

School Innovation in Science - the development, education and public communication of science in Victorian schools

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Abstract

Schools can be powerful vehicles for raising the awareness and understanding of science not just in their students, but also in their wider communities. This awareness raising is critical in gaining parental and community support for a school's activities, particularly in rural and isolated settings.

For the past three years, the 'Science in Schools Research Project' (SiSRP) has operated across Victoria, Australia in 224 primary and secondary schools with 98 000 students and over 2000 teachers. From this research, conducted by a consortium from Deakin University on behalf of the Department of Education and Training, has come the 'School Innovation in Science' (SIS) program, which focuses on improving teaching and learning in science classrooms. In 2003, 'School Innovation in Science' will be available to another 100 schools statewide.

In many cases, the schools' involvement in the project has acted as a catalyst, providing ways to raise awareness of the importance of science, technology and innovation in industry and the community.

This discussion paper outlines the context in which 'School Innovation in Science' operates. Three case studies provide information about the activities of schools located in the Goulburn North-Eastern Region of the Department of Education and Training. These examples highlight the important role schools play in communicating science to the broader community within the Victorian Education System.

Paper

1. Science Technology and Innovation: a Whole of Government and Whole of State Initiative

The Victorian Government recognises that science, technology and innovation are key drivers of future prosperity and quality of life. The Government supports the ongoing development of a scientifically and technologically advanced Victoria. Committed to building Victoria as a location for world-class science and technology, the Government aims to:

- * create wealth, high skill and high value jobs through innovation in existing industries and fostering emerging industries;
- * enhance and conserve the environment;
- * build sustainable primary industries (agriculture, forestry, mining and fishing) while driving for increased productivity and exports;
- * enhance the health and wellbeing of Victorians.

A range of Government organisations and agencies are responsible for implementing Science, Technology and Innovation programs and projects. Those involved include the Department of Innovation, Industry and Regional Development, the Department of Education and Training, the Department of Human Services, the Department of Natural Resources and Environment and the Department of Infrastructure.

2. 'School Innovation in Science'

As a result of the whole of government focus, the Department of Education and Training (DE&T) has a strong commitment to Science, Technology and Innovation in Victorian schools. The aims of initiative, known as the Science in Schools Strategy, are:

- * to improve the teaching and learning of science and some components of technology;
- * to increase the level of student scientific literacy; and
- * to encourage more students to study post-compulsory science and technology and consider a career in science and technology

To achieve these aims, the Science in Schools Strategy is implementing a range of projects that:

- * support teachers to provide exciting, stimulating and innovative learning experiences for students
- * strengthen the connection between the classroom learning of science and technology and the broader application of science and technology in the community
- * improve student and community attitudes to science and technology

The 'School Innovation in Science' (SIS) program is the result of extensive research and development, carried out a Deakin University Consortium on behalf of DE&T's Science in Schools Strategy. It involved all levels of school communities and used a range of methods including achievement and attitude tests, monitoring of teacher practice, surveys of teachers and students, field notes and interviews. Outcomes from the majority of participating schools have amounted to cultural shifts in approaches to science.

'School Innovation in Science' allows schools to celebrate and demonstrate the relevance of science and technology in everyday life to their students, parents and community.

2.1 Key Features of SIS

- * the SIS Components, a framework for describing effective teaching and learning in science;
- * the SIS Strategy, a process through which schools review all elements of their practice in science, develop initiatives based on their practice in science, and develop initiatives based on their particular needs;
- * Network support, lead by Regional Science Project Officers and Regional Core Team;
- * Training processes and materials, including professional development, a website, research based training and support materials and instruments for driving and monitoring the change process for students and teachers; and
- * Schools' resources, including provision by the school of time release for the science leader and for teachers for planning and professional development.

'School Innovation in Science' can be a catalyst, providing schools with ways to raise awareness of the importance of science, technology and innovation, making schools powerful vehicles for developing understandings of science not just in their students, but also in their wider communities. This is critical in gaining parental and community support, particularly in rural and isolated settings

2.2 The SIS Components

The SIS Components are a core element of the program. They relate to teachers, students and classrooms and strongly reflect current educational trends in student engagement, a thinking curriculum, the use of information and communication technologies and school and community links that reflect an outward vision of the purposes of schooling.

The SIS Components have become instrumental in planning for change within a school's Science Teaching and Learning Program. Based on one or more of these components related to their particular environment, schools develop and implement a number of local initiatives and activities.

Component 1: Students are encouraged to actively engage with ideas and evidence. Component 2: Students are challenged to develop meaningful understandings. Component 3: Science is linked with students' lives and interests. Component 4: Students' individual learning needs and preferences are catered for. Component 5: Assessment is embedded within the science learning strategy. Component 6: The nature of science is represented in its different facets. Component 7: The classroom is linked with the broader community. Component 8: Learning technologies are exploited for the learning potentialities.

The following three case studies highlight the contribution schools in the Goulburn North-Eastern Region make to raise the awareness of science in their communities. This is a result of their involvement in 'School Innovation in Science'

3.1 Case Study One: Implementing Component 3 - Linking science with student's lives and interests

Myrrhee Primary School is a small rural school, located in the King Valley, a premier grape growing and wine making region in North-East Victoria. The school's 32 students have been involved in a number of innovative science programs.

