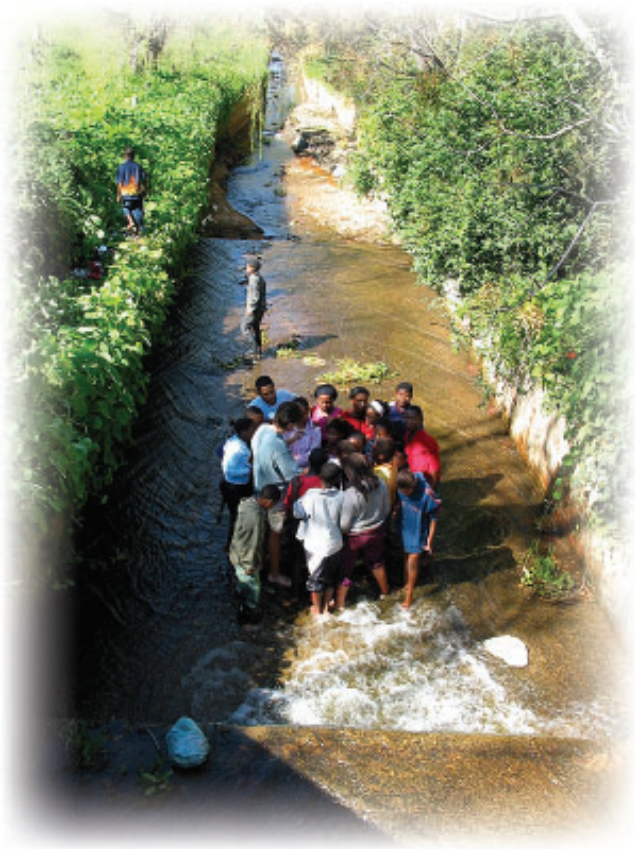
Water Analysis Kit Promotes a Healthy Environment

The water education project SWAP – kick-started in 1992 with funding from the Water Research Commission – is still going strong in the Western Cape.
***Sue Matthews** reports.*

The Schools Water Project (SWAP) makes use of a simple water analysis kit to raise children's awareness about the need for a healthy environment. At the same time, it promotes other important outcomes such as critical thinking, problem-solving, effective communication and team work to achieve a desired result.



"The kit is actually a resource for both learners and teachers," says project leader Dr Chris Reddy, of Stellenbosch University's Faculty of Education. "The SWAP tests are learner-centered, hands-on and investigative, but we're also interested in the professional development of science teachers to enable the new curriculum."

NATIONAL CURRICULUM ENVIRONMENTAL EDUCATION

The Revised National Curriculum Statement has a strong focus on environmental education, and also requires more learner-centred approaches to teaching. However, its implementation may be hampered by the lack of capacity of many teachers, and a shortage of learning support materials. Dr Reddy and his team hope to address this by helping teachers to understand the curriculum statements and providing them with support material for environmental education.

SWAP

The SWAP kit consists of a 'jam-tin' containing items such as sampling vials, litmus paper, a plastic pipette, a turbidity disc and a bottle of methylene blue, as well as a series of A1 posters that can be folded and set up as 'labs' in the classroom. These cover aspects such as basic scientific tests for nitrates, turbidity, oxygen and pH; historical research with tips on interviewing skills; an assessment of the catchment area and the health risk posed by the river's water quality, and water life observations, with a bug-dial to identify invertebrates that can be used as biological indicators. In addition there is a teachers' guide containing user-friendly worksheets that can be photocopied and taken on field trips to nearby rivers or canals.

The teachers - currently representing 18 disadvantaged primary schools in the Steenberg, Grassy Park and Retreat areas of Cape Town – are also given training and additional support by the SWAP team.

"After conducting initial workshops on how to use SWAP as a learning support material, we take the teachers on river visits so that they can do a trial run, and then provide further support by accompanying them with their class to the river. Once the year is over, schools should be able to run with the project themselves," explains Dr Reddy.

SHUTTLEWORTH FOUNDATION

This year the project is being funded entirely by the Shuttleworth Foundation, established by South

Learners (top) proudly show their SWAP "jam-tins". The SWAP kits are used for water quality monitoring. Bottom: Searching for bugs that could indicate a river's "health".

