DR KAY YEOMAN

Keeping science in the family

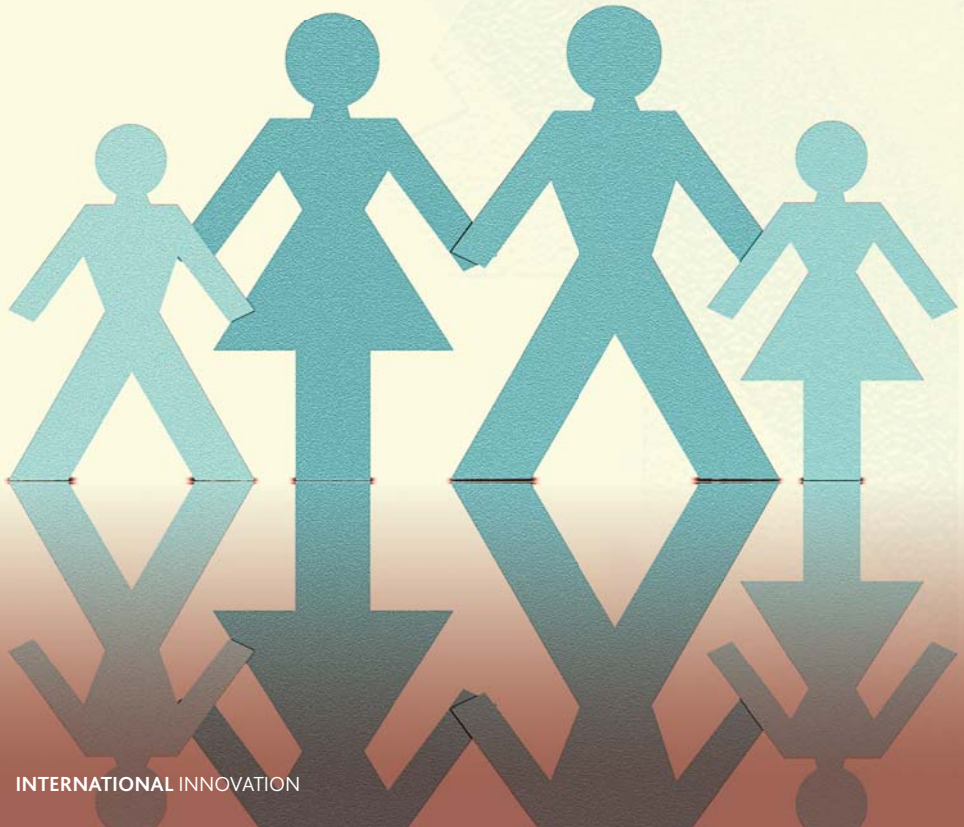
Dr Kay Yeoman at the School of Biological Sciences, University of East Anglia, explains how she is empowering a new generation – and their parents – to take part in a range of biomedical sciences

To begin, could you provide an overview of your research project and explain the process that led you to bring biomedical science to the people of Norfolk, UK?

In 2006-7 I received funding for a workshop on DNA and identity, aimed at raising the aspirations of pupils in 20 rural schools in Norfolk, where traditionally, rates of entry into further and higher education are low. It led me to appreciate how cut off these communities of learners were to city-centre science-related activities, which inspired my application for a Wellcome Trust People's Award, to develop the Mobile Family Science Laboratory (MFSL). The MFSL is a unique and exciting way for children and adults of all ages and abilities to interact with biomedically-related science.

How do you engage with different people through the MFSL?

The MFSL has two main activity strands: science days and longer extra curricular clubs with schools; and family science days. We always ensure that after each session of a school science club, or after a day's science activity, children have something they have made to take home. This could be their DNA (extracted from cheek cells), or a three-dimensional model section of human skin made from foam and wires. This gives a focal point for family discussion, enabling parents and carers to interact with their children informally about their learning. Our family science days consist of activity stands covering different aspects of biomedical science, each one looking at a different concept. Within each stand there is something to do or see, with a scientist acting as a facilitator for the experience.



What was the purpose of focusing on junior school aged children? What is the ultimate aim of the science clubs?