The Principal believes that the lead up to the grape harvest in the area is a perfect time to involve students in the science of everyday work on the farm. This period is a great opportunity to participate in science investigations that explore the differences in the grape varieties grown locally.

Using some basic testing equipment, such as pH meters and refractometers, students drew up charts describing important grape characteristics - colour, smell, skin thickness, pips, pH level and sugar level – and product potential from bunches and berries. Students produced advertising brochures outlining their services and then tested samples provided by parents. Other fruits can be tested using these same processes.

Earlier this year Myrrhee Primary School was chosen as one of seven Victorian schools invited to the Australian Innovation Festival held at Scienceworks in Melbourne. Here they demonstrated their innovative Grape Science Program. Many students are now considering careers as scientists in the viticulture industry.

Myrrhee Primary School participated in another project, the 'Dreams and Schemes Awards - Students as Innovators'. This provided an opportunity for students across Victoria, encouraged by their teachers, to discover and develop an innovative scientific idea through a problem solving approach, supported by investigation and basic research. Top student entrants, with the help of commercial and science mentors, had the opportunity to develop their science and technology ideas to potential commercial development. Several prizes in this competition, including the 2002 Super Science School, were awarded to Myrrhee Primary School for their ideas. Many of these related to grape growing.

Students from Myrrhee have also investigated the use of plastic bags in the community and they set about creating a plan of action. From interviews of shoppers and the manager of their local supermarket, they found that consumers use a staggering 40,000 plastic bags each week. The students researched viable alternatives to plastic bags.

They discovered that the best alternative - bags made from calico were usually imported. The students sourced an Australian producer of environmentally friendly calico bags and initiated contact between this company and the supermarkets in their area.

They students shared their findings with the community at large via interviews with local newspapers, television and radio programs, posters, leaflets and a letter to their local member of parliament. Through their project, the Myrree students directly influenced 57% of local families who are now using alternatives to plastic bags when shopping.

http://www.myrreeps.vic.edu.au/to_date.htm
<http://heraldsun.news.com.au/printpage/0,5481,4977157,00.html>

3.2 Case Study Two: Implementing Component 6 – Representing the nature of science in its many facets

Science is a significant human enterprise with varied investigative traditions and constantly evolving understandings that also has important social, personal and technological dimensions. The successes and limitations of science are acknowledged and discussed.

Earlier this year eight communities nationally, one in each state/territory, were selected by the Australian Science Teachers' Association (ASTA) to develop, trial and evaluate a science awareness-raising model. Applications were called for from schools that could form a community, to work together to promote science literacy in an appropriate way for each community. Ovens College in Wangaratta was the successful Victorian applicant.

The community group consists of two research schools, Ovens College and Yarrunga Primary School, Merriwa Industries and Parks Victoria. Together these organisations developed a community awareness of the Wangaratta Grasslands Common, a large remnant of Northern Plains Eastern (wet) Grassland, unreserved elsewhere.

Though ecological monitoring, students from the schools involved help to protect this viable representative sample of the state's natural environment. To increase the community's awareness of the science involved in such ecological protection, projects such as community information sessions, wildflower tours and the development of information boards are being development.

3.3 Case Study Three: Implementing Component 7 – Linking the classroom to the broader community

Through their involvement in SIS, some schools have made a variety of links between the classroom program and the local and broader community. These links emphasise the social and cultural implications of science, placing the learning of science in a wider, more relevant context for students.

The Waste Wise Schools Program, an initiative of Eco Recycle Victoria, has been set up to help schools achieve a whole school approach to waste and litter education. The program integrates curriculum and waste conscious school operations. This offers not only educational benefits and reduced environmental impact, but also cost savings to the school and, in many local communities a significant change in attitudes and actions in relation to waste management.

Rutherglen Primary School, a small rural primary school of about 200 students has won many awards for their Waste Wise projects. The students themselves instigated and administered many of these. For example in 1998, the school used two pallets of paper (about 400 reams) of photocopy paper, at a cost of about \$2,200 for the year. This equates to nearly 1000 sheets of paper per student. In 1999, the school developed a simple paper reduction strategy as part of a wider waste wise school program.

The school's initial aim was to cut paper use by about 10%. However, the strategy proved to be so successful, that the school achieved a 50% reduction, using only one pallet of paper (200 reams) for the year. The school estimated that this saved \$1,100 in the cost of buying photocopy paper and a further \$1,300 in savings in the cost of running and maintaining the school's photocopier, a total for the year of \$2,400. If savings in electricity for the photocopier were considered, this figure would be even higher.

Rutherglen Primary School is also a Waste Wise support school, which means it receives additional benefits in return for providing assistance to other schools to set up waste and litter education programs

<http://www.rutherglenps.vic.edu.au/>

4. Summary

"Innovation is about turning Australian ideas into more jobs and higher wages in Australia. It is one of the keys to our prosperity in a world that is increasingly competitive and technologically advanced." John Howard, Prime Minister of Australia, 'Backing Australia's Ability'

As science communicators, Victorian schools are perfectly positioned to enhance the community's ability to understand, communicate and use science and technology. This ability will have a significant impact on the economic, social and environmental well being of Australian society.

References: References:

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