Chapter 3 Mathematics, education, policy and poverty

This chapter continues the literature review, bringing relevant literature from areas wider than Malawi. First, I offer a section about mathematics education and the cultural baggage it brings with it. Second, I explore some literature on the relationship between education and poverty in majority world countries. Finally there is a section on the formation and implementation of educational policy in wider Africa.

As in Chapter 2, I suggest some questions yet to be answered and indicate where they relate to my own research. At the end the many questions from Chapters 2 and 3 are drawn together to form the basis of the research categories as described in Chapter 4. The results of research based on these categories appear in Chapter 6, and analysis of these results in Chapter 7 and finally some implications – which goes some way towards answering some of the questions – in Chapter 8.

3.1 Mathematics education

In Malawi and across the rest of Africa, the performance of pupils on mathematics is weak, teaching methods are dominated by rote learning without understanding, the syllabus aims for everyday life applications but in fact is more interested in examination preparation. Learning in mathematics as well as other subjects is heavily dependent on literacy. Pupils perform poorly at all levels, and the special requirements of language offer challenges to pupils and teachers. The local language used for teaching lacks a register of special terms for mathematical ideas and the English language is too foreign for understanding to develop. All this is on top of the large classes, poor conditions, lack of equipment, food shortages, HIV/AIDS, and the rest.

- Is it possible that there is something special about mathematics as it is taught in schools in Sub-Saharan Africa that leads to this gross mismatch between common practice and the real needs of the pupils?

In this section I will try to uncover the breadth of the role that mathematics education plays as part of the education systems in sub-Saharan Africa. After literacy, some form of mathematics is the most valued part of education, and is taken very seriously by communities, parents, teachers and pupils throughout Africa and the world. In the current international effort towards 'Education For All', 'mathematics for all' seems to be taken for granted. To what sort of mathematics education does this lead?

3.1.1 Purposes of learning mathematics

The question 'Why do we need to learn mathematics?' is fundamental. For many teachers and pupils in Africa, as elsewhere, the only answer is that it is required by the school, and needed to pass the examination. But if we inquire further, asking why certain things are required by the school, and why the examination asks certain kinds of questions, we come to the real purposes underlying what goes on in the name of mathematics education. This is not necessarily the same as the statements of purposes of mathematics education in documents.

Mathematics (whatever it means in this context) seems to be regarded as the most important part of education, after literacy. Its status is unquestioned, worldwide.

> Mathematics is appreciated not only as the science which provides formal concepts, models and theories, but also as an universal language with an unambiguous grammar for the description of scientific relationships, and its extensive use has made it the driving force for almost all scientific and technological developments and mathematical models sustain predictions and prescriptions beyond

> natural sciences into daily life and into such fields as economics and social sciences. Coping with numbers, acting with a reasonable number sense, and being able to interpret data and their visualisations created by tables, graphs or diagrams are now the abilities required in a society that might be said to be thoroughly mathematised.
> (Keitel, 1997, p. 1)

Having agreed that mathematics is important for their future, many countries then embark on institutionalised mathematics education in which the reality is far removed from the idealised world in the quote above. The quote is based in the (idealised) experience of developed nations (e.g. Europe and USA), and its relevance to majority world countries, such as those in sub-Saharan Africa, needs to be further examined. However, the quoted view of the usefulness of mathematics seems to permeate the thinking of educators and politicians in many African nations. The fact is that mathematics is supposed to be the same for everyone – 'pan-cultural'.

Swapna Mukhopadhyay refers to the paradox of mathematics education in this way:

> … if the claim is made that mathematics is a pan-cultural mental activity, why do people experience such a strong aversion and resistance to learning mathematics at school? How can we explain the apparent contradiction that mathematics, on the one hand, is a natural part of life and, on the other, gives rise to non-engagement, resistance, and failure?
> (Mukhopadhyay, 2000, p. 3)

This is a serious issue, and is not confined to African or developing nations. In relation to the rest of the school curriculum, mathematics stands apart in many respects. The differences between mathematics (or at least the way it is presented to pupils in schools) and the rest of the curriculum may highlight some of the reasons for the paradox described above.

Bishop (1988) has synthesised his concerns with the view of mathematics education as it is commonly taught, worldwide. This approach to mathematics education is extremely common in Africa. Bishop (1988) lists 'four major areas of concern':

- a technique-oriented curriculum
- impersonal learning
- text teaching, allowing the teacher to avoid responsibility for the learning of the pupils
- two false assumptions: that mathematics education is primarily designed to train experts, and that the teacher's responsibility is to teach mathematics, not people.

These could be seen as ‘areas of concern’ about mathematics education everywhere; it is just that in Africa they are also vehicles for the subversion of culture. It happens through the values conveyed by western mathematics (Bishop, 1990). He identifies several areas of values that were imposed by the colonisers and which were new to many indigenous cultures. For example, there is the view of what society is about: stability or ‘progress’. It is mathematics that is an essential aspect of the technology that drives the western view of progress and modernisation. The values that appear in the products, the manufactured items and the ‘wealth’ flaunted by the colonisers are seen as values of the whole system of education, including mathematics. Bishop (1990) recognises that many of the countries that adopt the common curriculum of western mathematics do so in the belief that it is somehow universal, values free and culturally neutral. The abstract nature of much of western mathematics has led many to believe that it must be without values, and yet the values it conveys are gradually undermining the cultures that innocently adopt it.

