

The Small Rural School and In-Service Provision in Science

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The theme of this paper is to examine questions related to in-service provision in elementary science in small rural schools in England. It argues that the most effective in-service programs are those which take place in the classroom with both teachers and tutors sharing the teaching, analyses and evaluation.

SCIENCE IN THE CURRICULUM

Over the last few years the importance of science as an element of the primary school (ages 5 through 12 years) curriculum has grown considerably, both at national and at local levels, in the United Kingdom. This growth has been stimulated by a variety of factors, one of which was a U.K. government survey of primary schools [6] in 1978 in which it was found that "few primary schools visited in the course of the survey had effective programmes for the teaching of science," and "the work in observational and experimental science was less well matched to children's capabilities than work in any other area of the curriculum." Such statements had a big impact on the consciousness of all concerned with the education of primary children.

Since the 1960's there has been a growth in books, ideas and materials published both in the U.K. and the U.S. aimed at stimulating and supporting teachers in the presentation of elementary school science but the initial response of teachers was poor. The tradition of science teaching as a characteristic part of elementary school work had not been developed in the same way as many other subjects e.g. math. Science was identified by many teachers as having a low priority in the education of young children. Many primary school teachers in England lacked any effective scientific training and more importantly chose not to seek in-service development in the scientific fields [5].

It has become clear that this unsatisfactory state of affairs must not be allowed to continue, and it has led government to strongly advise schools to include science as a major part of the education of all children during the compulsory years of schooling from entry at five years to the leaving age of sixteen. A recent publication by the Government Department of Education [7] states that "All pupils should be properly introduced to science in the primary school, and all pupils should continue to study a broad science programme, well suited to their abilities and aptitudes, throughout the first five years of sec-

ondary education". Science, once seen as being interesting but peripheral, is now seen as having a central place in every child's education. To produce an effective implementation of this policy it is insufficient to simply offer the directive; a positive and enthusiastic response is required from all the teachers who are to be involved. The task of creating a valued tradition of science teaching in all our schools is a major problem and a challenge to the profession.

Many of the primary schools in the United Kingdom are both small and scattered over rural areas and this compounds the problem. To give a sense of scientific community in rural areas where professional isolation is only too evident is a problem which requires a solution of a different nature to that for the urban school.

PROFESSIONAL ISOLATION

The large elementary and high schools normally found in urban areas are staffed by teachers who collectively have a breadth of expertise and at the same time a high degree of specialization. As a consequence it is relatively easy for the school to identify its own problems associated with curriculum innovation, implementation and professional development. The situation is not the same in the smaller primary and elementary schools which serve scattered communities in rural areas. These schools may have only two or three teachers to cope with all the demands that a school presents. The expectation that teachers in the small rural schools can show the full range of understanding for curriculum change and innovation on the scale envisaged is, in the main, unfounded. Sigsworth [10] observed that whilst teachers in small schools have confidence in their professional and pupil relationships they find the task of curriculum generation daunting. For small rural schools to develop and maintain a breadth and quality of curriculum comparable to that found in the best of the larger schools they require help from outside. Rural isolation limits opportunity for professional contacts with colleagues. Education centres and institutes

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of higher education are often geographically distant, and opportunities for extended teacher release from these schools are made difficult by their very smallness.

A teacher of five- to seven-year-old pupils in a small village school remarked,

I do not attend courses or conferences since I do not know anyone there and I do not feel part of the wider educational discussions.

Such a comment raises several questions about the deep sense of insecurity experienced by the teacher. Such teachers are prepared to continue in their own way until external pressures are brought to bear. These influences are then regarded as an unnecessary form of interference. It may also be the case that such teachers have the feeling that things are so much better elsewhere and that they do not stand any chance of improving their own practice to the same standard of expertise. The skill required to take part in 'wider educational discussions' is gained through talking to colleagues about matters of common concern, and such colleagues are not immediately at hand in the small rural school.

