2008

Real-world soil science for Senior Chemistry students: acid sulfate soils

Summary

Senior school students can now explore soil chemistry through real life studies of acid sulfate soils in Queensland and their toxic effects on the environment because of a NRW and Education Queensland partnership. Soil chemistry, up until now, has been absent from the school curriculum.

NRW chemists and soil scientists at Natural Resource Sciences (NRSc) worked with a Senior Science Officer (SSO) and two teachers from Education Queensland (EQ) to design a teacher professional development module on acid sulfate soils. This project was to promote soil science as a context for Queensland Senior Chemistry school classrooms. It arose from discussions between the Australian Soil Science Society – Queensland sub-branch and the Science Teachers' Association of Queensland (STAQ) in 2006.

The module was designed as a state-wide resource to train novice teachers in the use of acid sulfate soils (ASS) as a 'real-world' context for teaching basic chemistry concepts (e.g. acid-base chemistry) and chemical laboratory techniques (e.g. titrations). The resource is also available to non-EQ schools through the involvement of STAQ. NRSc staff helped to present the teacher workshops as guest 'experts'. The professional learning resource can also be used by university staff for pre-service teacher education. Pre-service teachers are a useful distribution mechanism for the materials because they are generally posted across the state.

Objectives

The project objectives were to:

- train teachers in basic chemistry concepts using ASS as a context
- provide teaching resources on ASS for Senior Chemistry classes
- train teachers in basic laboratory techniques
- promote soil science as a career option to senior high school students.

The Project

The project was overseen by an advisory group comprising EQ and NRSc staff and was actively supported by the relevant Directors and managers. It was able to build upon existing community engagement presentations used by the Acid Sulfate Soil team around the state.

EQ staff in this project was funded by EQ's Science Education Strategy which also funded most of the teacher workshops. Once the professional development module was developed, the implementation and review phases of the project have been largely driven by the EQ Senior Science Officer (SEQ).

The involvement of NRW staff was facilitated by NRSc project officers as part of an Enterprise Learning project funded by DEST (now Department of Education, Employment and Workplace Relations) and the EQ-NRSc Schools' Partnership project.

Five teacher workshops have been held since early August 2007 in Brisbane, Cairns, Gold Coast and Sunshine Coast. One conference workshop was also presented in 2007. More workshops are planned for 2008 in Capricornia and Brisbane. A full half day workshop will be presented at the National Science Teachers' Conference on the Gold Coast in July 2008. The use of acid sulfate soil context for Senior Chemistry is currently on trial at Caloundra State High School.

A CD containing the professional development and classroom resources on acid sulfate soils is continually updated and used for training teachers at these workshops. The introduction to the teacher professional development workshops focuses on the remediation of an acid sulfate soil affected area in East Trinity Bay in North Queensland.

Results/Evaluation

Over 120 teachers have participated in the workshops to date. The participants provided feedback after every workshop. Their comments indicated that the teachers found the workshops valuable and their suggestions for improvement were incorporated into subsequent workshops.

From teacher feedback the first three objectives have been achieved. The last objective, to promote soil science as a career option to senior high school students, will require longer term monitoring.

The unexpected outcomes from the project include:

- the inclusion of a field trip to demonstrate sampling techniques to teachers and students
- the invitation for teachers to attend other field trips organised by Departmental (NRW) staff
- more resources for the CD including video demonstrations
- positive media coverage of the project activities in Cairns
- scientists gaining confidence and knowledge in their own field
- professional stimulation for teachers.

Because this project was not funded under a specific program, it has no imposed parameters other than the project aim. It was built from the 'bottom up' on the basis of on-going consultation and evaluation and has tended to evolve rather than start with a very structured project plan. The implementation phase has been contingent on the capacity of staff to donate time to the project.

Sustainability

Currently there are plans for the project to continue until December 2009 when funding for the EQ SSO role finishes. There may be future opportunities under the new Science, Technology, Engineering and Mathematics initiatives, yet to be announced. The professional development module on CD is a transferable product that can be used by any agency with expertise in ASS.

The workshops outside South East Queensland have been organised by the relevant regional Senior Science Officers. The Griffith University (Gold Coast) 'Science on the Go' program hosted the Gold Coast teacher workshop. Other agencies such as Terrain NRM regional body have helped to promote the workshops and resources. The resource is only relevant in areas affected by acid sulfate soils. This may yet include inland areas in which ASS have now been identified.

The approach taken in the ASS project is an effective and transferable model for similar projects seeking to link schools and scientists. Other government departments and professional associations have expressed interest in the ASS model as a cost-efficient way of promoting their science.

Summary of lessons learnt

The success of the project is a product of the enthusiasm and goodwill of the staff involved. The NRW staff contributed their time in addition to their work duties. The active support of managers is absolutely vital to the success of the project. There is currently no allocated time in existing NRW projects for school programs.

The two teachers who worked with the scientists to develop the resources found the experience professionally stimulating. The teachers felt their educational expertise was valued and respected by the scientists. The teachers' contribution was to create a product that met teachers' needs and could be implemented in an average school environment.

There is very little professional development provided for chemistry teachers and the teachers who have participated in the project were very appreciative of the opportunity to participate. Although, NRW staff reported that some teachers seemed to mildly resent NRW staff advice in the practical sessions.

On the positive side, NRW staff reported that they also found the project professionally stimulating. They:

- learned alternative techniques from the teachers
- gained new knowledge while working with the scientist from other areas
- deepened their understanding of their own field of expertise

- developed confidence in delivering presentations and working with people outside their field.

The NRW staff indicated that they were keen to continue to assist with the project.

The funding allocated to the project to date has been quite modest, given the outcomes achieved because existing resources and networks were used. The EQ staff members who assisted in organising the workshops are skilled in this area and were able to pull it together with very little fuss.

The scientists do need a structured timeline with plenty of advance warning to accommodate the project activities in their work schedules. They also require guidance from the teachers about the relevant curricula and equipment available in school laboratories.

Where to from here

It is hoped that this model can be used to develop additional resources for teachers. This project provides an example of the value of:

- integrating community engagement strategies with school engagement strategies as an alternative promotional strategy for departmental initiatives
- effective cross-department collaborations for enhancing existing departmental programs.

There is active interest from other groups in NRSc and in regional areas to promote the science they are doing. It may also be possible to develop resources in collaboration with NRM regional bodies and other agencies.

Contact

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