There are alternatives to the ‘traditional western’ value-loaded and culturally invasive style of mathematics. They will be discussed in section 8.6.6, as I explore some of the implications of this study.

The pressure of competition for places at secondary school means that there is a sacrifice of relevance to rural life for relevance to selection chances, particularly in the upper levels. When I put the idea of relevant numeracy to Alison Croft, she replied as follows:

> I like the idea of developing activities related to local needs for numeracy, but formal education is also viewed as a way out of the local environment, so particularly in the later stages of primary school, if you deal with these, you will experience strong examination backwash as schools prepare their students to compete for limited secondary places.
> (Croft, personal correspondence, 2004)

The focus for most mathematics teaching is to be able to 'do' mathematical things. These things are normally very abstract and unconnected to applications. Put another way, part of the problem is that we have ignored educating our students in how and when to use mathematics. Using an analogy with language, mathematics at present still focuses on the grammar, correct sentence construction, and so on, but doesn't often let students write stories.

Ernest (2000) reflects on the different interest groups (in UK) who would like mathematics education to take different directions. He recognises five different groups, from 'radical "new right" conservative politicians' (interested in 'basic skills and numeracy and social training') to 'democratic socialists and radical reformers' (interested in 'empowerment of learners as critical and mathematically literate citizens in society'). A scanning of curriculum documents and text material from Africa suggests that the 'basic skills and numeracy and social training' groups presently totally dominate what actually happens.

Ernest (2000) suggests that there are four main aims for mathematics.

1. To reproduce mathematical skill and knowledge-based capability
2. To develop creative capabilities in mathematics
3. To develop empowering mathematical capabilities and a critical appreciation of the social applications and uses of mathematics
4. To develop an inner appreciation of mathematics: its big ideas and nature

But as described above, the first totally dominates, for political reasons. This also describes the situation in African nations. The reason that politics is so concerned in this decision is that mathematics, largely through its assessment mechanisms, serves to maintain the status quo socially.

> … this serves not only to reproduce mathematical knowledge and skills in the learner, but to reproduce the social order and social injustice as well.
> (Ernest, 2000, p. 7)

It is important to acknowledge that the socially divisive role of education in sub-Saharan Africa acts principally through the subject of mathematics and its assessments. The next sections will elucidate some aspects of this as it impacts on sub-Saharan Africa.

3.1.2 Western mathematics: language of power and exclusion

The ability to know and perform mathematical tasks enables its holder to wield power. Partly it has done this by declaring that it is difficult, abstract and the province of white males. The consequence is that mathematics is portrayed in schools in sub-Saharan Africa as foreign, difficult and irrelevant to the local cultural experience of the pupils.

> Mathematics has been mistakenly regarded as the sole creation of a few, singularly brilliant (white male) individuals. This has placed mathematics outside the realm of experience of most people. It makes a sharp distinction between the few and the many as a fundamental assumption of social organisation. In other words, having disinvited participation by the majority, the practice of mathematics now gives a lot of power to a minority. It is clear therefore that the maldistribution of mathematical experience is not without political implications and moral consequences.
> (Volmink, 1994, p. 51)

Even in relatively 'developed' countries, the attitudes of very many learners towards mathematics border on fear. Maths-phobia and maths anxiety are well-known, and girls and women seem to suffer the corresponding loss of self-image to a larger measure than males.

Mathematics education not only has an image problem, it has an identity problem. To repeat Bishop's (1988) point, mathematics education needs to take seriously that it is about *educating people*.

Bishop (1988) identifies the Mathematico-Technological Culture as an international phenomenon that has created an international following, particularly since it acts as the servant of both international science and computer programming. However, he also notes that there are 'challenging gaps' between many cultures and this internationally dominant Mathematico-Technological Culture.

From the research Bishop (1998) identifies nine groups whose 'home culture and the school mathematics culture can be conceptualised as mutually exclusive'. They are:

- Girls, Ethnic minority children and Indigenous 'minorities' in Western societies
- Western 'colonial' subjects
- Non-Judao Christian religious societies
- Rural learners, particularly in developing countries
- Physically and mentally impaired learners
- Children from lower class (caste?) families
- Adult workers in lower status jobs who are in training or re-training.

(Bishop, 1998, p. 2, slightly shortened)

For our purposes, we can note that almost all of Africa is included. Bishop then describes the elements of the Mathematico-Technological Culture that conflict with the 'home culture' of these groups.

