IMPROVING SCIENCE EDUCATION IN THE REGION

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The importance of Science and Technology education in improving the well-being of Pacific Islanders is recognised by most governments in the region. Indeed, a number of countries have placed Science and Technology education high on the agenda in their development plans, and are attempting to improve the quality of and access to school science. In all these attempts, a number of issues and problems need to be addressed, although these will vary from one country to another.

My recent observations of science teaching in Fiji and in other countries of the South Pacific indicate that there are several issues that are common to all the countries.[1] Observations of students' and teachers' work in classrooms, and interviews with students, teachers and curriculum officers, indicate that a number of factors contributed to the mismatch between the aims of science curricula and their translation into action.

These included a lack of adequate facilities, including materials, equipment, teaching aids and other resources for learning. It was evident, too, that the use of existing resources was not being maximised. Science teachers, through no fault of their own, were often ill-prepared, coming from inadequate subject backgrounds, lacking the confidence to attempt non-instructional teaching in the methods of scientific enquiry, and indeed often badly briefed about how this kind of activity work would fit into the overall goals of the Science curriculum. Science teachers were also found to work typically under severe institutional constraints, with pressures from high loading, examination expectations, and the need for syllabus coverage, all of which can get in the way of imaginative teaching. Potential support, from experienced Heads of Departments, from sensitive administrators, from ministry officials charged with communicating policy to practitioners, or from in-service courses or subject networks, was often either inadequate or absent. Overall, these problems were if anything more acute in the primary sector where the foundations of an understanding of Science need to be laid.

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In general, the aspects of "in-service training", "resource support", and "feedback mechanisms" which Fullan and Pompfret consider as important for successful implementation of programmes were the ones lacking in the implementation of Science curricula.[2] The problems confronting Science education seem immense at first sight, defying any easy solutions. I strongly believe that in the South Pacific, the most important resource in science education is the teacher, and that the strategies we adopt for solving problems must concentrate on the professional development of teachers. Pre-service education has a part to play in addressing some of the issues, but what is needed is a recognition of the role in-service education can play in improving teaching, curricula, examinations and learning.

Some Ways Forward

Very few teachers I interviewed had had the opportunity to take part in in-service courses or workshops during their teaching career. For the majority, the only training they had received was through the pre-service courses. It is only after being in the field that teachers start to recognise the gap between theory and practice, and that is where the importance of in-

service education comes in. The majority of teachers I spoke to expressed the desire to update their knowledge and techniques but they did not have the opportunity to do so. The ministries need to establish, as a matter of priority, an on-going in-service programme for Science teachers. Such workshops should be problem-centred and based on knowledge of the observed curriculum. The problems teachers face in translating the aims into action, and the "omnipresent gap between *intention* and *realization*" need to be discussed in such courses.[3] Teachers must feel free to reflect on their experiences and to take a critical look at their practice. The emphasis in such workshops would profit from a shift from "how to teach" to "how to learn" because to be a good teacher is to be a good observer, a good listener, and a good learner. As Arons points out:

Time and again in our investigations, we have confirmed the empirical assertion that adults (pre-service and in-service elementary teachers) acquire the abstract reasoning patterns and the conceptual understanding conveyed in the elementary science curricula only by overcoming exactly the same obstacles, hurdles, and difficulties that are experienced by the children - and at no more rapid, and frequently slower, pace than they do.[4]

It is by becoming learners themselves that teachers will be able to understand better the problems their students face. Covering the syllabus is easy but it is "uncovering" it to students that is difficult.

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Opportunities must be provided for teachers to take a critical look at the quality and appropriateness of curriculum materials and examinations in use. Teachers should be made aware of recent research studies on teaching and learning. It might also be useful to expose teachers to science curricula developed elsewhere so that they can compare the approaches used to develop similar concepts. It is not appropriate here to discuss all the themes that might be covered in teachers' workshops. The point being made is that regular in-service courses must be seen as an essential form of professional support for teachers. For such courses to be effective and worthwhile, Science teachers also need to be involved in planning and contributing to them.

Developing a Science curriculum is not simply a matter of writing pupils' books and teachers' guides and supplying them to schools. A number of areas need attention for the proper functioning of the curriculum. Revision of materials based on the observed curriculum and feedback from teachers, establishing support systems for teachers, improving examinations, and evaluating the effectiveness of the curriculum; all these demands call for an increase in the number of skilled Science education personnel in the ministries. But many countries in our region do not have the resources to undertake these tasks. One way to tackle this problem is to identify primary and secondary teachers who have the necessary skills, and use their services part-time to supplement the Ministry's resources. There are further advantages in using this approach. Not only are teachers more likely to relate better to their own colleagues but such teachers can play a role in encouraging the sharing of resources and expertise between Science teachers in different schools. Over a period of time this can create a substantial pool of expertise to draw upon.

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The University of the South Pacific has a role to play, too, particularly through its Distance Learning programmes. Following the drop in the pre-service enrolments in teacher education programmes in the mid 1980s, the Department of Education (now Department of Education & Psychology) at the USP started developing a number of distance education courses and pro-grammes designed to assist the professional development of teachers in the field. There is a great demand in the region for our programmes in Educational Evaluation, Educational Administration, and Guidance and Counselling. We are also developing courses in Teaching and Learning in different subject areas designed to upgrade the knowledge and skills of teachers in the region.

Attempts are also underway to equip regional USP Centres with science laboratories and computers and

to implement the recommendations of a recent survey of science teaching through the distance mode.[5] With the availability of these facilities, science teachers in the region will be able to upgrade their content knowledge by taking science courses offered through the distance mode. These facilities can also be used for conducting in-service workshops for teachers. The availability of computers makes it possible to replace some traditional laboratory experiments with computer-based activities using simulation and modelling. Attempts are also being made to improve the satellite-tutorial facilities for students in the region.

The Media Centre at the USP, and the newly established Centre for the Enhancement of Learning and Teaching (CELT) will also have an important role in improving the quality of our distance education programmes.

Conclusion

We have seen how, in their day-to-day work, Science teachers have to grapple with a number of demands and dilemmas. What Olson and Russell (1984) wrote about science teachers in Canada applies with an even greater force in the South Pacific:

Not all these teachers are trained scientists and not all work with ample resources, but all of them work with large numbers of children whose abilities vary considerably and whose home support varies even more. Teaching children with such a large range of social and psychological backgrounds is very demanding....To ask teachers to change their methods and objectives without first considering the reasons they behave as they do in the first place is unwise, to put it mildly.[6]

Policy-makers, curriculum designers, school administrators, teacher-educators, and teachers - all have a part to play in addressing and responding to these challenges. But I would like my final word to be for the teachers, who have the key role in translating the curriculum. Those who make policies and those who design Science curricula need to be sensitive to teachers' concerns and must seek ways to support and strengthen the work teachers do. As Holt has pointed out:

If we seek to improve the curriculum, we must help teachers to extend their professionalism so that they can identify curriculum problems, generate alternative solutions to them, justify defensible solutions....they are the essential matters on which effective curriculum building and effective learning depend.[7]

It is a challenging agenda, and one that we should face and not avoid.

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