There is strong evidence from the Programme for International Student Assessment that the 'top performers' in science across the OECD countries took part in extracurricular science activities from the age of 10. Children are very receptive to and enthusiastic about science and new ideas at this age, and this can carry through to their transition into high school education, when scientific theory becomes more complex. Our work with high schools is targeted mainly towards 13-14 year olds, when their knowledge and practical skills can be stretched. The ultimate aim of the clubs is not necessarily to encourage more students to study science at university, although that is a welcome outcome, it is about capturing enthusiasm for science at a young age, which will allow these pupils, as adults, to enjoy interacting with the human endeavour we call science.

Could you explain the Crest Awards scheme run by the British Science Association and why it is important to enrol children on these schemes?

The British Science Association manages the Crest Awards scheme and there are three levels: bronze, silver and gold. These act as achievement points in a child's scientific understanding and are highly valued by

children and parents/carers. They are also nationally recognised and endorsed by the Universities and Colleges Admission Service (UCAS), providing good evidence in personal statements for university applications. For a bronze award, the children need to complete 10 hours of experimental work; ideas for activities are provided on the British Science Association website. This is an ideal award for children aged 10-14. The silver and gold awards are more in depth and require a minimum of 30 hours and 70 hours of investigative work, respectively. These awards provide goals and give structure and recognition for hard work.

Lastly, what benefits are afforded to high- and low-achieving pupils by taking part in extracurricular activities?

An important part of inspiring science in pupils is providing extra opportunities. The Department for Business, Innovation and Skills (BIS) funds public attitudinal surveys about science and technology; in 2011, they conducted a survey on young people aged 14-16 in the UK studying for their GCSEs. This study revealed that only 57 per cent of learners had access to science and engineering clubs at school: where there was access, 60 per cent had never been and only 5 per cent attended on a regular basis. The importance of extracurricular activity has been well documented – it provides gifted pupils with an opportunity to be stretched and affords struggling pupils the opportunity to achieve. Extracurricular activities are associated with many positive outcomes, such as increased academic achievement, greater life aspirations and higher levels of self-esteem.

Next stop, **biomedicine**

At the **Mobile Family Science Laboratory**, you can build your own DNA model – and a passion for biomedical sciences. Supported by the Wellcome Trust, it is bringing science communication to the doorsteps of Norfolk, UK

MANY OF US will remember our first exposure to science and scientific ideas from schooling – whether fond memories or otherwise. But the manner in which science is communicated in school settings and, crucially, beyond can have a profound effect on our future engagement with science; not just regarding careers in science, but as well-informed citizens, empowered and curious about science. Based at the University of East Anglia (UEA) which is part of the Norwich Research Park (NRP), Dr Kay Yeoman is leading a project which aims to engage young people and families in biomedical sciences, through events which offer active participation and discussion on diverse and crucial themes. From a health perspective, biomedical sciences could not be more relevant, regardless of whether or not you are a scientist.

For Yeoman, the NRP is an exciting and invigorating place to work as it couples research excellence in the plant and microbial sciences, food, diet, and health and interdisciplinary enviormental sciences with strengths in the humanities and social sciences. The NRP is also fully committed to the public engagement of science. With this in mind, her Mobile Family Science Laboratory has been touring Norfolk, appearing at public events and schools with traditionally low aspirations, in both rural and urban settings. The Laboratory endeavours to communicate with a diverse public, through various different means: "The hands-on science can include looking at human and microbial cells, extracting DNA and learning how mutation in DNA can lead to disease," Yeoman explains. "Citizens are able to participate in discussions and debates over topical issues related to biomedical science, such as full-genome analysis from birth and genetic screening." Furthermore, visitors can take part in specially-developed art in science activities, which provide multiple routes through which to engage: whether verbal, visual or kinaesthetic.

FUN SCIENCE

When asked whether science was 'fun' by Yeoman in a survey, 96 per cent of those questioned at public events responded 'yes' – and a healthy 76 per cent within school events. One new finding in Yeoman's work has been that children enjoy extracurricular science activities or interventions as much within school as outside of it. At the public events, though, she has had the opportunity to observe first-hand the three-way dialogue which occurs between child, facilitator and parent/guardian, termed by Yeoman as 'family centred learning'. Through well-designed activities, the enabling of creativity and engaging presentation, Yeoman has witnessed how appreciative these young people are of the effort that goes into these events.

