

Title: After PISA - real approaches to Science in Wales

Strapline: Verity Jones discusses...

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Following the announcement in December 2016 that Wales had the lowest PISA (Programme for International Student Assessment) scores, with particularly poor results in Science, questions mount with regard to how schools will now move on. The Welsh Government are committed to raising standards, but to date the emphasis has been on the implementation of the Literacy and Numeracy Framework (2013) and, more recently, the Digital Competency Framework (2016), and so a focus on Science has been lacking. While schools must still report on end of Key Stage 2 Science standards, there has been little by way of support provided for teachers to develop their science teaching skills and knowledge. In six years of working within Wales I was never once offered science specific CPD, and my own teacher training consisted of one day of science workshops. I know, having spoken to teachers across the border that similar situations run amock in English schools; with the added pressure of the reintroduction of Science SATS papers in England to contend with, confidence is low.

My question then is this - How are teachers to provide high quality scientific experiences for young people in their classrooms with continued reforms to education and little by way of funding for professional development? How are we realistically going to improve standards?

### [Embedding Science: a case study](#)

As a teacher I have found for many years the science knowledge and understanding of the children I taught in Year 6 was, year on year, being compromised - in part by the pressures of a government focus on maths and literacy and a short sighted approach to how to teach these subjects in a cross curricula way. I knew that in their last year of Primary Education it was unrealistic to fill these gaps. What was required was a fuller integration of science throughout each year group which could be

implemented in a rich task programme, developing literacy and numeracy simultaneously and providing worthwhile content for the Literacy and Numeracy Strategy (a statutory part of the curriculum from September 2013, with assessment against the LNF becoming a statutory requirement from September 2014). As the Science Coordinator for a primary school in Wales I developed a two year rolling plan for the whole school where weekly sessions were planned for all classes, along with an audit of science training needs of staff. With a background in Science I was more than happy to take on the task, ensuring that skills were introduced and embedded in an accumulative way for children and teaching skills and knowledge were developed through peer mentoring, lesson studies and professional dialogue (all embedded in the annual performance management programme and School Development Plan). In addition to this, class support was re-timetabled and every science lesson had a teaching assistant assigned to them. The resulting growth in confidence with regard science teaching was notable, while the themed approach meant that science became the bedrock for the whole school curriculum - all other subjects became the building blocks off it. This was a successful model; it not only ensured science was taught progressively, but it also demanded it be considered within the changing themes and topics. The impact ... year on year improvement in Science standards at the end of Key Stage 2, more confident teachers developing deeper interest in scientific knowledge, and plenty of evidence for cross curricula numeracy and literacy which ESTYN and local authorities were keen to see as the LNF became part of the statutory assessment procedure.

Having looked at the success stories of education in Singapore and Japan, it seems it is this combined emphasis on teachers having a depth of subject knowledge (in order to stretch and challenge learners to engage in deeper thinking), and teaching and learning in context, that sets their system apart. On a micro scale this is what we did in a small school in west

Wales. However, I am well aware that not every primary school has Science specialists, and quite often you only have mention you've watched David Attenborough's Blue Planet and you are the new Science Coordinator. So, the question remains, are there other models which may be successfully used?

### [The Private Sector's role in training Scientists of the Future](#)

The Pembrokeshire coastline is world famous for its beauty, yet the refineries dominate the landscape in Gelliswick Bay. One of the terminals, Dragon LNG, is a receiving, storing and regasifying facility based in Milford Haven, which has two shareholders, Shell and Petronas. One of just three such terminals in the UK, Dragon forms a critical part of the nation's energy infrastructure, providing a link between the UK and its overseas gas suppliers. As part of their community work they fund The Darwin Experience; a small education team who have supported the delivery of STEM (science, technology, engineering and maths) subjects in the area, working with over 33,000 pupils since 2005. The team have offered *free* fieldtrips and workshops to every school in the county, offering whole classes the opportunity to discover rock pools and river, as well as the complex physics of roller coasters at the local theme park. While this broad brush approach has enthused a whole generation of future scientists across the county, as well as provided CPD by stealth (teachers picking up lots of great ideas during the trips and workshops), whether it has seen a shift in standards is questionable.

As a science based employer, it is crucial to Dragon LNG that they have highly qualified employees for the future in the STEM disciplines. With this in mind, The Darwin Experience have changed their approach. Starting in September 2016 the team are now concentrating their efforts on the eight primary schools and one secondary school within Milford Haven. Starting in year four and continuing on until year nine, children will be provided with

bespoke workshops from the team, the teachers being provided with access to experts, as well as curriculum linked resources to assist with the delivery of science in the classroom – the emphasis on literacy, numeracy and digital competency being embedded. Children work with ‘real’ scientists and extend their understanding of what employment in this sector may entail. An online resource library is also being developed, along with a bank of tried and tested resources produced by the teachers as they work through the resources. The emphasis here is on sharing good practise, teachers feeding in to the process annually through review, and providing long term support for children and teachers alike. The scheme has also seen Local Authority support with the Director of Children and Schools speaking directly with Head teachers, encouraging full participation. All are partners in a three way model - Private Sector and Voluntary Sector working together with the Public Sector for maximum impact. But what is the target? This is four-fold. The project hopes to see a statistically significant increase in attainment at year six compared to past data and data from all other school clusters, provide transition opportunities between Science Departments and feeder primary schools, increase the number of children choosing to take Biology, Chemistry and Physics as single Science GCSE, then going on to take and achieve well in the Sciences in further and higher education. Finally, and perhaps most importantly, the project hopes to relate science to children’s experiences and normalise complex theories and languages surrounding the subject.

This project is a long term commitment by the private sector to raise standards, providing CPD and science in context. It is still early days, but the schools involved are incredibly enthusiastic and engaged in the project. Activities which were planned to take one or two lessons, have already been developed into projects spanning a whole term. What was a fieldtrip to the local rockpools of Freshwater West has now become an investigation into

beach litter, considering political, economic, social and environmental implications on a local and global scale. Children and teachers have been inspired to create art, poetry and prose based on their work, they are writing to local politicians and environmental groups, making their own David Attenborough style documentaries – the science is becoming embedded in schools and every child and teacher is benefiting.

### Conclusion:

Education in Wales is under scrutiny. It is also undergoing huge reform and in 2017 schools will be preparing for yet further implementation of new regulations in 2018. This new curriculum will have greater emphasis on equipping young people for life. It is hoped that it will build their ability to learn new skills and apply their subject knowledge more positively and creatively. Undoubtedly these are fine sentiments, but models for real world contexts, communicated by experts, are required. Without the funding for such development from the Government, do we need to be looking towards the private sectors to provide the expertise? Is it time they invested in the future of their companies by assisting with the education of their future employees? Are there industries within your local area willing to invest in the future and create the scientists, engineers and mathematicians of the future? One thing is for sure, our education system has been ranked against the world, the conclusion of which it is failing and the extent to which government reforms in England and Wales have raised standards is questionable. If we want to offer our children world class opportunities, then we need to be rethinking provision for teachers and pupils alike, and looking elsewhere for support.

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