

12. Malawi and Zanzibar: Exemplars of Inquiry Science in School and the Community

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Science Kasungu Demonstration School

An old metal trunk stands on its end in the corner of a mud-brick hut in a village in Malawi, one of the poorest countries of the world. A 12-year old boy, let's call him John, proudly asks me to open it. Even before I do, I can feel that it's cold. Inside is a big clay pot filled with cool water and a bottle of soda that John insists that I drink to prove his 'cooler' really works. It is refreshing on this very hot day. The 'cooler' is lined with charcoal held in place with sacking that dips into a tray of water that is replenished periodically. John lectures me about water and the latent heat of evaporation as he takes me to the science club in a nearby primary school. As we walk, John explains how energy is needed to turn liquid into vapour and that is why we feel cooler when we sweat. When we reach the science club it's obvious why John brought me. A group has two similar old book boxes also made from metal set up with the same sack and charcoal arrangement. However, one has a rewired electric motor fixed in its top with a fan attached. They claim that the fan will increase the rate of evaporation, and that the box will become cooler more quickly. The data in their well-thumbed notebook fails to convince me.

I comment on the strange looking stoves I saw outside some huts in the village. One had clay packed round the outside of the usual metal charcoal version. Others were filled with sand or appeared to use ground up old maize cobs as fuel. Mary is the science club's expert on stoves and reports the results of her research. This time the meticulous experimental design and records convince me that insulating the metal stoves and using fuels such as kerosene poured on sand indeed leads to savings.

In a very different house, the mathematics tutor at the training college proudly shows me various electrical gadgets such as the radio that his son has repaired. He tells me that this son has become much sought after by his colleagues since he is a better repair man than any of those in the nearby town. He also shows me with equal pride a poster presentation with models of the history of calculating machines made by his daughter. The tutor expressed his astonishment, saying that he had no idea that his

daughter had any interest in mathematics at all until he had seen her display at the annual schools science fair. And she got her ideas from an old journal that I'd left lying about the house, he exclaimed.

Diary entries, 1998–2000, Mike Savage

These diary extracts serve to illustrate the impact that the activities of the school science club have on the lives of the communities served by Kasungu Demonstration Primary School. The school is a modern, pleasant building that is part of the complex attached to the training college that was built recently. By the standards of most primary schools in Malawi, the school is extraordinarily fortunate though it lacks a room where work of the science club can be permanently on display. The science club itself is astonishing. There is always a rich variety of children's work, especially things electrical.

On one visit boats were the craze. About a foot long, made of wire covered with plastic from discarded bags, the boats were attractive, well-made models that sped down the artificial river children had made. One was a mono hull, another a catamaran with a searchlight mounted on its bows. Driven by small electric motors, the engines were mounted so that they could be raised from the water by pulling a lever. These boats, children said, were like the ones they saw on the lake. Their 'fire' boat was not! Children had bent a thin metal tube over a candle's flame, the two open ends bent under the water on either side of the boat. Expanded hot air bubbled from the tube propelling the boat forward. But not for long, and not with much force. During discussion the children had lots of ideas about what they could try next: coiling the tube or attaching a tin instead of the tube above the flame; squeezing the outlets of the tube to make them smaller – all ideas showing children had grasped the problem, though on my subsequent visits children reported that these ideas never did work.

On one occasion, a couple of girls had made a series of microscopes. I forgot to ask where they'd found the lenses. The optics weren't grand, but the microscopes did magnify. The real problem the girls had identified was how to ratchet the scope to bring objects into focus. Each microscope design was an improvement on previous models but the girls weren't satisfied. The same girls were also exploring pinhole cameras and making light-sensitive paper.

A striking display was a flood monitoring station. This was an elaborate, beautifully made model village. A bucket was the river. Children told me they had found out that flood water is more acidic or basic (I've forgotten). A piece of cloth dipped into the river. The other end was in contact with a piece of paper soaked in some plant juice. Pour acid into the children's river and the paper changed colour giving advance warning of floods. Pouring water into the bucket to simulate a flood caused a float to

rise inside a tube. Bells rang in the village flood monitoring station. After a while, they stopped. As water continued to rise, the bells rang again and this time bulbs festooning the outside of the monitoring station light up. Then silence and darkness reigned again. The final warning was a light flashing atop a big tower in the middle of the village with continuous ringing of the bell.

A couple of very young girls were busy developing what they called a classroom museum. A long, thin cardboard box contained a series of envelopes arranged alphabetically and labelled food, health, leaves and so on. Open an envelope and it might contain big cards labelled protein, vitamins, or energy foods. Smaller cards had individual food items such as avocados, roast chicken or rice drawn on them. One was challenged to stack smaller cards on the appropriate large cards. Rubber bands held a series of matchboxes together to make something similar to a crafts person's toolbox. The girls conceded there was a problem since taking out an individual box caused others to fly all over the place. They were working on that, they claimed. Each box was labelled. Seeds, beans, elastic bands, paper clips, pins, small stones – the girls had collected all sorts of small things they thought others might find interesting or useful. A current display on the desktop that girls said they changed every now and then, was of fruits, some cut into sections. They had written questions about the items, challenging visitors to observe more closely and think about what they saw.

