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The strategy of the Primary Science Teaching Trust (PSTT), known as the Flower Model (Shallcross et al, 2015, Franklin, 2016) seeks to support exemplary teaching of science in every classroom in every school in the UK. Exemplary teachers of science at primary school level are at the centre of the flower model forming the PSTT College. However, one of the key stakeholders in the strategy are researchers in the area of primary science education and are referred to as academic collaborators. Why does the PSTT believe that such stakeholders are important? Properly designed and implemented research is vital to shape the direction of the PSTT’s activity and to provide the evidence base for the implementation of innovations in the classroom and to shape national and international education policy. The close collaboration between practitioners and researchers is essential and through the academic collaborator strand we seek to achieve this. The current group of academic collaborators have been working with the Trust and each other under the PSTT umbrella for nearly 4 years; there are notable achievements from early years through KS1 and KS2 and into transition from primary to secondary school as this document will describe.

We use a flower as a model to illustrate the strands and ultimate aim of the Trust.
- At the centre of everything we do is the College; pictured as the centre of our flower.
- Around the centre are the Clusters of schools.
- The petals on the flower represent the Collaborators.
- The Collaborators may change over time, but will always support the Clusters and College in a variety of ways.

"close collaboration between practitioners and researchers is essential"
Introduction

The Primary Science Teaching Trust aims to be at the forefront of research into teaching and learning in primary science. We support and collaborate with a number of academic institutions across the UK. Through their distinct professional activity or research and development in a particular area of primary science, each of our academic collaborators and strategic partners contributes to the overall vision of the Trust. Each collaborator is part of a wider primary science network which helps give us a broader awareness of the challenges in primary science currently faced by schools. This increases our capacity to be responsive to a wide range of issues, to extend our impact and to have influence in education policy and on research initiatives.

The Primary Science Teaching Trust’s model of the College, the Clusters and the Academic Collaborators is unique in that it enables teachers and academics to work together with the shared aim of improving primary science education. This close relationship between excellent practitioners and cutting edge researchers is instrumental in ensuring that we are at the forefront of the development and implementation of effective strategies for teaching, learning and leadership of primary science.

This impact statement demonstrates how we are addressing some of the most pressing current issues in primary science across the UK. Having identified the key issues, we explore their implications and outline how we are responding to them. We describe how our shared networks and collaborative approaches to research and development enable us to continue to be responsive to new challenges in primary science.
a. Status of primary science across the UK

Issues identified

- There is currently no requirement for Ofsted or other inspectorates to focus on science in primary school inspections
- Science does not feature in primary school 'floor standards' and remains outside the dominant markers for accountability
- There is no requirement placed on schools for a specific number of hours of primary science a week

Evidence base

The importance of science education at primary schools is widely understood, and the challenges faced are, in many cases, not new. But in spite of this, there is a growing cause for concern when teachers report that science is now seen as a less important part of the curriculum in many parts of the UK (CBI, 2015).

The process of holding schools accountable for the quality of science provision has been overlooked. The Wellcome Trust (2014) found that science is rarely highly prioritised in school improvement planning or linked to other curriculum development areas.

Implications

- There is a perceived lack of recognition of science as a core subject by many head teachers and school governing bodies, resulting in proportionally less curriculum time, reduced budgets for resources and CPD, and minimal or no investment in developing science as a subject
- Children’s experience of science is narrowed and their progress in science is compromised
- Science is not reported to parents with the same rigour as English and maths

Collaborators’ responses

- Continuing to identify and promote a clear model of good practice in primary science teaching in learning by disseminating Primary Science Teaching Trust activity through:
  - individual college fellows sharing examples of good classroom practice
  - the Primary Science Teaching Trust cluster programme and Scottish Schools Education Research Centre (SSERC), Science and Engineering Education Research and Innovation Hub (SEERIH), and the Primary Science Quality Mark (PSQM) clusters exemplifying the importance and effectiveness of established professional learning networks
  - the academic collaborators’ research and interventions

- Continuing to promote and encourage widespread participation in the PSQM programme to raise the profile of science and develop leadership

- Working with OFSTED in England to develop a portfolio of leading practice for primary science to be used for benchmarking purposes

- Engaging with other stakeholders (including the Association for Science Education (ASE), the Learned Societies, the Wellcome Trust, the Ogden Trust and the BBC) to develop a collaborative voice and to ensure that the Primary Science Teaching Trust will be represented at policy level

Further responses planned

- To support leaders of primary science to develop their skills and capacity to disseminate best practice more widely
- To work with other stakeholders to lobby for:
  - schools to recognise science as a core subject, and to teach it each week for at least two hours a week (in line with the international average) in KS1 and KS2
  - schools to be accountable for the progress made by each child in primary science
  - agreed science content in primary ITE courses
  - a supportive model of school self-evaluation that is verified through inspection
b. Assessment in primary science

