Project Malawi:
Teaching computing in schools in Malawi

An outreach project by the School of Computer Science,
University of Manchester

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Introduction

We describe a pilot project to deliver Computer Science education to schools in central Africa, through a team of University of Manchester staff and students, and UK schoolteachers. We evaluate the effectiveness of this support for education overseas.

Context

Computing at School (CAS) is a UK-based organisation of schoolteachers engaged in computing education, with a current membership of over 25,000.

The University of Manchester is one of 10 CAS Regional Centres in England. These are government-funded centres, co-ordinated by the British Computer Society, with a remit to support schools and schoolteachers in their teaching of computing. The Manchester Regional Centre employs 4 staff and supports over 2,000 schools in the region.

The University of Manchester has three core “Strategic Goals”, one of which is Social Responsibility: “The university will contribute to the social and economic success of the local, national and international community by using our expertise and knowledge to find solutions to the major challenges of the 21st century, and by producing graduates who exercise social leadership and responsibility.” Project Malawi is an attempt to tackle one of the major challenges of the century, namely the inequality of educational opportunities for children across the world. The School of Computer Science is one of the largest in the UK and with a top research rating.

Malawi is situated in south-central Africa, and dominated by the Great Rift Valley and Lake Malawi. It has a population of 18 million. It is ranked one of the poorest countries in the world in terms of GDP per head of population.
**Ripple Africa** hosted and supported the Project Malawi team. It is a UK-based charity with a wide range of activities in northern Malawi, including in education, agriculture, medical services, conservation and green initiatives.

**The Project: Preparation**

With the expertise of the CAS Regional Centre team in supporting school computing education across the region, the outreach activities of Computer Science students in schools, and support from the University of Manchester, it was suggested by a member of the university staff that the model of educational outreach used in the UK might usefully be used in countries which struggle to teach technological subjects, with a suggestion that a pilot project could be undertaken in the summer of 2017 visiting Malawi, and, if successful, this could lead to a continuing relationship building links between the university and schools in Malawi.

Planning was long and detailed:

1. We needed a host organisation in Malawi, and eventually settled on the charity Ripple Africa, which has provided excellent support in the UK and in Malawi, and has a superb organisation for overseas volunteers.

2. The Volunteering and Engagement Team at the University of Manchester, in particular Emma Richardson, has experience of overseas volunteering projects and provided considerable support and help in the planning.

3. The School of Computer Science offered substantial support, with staff dedicating time to help in all the details of the planning and preparations, from transport to Risk Assessments, from funding to equipment donations, from liaising with outside organisations to ensuring the team was properly prepared.

4. Funding: The EPS Faculty generously contributed through its Social Responsibility fund, and the School of Computer Science has provided considerable financial support for the project. There have been a number of “crowd-funding” initiatives, raising a good deal of money, especially to support the charity and to buy equipment for the project.

We approached various companies and organisations for support funding, but without success – partly because we had limited time to set up relevant links and make applications. Some companies however have donated equipment for the project.

5. The team consists of the members of the CAS Regional Centre, one academic member of staff, a local Master Teacher, together with a carefully selected group of students, all of whom have extensive experience in schools activities and teaching children. The team was chosen to balance skills and to be able to work closely together in sometimes stressful and difficult circumstances.

6. Equipment: It was decided that all equipment needed would be taken out by the team, and all the equipment taken would be left for the Malawian schools to use.
Generous donations of equipment for Project Malawi included micro:bits donated by Nicholas Tollervey, Joe Finney at Lancaster University and the micro:bit Foundation; laptops donated by Lowerplace Primary School in Rochdale; Pi-tops supplied through the fund-raising of Jo Hodge and the generosity of Our Lady of Lourdes Primary School in Southport and its supporters; Barefoot materials were delivered to teachers to use in Malawian schools. In addition, equipment was donated by the University of Manchester, and a set of hand-bells by the Master Teacher on the programme.

5. Education: A preliminary timetable of access to the schools prepared by Ripple Africa was populated with a proposed series of activities for the schoolchildren developed by the CAS Regional Centre team.

6. The opportunity was taken to arrange a visit to Mzuzu University, the major university in northern Malawi, partly to discuss how to provide local support for the schools outreach.

**The Project: Delivery**

As a pilot project, it was decided to make a 3-week visit to Malawi with a small team of 3 university staff, 3 Computer Science students and one Master Teacher.

In Malawi, we focussed on three secondary schools, Kapanda Community Secondary School, Bandawe Girls School, and Bandawe Secondary School, with a visit to Mazembe Primary School as well.