Diary entries, 1998–2000, Mike Savage

By now I am a well-known visitor to Kasungu, but I can never anticipate what I will see the next time I visit. On one occasion it was a complex working model of a bakery, on another a weather station and a fishpond. But my visit in late 2000 was the most striking of all.

AFCLIST had given Andrew Nchesi, the teacher who inspired such work, a small grant for him and his students to write supplementary curriculum materials and to see what they could do to inspire similar work in six nearby schools. Over 30 schools, both primary and secondary, had signed up. Many had built similar weather stations. The research on placing fans in 'coolers' was taking place in one of these other schools. Students in another were involved in finding out local knowledge of the night sky. Teachers met to engage in tasks such as planning schemes of work and lesson plans, and designing ways to assess and test students work. They had organised science fairs that aroused great local interest and community support. Inspired by the work of children in Kasungu Demonstration School, student teachers had set up their own science club.

The important lesson to be learned from Kasungu is that with minimal encouragement and support, inspired teachers can transform attitudes to

science and technology not only in their classrooms, but in their school, neighbouring educational institutions and, most important, the entire local community. Indeed, Nchesi has influenced more than his immediate community. Through his students' exhibits at national science fairs, the school science club has been visited by the Head of State; they have won international awards offered by organisations such as the Forum for African Women Educators and the British Council; they receive regular media coverage and all Ministry of Education officials are aware of the level of work pupils can achieve when they are motivated. No mass media campaign could have such a deep and lasting impact.

Out-of-School Programmes

ZALA: The Zanzibar Land Animals Park

You see the first signpost to ZALA, the Zanzibar Land Animals Park, after driving for about half an hour southwest of Stonetown, Zanzibar. Fifteen minutes more and you're there. ZALA is in Muungoni, a typical, Zanzibari village. The only building with electricity is a petrol station that opened in November 1998. ZALA is modest. It blends with its surroundings; the buildings are built with the coral blocks and lime that is so characteristic of these islands. Yet some 350 visitors come to this quiet village each month and ZALA is the attraction.

Muungoni is not the sort of place where you would expect to find the only land animal park in Zanzibar, but there it is. For the most part the animals are snakes, lizards and amphibians. Such animals are not usually the most popular, but at ZALA they look so healthy and at home that they are a joy.

Diary Entries, 1998–2000, Mike Savage

Mohammed Ayoub started ZALA, it was not called that then, from very small beginnings. In 1988 he began to collect snakes, identifying them using *The Field Guide of Snakes of East Africa*. Mohammed reports that people thought he was crazy, calling him 'Mchawi' or witch doctor. To begin with he kept them in big plastic bottles but Mohammed could see that the snakes were not happy. In 1994, he built an enclosure outside his house from local materials that cost about Tsh. 25,000, quite a lot of money for a teacher only earning Tsh. 28,000 per month.

Mohammed's neighbours and people from nearby villages began to visit to see the snakes. Questions he could not answer motivated Mohammed to find out more and more about snakes. Periodically he brought classes from his school, and as staff from the Ministry of Education found out more about Mohammed and his snakes, they brought visitors. That was how Professor Bob Lange of

Brandeis University, Massachusetts, USA became a strong advocate of ZALA.

With support from Bob, Mohammed built a library, furnished five more enclosures for various reptiles and named the park. As important, his contacts with Bob made Mohammed reflect about the purpose of ZALA. He is clear that ZALA's objectives are to educate, promote conservation and to engage in research. In late 1994, ZALA was first officially open to visitors.

Like many activists, Mohammed Ayoub can be impatient. To regularise ZALA, in 1997 he registered it as a business organisation, an action he now regrets since it is difficult for the Ministry of Education or donors to support a business. However, he plans to re-register ZALA as an NGO. To become independent and self-sustaining, ZALA must make money (though not a profit). Tourists already visit ZALA, but with tourism rapidly growing in Zanzibar, it plans to promote itself better. It has already developed plans to put together a package with the nearby Jozani Forest Protected Area that is home for families of the rare red colobus monkey, as well as having an untouched mangrove forest.

The educational programme

Visitors can see reptiles, amphibians and other small animals in ZALA. A favourite with some, and regarded with suspicion by others, are the chameleons. This is not surprising – the chameleon is a strange animal until one becomes used to it as many visitors do. Handling them perhaps does something to allay the many superstitions surrounding chameleons such as the bad luck they are supposed to bring if you see one crossing from left to right, the idea that you will die if one drops on you and that its touch causes a skin disease. Another belief involves the plated lizard. Though harmless, it is threatened because a local belief has it that if one bites you, the only cure is to sleep with your sister! Even ZALA finds it difficult to keep the lizard. A large one was recently stolen, since a massage with its fat is said to cure arthritis and rheumatism. People believe the python carries away babies, hatches monsters and that smoke from its burning skin cures headaches. Some believe that backward babies will crawl if they see a snake and that seeing snakes fighting leads to divorce or a break with a best friend. The people of Zanzibar have many superstitions. ZALA believes that only by changing such beliefs can the people of Zanzibar conserve one of their most important resources.