Issues identified

- There are no statutory tests for science and no demands to introduce them from the science education community. Judgements about children’s attainment in science is made by teacher assessment
- Teachers lack confidence in making reliable and valid assessment judgments of children’s classroom attainment in science, particularly in science enquiry
- The removal of National Curriculum levels in England conflicts with the pressure on schools to demonstrate incremental progress
- Many schools have resorted to the use of published tests. These vary greatly in their reliability, do not effectively measure attainment in science enquiry and are used for summative purposes rather than as assessment for learning
- Assessments in science are less rigorously moderated than English and maths, both within and across schools

Evidence base

Assessment is identified as the area of greatest weakness in current training programmes (DfE, 2015).

Teachers need much more help in developing their assessment practice (both formative and summative). This is consistently identified, by Ofsted, as the weakest element of professional practice (Education Committee, 2017).

Implications

- Children’s attainment in science is at risk of being unrecognised and/or underplayed
- Lack of clarity or mistrust of assessment data at key points of transition across key stages, leads to limitations on pupils’ progress
- Teachers base assessments on subject knowledge acquisition. This skews the focus of teaching and learning away from working scientifically and application of understanding, towards the recall of information and facts
- Children and their parents see science as set of things to know rather than a way of thinking, acting and solving problems, and finding out about the world around them

Collaborators’ responses

- Supporting the Teacher Assessment in Primary Science (TAPS) project at Bath Spa University to develop clear exemplifications of primary science assessment standards using genuine, moderated classroom outcomes
- Disseminating the TAPS project to give guidance on good assessment for learning practice, and encouraging the interactive use of the TAPS pyramid through:
  - individual college fellows presenting at local subject leader meetings, and at regional and national conferences
  - the PSTT cluster programme
  - academic collaborators’ presenting at national academic conferences
  - PSTT publications
- Developing and disseminating resources and training to give teachers support with building assessment for learning into their practice, e.g Let’s Go! Science Trails and “I can explain!”
- Working with the Standards and Testing Agency in England to develop and evaluate a Teacher Assessment Framework
- Working with Standards and Testing Agency in England to produce exemplification of standards for KS1 and 2

Further responses planned

- To contribute to research and to policy level initiatives around assessment in primary science
- To ensure the outcomes and evaluation data from the TAPS projects are widely publicised
- To work with other stakeholders to lobby for:
  - Clear guidance and exemplification of good practice in assessment for learning which is shared and endorsed by the inspectorate
  - A clearly defined framework for summative assessment and an outline of expectations for the tracking of children’s attainment
  - statutory moderation of teacher assessment in science
  - agreed teacher assessment in science content in primary ITE courses
  - CPD for all teachers in primary science teacher assessment
Primary Science across the UK, 2015-17

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C. Continuing Professional Development for primary science

Issues Identified

■ Many teachers lack the confidence for teaching science that they have for teaching other subjects
■ Science specific CPD is not prioritised in schools, resulting in a lack of access to high quality, bespoke primary science CPD provision
■ There is little or no advisory support available for primary science (through the local authority or other)
■ There is no identified route for career development in primary science
■ The DfE’s (2016) published guidelines for the standards for teachers’ professional development state that CPD should be: focused on improving pupil outcomes, underpinned by evidence and expertise, collaborative, sustained over time, and that all these requirements must be prioritised by the school leadership

Evidence base

Across 17,000 primary schools in England in 2009, there are only 6000 teachers with both a science degree and specialist science teaching qualifications (CBI, 2015).

Decision making about improving the teaching of primary science through professional development is ad hoc, rather than strategic (Wellcome Trust, 2014).

Implications

■ There are limited opportunities for strategic development of science by subject leaders
■ Science subject leaders feel isolated, with few sources of information to hand other than the internet
■ Teachers’ particular needs are not being met adequately and this affects children’s progress in learning
■ School leaders are offering generic CPD in response to the school improvement plan or to current national drives, rather than to teachers’ individual needs
■ Subject leaders resort to ‘holding the fort’ as opposed to innovating and developing their school science curriculum

Teachers who lack confidence resort to ‘safe’ teaching which tends to be limited to teacher directed, factual learning rather than practical inquiry using child-led, open-ended or creative approaches