To enhance the quality of facilitators, Yeoman enlisted the support of undergraduate students on a final year degree module in science communication and also postgraduate students in the School of Biological Sciences at UEA. This – as well as providing them with great experience and a CV boost – was a boon for the events: "The students were brilliant at coming up with new ideas around the broad theme of biomedical science, trying them out and then delivering them to the children," enthuses Yeoman. "Seeing young men and women being enthusiastic about science was an unforeseen benefit for the children; these positive role models were fantastic at breaking down the stereotypical image of 'the scientist'."

SCIENCE CLUBS

As part of the Mobile Family Science Laboratory, Yeoman has developed extracurricular school science clubs for children across Key Stages, selected not for 'ability', but for their enthusiasm. While she recognises that it can at times be

THE MOBILE FAMILY LABORATORY

OBJECTIVES

The Mobile Family Science Laboratory travels throughout Norfolk and also goes to rural hard-to-reach communities. Events provide hands-on biomedical-related science activities for children and adults of all ages and abilities using family learning as the platform.

PARTNER

The School of Biological Sciences, University of East Anglia, Norwich, UK

KEY COLLABORATOR

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DR KAY YEOMAN obtained her PhD from the University of Liverpool in 1992. She then held postdoctoral and teaching posts at the University of East Anglia (UEA) until, in 2006, she became a Senior Lecturer in the School of Biological Sciences at UEA. Yeoman is a microbiologist but she is also interested in how students can gain crucial employability skills by taking part in community engagement. In 2007, she was awarded the UEA Teaching Excellence Prize and was also awarded the Cue East Public Engagement Award in 2010.

challenging to focus the enthusiasm of a room full of children, the results can be astounding: "Children have no difficulty in learning how to use new equipment, they are not afraid to try it out," she explains. "After only a few minutes, we can get children not only using quite complex light microscopes, but also equipment linked to computers, to measure heart rate, for example." Consulting with the school regarding children's previous learning – to ensure that the sessions are relevant and fresh – Yeoman has also worked with a consultant secondary school teacher on the sessions, who helped to refine and target activities.

While some sessions may be pitched to year 6 pupils, Yeoman does not believe in talking down to children about science: "One challenge is to reduce the complexity of language around science. This does not mean avoiding scientific terms, but does mean ensuring terms are explained and that language around them is straightforward," she highlights. With titles such as Totally Amazing Me! and My Visible and Invisible Body, the sessions have invited children to culture microorganisms from their hands, to extract DNA and to measure brain waves and heart activity. No wonder the feedback from parents and participants alike has been so resoundingly positive, with children returning home in their very own lab coat – bought by the project – feeling like a scientist. Indeed, some participants have gone on to be enrolled on the British Science Association's Crest Awards scheme – which could have profound effects on their futures.

CROSS-CURRICULAR LEARNING

The devised activities have straddled both public and school events, with more time in a school setting to go deeper into ideas. 20 schools have been involved in the scheme and over 850 children and young people, at infant, junior and high school levels – with some schools having clubs which ran for a whole academic year. Lending equipment and taking part in school fetes, Yeoman is passionate about the connections they have forged with educators: "We have built up excellent relationships with some of these schools and visit them every year with different types of activities, as well as different themes for science clubs," she enthuses.

As well as straddling science and education, Yeoman believes that the borders between art and science should not be overstated – indeed, one can enrich the other hugely in creating new knowledge and understanding: "Bringing art into science is an example of cross-curricular learning, which can promote creative thinking," she notes. "The philosophy of cross-curricular learning does not seek to dilute each individual subject, but create a system of learning which is greater than the sum of its parts."

POSITIVE OUTCOMES

With the public events reaching some 13,600 people, Yeoman believes the potential of the project – both from these participants and in future schemes of this kind – is enormous: "I would be extremely pleased if this model were to be extended to other counties in the UK, which would require other centres with equipment and props, as well as more scientists trained to work with the resources".

The implications of the project in science communication are exciting – exploring how learning can be enhanced through maximising family interaction – and Yeoman will elaborate further on this in her forthcoming publication, *Science Communication: A Practical Guide for Scientists*, co-written with Laura Bowater and published by Wiley-Blackwell.

Yeoman is fervent about the importance of extracurricular activities and is confident the scheme could reach new heights through lending of equipment to schools and through a proposed 'Passport to Science' initiative: "We have the opportunity to establish a very special scheme with the potential to be a model of national importance," she concludes.

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University of East Anglia