



TEACHING EXPERIENCES AT MWAYA

The three reports contained in this document were written by Paul and Amy, two post-doctoral graduates, who volunteered with RIPPLE Africa from August to November 2005, with additional comments made by Črt, the third volunteer involved in teaching at Chifira and the training course for secondary school teachers. They are as follows:

- Standard 7 Maths Lessons — Term 3, 2005
- Teaching at Chifira Community Day Secondary School
- Maths and Science Intensive Training Course for Secondary School Teachers

[Editor's Note: This document was written towards the end of 2005 and, consequently, is somewhat out of date with regards to some teachers' names and places. I have inserted comments in italics where I think clarification is necessary.]

Standard 7 Maths Lessons – Term 3, 2005

This term, Standard 7 maths has been completely taught by volunteer teachers (Paul Watton and Amy Cherry). Harvey, the Standard 7 teacher, was very keen for us to take over all of the teaching. Although this is partly due to some laziness on his part, it is also clear that Harvey doesn't understand many of the topics completely himself. For the majority of the time, Harvey was present in our lessons and was useful, translating some explanations into ChiTonga for students who didn't completely understand English. More importantly, on several occasions he commented that he himself had learnt some maths which he hadn't previously understood.

Although maths is only scheduled for seven lessons a week, Harvey was happy for us to teach a double lesson at the start of every morning. This was useful as it is extremely difficult to teach anything in one 35-minute lesson, due to the amount of time spent writing on the blackboard.

We based our lessons strictly on the Malawian syllabus, working through the set text books. Both the pupil's and teacher's Standard 7 maths books should be found in the RIPPLE Africa office. In general, the books are easy to follow. Some of the maths is done in a slightly different method than we are accustomed to. In particular, addition, subtraction, multiplication, and division of length and mass are done by what initially appears quite a complex method, but it is really quite easy once you see how it is done. Although we followed the topics in the book, we did in some cases write our own questions for the class rather than use the examples in the book. This is because the examples sometimes use rather ridiculously hard numbers. We felt it better to give examples with easy numbers, so that the students could focus on learning the mathematical concepts, e.g. area of a circle, rather than spending a long time doing complex calculations. Also, be careful when using the examples in the book as the answers (given at the back of the teacher's book) are sometimes incorrect! (A keen volunteer may like to rewrite better example questions for Standard 7 to use in future!) When we covered measuring angles, Amy provided 20 cardboard handouts with triangles drawn on them for the children to measure as otherwise they are unable to do this exercise due to a lack of text books. I think that this topic has probably always been missed out in the past, as most children do not have protractors and possibly Harvey does not fully understand how to use a protractor either. We bought 30 mathematical sets for the school and divided the various instruments into separate tins, so there should be a labelled tin in the school store room with 30 protractors which can be used in future. Also, we bought one metre ruler for each class and set squares, a protractor and a compass which can be used on the blackboard. Funding was kindly provided by Črt.

Whilst we were teaching, we noticed some key areas where the students have problems:

Tables

Although initially it seems that the students know their tables, as in class they will always shout out the answer, the majority are quite poor. Most children have to count on their fingers to work out tables or do a tally chart in their book rather than knowing them off by heart. Clearly if they were better and faster at this, this would benefit all other areas of maths.

Odd and Even Numbers

We think that this concept is probably never taught. You can ask a child to add two even numbers, and they will do it by counting and give you a wrong answer which is an odd number. If they understood odd and even numbers, they would instinctively know that the answer should be an even number and they have got the sum wrong.

Multiplying and Dividing by 10, 100 and 1000

Very few children understand that when you multiply a number by 10, 100 or 1000, you simply have to add 0, 00 or 000, respectively, to the end of the number. Most children you ask to do such a sum will write it down as a long multiplication and go through the sum systematically. Similarly, when you have a number with a decimal point, they don't understand the concept of moving the decimal point in one direction or the other, depending on whether you are multiplying or dividing by 10. Again, they will write the sum out as a long multiplication or division. This is a subject which they need to master as they are expected to convert between cm^3 and dm^3 , etc., which involves multiplying and dividing by 1000.

Measuring

Students are very poor at measuring and drawing lines accurately because they have little practice with rulers. They often start measuring either from the very end of the ruler or from the 1cm line rather than from the 0 line. Previously, the school did not have a good metre ruler for the teacher to demonstrate with on the blackboard, but we have since provided them with a metre ruler for each class. There should also be at least 55 30cm rulers in the school store room which we have provided for the children to use.

