STEM Learning UK

SCIENCE EDUCATION IN PRACTICE: TRANSFORMING ASPIRATIONS AND ACHIEVEMENT

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As an experienced Headteacher, Allie Denholm understands first-hand the importance of skilful teaching to raise children's aspirations and achievement. Here she discusses what works – and how to develop great science teachers – drawing on her own experience transforming science education and raising attainment.

WHY SCIENCE EDUCATION MATTERS

What drives me, more than anything, is helping children, especially those facing challenging circumstances. I want to be where I can make the biggest difference - this has taken me from working in leafy semi-rural schools in Sussex to schools in the northeast, working with children in very disadvantaged areas.

Wherever I work, one constant is making sure the children in my school get a great education in science. Children do really well from studying science – it is a powerfully facilitating subject that gives them a great footing for everything else, whatever they want to do next. And children need to understand the world they live in, from environmental issues to the nuances around Covid. Science education empowers them to be great citizens, to look after themselves and their families.

MY JOURNEY IN SCIENCE EDUCATION

In 2005 I had just been appointed as Head of Science in a lovely leafy school in East Sussex. The school had good uptake of science but was a little bit stuck in its ways - I wanted to engage and inspire our students and make science the most popular subject in the school. I was excited, but also a bit daunted and knew I needed support to realise my ambitions. Like many teachers on a leadership path, I went from being a classroom teacher - who had helped to coordinate work but never had to manage staff - to being a manager in charge of 14 teachers and five technicians.

Fortunately for me, I had access to professional development (CPD). The new National Centre for Science Learning was running its first "New and Aspiring Heads of Science" course – exactly what I needed! It was (and is) a highly practical course that blends face to face training with project work that you do as part of your day job – and helps you do that job better. Experienced teachers and leaders shared their experience, including how to get the best out of staff and lead with confidence across all three science subjects. Residentials built peer support networks, sharing experiences to build confidence and knowledge. With this support, I led science to become the most successful subject in the school - GCSE results were outstanding and 80% of sixth formers chose to study science.

HOW TO DELIVER GREAT SCIENCE EDUCATION – DEVELOP GREAT TEACHERS

My own experience showed me the importance of professional development for teachers, the power of CPD to transform outcomes for children. This was the key to success in my next job, as Assistant Head at a school in a deprived area of Hastings. I was asked to sort out science – results were poor, staff lacked confidence and teacher turnover was a problem. It took just six months to turn this around - using CPD to raise teaching quality and staff

confidence, skills, energy and motivation. I invested in leadership CPD for the most promising, which helped us to hold on to them as future leaders who could keep science strong at the school.

I also used CPD to transform outcomes at my next school in South Shields, in a very challenging area where 70% of the children qualified for pupil premium funding and it was difficult to recruit and retain science teachers. With children from disadvantaged backgrounds, it is even more important that their school engages them, raises their aspirations as well as their attainment. We were able to close the gap through a relentless focus on staff development, using CPD to train staff to do a great job of supporting children from disadvantaged backgrounds.

WHAT GREAT TEACHERS DO: HOW TEACHER CPD MAKES A DIFFERENCE

Great teaching starts with the children in front of you – you need the skills to assess and the confidence to adjust to meet them where they are. You need to ask yourself "I'm going to be presenting this concept today. What ideas and experiences am I taking for granted?"

For example, in biology we may be talking about animal and plant species that children have never come across. In South Shields, even though it was on the coast, there were children who had never been off their estate to walk to the sea. Another challenge is scientific literacy - children from disadvantaged backgrounds are typically significantly behind their peers in terms of literacy. Science is littered with phrases and terminology that, from the perspective of the child, feel like they are reading a foreign language, words like species, calibration or momentum. These need to be explained or children will feel bewildered and disengage.

Teachers who have benefited from professional development understand what to watch out for, how to "scaffold" concepts to build understanding not bewilderment. And when such a teacher does (inevitably) overlook something, they will know the signs and have strategies for bringing the students back in. For example, when I moved to South Shields, my first practical with year 11 was carnage. Nothing to do with behaviour, they simply had no idea how to manipulate objects, to use the equipment, because their previous teachers had not been skilled up to teach them this. Children from very disadvantaged backgrounds have often not had the chance play with toys like Lego that teach you how to manipulate objects. Fortunately, I had the skills to step back and adjust, strip it back to basics to build up their skills.

Checking understanding is a key aspect of teaching. Less skillful teachers tend to operate on transmit, rather than letting the children speak - they will ask closed questions that invite one word answers. Skilful confident teachers use open questions – this can feel risky because you may find the children do not understand something and you need to improve or change how you are teaching it. But a skilful teacher is not frightened when a child does not understand – they respond to the challenge of explaining it, perhaps in a different way for the child who did not latch onto it the first time.

WHAT DO WE NEED NOW TO ENSURE A GREAT SCIENCE EDUCATION FOR ALL OUR CHILDREN

I am now Headteacher at a big secondary school in Gateshead where just over half of our children are in receipt of people premium – and many more whose families are only just managing. My mission is to help these children achieve as much as children who are not disadvantaged – developing the skills and confidence of my staff is key. Even with all the other challenges we currently face, I am committed to developing my staff to become great teachers.

Indeed the challenges created by Covid mean that our children need skilful teaching more than ever. We need CPD to support teachers producing online learning, which is a new area for most teachers. Back in the classroom, skilful questioning is key - we need to understand where individual children are in their learning after such a long period out of school. Assessing this through tests would not be good for well-being, but "diagnostic appraisal" - a skilful teacher asking skilful questions - can find out as much as a paper test without risking damage to the child. We also need to be skilful in our choices about what we cover, what to prioritise within the curriculum, what foundation concepts do the students need to build their understanding - this kind of strategic adaptation takes a lot of skill, this is exactly the sort of thing that teachers learn from good CPD..

Our children need skilful teachers more than ever and I know that my school can deliver great science education by developing great science teachers. I hope that the Government will continue to invest in CPD for science teachers – it is transformative. □