
Proceedings

Learning Journeys in Science for Primary Teachers: A Case Study from the Centre For Science Education: Open University, United Kingdom, 'Primary Teachers Learning Science'

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Summary. *The introduction of the National Curriculum in Science in England and Wales has resulted in a series of new professional demands being made on primary teachers to manage and deliver the science curriculum when they frequently have limited knowledge, confidence and experience of the subject. This has led to significant changes in the emphasis and content of courses which offer opportunities for professional development in learning and teaching primary science. A collaborative initiative between the Centre for Science Education (CSE) at the Open University (OU) and the BBC Education has developed a range of materials to support professional development opportunities in this area. Recent work at the CSE has focused on researching, developing and implementing the first presentation in 1995/6 of a post graduate course based on OU/BBC resources which has been delivered nationally in partnership with Local Education Authority Teams, mentored by CSE members. A workshop at the Maltese Forum for Science Teachers in September 1996 provided opportunities to consider the impact on teachers of the course 'Primary Teachers Learning Science' via the course resources and its assessment strategy. Participants were able to examine course materials and the assessment guide, and to work closely with copies of marked assignments which had been presented as part of the Certificate awarded by the Faculty of Science, Open University.*

Keywords: primary teachers, professional development, science curriculum.

The Open University/BBC Primary Science Project

Over recent years, the CSE of the Open University has gained considerable experience in the in-service education of primary teachers in science with the development of the 'Science for Primary Teachers' course (Tresman et al, 1994; Tresman and Hodgkinson, 1994). The initiative utilised the distance learning techniques of the Open University, in a framework of Government sponsored short course arrangements using Local Education Authority advisory staff.

In developing this course, the project team were building on the OU's experience of teaching science to adult learners with limited formal science background in undergraduate courses such as the 'Science Foundation Course' and 'Science Matters'. This experience had alerted the Primary Science project team to the possibility that mixed media study programmes could be designed which provided science knowledge for the teachers and constructed frequent and explicit bridges between that knowledge and strategies for teaching. In this way, teachers' experiences of learning science could impact on primary practice in a sustained and durable way.

The plans for the new media resources of the BBC Primary Science appeared to complement the CSE's plans for a new course in 1995, so a collaborative team was set up to coordinate the production of all aspects of the teacher's professional development resources. Examples of the full range of resources were introduced

through a series of activities at an additional workshop provided at the Maltese Forum for Science Teachers in September 1996.

The Course

Designing a course which is both accessible and challenging to experienced primary teachers requires explicit links to be made between appropriate selected content and practice, so that the teachers' investment in time and effort in the course will be professionally relevant.

Six workbooks are provided that focus on key areas in science in the primary curriculum:

Life: Diversity and Evolution

Materials: Chemical and Physical change

Forces and Energy

Electricity: Making connections

The Planet Earth

Ecosystems

These are linked with the BBC broadcasts for teachers and children. The Course Team advises Local Education Authority groups on planning training programmes around the materials. Tutorial support is offered to assist teachers' preparation and planning for assessment.

Each workbook takes the reader through a learning process of exploring, planning, implementing, and reviewing in a reflective learning cycle. Such a model for

learning aims to assist teachers to process information, gleaned during the course, and insights gained with experiences during the course to move forward into new learning. The assessment woven into the course is a key element in establishing whether new learning has occurred and whether teachers have been able to graft this onto established practice. Two strands can provide evidence in this respect: personal learning and associated learning strategies and the impact of these on practice in the classroom and school.

Within the opening section of each workbook, explicit statements are offered on general and subject specific outcomes expected after studying it. Performance criteria relevant to each specific outcome are given and guidance on how to use them to map out an appropriate route through the workbook.

Teachers are asked to compile a learning file (supplied as part of the course materials) to enable them to keep a record of their learning journey, through notes, responses to activities, pieces of children's work, results of reflections, group discussions, marked and returned assignments.

Assessment Strategy

Self assessment plays a leading role in evaluating learning. Within the workbooks are embedded activities which develop teachers' skills in interaction with new concepts and ideas in science and science teaching introduced in the text or associated broadcasts. 'Core Skill Activities' develop skills that underpin all learning and are intended to assist evaluation of learning. Responses to these activities may contribute in the process of planning and structuring tutor marked assignments which form the summative assessment of the certificate course. Other activities are concerned with specific concepts linked to the subject areas covered in the particular workbook. These are structures to develop knowledge and ideas, reinforce understanding and provide opportunities to practise using and applying newly acquired concepts.