Africa's home-grown astronaut, Mark Shuttleworth, in October 2001. The Foundation aims to improve the quality of education in South Africa, particularly in the subject areas of maths, science and technology at school level. Funded projects must be curriculum-aligned, and provide innovative solutions to educational challenges in an African context.

"We're making explicit curriculum links with SWAP, particularly the science curriculum," says Dr Reddy. "The project is endorsed by the Western Cape Education Department's EMDC South – the district under which the 18 schools fall – and having this formal legitimacy gives it added credibility with teachers."

He explains that Fadli Wagiet, the natural science curriculum advisor for EMDC South, highlighted the links between SWAP activities and the science curriculum at a workshop in May attended by 65 teachers. He showed them how to use the resource as part of their normal teaching, rather than seeing it as 'add on' task.

"SWAP activities can also be made applicable to other learning areas too, such as art, language and social sciences, so it's really cross-curricular," adds project facilitator, Andre Rowan.

The current version of SWAP dates back to about 1997, when the potential use of this resource in implementing Curriculum 2005 became apparent.

Since first being established in 1992 by Prof Danie Schreuder of the University of Stellenbosch and Dr Rob O'Donoghue of the then-Natal Parks Board, the SWAP kit has undergone a continuous process of evolution. Spawned from the low-cost water quality monitoring procedures developed by the Global Rivers Environmental Education Network (GREEN) founded by Prof Bill Stapp in Ann Arbor, Michigan, it was initially aimed at high-school level. In fact, SWAP originally stood for the Stellenbosch Water Analysis Project, as it all began with seven high schools in the town's Eerste River catchment.

WRC

The WRC funded the project for the first three years, but other roleplayers like WESSA, Umgeni Water and Rand Water later came on board. With wider implementation came a name change to Schools Water Action Project, and resource materials were soon being distributed countrywide as Share-Net publications.

The first SWAP kit enabled learners to test for chemical indicators such as nitrates, phosphates, organic solids and biochemical oxygen demand, physical indicators like turbidity, temperature fluctuations, stream velocity and flow patterns, and biological indicators such as invertebrates, alien vegetation and faecal coliforms.

SAFETY

Later, Rob O'Donoghue developed a simpler version for primary schools, using plant and animal life in the river to assess water quality by 'reading nature', rather than conducting actual measurements.
"I became concerned about the safety of the original kits," explains Dr O'Donoghue. "The test for dissolved oxygen used some fairly

Swap facilitator, Andre Rowan, demonstrates one of the SWAP water tests to learners from the Constantia Primary School in the Western Cape.

noxious chemicals, and we often found some nasty bacteria growing in the Petri dishes alongside the coliforms."

Somerset Educational later produced a compact MicroChem kit for high schools that was much safer that the original kits, while the primary school version of today's SWAP incorporates the innocuous 'oxy-bac' test using methylene blue. "The methylene blue test is fantastic – it's very safe and extremely useful for illustrating a contaminated river," says Dr O'Donoghue. "It measures the extent to which there are plants and animals in the water that are using up oxygen. If there's lots of microbial activity in the water it goes clear – the kids love it because it's like magic!"

In the meantime, Dr O'Donoghue has maintained his focus on environmental education tools that use biotic indicators to monitor water quality, while also incorporating indigenous knowledge.

MINISASS

Working with Umgeni Water, Dr O'Donoghue played an instrumental role in developing miniSASS, a simplified version of the South African Scoring System technique used by aquatic scientists to measure the 'health' of rivers.

A paper published recently in the *African Journal of Aquatic Science* (Graham et al., 2004) showed a high level of correlation between miniSASS and the full version, which is very expensive and labour-intensive. This means that the results of miniSASS can be used with some confidence, producing data that is sufficiently accurate to be of value to anyone with an interest in river health.

"Potentially every school, environmental or community group in the country could become a monitoring cell, and with this geographical spread use the miniSASS tool as a 'red flag' for the identification of aquatic pollution sources and events in their immediate environment", the authors state.

Schools will be able to enter their data on an internet web-based mapping programme, giving them the opportunity to make a real contribution to environmental management.

"It's likely that we'll see a tendency towards catchment observation using miniSASS in future," says Dr O'Donoghue. "But over the years a whole variety of activities - taken up by schools in different ways - have blossomed out of SWAP!"