Decimal Numbers

Children don't really understand the meaning of numbers after the decimal place. This is often a fault of the teachers who will read the number 1.234 as "one point two hundred and thirty four", instead of "one point two three four". Consequently, they have problems adding such numbers. For example, if you ask a student what is the sum of 0.9 and 0.1, they will often say "zero point ten", rather than the correct answer "one point zero". This is a very important concept when it comes to rounding off numbers to a given decimal place or significant figure.

Use of the Equals Sign

Students are sloppy at putting the equals sign in the correct place every time they proceed to the next line of a calculation. Sometimes they will put in one of the other mathematical symbols or sometimes just nothing. This can lead to confusion later on and then mistakes are made.

Crossing Out, Borrowing and Carrying Numbers

When doing subtractions and students need to borrow numbers from the next column, many do not bother crossing out the number and changing it. This is a very bad practice as often, when they then move to the next column, they will forget that they have borrowed a number, use the original number and hence get the sum wrong. This bad practice needs to be addressed. Similarly, in additions and multiplications when students need to carry a number to the next column, they often write the number they are carrying in a completely random place on the page, rather than directly underneath the column which they are transferring it to. Once they have done this a few times, it is easy to forget which number on which part of the page they are supposed to be using.

In hindsight, if we had picked these problems up earlier, we may have run lessons specifically on these areas rather than just ploughing through the syllabus, as an understanding of these basic concepts is fundamental to much of the work in the syllabus. Alternatively, these issues could be addressed during afternoon revision classes.

Maths Afternoon Revision Classes

For this term, we have been running maths revision classes for students from Standards 6 and 7. The Standard 7 class was run on Monday afternoon and Standard 6 on Wednesday, although some of the keen Standard 7 pupils also came to the Standard 6 class. These days were chosen as the best days after discussion with both teachers and pupils as the children have sport on Tuesday and Thursday afternoons and a market is held every Friday afternoon which most people go to. 2:00pm was chosen as the best time so that the students have enough time to go home for lunch and get back again. However, it is difficult to get the children to be punctual. We kept a list of students names and their times of arrival, emphasising to those students who were late that they were late. This did encourage some of the better students to turn up on time, but there were always some who would come later. This can make the class tricky as those who came late missed the explanation at the beginning. Therefore, it is useful to have more than one teacher running the class as a second teacher (or third or fourth teacher) can quickly bring the late students up to speed or start a different topic with them. Really, the more teachers available, the better as the students have very varied abilities. Due to the punctuality problem, we had no fixed finishing time for our class, but simply finished when all of the students had had enough. This class is very beneficial for the students who attend as they receive much more personalised tuition, and the bright ones can progress faster without having to wait for the less able members of the class. Furthermore, the students do tend to have quite poor memories, so this is a chance to revise topics which have been covered earlier in the year.

Teaching at Chifira Community Day Secondary School

[Editor's Note: Paul, Amy and Ārt taught at Chifira CDSS because Kapanda CDSS did not open until 2008. The majority of volunteers teach at Kapanda but a few have taught at other secondary schools in the area as well.]

Chifira Community Day Secondary School has a desperate need for maths and biology teachers. The teacher who was previously teaching maths to Form 4 and biology to all years left to teach in Nkhata Bay. Therefore, Chifira welcomes any volunteers who can teach these subjects.

This term (August to November 2005), Paul Watton taught Form 4 maths, and Amy Cherry and Ārtomir Praprotnik taught Form 4 biology. Ārt was also teaching Forms 1 and 3. Maurice, the Standard 1 teacher at Mwaya Primary School, took us for an initial meeting with the teachers at Chifira. They were very keen for us to help and completely rearranged the school timetable around the times that we were able to teach. Paul taught double maths lessons three mornings a week and also ran a revision class one afternoon a week. Amy and Ārt each did one double biology lesson one day each a week. Ārt was also teaching one double lesson in Form 1 and one double lesson in Form 3. However, in future, the school would also welcome people to teach other subjects such as geography.

Travel

Chifira is 2km further on from Kande. On a bicycle, Chifira can be reached from Mwaya in 40 minutes. If enough time is allowed, it is possible to get to Chifira by matola. To guarantee being there for the start of school (7:30am), it is probably best to be at the Matete road block for 6:00am. The journey should cost around K70. It is also possible to walk, which will take about 2 hours.

Course Material

[Editor's Note: Since this document was written, RIPPLE Africa has raised money to buy a number of secondary school text books for Kapanda CDSS. Also, the Community Library at Mwaya has some secondary school text books.]

