

Theme editorial

Science during primary-secondary transition

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The issues and challenges for pupils and teachers raised and discussed in this Special Issue of *School Science Review* on science during primary-secondary transition have exercised the minds of teachers, researchers and education departments in many countries for decades. The underlying aim of science education for pupils during transition from primary to secondary schooling continues to be continuity and progression in their learning.

Serious attempts have been made to develop science curricula that provide seamless progression in knowledge, understanding and skills across the primary-secondary interface. Assessment procedures – both formative and summative – have been developed at the level of individual schools and nationally to support progression in pupils' learning in science from 5-16 years. Teacher education and training for primary professionals, both pre-service and in-service, has focused on improving knowledge, understanding and confidence in the teaching of science, not only to support pupil development but to attempt to address the concerns of secondary science teachers about the quality of pupils' learning in science in the primary phase, to overcome the widespread belief that secondary school science provides a 'fresh start' for pupils.

Over the past thirty or so years, a number of initiatives have been developed to bridge the primary-secondary gap. A number of these are discussed in the issue, including bridging work and units and classroom assessment strategies. The underlying thrust of the articles presented here is the need for primary and secondary science teachers to work collaboratively to support continuity and progression in pupils' learning in science before and after transition. However, the articles do not avoid discussion of the challenges of lack of opportunity, time, multiple feeder primary schools for every secondary school and teacher confidence in the information shared about pupils' understanding of science at the primary-secondary interface.

Where do we go from here? The answer is still not entirely clear but, as these articles show, there continues to be an appetite for present practices to be improved. Perhaps the time has come to listen more carefully to pupils' views about their experiences and interests in science and to build on this to promote continuity and progression in their learning.

The special issue begins with an article by Martin Braund, whose title 'Oh no, not this again! Improving continuity and progression from primary to secondary science' indicates that this is not the first time that people have considered the issue of transition in school science. He reviews the literature on why pupils so often regress in science after moving from primary school and then discusses bridging work in

which he has been involved. An early model for such work proved hard to use successfully in situations where there are large numbers of diverse and dispersed primary schools transferring to relatively large secondary schools. In response, and undertaken in conjunction with teachers and advisors, shorter Scientific Enquiry Progression Tasks were devised. The most important determinant of success proved to be that teachers near the start of the secondary school talked with their classes to show how what the pupils had done at primary school is now valued and built on in the secondary school.

Karen Kerr focuses on science learning in the outdoors to support primary-secondary transition. She analyses the benefits of outdoor learning through the use of shared learning days with young people across four possible outcome categories: cognitive impacts, affective impacts, interpersonal/social impacts and physical/behavioural impacts. Encouragingly, she found benefits under all four headings and that many of the pupils talked about things they would now do, in relation to transition, as a result of being involved in this project. Secondary pupils said they would look out for and help primary pupils when they saw them around the secondary school the following September, while primary pupils said they were now actively looking forward to going to secondary school and learning science there.

Maurice Galton has worked in the field of school transitions for many years. His article reviews the use of bridging units in science to improve curriculum continuity during transition from primary to secondary schooling. Based on research evidence collected over several decades, it seems that the use of these units rose to a peak around the time of the millennium, but that in recent years few schools have continued with them. Somewhat depressingly, he concludes that the situation has reverted to that which existed in the early studies of transfer during the 1970s and '80s. Most secondary teachers who were observed in a recent study opted for the 'fresh start' approach and many appeared to have only a limited knowledge of (or appeared interested in) the work done in the primary school.

In his article, Michael Allen advocates the use of learning progressions to help tackle issues over primary-secondary transition. Learning progressions are maps of the possible routes that a pupil's thinking may take on the way to the final destination of successful learning of a science concept. The premise is that pupils do not always learn a particular science concept in a single conceptual leap; instead, there are 'halfway houses' of partial understanding that are often useful learning targets that teachers should aim for. An important principle is the view that new learning is always built upon pre-existing concepts.

In her article, Lorraine McCormack reports on the effectiveness of the Cognitive Acceleration through Science Education (CASE) programme as a bridging unit. CASE was selected in part because it was designed for implementation over a two-year period and this fitted with the two years associated with the primary-secondary transition. The study found marked benefits for science reasoning in the intervention schools, compared to a control groups. The primary and secondary school teachers who were involved in the study all reported very positively about their experience of

using the programme and cited the value of the liaison and opportunity to develop stronger links with the teachers from the other school phase.

Much school teaching still fails seriously to take account of pupil views. Colette Murphy, Mary Mullaghy and Alice D'Arcy explore pupils' experiences and views in schools that have adopted innovative practices that aim to empower, excite and inspire children in science. One of these practices focused on explicit teaching of the nature of science, using an inquiry-based science approach; a second involved a 25-week programme in which scientists and primary teachers co-teach 'rocket' science through games, experiments and challenges. Both practices proved to be successful and the paper concludes with lessons the authors had learnt for improving pupils' experience of transition between primary and post-primary science lessons as the pupils experienced and talked about what they had done.

Christine Harrison looks at the importance of assessment for transitioning. As pupils go through their school career, they move from teacher to teacher, whether that is class teachers in primary school or subject teachers in secondary school. While one teacher might build up a good profiled knowledge of a pupil, passing such information onto the next teacher can be problematic, unless time and opportunity is given for the two teachers to meet and discuss the assessment data collected. Current changes in the National Curriculum in England and Wales provide an opportunity for assessment practices, including communication between teachers, to be re-evaluated.

The final article by Keith Skamp looks at assessment practices across the primary-secondary transition in Australia. Earlier studies had indicated that secondary teachers focussed on summative assessment while primary teachers had more of a formative emphasis. Recent professional learning initiatives have encouraged teachers at all levels to enhance their formative assessment skills and some primary teachers appear to be using formative assessment on a more regular basis. However, evidence that secondary teachers are moving in the same direction is unclear.

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