



The Modern Science

SSERC's latest publication *The Modern Science Teacher* [1] is designed as an introductory support for new entrants to the science teaching profession.

It is provided to all of Scotland's secondary PGDE science students as part of the Scottish Universities Science School (SUSS) provided by SSERC. It is also given to participants in SSERC's course for probationer science teachers and to participants on leadership and head of faculty courses who will have a role in supporting probationers.

In his foreword Graham Donaldson, author of the report *Teaching Scotland's Future* [2], observes that "It is relevant to all science teachers, irrespective of whether they have recently qualified or have been teaching for many years and is an important point of reference for those whose decisions will set the

BOX 1

A modern science teacher will be expected to:

- have expertise in their science subject(s), pedagogy and educational theory that they keep up to date throughout their career;
- take responsibility for their own professional development and progress;
- contribute to the development of other teachers;
- engage in innovation and change that is based on research, thought through and well planned;
- evaluate the impact of what they do in relation to the improvement of children's learning.

Adapted from the Donaldson report - *Teaching Scotland's Future*.

context for the kind of high quality science education which Scotland's young people need and deserve."

Divided into three parts, part one 'Starting a Career in Science Teaching' covers teaching in a laboratory setting including health and safety. Part two covers 'Developing Science Learning and Teaching'. The third part 'Continuing to Make Progress' covers CPD, action research, and self evaluation and inspection.

The second part 'Developing Science Learning and Teaching' is the largest and most demanding component. Relevant to the new era of Curriculum of Excellence it recognises the classroom practitioner as the driver of curriculum development and improvement. It draws together the key features of learning and teaching, assessment and the principles of curriculum design in science in an integrated way to support the development of a science curriculum suited to the 21st century.

In learning and teaching about science, attention is drawn to the culture of science in drawing conclusions and making decisions based on evidence rather than on opinion. The honesty and integrity of the scientific research involved in presenting results, considering alternatives and contrary points of view by accepting that scientific explanations are always reviewed in the light of new knowledge and experience is also considered. The importance of practical work in science having a clearly defined purpose for learning is stressed. The different possible purposes of

BOX 2

Science practical work can fulfil a number of educational purposes including to:

- illustrate scientific phenomena to support and develop deeper understanding;
- develop competence in practical techniques;
- develop valid and reliable experimental designs;
- generate data for subsequent analysis;
- test hypotheses and draw conclusions.

practical work are outlined (Box 2) emphasising that practical work should be 'minds on' as well as 'hands on'. Curriculum progression is viewed as involving both progression in depth of knowledge and understanding through developing concepts, big ideas and that which is important and powerful to learn in science (Box 3) along with the application of science skills in more complex and unfamiliar contexts as the curriculum progresses.

In assessment, emphasis is placed on the importance of teacher belief that high quality learning experiences will not only stimulate deep and lasting learning but they will also result in higher attainment than emphasis on rote learning, drilling and rehearsal. In short, teaching *for* the test rather than teaching *to* the test. The importance of gathering evidence of achievement to support learning as well as to inform of progress in terms of breadth, challenge and application is also considered as is the importance of school based

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moderation practices to develop a shared and clear understanding of expectations and standards between teachers and learners.

In curriculum design a number of different frameworks for developing a science curriculum are offered from which teachers can develop their own curriculum framework for science. Central to that is the importance of developing scientifically literate citizens (Box 4). Scientifically literate citizens are able to identify the scientific issues underlying national and local decisions and to pose and evaluate arguments based on evidence from which they can apply conclusions to real life situations. Interdisciplinary learning is approached from the point of view that learners should have the opportunity to integrate their knowledge and ways of thinking from other disciplines with their

BOX 3

Why big ideas of science education are important:

- The goal of science education is not knowledge of a body of facts and theories but a progression towards key ideas which enable understanding of events and phenomena of relevance to students' lives.
- Identifying big ideas in science is a natural accompaniment to promoting inquiry-based science education.
- Current school science leaves many students untouched in developing broad ideas of science that could help understanding of things around them and enable them to take part in decisions as informed citizens.

From Harlen W. (2010) *Principles and big ideas of science.education* [3].

science to raise questions, solve problems and offer explanations of the world around them in a way that they could not do with science alone. Emphasis is placed in particular on integrating learning from Health and Well Being, Literacy and Numeracy with their learning in science.

Copies of The Modern Science Teacher can be downloaded from the SSERC website www.sserc.org.uk or printed copies can be requested by email from sts@sserc.org.uk.

BOX 4

The three elements of scientific literacy are:

- how things work - the knowledge of science;
- how science works - how science is done;
- making decisions - what is done with science.

References

- [1] *The Modern Science Teacher - A guide for new and recently qualified science teachers*, SSERC, 2013. www.sserc.org.uk
- [2] *Teaching Scotland's Future - Report of a review of teacher education in Scotland* (The Donaldson report), Scottish Government, 2010. www.scotland.gov.uk/publications
- [3] Harlen W. (2010) *Principles and big ideas of science education*. ASE: Hatfield. www.ase.org.uk

A year in the life of SSERC

For the past few years SSERC has published a year planner which features our professional development courses for the coming 12 months. The most recent version has been printed and copies have been sent to schools throughout Scotland.

As we add new courses the planner will be updated and it can be accessed on the SSERC website.

Copies of the Year Planner can be requested - email us at sts@sserc.org.uk.