Maths

Form 4 maths is slightly harder than GCSE level maths, but not as hard as A level. Two text books are used: the Strides 4 mathematics book and Book 4 from the Secondary School Mathematics range. These are both available in the RIPPLE Africa library. Anyone with a good A level in maths and either a maths degree or degree with a large mathematical component would be able to teach at this level.

Biology

Form 4 biology is also slightly harder than GCSE level, but nowhere near as detailed as A level. Two text books are used. The first is a Malawian book for the MSCE syllabus by Chanco, and the second is an English text book for GCSE called Life Study. There is a new GCSE book available in the Chifira Secondary School library: GCSE Biology from the same author as Life Study. The Chanco book is not always clear or even correct in some parts but provides a good idea of what the syllabus covers. Life Study is currently available in the RIPPLE Africa library, and the Chanco book may be in the future, but otherwise the teachers at Chifira are happy to lend volunteer teachers a copy. Anyone with a degree in a biology-related discipline would be able to teach at this level.

Form 4 Revision Classes

Students selected the topics for revision. Some students were very knowledgeable, but all of them were very attentive and interested.

Students have no books. At the school there are about 10 books of Strides in Biology 1 and Strides in Biology 2, two Life Study books and two GCSE Biology books which were donated by Ārt.

There are some papers from past years' exams in the folder in the RIPPLE Africa office.

Individual tuitions were arranged for some students from Mwaya.

Form 3

There are about 35 students in the class. They are attentive. English is not a problem, except when they are required to write something down, so encourage students to revise topics in their own words. Students have no books, but you can use the books which are available at the school in the class. Ārt produced a lot of posters but left them with students.

Form 1

There are about 65 students in the class. However, only about 30 to 40 attended the classes. English is still a problem from time to time, and biology basics have to be explained. Students have no knowledge of chemistry, physics, etc., and they had no idea what H₂O or NaCl means!

General Observations and Recommendations

- Handouts or notes should be prepared for the students since they have no books. Črt photocopied the chapters from Life Study and Revise biology GCSE (available at the Mwaya community library) for them.
- Any teaching aids would make teaching easier and students are very interested in posters, diagrams, etc. You can leave them in the class after a lecture, and they will copy them into their notebooks.
- Students are not punctual and tend to come late to school. Many of them walk or cycle a long distance in the morning. However, encourage them to be punctual, and their punctuality will improve during the term.
- Students tend to have a good opinion about their knowledge, but test results don't support this! Students are not used to taking tests. Črt photocopied tests for them, and the time spent on test writing was well worth it.
- Teachers and students were very grateful for our assistance.

Donations

Črt donated about 70 books to the Chifira Secondary School library as he felt it was the best way he could help the school. He asked the staff which books were used in different subjects, and he bought them in Mzuzu. There are enough books for maths and biology to use in the class now at Chifira.

Črt wanted to buy some more GCSE biology books, but they were not available in Mzuzu. If some more biology books are bought, he would highly recommend the GCSE biology book.

He says that he always asked for discount in the bookshop (called Maneno), and he was always given a 5% discount because he bought so many books at once. This meant he was able to buy more books and small presents for the students who did best at exams.

Have fun!

Maths and Science Intensive Training Course for Secondary School Teachers

[Editor's Note: At the end of 2008, another volunteer tried to organise a training course at Mwaya based on this one but attendance was very poor. Subsequently, we discovered that all of the teachers who enrolled expected to be paid allowances for transport, food, accommodation, and something called a disturbance allowance which teachers are paid by the government to attend courses. As we do not believe in paying people allowances for attending courses, a number of the enrolled teachers did not turn up. However, at the end of 2009, Matt, a post-doctoral microbiologist, gave some teacher training courses to teachers at Chintheche CDSS, Bandawe Boys' Secondary School, Chifira CDSS, and Kapanda CDSS. He carried out the courses actually at each of the schools, and these were much more successful so we believe that this is probably the best way to run these courses in the future.]

Dates

24 October 2005 to 4 November 2005

Course Organisers

Dr Paul Watton, Dr Amy Cherry

Course Teachers

Dr Paul Watton, Dr Amy Cherry, Črtomir Praprotnik DVM

Funding

Funding for photocopying costs, stationery and refreshments was kindly provided by Donncha O'Donncha. For four teachers, the two week course cost approximately \$100.

Aim

To improve mathematical and scientific understanding for secondary school teachers, particularly with respect to teaching the Form 4 syllabus.

