UK Association for Science and Discovery Centres

Summary of Evidence that Science Centres raise science grades and influence students to take science careers

Date: June 16 2011

This document summarises six studies published in the last 2 years which provide evidence that science and discovery centres and museums have a considerable impact on attainment and careers in science. There are a large number of other studies available.

1. IRIS: Interests & Recruitment in Science (2011)

(see more detailed report attached)

IRIS is a major three-year collaborative EU-funded academic research project involving partners in Norway, the UK, Denmark, Slovenia and Italy. The project aims to examine the factors that influence a student's decision to study science, technology and mathematics in higher education. Professor Justin Dillon of Kings College, London has kindly provided us with this interim data along with the attached two page summary of the project and its findings. The project completes in 2012.

The project asked 3666 first-year university students a range of questions about what had prompted them to study STEM, including the following question.

Qu: How important were museums / science centres in choosing your STEM course

- 25% of UK STEM students said that that science centres and museums were 'important or very important' in their decision to take a STEM course*.
- This UK figure is higher than for Italy, Denmark and Norway – see attached report

*this is the latest and final data and an increase on the 23% I quoted on June 1st 2011.

There is further data coming from the project about the relative influence overall of mothers, fathers, teachers, careers advisors and science competitions.

Relevance of this data

That UK science centres and museums have such a strong influence on 25% of those studying science is impressive, particularly because:

- Not all students go to a science centre or museum
- Mostly, they go for only one day - compared with the thousands of days they are at school
- Most are prepared to pay for the experience, and do it in their leisure time so clearly find it a good return on investment

2. The National Space Academy, Leicester (2011)

The attached report contains fuller data

Below is an excerpt from the accompanying 2011 report by the National Space Academy which gives a range of evidence of the considerable impact on students who have participated in its Space Academy Programme. The evidence is wide-ranging, and as an example I include two items of data from two schools who participated in the space academy.

Following involvement in the space academy in one school

- 95% of students gained the higher Level diploma at Grade C or above.
- 90% gained an A* or A for their projects,
- The remaining 10% gained a B Grade.
- In comparison, only 35% of students gained A – C grades in other ICT courses which did not use the Space Academy
  Core Curriculum Team Leader ICT Gleed Girls' CAL & Technology School & Principal Examiner (IT Advanced Diploma) for Exexcel.

The space academy masterclass had this effect in another school

'Since support through masterclass programmes began, we saw a 285% increase of numbers of students gaining the highest grades (A-A*) in Additional Science (from 7% in 2008 to 20% in 2010).

We also saw 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

3. Major Report from US National Research Council of the National Academies: Learning Science in Informal Environments (2009)

Selected quotes from this major 3-year US investigation and report

'Do people learn science in nonschool settings? This is a critical question for policy makers, practitioners, and researchers alike—and the answer is yes.'

'……that structured, nonschool science programs can feed or stimulate the science-specific interests of adults and children, may positively influence academic achievement for students, and may expand participants' sense of future science career options'.

'The committee found abundant evidence that across all venues—everyday experiences, designed settings, and programs—individuals of all ages learn science. The committee concludes that:

- Everyday experiences can support science learning for virtually all people. Informal learning practices of all cultures can be conducive to learning systematic and reliable knowledge about the natural world. Across the life span, from infancy to late adulthood, individuals learn about the natural world and develop important skills for science learning.
- Designed spaces, including museums, science centers, zoos, aquariums, and environmental centers, can also support science learning. Rich with real-world phenomena, these are places

where people can pursue and develop science interests, engage in science inquiry, and reflect on their experiences through sense-making conversations.'

The report also found that not only do free-choice science learning experiences jump-start a child's long-term interest in science topics, they also can significantly improve science understanding among populations typically underrepresented in science.
http://www.nap.edu/catalog.php?record_id=12190#toc

4. Scottish Government-commissioned research (2011):

The Evaluation of Scottish Science Centres

http://www.scotland.gov.uk/Publications/2011/01/11104751/0

Headline: 30% feel their visit to the science centre had changed their overall attitude towards science

The Office of the Chief Researcher, on behalf of The Office of the Chief Scientific Adviser (OCSA) in the Scottish Government commissioned Morris Hargreaves McIntyre to undertake this major study. Visitor surveys took place over nearly 2 years, from October 2008 to August 2010, with publication in 2011. A total sample of 6,054 visitors was included. Amongst the findings were:

1.3 Whilst visitor profile, extent of outcomes delivered and level of satisfaction varied between venues, the overall picture from the two years of research has established that the Scottish Science Centres are family-friendly visitor attractions delivering significant learning outcomes around science.

1.4 The research found that the Centres delivered a wide range of outcomes, from simply providing an enjoyable and social day out, through to more profound outcomes such as inspiring people to change their lifestyle or explore certain topics in more detail. Some visitors experienced significant shifts in perspective, with 3 in 10 feeling that their visit had resulted in them changing their overall attitude towards science.

5. What % of the public go to a science centre or museum every year?

Data from the Public Attitudes to Science 2011 Research (Ref: BIS / Ipsos MORI)

- 22% of people have been to a science museum in past 12 months
- 11% of people have been to a science centre in past 12 months
- 7% of people have been to a planetarium in the past 12 months

Notes: Sample size of 2103 UK adults (over 16). Not clear what the overlap is between these three groups. All 3 Groups are ASDC members.

6. The publications of John H. Falk

Sea Grant Professor, Department of Science & Mathematics Education, Oregon State University

Measuring the Impact of a Science Center on Its Community (2011)

John H. Falk & Mark D. Needham

Abstract: A range of sources support science learning, including the formal education system, libraries, museums, nature and science centres, aquariums and zoos, botanical gardens and arboretums, television programs, film and video, newspapers, radio, books and magazines, the internet, community and health organizations, environmental organizations, and conversations with friends and family. This study examined the impact of one single part of the science education infrastructure, a science centre.

This research of the LA population demonstrated that visitors believed that the California Science Centre had strongly influenced their science and technology understanding, attitudes and behaviours. Interestingly Science Center visitors are broadly representative of the general population of greater L.A. including individuals from all races and ethnicities, ages, education, and income levels with some of the strongest beliefs of impact expressed by minority and low-income individuals.
Ref: Journal of Research in Science Teaching, volume 48:
http://onlinelibrary.wiley.com/doi/10.1002/tea.20394/abstract

School is not where most Americans learn most of their science (2010); The 95% Solution

John H. Falk & Lynn D. Dierking

'The scientific research and education communities have long had a goal of advancing the public's understanding of science. The vast majority of the rhetoric and research on this issue revolves around the failure of school-aged children in the United States to excel at mathematics and science when compared with children in other countries. Most policy solutions for this problem involve improving classroom practices and escalating the investment in schooling, particularly during the precollege years. The assumption has been that children do most of their learning in school and that the best route to long-term public understanding of science is successful formal schooling. The "school-first" paradigm is so pervasive that few scientists, educators or policy makers question it. This despite two important facts: Average Americans spend less than 5 percent of their life in class-rooms, and an ever-growing body of evidence demonstrates that most science is learned outside of school.

The dominant assumption behind much current educational policy and practice is that school is the only place where and when children learn. This assumption is wrong. Forty years of steadily accumulating research shows that out-of-school, or "complementary l earning" opportunities are major predictors of children's development, learning, and educational achievement. The research also indicates that economically and otherwise disadvantaged children are less likely than their more advantaged peers to have access to these opportunities. This inequity substantially undermines their learning and chances for school success.'
Ref: American Scientist volume 98, 2010