A range of educational activities was planned and delivered including both “unplugged” (without machines) and computer-based activities. Unplugged sessions included teaching algorithms through dance, and through music including with hand-bells, programming “human robots”, and using Barefoot activities and materials. Computer-based activities, using laptops and pi-tops, included programming in Scratch using Code Club resources, programming in MicroPython on micro:bits using Mu, and building and programming cars with Crumble kits. There were multiple sessions at several schools most days, including at the weekends.

Schools were very enthusiastic to take part in the educational programme. Sessions were largely limited by the amount of equipment we could transport to (and around) Malawi, with 12 machines available, sometimes three children to a machine and sometimes running multiple sessions. In Secondary schools, we taught all Forms (1, 2, 3 and 4, with Forms of mixed ages). Primary Schools didn’t have electric power so teaching was restricted to unplugged activities, and Primary children had limited English.

In all, we delivered about 80 hours of teaching in 50 sessions to over 200 school students across a large age range, from Primary-level to Form 4 at Secondary School. Girls made up about 40% of the children involved.
One of the university students provided technical support for computers and, indeed, using University of Manchester donated equipment, he built a networked computer lab for one of the schools, and helped repair and maintain machines in other schools.

One member of the team visited Mzuzu University – the local university and the main university in northern Malawi. This was an interesting engagement, in which the university expressed interest in establishing links with the University of Manchester and with our outreach programme and helping to develop the schools activities. They have previous experience of engaging with organisations outside the country to support schools.

**Evaluation**

As a pilot project, running under difficult circumstances, this proved highly successful:

(A) Schools, Head Teachers and teachers were very keen on our participation.

(B) Schoolchildren were keen to engage with the subject and saw it as a connection with the wider world. They were ready learners, and could clearly see the point of this education. The level of activities was pitched just right. Some were inspired to take these studies further. Experience with technologies new to them was a positive aspect of the project.

The combination of unplugged activities, especially in the first week, with computer-based activities later, worked well, with the unplugged contributing to an understanding of the computer-based activities. The smaller class numbers and the unreliable power for computer-based classes made this a good arrangement for the teaching.

(C) The team worked well together to deliver interesting Computer Science in a range of formats and using a range of technologies. The work was intensive and adaptability was key, developing activities on-the-fly as required.

(D) Equipment was transported and deployed successfully, with some effort required to maintain the equipment in working order.

The pilot allowed us to evaluate the feasibility of such a project, its impact and value, and how the project should be developed in future years.

**Impact in schools:** It is clear we enthused a large number of Malawian schoolchildren, numbers limited only by amount of equipment available, the number of members of the team available to deliver sessions, and the number of schools we had contact with. Schools and schoolteachers were very enthusiastic about our participation.

The acting Head of Kapanda Secondary School said:

“This is wonderful, an ideal contribution to the children’s education. Schools in Malawi suffer from a lack of equipment and a lack of skills and feel they are left behind in technology. The team’s work is ideal – at the right level and with the right material.”
One of the teachers who attended the teaching sessions wrote:
“It was a great experience. I learnt a lot and had some of the questions I had answered directly or indirectly. I was really pleased with the team’s commitment and patience as most (all) of the students have never worked with this equipment before”. “I intend that all of the equipment will be used to teach [in the future], not just what we have learnt but also to explore other possibilities”.

**Impact on team members** was entirely positive, with an enthusiastic endorsement of the project and the experience: “Fantastic – I’d do it again” (DA), “It was a great thing to do” (TT), “Thanks for such an amazing opportunity. I think it was most definitely one never to be forgotten. I have already had an assembly for year 6 and have written a collective worship for my school which talks about Malawi and how we can be good neighbours!” (JH). “Made me realise how lucky we all are. Will never forget the smiles despite their poverty.” (JH) “It was amazing … I would do it again in a flash. It makes you appreciate a very simple way of life and how people can be happy without all the stress of modern day technology. It also opened my eyes to similarities in which children and teachers learn even in such different environments…” [SZ]

Ripple Africa have also endorsed the project and their involvement with it, encouraging us to do something “bigger and better” in future years.

**Issues:**

1. The “CAS model” for supporting computing in schools is to train Master Teachers, who then provide CPD for teachers, who then have the skills to deliver Computer Science in schools. Whilst at some schools, teachers participated in the sessions, at other schools this did not happen and contact with teachers was sporadic. It is clear that a different approach is necessary to engage with teachers, something that is vital for “legacy”: for Malawians to take charge of this education. We will address this aspect of outreach in the future.