Background

We came to Mwaya as volunteers with an interest in improving education and hence have been involved in teaching at Mwaya Primary School. However, being here for only a short period of time (3 months) and having a strong background in maths and science, we felt that the most useful thing we could do is improve the standard of local

teachers in these subjects, as this will have a beneficial effect on many future generations of students.

Initially, we spoke to teachers working at Kunyanja Secondary School, Nkhata Bay, about the possibility of running such a course. (This school was chosen simply because we had a contact there – Force Ngwira from RIPPLE Africa co-founded it.) All the teachers at this school were very keen to attend, but only two were selected as the course had to run during term time; those involved had to take two weeks off from school. We then approached teachers from the secondary schools more local to Mwaya, namely Chifira, Kande and Tukombo. We offered a total of eight places on the course to ensure that those attending would receive personalised attention and tuition. Two teachers at Chifira and two at Tukombo confirmed that they would attend and others from the other schools expressed an interest.

We sought and gained permission in writing from the District Education Manager of Nkhata Bay to run the course and allow the government employed teachers to have time off of school. Unfortunately, the teachers from Tukombo failed to attend, and we had a smaller number of participants than expected, i.e. two from Nkhata Bay and two from Chifira. Therefore, in future, we would suggest that some sort of registration deposit be paid which can be reclaimed upon attendance of the course to ensure good attendance. Additionally, providing transport to and from the course may have been helpful. Furthermore, it may have been preferable for the course to run during school holidays, allowing attendance without compromising teaching duties.

Force Ngwira arranged accommodation for the teachers from Nkhata Bay for the two weeks, and the other teachers travelled daily to and from Mwaya Beach by public transport.

Course Material

Course material was taken directly from the MSCE syllabus. The teachers at Kunyanja Secondary School have only been teaching up to Form 3 this year but will be teaching Form 4 next year, so they wanted to improve their understanding of the Form 4 topics. These teachers suggested the topics to be covered and the teachers at Chifira agreed that these would be useful areas to study.

Maths

The topics covered were:

- Travel graphs
- Inequalities
- Linear programming
- Polynomials
- Arithmetic and geometric progressions
- Vectors
- Statistics
- Matrices
- Probability
- Graph drawing

Almost all of the topics from the Form 4 syllabus were identified as problem areas which would require further tuition. Paul prepared example questions drawn from the Strides 4 Mathematics book and Book 4 from the Secondary School Mathematics range. He provided a full set of question and solution sheets for all the teachers. This should enable the teachers to teach more effectively at this level as they now have a documented set of solutions for the questions they will set and discuss with their students. Both of these sets of books are available in the RIPPLE Africa library, and photocopies of the question and answer sheets used can be found in the RIPPLE Africa office.

Teaching this material was relatively easy for Paul as he has BSc, MSc and PhD degrees in maths. Additionally, He has tutored mathematics to GCSE and A level students for the past 10 years, so he is very familiar with the difficulties students may encounter understanding the mathematical concepts at this level.

Initially, Paul was unsure if he was going to pitch the course too easy for the teachers. However, their mathematical understanding was actually below what he expected. There is a lack of basic mathematical techniques and understanding, e.g. basic algebra and graph drawing skills. Sloppy use of the equality sign leads to mistakes. Mathematical problems can be particularly difficult if the mathematical techniques to solve the question are not given.

Ideally, to be able to teach effectively, ones mathematical knowledge should be a few years above the level that one is attempting to teach. In Malawi, it is often the case that mathematics teachers have only been educated to Form 4 and then are expected to teach mathematics at this level. It is highly unlikely that they have mastered the level of mathematics they are required to teach. Thus, it is no wonder that the students, and thus the next generation of Malawi mathematics teachers, have poor mathematical skills. There is a real need to break the cycle of poor maths teachers creating the next generation of poor maths teachers. Therefore, it is of high priority to improve the mathematical ability of the current teachers.

Future courses should be designed to continue improving the mathematical understanding at the Form 4 level. English AS level mathematics books may be useful if slightly harder examples are required.

Biology

The topics selected were:

- Mitosis and meiosis
- Genetics
- Evolution
- Reproduction
- Co-ordination
- Excretion
- Immunology
- Digestive system

Amy used the Malawi text book by Chanco to guide her on the material to be covered. (RIPPLE Africa does not currently have a copy of this book, so it had to be borrowed from Chifira, but it may be available in the RIPPLE Africa library in future.) However, the author of this book does not have a complete understanding of all areas of biology. There are some areas which are not explained well, and there are also some facts which are completely wrong. Also, the diagrams are generally not very clear. The explanation of mitosis and meiosis is a good example of this. Consequently, Amy prepared her own handouts based on her own knowledge and information from A level texts on the internet (photocopies of these should be found in the RIPPLE Africa office). She thinks that using detailed handouts works well as the participants don't have to spend lots of time writing and can concentrate on listening. This enables more material to be covered in a short space of time and students will have detailed, accurate notes to take home and read. She also included some material in her courses which went a little further than the MSCE syllabus — the teachers found this stimulating and interesting, and this information should help them to have a better understanding of the MSCE material.