The sense of insecurity becomes acute when isolated teachers are confronted with the need to introduce science into their curriculum. Because of the form of their training as teachers their knowledge of science is likely to be poor; similarly the science which they themselves studied at high school is not appropriate to their elementary school situation. The consequence of this, if the problem is to be solved, is that the roles of superintendents, advisers and in-service tutors in helping to identify areas for INSET work are often far greater than in urban regions.

SCHOOL-BASED INSET PROVISION

That all elementary schools should have a policy for science education is now unquestioned; what has still to be decided is the form such a policy should take. The tradition of school work which is usually present in many areas of the curriculum cannot be relied on for science, so modification of existing practice through discussion with the teachers is not a worthwhile possibility. Such discussion assumes that the teachers have a depth of knowledge, expertise and experience concerning science teaching and learning. This is often absent in small rural schools. Many teachers lack confidence in their ability to teach science, and they feel insecure in tackling any form of discovery or enquiry learning in science. Science is both alien to their nature and to their understanding. Many have a strong aversion to the physical sciences in particular which derives from their own experiences, or in many cases their lack of experiences, whilst at high school and college.

In the early 1970's in-service provision relied largely on courses and workshop sessions where the major activity associated with curriculum innovation was the development of teaching resources and ideas that teachers would then implement in their own schools. This approach achieved, and continues to achieve, limited success. It can

be effective when applied to committed teachers in science, but in many cases enthusiasms generated at courses fail in their classroom application. Bradley [2] concluded that the provision of workshop courses of short duration for teachers new to science failed to justify the effort involved, and it failed to attract those teachers most in need of guidance. These conclusions focus on the critical question for in-service agencies of how to help those teachers with limited scientific backgrounds, training and interest develop an expertise in the teaching of science.

School-based in-service work has a different character to the workshop type of activity referred to earlier. It has a greater immediate influence on teachers and, because of the deeper involvement of the teacher, its effect should be longer lasting. It brings the training into the classroom where change and innovation are needed. It can be seen by both teachers and in-service tutors as being directly relevant to children and uses the available resources in the classroom rather than equipment which is often unavailable in the small school. It allows meaningful discussion to occur since it provides a common series of experiences for both the in-service provider and receiver. It allows the teacher to develop confidence and skills in teaching science through the immediate guidance of the tutor over an extended period, so that teaching strategies, styles and understanding can be modified through continuous reflection rather than through imposed ideas developed outside the classroom. Working closely with the tutor greatly reduces feelings of insecurity when embarking on new studies.

THE INSET PROGRAMME

Norfolk and Suffolk are rural counties in England each with several hundred small village schools having two to three teachers. Advisory staff from both the county education authorities approached the School of Education at the University of East Anglia to see whether school-based courses could be arranged in some of these village schools. The aim was to provide in-service help for those teachers lacking in both confidence and expertise in science. The School already had experience of this type of work in relation to mathematics teaching. Salisbury [9] had offered to teach any mathematical topic requested by the staff of the village schools in which he was working. Such an offer depended heavily on his knowledge and skills as a teacher and also on the teachers being confident enough to be able to identify those areas of mathematics teaching where they thought that such help would be valuable. They already had a degree of basic understanding about the kind of mathematics that was appropriate to their pupils.

The science in-service tutors considered that such an approach would not be so productive, primarily because it was felt that the teachers' experience of science teaching was so minimal as to be a poor foundation on which to build. It was decided that the school-based work should follow a three-phase pattern. Firstly, there would be a period in which the classroom skills of the tutor would

be authenticated in order to win the confidence of the teacher; secondly, a transition phase in which the skills and confidence of teachers were developed so that they would feel adequate to proceed to the third phase which was to be concerned with producing a science policy for the school.

It was decided to prescribe a series of lessons which would illustrate the variety of techniques available, the important aims of science teaching and give a glimpse of some appropriate scientific concepts. Such prescription is contrary to British practice where each teacher is expected to select content, strategies of presentation and choice of resource material within a broad school curricular framework. It was argued that by shifting the responsibility for making such selections from the teachers to the tutors, the former would be able to focus their attention on the process of teaching elementary science and on the development of a conceptual pattern implicit in a science curriculum. It was felt that to ask teachers to select and prepare science teaching activities when they were still unsure of their stance would produce another layer of unease which could destroy fragile confidence. It would be too easy for the teachers to avoid the problem. Once confidence had grown the teachers would be more able to tackle the third phase.