2. Most of the schoolchildren had no access to a computer, had not used a computer before and had no basic skills, such as those required to operate a keyboard and a mouse. Although this was recognised in advance, it is clear that dedicated lessons in keyboard skills and other basics are necessary for students to be able to program.

Whilst we delivered a graduated series of activities for the schoolchildren, it was not structured as a course. This was deliberate as it gave flexibility for delivery. However, courses with a certificate would be desirable but would ideally require a longer visit and a larger team. On-line courses (with certificates) may be an option, if Internet access can be arranged. There is also a need for material on “computing in context” including career options.

Teachers were interested in this style of teaching through activity-based learning, as opposed to the more instructional style traditional in Malawi.
3. Infrastructure: All the Secondary Schools we visited had electric power, but with limited access and sometimes not in a safe condition. The Primary School had no electric power. Internet access for the schoolchildren was difficult or impossible in all schools.

Some schools had old computers in “Computer Labs” but these were non-operational. There were no technicians, teachers had very limited skills, and schools could not afford to repair equipment. Part of the work of the outreach team was to improve this situation, if only temporarily.

4. Language proved only a small barrier in Secondary Schools, which all teach English, and some teach only in English. However, in Primary Schools, children had very limited English and a translator was required.

5. There was no opportunity to run out-of-hours “computing clubs” on this visit, but instead schoolchildren came for weekend teaching sessions on both Saturdays and Sundays – showing considerable commitment.

6. As in the UK, there is a gender inequality in Computer Science in Malawi. At Mzuzu University, there are large CS classes without any female students at all. There are cultural difficulties in Malawi, with many women dropping out of education early, and expectations for women often prevent engaging in technical subjects. We were therefore delighted to have the opportunity to deliver sessions at a girls’ school, and it was clear that girls were keen to engage with the subject and felt no inhibitions in doing so – and expressed their appreciation of both the chance to do so and seeing women in the team teaching the material.

7. The support from Ripple Africa was invaluable, not only to host the team, but also for logistics, especially to provide transport between schools over difficult, sometimes dirt, roads, to liaise with the schools and arrange access and a timetable for us to visit schools, and to provide an equipment ‘library’ for schools.

8. Primary teaching. Some of the team would like to see more Primary teaching, even though the Primary School we visited had no power, and the children had little English. We need to consider this carefully, and how we arrange and justify Primary classes. The justification in the UK is clear – Primary children are already exposed to considerable computing resources, have the opportunity of taking computing qualifications later, and will need computing in many jobs they take later in life. The justification in Malawi is different and what we can teach perhaps is different.

9. Help with maintenance and operation of computing equipment: This turns out to be an important aspect of the visit, helping schools repair and operate their equipment (if any) and maintaining the equipment we take out in running order. This year we were fortunate in having a student with considerable expertise in this area. In the future, we should plan technical support.

10. The question of “legacy” looms large in a project such as this, and needs to be addressed properly, through a series of initiatives, including engaging with teachers,
with local universities, addressing the equipment and maintenance requirements, and continuing the support for the schools throughout the year.

11. The question of “reach” also looms large. In this pilot project, we showed how a small number of schools can benefit from UK input. To extend this more widely across Malawi, we need to consider a number of factors and engage with existing organisations in the country, including universities.

There are more general issues, including the efficiency of this form of support in which personnel and equipment are transported at considerable cost over long distances. It is clear that countries such as Malawi have a widespread reliance on outside funding and services from other countries, and from NGOs, including a large number of charities and religious organisations. There is a lack of any real co-ordination between these providers to allow a more comprehensive and “joined-up” delivery of services, and there is little sign at a national level of a movement away from this reliance and towards a more sustainable national provision of high-quality basic services.

The future

Plans are underway to continue this engagement with education in Malawi. The pilot makes it clear that it is both feasible and worthwhile, and also directions in which it should be developed.

Summary

The pilot of this project to develop Computer Science education in schools in a sub-Saharan African country was successful and showed clearly the feasibility of the scheme developed by the School of Computer Science at the University of Manchester, with the Computing At School team, and hosted by Ripple Africa.

Schools, schoolteachers and schoolchildren across a wide range of ages were enthusiastic about the programme and, despite limited or no exposure to computing equipment, schoolchildren quickly engaged with the activities, including developing ‘computational thinking’ and programming in Scratch and Python.

The pilot also showed directions in which the project may be developed, with more substantial and lasting impact, in future years.