If she did the course again, she would include more questions for the students to do. Most of her lessons were in the form of a lecture (with time for questions), but in her genetics lesson they did questions which was very enjoyable and gave the students a break from just listening to her. GCSE and A level (English exams for 16 and 18 year olds) exam questions can be downloaded in pdf format from the AQA exam board website. These may be useful in future, but volunteers will have to be selective with the questions as the A level syllabus goes much further than the MSCE syllabus.

Chemistry

The topics covered were:

- States of matter and kinetic theory
- Structure of the atom and the periodic table
- Chemical bonding
- Chemical reactions and equations
- Organic chemistry

The subject areas were taken directly from the Keith Wallis book for the physical science MSCE. RIPPLE Africa does not currently have a copy of this book, so it had to be borrowed from Kunyanja Secondary School. However, it may be added to the library in future. What the book says is essentially correct, but not necessarily written in the clearest way. It waffles quite a lot and uses very poor analogies which aren't necessary. Therefore, Amy prepared handouts with more concise explanations. She stuck strictly only to the material covered in the book, and this was at the right level as even the teacher who was already teaching from this book needed much of this material explaining.

Physics

Topics covered included:

- Structure of the Atom and Radioactivity

The Keith Wallis book for Physical Science for the MSCE does not currently cover this topic, although it has recently been added to the syllabus. Therefore, Complete Physics by Stephen Pople was used for the preparation of lesson material. This book is often used by students studying for the MSCE, and a copy is available in the RIPPLE Africa library. The complete chapter on radioactivity was photocopied for students, and one copy can be found along with the other lecture notes in the RIPPLE Africa office.

Teachers had very poor knowledge of physics; however, they were very keen to learn. We did a lot of questions, and it took us more time than it was expected.

Location

Lessons were held in the training room at Mwaya Beach.

Time Table

Week One	8:30	9:30	10:00	11:00	11:30	12:30	2:00
Monday	Maths	Coffee	Biology	Coffee	Maths	Lunch	Biology
Tuesday	Maths	Coffee	Biology	Coffee	Maths	Lunch	Biology
Wednesday	Maths	Coffee	Biology	Coffee	Maths	Free	Free
Thursday	Maths	Coffee	Biology	Coffee	Maths	Lunch	Maths
Friday	Maths	Coffee	Physics	Coffee	Physics	Free	Physics
Week Two	8:30	9:30	10:00	11:00	11:30	12:30	2:00
Monday	Maths	Coffee	Maths	Coffee	Maths	Lunch	Chemistry
Tuesday	Maths	Coffee	Maths	Coffee	Maths	Lunch	Chemistry
Wednesday	Chemistry	Coffee	Chemistry	Biology	Biology	Biology	Biology
Thursday	Maths	Coffee	Maths	Coffee	Maths	Lunch	Free
Friday	Chemistry	Coffee	Chemistry	Free	Free	Free	Free

Note: Originally, we had scheduled one of the morning sessions as a period for personal study time to practise questions and had an extra lesson in the afternoon. However, as some teachers were travelling a long way on public transport, we changed to the time table shown to allow them to get home at a reasonable time. In future, if transport was provided, it may be worth reintroducing the personal study period as this would highlight any areas which the students didn't fully understand during the lesson.

Food and Refreshments

On days when teaching lasted all day, we were required to provide lunch for the teachers. Harry and Martha were happy to cook nsima and relish for free on these days, although we did pay them afterwards to thank them for their trouble. We also provided coffee and bananas at break times.

Feedback

All of the teachers who attended the course said that they had learnt a lot and that they now understood things which had not been taught properly to them at secondary school. They said that they would be using the material learned in future lessons and, in particular, the headmistress at Chifira said that, even though she had not taught maths before, she would begin to do so. All of the teachers said that they would attend another course if it was run again in the future. However, it would be better in future if this could coincide with school holidays in April or August so that no school time would be missed. Alternatively, a course could be run for the local teachers one afternoon or evening a week, over a longer period.