Collaborators’ responses

■ Continuing to publicise and promote the CPD opportunities offered by the Primary Science Teaching Trust through the Fellows, collaborators, clusters and the website
■ Raising awareness across networks of schools of good quality and affordable CPD opportunities form a range of providers
■ Developing and promoting models of effective CPD for teachers in primary science, e.g. through practitioner research programmes at Oxford Brookes and the University of Hertfordshire, through SSERC’s ‘cookalong’ CPD sessions which can be accessed by schools in remote areas, and through The University of Manchester’s Trajectory of Professional Development framework (Bianchi, 2016)
■ Supporting the creation and development of the Stranmillis Student Teacher College, which requires its members to demonstrate a commitment to their own CPD in primary science
■ Supporting Oxford Brookes University to conduct research in creativity and primary science, and to develop CPD to enable teachers to implement creative approaches to teaching and learning in science
■ Developing and disseminating resources and training to support teachers with delivering science lessons that are cross-curricular and relevant to the real world, e.g. Titanic Science, and the Project 500 and Science in the Media resources created by Queen’s University, Belfast
■ Supporting the University of Hertfordshire’s PSQM which enables subject leaders in individual schools, MATS and other school groups and clusters to audit CPD needs across schools and implement a strategic programme of professional development for all staff

Further responses planned

■ To share more widely the evidence for the effectiveness of the Primary Science Teaching Trust’s CPD programmes
■ To support Fellows in their own schools and beyond to influence and support schools with prioritising and implementing good CPD for staff in science
■ To develop a core CPD unit for the PSTT website that addresses working scientifically. This will be specifically targeted to support student teachers, NQTs and ITE providers, but will also be of wider value to the profession. To evaluate the model of the Stranmillis Student Teacher College with a view to supporting its replication in other ITE providers
■ To contribute to research and to policy level initiatives around CPD and teacher career progression
■ To work with other stakeholders to lobby for:
  ◦ Ring-fenced entitlement for all teachers to high quality sustained CPD in science
  ◦ Availability of a kite-marked range of CPD providers for primary science on a regional and national level
  ◦ Development of an association with secondary/high Schools, teaching school alliances, academy chains and other existing networks and collaborations to share learning, knowledge, skills and resources
Primary Science Networks

The Primary Science Teaching Trust’s three part model of College Fellows, Clusters and Academic Collaborators working together is acknowledged as effective UK wide support for our primary science networks. All our Academic Collaborators share outcomes of their own work, and transfer knowledge across our networks. The nature of support we offer to a network is responsive to its particular needs and context, and is not dependent on local resourcing.

Beyond our own networks, we are working to strengthen and expand existing primary science networks to enable teachers to locate resources, support and expertise more easily. We are working with a range of different networks to develop a consistent narrative for teachers about what primary science ‘is’ and the ambitions for it as a subject in the years to come. This is increasingly important given the current inconsistencies in the provision and coordination of the primary science landscape. It is also particularly relevant in areas where schools can no longer rely on Local Authorities to coordinate primary science networks.

Research and Development in Primary Science Education

Our strategic partnership with SSERC ensures continued support for the CPD of teachers throughout the clusters established in all the Scottish local authorities. Through Bath Spa University’s work the TAPS network has facilitated teachers across the UK not just to access support for assessment, but to contribute to the expanding portfolio of exemplars of good assessment practice. Our support for the University of Hertfordshire enables the PSQM network to include more schools each year, and to ensure that teachers across the UK can continue to be offered access to this highly effective programme. In addition, the PSQM stakeholder group brings together leading organisations in primary science. Schools across Greater Manchester continue to benefit from access to the SEERIH network, with teachers able to access appropriate CPD in primary science.

The Primary Science Teaching Trust aims to be responsive to key national issues for primary science and we are committed to adding to the knowledge base through the promotion and support of research in these areas. Our Academic Collaborators have worked together to identify common themes of research activity and outcomes in order to deliver papers as a Primary Science Teaching Trust collective. As such, we are developing a Primary Science Teaching Trust research profile. Current research themes include professional learning, assessment, creativity and talk. Collaborative presentations at conferences in 2016 include our International Primary Science Conference, and the Cambridge Primary Review Trust conference. Papers for two symposia have been accepted for BERA 2016, and two bids are currently in review for ESERA 2106. Collaborative bids will be submitted for other conferences, and where appropriate they will include participation from College Fellows.

Current Academic Collaborators and Strategic Partners

References

CBI (2015) Tomorrow’s World: Inspiring Primary Scientists
DfE (2016) Standards for Teachers’ Professional Development, HMSO
Education Committee (2017) Oral evidence: Primary Assessment HC 682
Wellcome Trust (2014) Primary Science: Is It Missing Out? Recommendations for reviving primary science

Further Information

If you would like to know more about the Primary Science Teaching Trust’s academic collaboration, please contact the Trust’s Academic Director, Ali Eley ali.eley@pstt.org.uk