The Summative assessment comprises two assignments and one end-of-course project. They have a dual focus: on personal learning; how the processes of learning as an adult occur and on professional learning; the use which is made of the subject knowledge within the context of primary teaching in science.

The assignment tasks relate to the aims of bridging personal learning of science and children's learning and classroom and school based activity. The first two are studies of learning and teaching, the third is a project on an aspect on the role of the science coordinator. The coordinator has responsibility for planning and coordination of the science curriculum in his/her school. The first presentation of the course is now complete and the examiners of these assignments reported on the first two tasks as follows:

'Through these assignments, teachers were able to articulate their lack of knowledge and skills at the start of the course and many demonstrated improvements in their first assignment (completed after three months). They described a variety of methods for identifying pupils' existing ideas in science, but many had difficulty selecting effective methods of developing detailed learning objectives for each child in their selected group'.

'In the second assignment, teachers were able to describe the strategies they had developed to increase their knowledge in science and confront difficult concepts. This helped them to identify with pupils as they were meeting new concepts. Teachers revealed increasing confidence in planning and teaching, using their wider knowledge of science to provide a broader spectrum of appropriate classroom activities. Many recognised the beginnings of change in their practice, moving away from 'telling' information and providing highly structured activities, towards more effective questioning and probing children's ideas which diagnosed misconceptions and could be used to plan effective programmes of learning for the children'.

The classroom based research project represents a shift in the level of demand to build on previous work and provides a challenge in the context of whole school science.

A choice of three contexts is provided:

- to write a report on the development of a portfolio of assessed and moderated children's work in one area of science for use in school
- to write a report of a project to plan science in the curriculum over a range of time scales
- to write a report on the planning, running and evaluation of a science school-based in-service training session.

In each case, teachers are required to demonstrate through evidence, how they have translated their own science knowledge and understanding to inform practice in the chosen area.

Since these have not yet been marked, outcomes of the project will be reported in a later paper.

The Workshop

A workshop was provided at the Maltese Forum for Science Teachers in September 1996. An introduction gave a brief overview of project resources and identified needs of primary teachers and how these had been catered for in a series of training programmes and partnerships established between the Open University and Local Education Authorities throughout England and Wales.

The participants were then split into two groups to engage in two activities. A period of 20 minutes was

allocated for each activity. Each group of participants was asked to report on one of these activities in a brief plenary at the conclusion of the workshop.

Activity 1

Participants were asked to review course materials, in particular the six workbooks and comment on opportunities contained therein for guiding teachers' learning about their own and children's learning in science in these key areas of science.

Activity 2

Examples of assignments produced by teachers participating in the first presentation of the course were made available for study. Participants were asked to compile a list of up to six important issues raised by these assignments in the areas of personal learning about science and six illustrating impact of the course on teaching science as demonstrated by the teachers' responses to the assignment tasks.

On reflection

Given the widely contrasting backgrounds of

participating teachers in knowledge of science and experience of teaching it within the primary curriculum, evidence of substantial progress from the starting points of individuals studying 'Primary Teachers Learning Science' has been demonstrated during the first year of presentation, 1995/6. This progress has been in terms of enhanced knowledge of science concepts and how to teach them effectively, an increased appreciation of the processes involved in learning science as an adult and as a child, greater awareness of the organisation problems of effective teaching and planning in school and improved knowledge of resources and equipment and confidence in how to use them.

References

- Tresman S and Fox D (1994) Reflections into action: Meeting INSET needs in Primary Science. *Brit. Jnl. In-Service Edn.*, **20**, 231-244.
- Tresman S and Fox D (1996) *Meeting In-Service needs in Primary Science, using reflective diaries*. An Occasional Paper (No.10) from the CSE, Open University, UK.

SCIENCE TEACHERS' SECTION

The Malta Chamber of Scientists is setting up a Science Teachers' Section. This section shall be responsible for matters concerning the teaching of science in Maltese schools. It shall also be responsible for the organisation of seminars, forums, training courses and publications related to science teaching. Any teachers of science in Malta, from primary to tertiary level, who wish to join, please contact the Secretary of the Chamber at the address below:

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