To convince villagers that science and technology is relevant to their lives, Mohammed is in the process of building a typical village household – but one with a difference. Bamboo guttering will collect rain-water to be stored in a huge clay pot. The household will have examples of fuel-conserving stoves

and evaporation driven 'coolers'. Inside, the mud from which the walls are made will be moulded to make sitting and sleeping bays. The outside pit latrine will be deep with the walls made of mud and arranged to provide privacy, as well as being well-ventilated with a chimney. Mohammed's current enthusiasm, shared by everyone in the local community, is devising improvements that can be made to local dwellings using local resources.

ZALA does not charge Zanzibaris an entrance fee. It charges tourists about US\$1.5, using this and other funds to subsidise school visits. Table 12.1 shows the number of visits between 1995 and November 1998.

Table 12.1. Visits by Tourists to Schools in Zanzibar

Year	No. of tourists	No. of Zanzibaris	Schools
1995	433	564	3 plus 1 college
1996	688	1024	5 plus 2 private
1997	1345	1242	8 plus 1 college
1998	2644	1354	12

Visitors' comments give some indication of the response to ZALA.

Very Interesting! Very well kept reptiles. Good luck! Really enjoyable.

Jane Portman, Northampton, England

Needs encouragement. Good to find another enthusiast. Good luck and keep in contact.

Bill Thomas, Kalimba Farm, Lusaka, Zambia

A man dedicated to snakes. Very interesting.

Dave and Peta Corral, Curators, The Zoo, RSA

Heart stopping. Breathtaking.

Judie Ratar, Editor, Kenya

Very good and beautiful.

Broccati Guzio, Italy

Astonishing and very interesting.

Jurgord Sashia Ashraf, Holland

Exciting and beautiful animals.

Perinelli, Dagmar, Germany

The conservation programme

ZALA is active in the local community where it has helped establish branches of the Zanzibar Wildlife Club and the Mangrove Rehabilitation Club with a membership of some 30 women. The village school now has a thriving

Environmental Club with Mohammed Ayoub as its adviser. Since 1997, ZALA has conducted a breeding and release programme called 'Young-to-Young'. The park breeds selected protected species such as chameleons, the plated lizard and the suni – a charming, rabbit-sized antelope. When the animals are mature, local children take them to the nearby Jozani Forest Protected Area and release them in their natural habitat, thus re-stocking the environment.

The Park is a member of several international conservation organisations such as the British Herpetological Society, Fauna and Flora International, the Association for the Study of Reptiles and Amphibians, the Africa Bird Club, the Environment and Development Group and the World Society for Protection of Animals, for whom Ayoub organises school visits to Changu Island where the Zanzibar giant tortoise is protected. Mohammed regularly attends the monthly meetings of the Wildlife Conservation Society of Tanzania, occasionally addressing it. Mohammed's membership of such organisations puts him in touch with the current literature and brings him professional contacts throughout the world. One such contact with the Jersey Wildlife Preservation Trust (UK) led to an invitation to attend a course at the zoo in Jersey; British Airways paid transportation costs.

The research programme

The Commission for Natural Resources has commissioned ZALA to help with several projects such as the Rat Eradication Project on Chumbe Island; the Blue Duiker Translocation Programme on Chumbe Island; and the Rat Eradication, Reptiles and Amphibians, and Conservation Programmes on Misali Island. ZALA periodically communicates with Professor Kim Howell, a herpetologist at the University of Dar es Salaam. As a result, in February and March 1996, two research students from Ireland spent a month updating the reptiles and amphibians of Zanzibar. To facilitate such contacts with researchers, in 1997 ZALA completed a small, fully-equipped guest cottage that also houses the ZALA office and library.

Discussion

This chapter has shown what is possible. An inquiring approach to science and technology education can make a significant impact on the lives of students and, through them, on the communities within which they live. Some may argue that Africa lacks the resources to implement such an approach. My response is that Africa lacks the resources for the traditional science and technology education whose failure to impact on lives throughout the continent is amply demonstrated everywhere. I wonder what are the

resources that Africa lacks since inquiry science demands little other than an environment rich in phenomena. Others may argue that such questioning is not part of our traditional culture. My response is twofold. First, I suggest that if this is true, how did Africa make any progress at all? Second, perhaps our traditional ways of schooling so rarely provide children with an appropriate learning environment that this explains why such intellectual vitality is so rarely seen. An argument that I frequently hear is that we have so few dedicated and resourceful teachers to which I respond again with the question: how often do we encourage our teachers to teach this way? I suggest that the biggest obstacle is inertia. With the vision, political will and an appropriate theory of change, education in Africa could be transformed. A subsequent chapter suggests such a theory.