RESEARCH FOR ALL

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Who inspired my thinking? – Young people, and teachers who encourage their creative thinking

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I've had many inspirational teachers and colleagues, but my work in the Institute for Research in Schools (IRIS) is inspired by the young people I teach and meet in schools and colleges. Young people make phenomenal advances in cutting-edge research, and I wonder why we don't enable them to contribute as a standard part of their education. Young people are generators of ideas and innovation, not just passive consumers of facts. Seeing the change in confidence, aspiration and understanding that young people develop when they do real science makes me convinced that if we opened up genuine scientific and engineering research to young people, everyone would benefit.

Many people ask if I had access to this sort of experience at school. Although my teachers were competent, my experience was very traditional, where one teacher even recommended that success in exams could be achieved by underlining notes once in black, once in blue and once in red. I became fascinated by physics when I bought some good books and thought I'd better try and really understand the subject myself. My main inspiration, as for many others, was Carl Sagan's Royal Institution Christmas Lectures – he had tea on Mars, and I thought it would be wonderful to join him there. Closer to home, when I passed my driving test in the sixth form, I drove each week to an astronomy evening class on the Devon coast. After the class, if the sky was clear, I would lie on the cliffs looking up at the stars, just wanting to get my head round the essence of the universe.

Later, at the University of Chicago, where I was working on the foundations of quantum mechanics, I was asked by the inspirational physicist Bob Geroch to present at the Relativity Group Seminar. This was an amazing seminar series where I met, among others, Stephen Hawking. I presented on 'Schrödinger's cat and her laboratory cousins', based on a paper by Professor Anthony Leggett, one of my brilliant tutors at Sussex University, who had moved to Illinois and who I visited to discuss this work. This was a very scary experience for me, but people were interested and asked questions, and even Subrahmanyan Chandrasekhar, the Nobel laureate, stayed. A few, more traditional academics clearly thought that students should not be presenting papers after just six months, and I remember thinking then that if there were ideas to air, then why not? I don't see any connection between age and insight. Knowledge, yes, and expertise, but aspects of science can benefit from people thinking freely, laterally and outside the box. Teenagers are free thinkers, and when given responsibility, they rise to it in an inspiring way.

It frightens me the extent to which young people find GCSE science uninspiring. Is it because there is no scope for them to play their part? In other subjects, such as music, students' views are recognized – they can enhance a performance by their interpretation. Music teachers wouldn't dream of teaching the bassoon by instructing the student to copy exactly the way Mozart's Bassoon Concerto has been played by the legendary Archie Camden. It is much more likely that the student would be invited

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to create their own cadenza. Science has its well-established method but we know young minds are more open to new ideas and taking risks, so why not channel this to add to the STEM effort? Technology and the vast amounts of data in areas such as astrophysics, genomics and particle physics offer opportunities for young people to participate and make valuable contributions.

For example, IRIS is working with the Wellcome Genome Campus on a groundbreaking project where school students are working with leading scientists to map the human whipworm. Together, they are helping to combat a neglected tropical disease affecting millions of children in developing countries.

Another project that IRIS supports is Wellcome's Authentic Biology, which offers students the opportunity to engage with real science alongside university researchers. Teachers are delighted to be involved. As one of the teachers said:

> After leaving research to become a teacher, I sometimes hanker after those moments of discovery at the cutting edge, but Authentic Biology allows me to rediscover these moments alongside young people. After a few years out of research you could feel deskilled and missing out on the latest progress but being involved in Authentic Biology, discussing our research with scientists in the field, allows me to keep abreast of current thinking, which makes me a better teacher.

I am convinced that genuinely embracing school students within the scientific community can lead to breakthroughs. For example, in our TimPix programme, students have the opportunity to study thousands of frames of data representing the radiation environment on the International Space Station. One comprehensive school in Sheffield took all the data and mapped all the points where there were zero counts of radiation on to a world grid. In doing this, they spotted a problem. NASA had a bug in the system. When NASA was informed, it said that it understood this fault and then asked the students for their analysis. The students' analysis showed that the bug was far more common than NASA had appreciated. The story of how a school student helped to discover this issue received extensive coverage on the BBC (www.bbc.co.uk/news/uk-39351833; www.youtube.com/watch?v=LVt6pwmLrFM).

But this is just one example of how young people have been contributing to science. This approach can show young people career progression and opportunities, and give them a real appreciation of 'how science works' because they will be doing science and therefore gaining a better understanding of its challenges.

Having been involved in research, students said:

> This exposure showed me that physics research is happening, even today, and it can be an exciting job. It was the first time I had considered a job exciting. I certainly developed communication skills more than anything else, and the confidence to ask questions.

> I couldn't recommend this more to students and schools; it gives you experience of solving real problems where the answer isn't known, and exposes you to an amazing range of projects and fields that you spend your career working in.

In IRIS, we have evidence for increased aspiration and attainment from schools where there has never been university success in STEM fields. We have anecdotal evidence that undergraduates and postgraduates have felt that the IRIS approach makes teaching more appealing.

In addition, taking part in research is great for teachers. As a teacher, I love physics and I want continually to update my physics knowledge. IRIS research projects enable teachers to develop their subject-specialist knowledge, and the excitement of being at the cutting edge with students is thrilling. I believe this is what teaching should be. If it was the norm that, as part of their science education, young people had an authentic experience of contributing to science, this would change the role of the teacher. The teacher would be walking side by side with the students, understanding new developments and contributing alongside them. Many teachers tell us that IRIS work reinvigorates them and results in more collaborative ways of learning. With a shortage of teachers and a shortage of postdoctoral positions, there might be new routes to embed research work in schools and empower young people and their teachers to be contributing valued members of the science community.

The school experiences I most valued were those when I was given the freedom to learn for myself. I therefore think we need to give young people a greater buy-in to their own education. Young people can think outside the box, approach problems in new ways and realize that they have a contribution to make.

It's not going to be easy, and not all fields in science are equally accessible. I'm not sure whether string theory in many dimensions is something we will be developing as a research project in the near future, but young people continually surprise us, tackling neural networks and machine learning with ease. Let's see what they achieve.

I feel there is already a move towards this genuine form of engagement, where science is part of what we all do, to a greater or lesser extent. I truly believe that by unleashing the brains of our children we can tackle some of the grand challenges that face this planet. Precious little of what we teach in science at GCSE gives students any insight into the process and scope of science. When we do let them do science, they do amazing work and excel beyond anyone's expectations. That's what drives me on with IRIS – if we fail to encourage this large cohort of students to input, we are missing out on innovation and science that will improve our world.

Looking back on my own science career, I was inspired by doing an astronomy evening class, by an inspirational teacher at university, Professor Sir Tony Leggett, by seeing what sharp, clear, lateral minds young people have. This is why I champion authentic research in schools.

Having been committed to exciting young people, and especially girls, with science over the last three decades, I have found that letting them do science is a game changer. That is why I am passionate about this now – I feel we must respect the potential that young people have, and make sure that we support students from all areas of the community to aspire and achieve great things and enjoy their science.

Notes on the contributor

After a physics degree and research at the University of Chicago, **Becky Parker** taught in a variety of schools. She is now Director of the Institute for Research in Schools (IRIS) based at the Science Museum, and her school base is in Sheffield. IRIS supports school students and teachers doing authentic research. Becky was awarded an MBE and is visiting professor at Queen Mary University of London.

References

Colthurst, D.R. and Tuite, M.F. (2018) 'Authentic Biology: Student-led research and discovery in schools'. *Research for All*, 2 (1), 6–15.