THE UK SCIENCE AND DISCOVERY CENTRES

Inspirational science for schools and families across the UK

Dr Penny Fidler
Chief Executive of the UK Association for Science and Discovery Centres

As a nation and as a global society we have some major challenges ahead, especially in relation to climate and energy. More than ever we need our young people to be inspired by science and engineering and to see it as something they want to be part of. This is vital for both our future economic success and societal well-being. Equally we want every UK citizen to feel sufficiently confident with science and the process of science to ask questions, assess evidence and discuss matters and policies that will have a big impact on their lives.

The UK Association for Science and Discovery Centres brings together over 60 of the nation's major hands-on science engagement organisations including science and discovery centres, national museums, environment centres and learned societies.

Together these trusted organisations encourage over 20 million children and adults every year to delve into science in a hands-on, intriguing and personal way. Over ten million of those who participate are female and science centres are signatories of the No10 / BIS 'Women into Engineering and Technology' Compact launched in May 2014.

... Science centres are in all parts of the UK ...

Each year, teachers bring two million school students from all backgrounds to take part in high-tech science practicals, science workshops, discussions and science visits. Science centres are in all parts of the UK and are the UK's largest infrastructure dedicated to inspiring children and families with STEM and supporting school science. They are charitable enterprises embedded in their communities, acting as regional science hubs, with excellent local relationships with schools, teachers, families, university scientists and industrial partners. Largely they are self-sustaining, achieving income through fundraising, entry tickets, and a variety of revenue-generating business enterprises. What they offer is valued highly enough that in most science centres, families and schools pay

ASDC is an educational charity. If you are an MP and would like to find out more or to visit your local science centre please contact Dr Penny Fidler on 0117 915 0186 or the science centre direct. The ASDC National conference is on Sept 24 2014 at the Royal Society www.sciencecentres.org.uk

At-Bristol Science Centre. Courtenayphotographic.co.uk

to visit science centres, and visit repeatedly.

Working together as a national network, science centres can deliver excellent practical science and science programmes to schools, students and their families in all parts of the UK.

As an example of this, The UK Association for Science and Discovery Centres secured funding from the Wellcome Trust to run a national strategic programme *'Hands-on DNA'*. In partnership with three expert science centres, we trained, equipped and supported 15 science centres from Dundee to Cornwall to run high level

... Supporting school science across the UK ...

molecular biology workshops with school students. Students ran DNA experiments and used techniques that are regularly used in labs and hospitals across the UK, and are in the curriculum, but rarely undertaken in UK schools.

Many thousands of students have now done these *Hands-on DNA* workshops. We collected evidence of impact on the first 1,500 students at 15 science centres (half aged 14-16 half aged 16-18). The results from students aged 14-16 after just two hours are shown below:

95% felt it increased their confidence in them being able to understand this area of science

89% felt it increased their interest in science

90% of students had never used this type of equipment before in school

74% felt it made them think that working in science might be interesting

And their teachers said…

100% felt that more workshops like this would increase students' motivation to study science

85% felt that the workshop will have made them more likely to consider a career in science

100% of the teachers said that they would recommend the workshops to their colleagues

100% felt that the workshop inspired their students

80% of a school child's time is spent out of school. To assume that science can only be taught inside a classroom is to give students a very limited view of science, and they miss out on all the excellent opportunities which have been developed to support teachers across the UK. In many countries science centres form an integral part of the national science learning strategy. Indeed, in Finland (which regularly tops the OECD PISA scales in science) student teachers have placements within science centres to ensure all teachers are confident and trained to deliver inspirational science. This approach would be particularly valuable to UK primary teachers.

Hands-on DNA

Schools are, however, the tip of the iceberg. The majority of the 20 million visitors to science centres are families, exploring and experimenting together.

The recently published 5-year ESRC-funded ASPIRES research, on young people's science and career aspirations age 10-14, revealed that the amount of 'family science capital' is key to young people deciding to pursue a career in STEM. One of the major goals of science centres is to build this science capital by engaging young people in science activities in family groups, so the conversation continues after they leave. There is now considerable evidence showing that science learning happens in a lifelong and life-wide manner. We ignore the non-school component at our peril. China has taken this data and invested heavily in a variety of hands-on science experiences that happen in informal contexts as they feel it is vital to the future wealth and prosperity of their nation. They now have the largest science centres in the world.

... science interventions need to begin at primary school ...

The ASPIRES data also demonstrated that science interventions need to begin at primary school to broaden students' career aspirations in STEM. Interventions solely at secondary school are likely to be too little too late.

Science centres champion both these approaches and work with huge numbers of primary students. For example ASDC ran a national strategic programme between 2012 and 2014 called *'Explore Your Universe'* in partnership with the Science and Technology Facilities Council (STFC). The programme aimed to 'inspire a new sense of excitement among young people around the physical sciences by sharing the amazing stories and technologies of STFC'.

... inspiring interest in both girls and boys ...

The project created an exceptional set of equipment and resources, and trained and supported ten UK science and discovery centres to run cutting-edge physics and engineering schools workshops, family shows and meet-the-expert events. The equipment included a solar telescope, a cloud chamber, a thermal imaging camera, meteorites, levitating magnets (using super-conductors), a piece of CERN and even a minidemonstration of a particle accelerator using a Van de Graaff generator. Along with the training academies for scientists and science centres, this enabled a large range of physics experiments to be carried out in science centres.

In the first year, 156,880 children and adults took part in *Explore Your Universe* with their families or schools. Crucially, scientists and engineers working with STFC went into science centres and met families and school children discussing all

sorts of topics including their careers. Over 50,000 children and adults met female and male space scientists, physicists, engineers and technicians through this programme.

King's College London assessed the impact on the first 3,883 students and 369 teachers who took part in the workshops, making it the UK's largest multi-centre dataset of the impact of informal science learning.

One notable finding was that this physics programme had been equally successful in inspiring interest in both girls and boys. 56% of girls and boys aged 10-13 said the workshop made them feel *more* interested in studying science, and 41% said it had made them *more* likely to consider a career in science. This effect was found after just one hour of physics experiments and discussions.

... ensure school children from less advantaged areas visit more often...

Science and discovery centres are keen to do more. They have the capacity and expertise to inspire more families and more primary and secondary students in a creative, innovative and highly cost-effective manner.

They (like ASDC) are charitable enterprises that exist to engage people from all backgrounds with science. They are poised and ready to offer more bursary schemes to ensure school children from less advantaged areas visit more often, and return with their families. They want to inspire girls to get more involved in science, and to run high-end science practicals for which schools do not have the equipment or specific expertise.

Science and Discovery Centres run successful sustainable day to day operations and are nimble and creative in securing mixed income streams to support their mission. However, unlike arts, sports or heritage organisations, future-focused hands-on science and discovery centres are generally ineligible to apply for capital funds from public sources. This poses a major challenge and we are hopeful this situation will soon change,

Excellent and innovative science learning is vital to the UK's future economic success as well as our health and well-being. If we want to keep our position as world leaders in science, we need to invest in nurturing the curiosity and inventiveness in our young people and use every mechanism at our disposal to inspire them – not simply school.

Girls using a Van de Graaff generator in *Explore Your universe*

The Association for Science and Discovery Centres Network