in Charge of Enrichment Opportunities and Head of Biology, Sir Jonathan North Community College
- An increase in student attainment through the use of space as a context with masterclass support, with A*-B attainment increasing from 42% to over 50%. An increase in the proportion of GCSE students choosing to pursue post-16 AS science courses (from 33% in 2007 to 46% in 2010)
Advanced Skills Teacher, Robert Smyth School
- Attainment rates (passes) in AS physics (85%) significantly exceeding predicted attainment from student prior attainment (37%). Although this was a

small sample the teacher's professional judgement was that masterclass and teacher CPD were significant factors that contributed to this success
Teacher of Physics, Regent College

- Enhanced attainment by masterclass-supported students in relevant physics modules compared to those physics modules not supported. masterclass support being a significant factor in helping the school achieve an increase in student attainment from Key Stage 2 to Key Stage 4 of three levels
Head of Science, Moat Community College

Level 3 evidence

- 6.1 Space Academy teacher masterclasses have been conducted beyond the East Midlands region on behalf of the new UK Space Education Office (ESERO-UK, funded by DfE and ESA) and the Learning Skills Improvement Service (LSIS). **Appendix 3** includes reports on the LSIS/BIS-commissioned A-level teacher masterclass programme held in 2009-2010 as well as evaluation evidence relating to the impact of Space Academy work for ESERO-UK.
- 6.2 In order to expand on the data provided for Level 2 evidence, one of the teachers was interviewed and asked questions about the impact of the Space Academy. The transcript of the interview is included in **Appendix 3**; the film footage is available on request.
- 6.2 Space Academy programmes have been recognised by Advanced Skills Teachers, School Leadership teams and external support agencies as being significant drivers of enhanced student attainment. **Appendix 3** includes written submissions from the perspectives of an Advanced Skills Teacher (Rushey Mead School), a science teacher (Crown Hills Community College), a Deputy Headteacher (Gleed Girls' Technology College) and an Aim Higher Development Officer.
- 6.3 Two unsolicited student testimonies are included.

Level 4 evidence

- 7.1 Two pieces of external evaluation have been performed during the course of the pilot programme to assess the impact of the Space Academy on teaching methods (2010) and young people's attitudes towards science (2009).
- 7.2 **Appendix 4** presents the results and conclusions from these studies:
- The masterclasses appear to have immediate positive effects on GCSE students' confidence in both understanding and using specific core physics concepts. This effect is still largely present after two months.
 - Students' attitudes became more positive about physics as a career option and largely remain so. They still see the subject as difficult, but are willing to be challenged.

- A-level student data showed rises in confidence that continued across the sampling phases. This effect was particularly marked in questionnaire items with low initial ratings (subject areas that, prior to the masterclass, were identified as being more challenging)
- Delegates attending the 2009 and 2010 Teachers' Conferences were unanimous in their praise for the overall quality of provision, some describing the events as "inspirational" and/or the best CPD (Continuing Professional Development) they had ever experienced.

In pre-Conference interviews delegates showed some concern that they would have sufficient subject knowledge to deal with the presentations and workshops. None expressed similar sentiments after the Conferences having found that their learning was mainly pedagogical and rich in usable ideas in a wide range of contexts.

8. Letters of Support & Endorsement

- 8.1 The Space Academy has delivered programmes on behalf of a number of institutions. A National Space Academy will help develop a bigger and more highly skilled pool of scientists and engineers for UK businesses.
- 8.2 **Appendix 5** includes letters of support from Sue Sissling, Head of STEM Networks for the Specialist Schools and Academies Trust (SSAT) and Prof Tina Jarvis, Director of the Science Learning Centre East Midlands
- 8.3 Also included is a report, including participant evaluation, on the Space Academy's *Space Industry Experience 2010*: an intensive two-week placement for post-GCSE students to work with industrial and academic members of the UK space industry.
- 8.4 Space Academy programmes are delivered by Lead Educators: current outstanding science teachers who are seconded to the project to develop and deliver student and teacher programmes. The Advanced Skills Teacher (AST) assessments, conducted by assessors appointed by the Secretary of State for Education, are included for the Lead Educators in Physics and Chemistry. In 2010, Ms Green (Chemistry) was winner of the Royal Society's Hauksbee Award for Excellence in supporting Science education.

9. Offers of Funding from Industry

Two requests for support have been made to date. Two offers have been made.

A letter offering £25k per annum for four years from Avanti Communications Group plc is included with this executive summary. A letter offering £30k per annum from Inmarsat is pending and will be made available on receipt.