The in-service program was school-based. Each school was visited weekly by one or other of the two science tutors for periods from three months to a full academic year. For each visit a lesson lasting one hour was developed in such a way that a variety of teaching methods, scientific content and processes were illustrated. These lessons have subsequently been published as a series of booklets [1 - 4] to help teachers make a simple start with science teaching. In the initial stages of the program the lessons were delivered by the tutor and later by the teacher supported by the tutor. During the lessons the teacher was able to discuss the work both with the tutor and the children so that there was immediate feedback on many points and after the lesson the tutor was able to draw attention to incidents which he considered to be significant. Whilst the lessons were seen as separate one hour sessions it was found that the work could be developed into wider contexts in other areas of the curriculum. Some of the lessons offered follow-up work within science, but of particular significance were the attempts to link science into mathematics schemes and to see science as an integral part of language arts programming in the schools. Here the traditions in those areas were supportive to the teachers.

There is general agreement amongst most curriculum developers that elementary science should be essentially exploratory, involving children in active investigation, observation and experimentation at their own level. One feature of the Norfolk-Suffolk program was that less emphasis was placed on discovery and enquiry methods which rely on pupils being able to develop ideas and investigations themselves. Many teachers feel uneasy about their abilities to expand the work into open-ended lessons and so the INSET tutors felt justified in prescribing both the scientific content and the method of instruction. A

recent discussion paper on science in primary schools [8] suggests that teaching styles may include individual work, class teaching, group work and demonstration and we feel that the program has used all these techniques. The appropriateness of each technique could be assessed by the teacher in the real situation using children whose characteristics were very familiar. In no sense were the lessons delivered to 'model' children in a perfect environment using ideal resources.

The program has helped teachers to overcome some of the apparent feelings of insecurity and lack of confidence when confronted with the need to introduce science into their work. It has allowed them to closely observe and guide pupils in their experimentation and so has broadened their own experience in designing and carrying out experiments. The presentation of a coherent and balanced course of science lessons has shown teachers how to develop work in elementary science. Prescription alone is insufficient but it is perfectly proper to make small beginnings which can be supported by school-based in-service training. Through their active participation within the classroom the teachers were able to exercise some control over the changes which they perceived as being relevant to their curriculum. Finally they could develop an understanding of those changes through their own teaching.

THE SMALL RURAL SCHOOL AND IN-SERVICE PROVISION

School management is becoming increasingly concerned with curriculum changes and development. Knowledge and methodologies are continuously revised, dictating the nature of the changes. The management in a small rural school is often synonymous with the teaching staff and so the chain of communication is short. It is possible for new ideas about teaching styles and curriculum to be implemented within a very short timescale. This is a powerful advantage of the smaller institution but it does mean that external support is necessary. Short courses, conferences and workshop sessions have a part to play in this process but it is because teachers perceive change more meaningfully when viewed in their own schools that school-focussed and school-based INSET have developed over recent years. Small rural schools can be professionally isolated and have few interactions with new thinking. If such schools are to respond positively to the increasingly complex demands made upon them then it is essential that teachers have access to good facilities and expertise. This is not a problem peculiar to the United Kingdom but is one that is found in rural communities worldwide. How can professional isolation be decreased. How can curriculum innovation be developed in rural schools?

The school-based INSET program offers one answer. Its central features are the priority given to the provision of school-based support in materials, equipment, curriculum projects, consultancy and, most significantly, in a sustained teaching commitment. Material resources alone are insufficient and we would argue that it is only

through activities centered on individual schools that major advances can take place in the personal development of teachers and in the effectiveness of their professional work. The in-service tutor and teacher can, through their jointly shared work, support one another in the classroom and this will lead to greater professional satisfaction and curriculum innovation.

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