> What the learners come into conflict with in the classroom then is the whole Mathematical knowledge and affective environment which is:
>
> - socially constructed by teachers and their peers,
> - embedded in a society which is increasingly being formatted by Mathematicians and industry spokespersons,
> - demanded by parents, administrators and society's leaders,
> - controlled by the institutions and frameworks of a vast education industry manifested in the books, materials, calculators and computers with which they currently engage,
> - underpinned by a culture whose values are implicit, and
> - destined to select a minority and fail a majority of the students.
>
> (Bishop, 1998 p. 5)

3.1.3 Western mathematics and globalisation: vehicles for cultural imperialism

Fasheh (1997) vividly describes the international (and socially irrelevant) side to this notion of mathematics education. He had lived in Palestine through the education systems designed by the British, Jordanians, Jordanians with Israeli modification and finally the Palestinians.

> What is startling about the math curriculum is—with the exception of some changes at the technical level—how stubborn and unchanging it has remained under the four completely different realities in which I have lived, studied, and taught; how insensitive and unresponsive it has been to the drastic changes that were taking place in the immediate environment! When something like this is noticed, it is only natural to ask whether this is due to the fact that math is neutral or that it is actually dead! (Fasheh, 1997, p. 24)

This international similarity has been widely observed, and commented on by a number of authors. Sometimes it is touted as evidence that 'mathematics is an international language', but at other times it is questioned from different perspectives.

Atweh and Clarkson (2002b) distinguish between the internationalisation and the globalisation of mathematics education. They use internationalisation to describe any activities of support or cooperation across national boundaries. They observe that the colonial

influence survives by imitation. The international NGOs also encourage the increased involvement of developing countries in Western mathematics.

> A number of the colonized countries have modeled their education systems, including their teacher education programs, on that of the mandate countries.
>
> In the post World War II era, other processes evolved in the form of international organizations such as the United Nations, UNESCO and the World Bank or its regional equivalents. These organizations have been highly influential in the developing of the mathematics education programs in many developing countries.
> (Atweh & Clarkson, 2002b, p. 160)

Globalisation is seen (by Atweh & Clarkson) as 'the increasing awareness of the "world as one" or a realization of the "global village"' (Atweh & Clarkson, 2002b, p. 62). This has led to a 'convergence of school mathematics and school mathematics curricula around the world', which seems, at first glance, to be a surprising development.

> A striking feature of the different curriculum documents and textbooks in mathematics education around the world is their similarities rather than their differences ... Moreover, these similarities have proven to be rather stable across the years; changes in curriculum in one country or certain region (mainly Anglo-European) are often reflected in other countries within a few years…
>
> Further, the status of mathematics in the curriculum is similar in many countries where it is given a special importance, second only, if not equal, to language education. In many countries mathematics is tied to scientific, technological, and hence to economic development (Kuku, 1995)… These similarities have given rise to the term "global curriculum" in mathematics education.
> (Atweh & Clarkson, 2002b, p. 162)

The conclusion that Atweh and Clarkson (2002a) reach is that mathematics is both shaped by globalisation and itself shapes and aids in the globalisation process.

Bishop (1990) takes a somewhat stronger line. According to him, Western mathematics has 'invaded' colonised countries in three specific ways: through trade and commerce, through administration and through education.

> ..through the three media of trade, administration and education, the symbolisations and structures of western mathematics would have been imposed on the indigenous cultures just as significantly as were those linguistic symbolisations and structures of English, French, Dutch or whichever was the European language of the particularly dominant cultural power in the country.
> (Bishop, 1990, p. 56)

However Bishop believes that the pervasive influence of western mathematics is more influential through the values it conveys. In contrast to the naïve 'mathematics is value free' argument, he identifies several areas of values that were imposed by the colonisers and which were new to many indigenous cultures.

For example, there is the view of what society is about: stability or 'progress'. It is mathematics that is an essential aspect of the technology that drives the western view of progress and modernisation, and the values that appear in the products, the manufactured items and the 'wealth' flaunted by the colonisers are seen as values of the whole system of education, including mathematics.

Bishop (1990) recognises that many of the countries that adopt the common curriculum of western mathematics do so in the belief that it is somehow universal and culturally neutral. The abstract nature of much of western mathematics has led many to believe that it must be without values, and yet the values it conveys are gradually undermining the cultures that innocently adopt it.

Young (2000), from South Africa, looks at globalisation and makes several points. Firstly, 'much of what is attributed to global trends, is better viewed as a consequence of Americanisation.' Secondly he observed the key role that mathematics in creating and maintaining the apartheid regime, through its denial to the black population.

> These educational barriers within the apartheid system were remarkably successful in subjecting the vast majority of the population to second class citizenship for over 40 years. Mathematics education (or the lack thereof) was an essential feature of this policy. During the 1960's and early 1970's, black school principals were encouraged to drop mathematics entirely from the secondary school curriculum - usually under the guise that it was detracting from their success rates in the national and regional matriculation examinations. This denied thousands of black children the opportunity to pursue even their limited opportunities for further education. Mathematics is used as a filter to the majority of courses offered in higher education. This tragic legacy still haunts us today.
> (Young, 2000, p. 16)

The cultural imperialism described by Bishop (1990) and Young (2000) continues apace. A growing number of educators, including this author, move across national borders to try to assist others to 'teach mathematics better'. At one stage these attempts to help others were more like missionary excursions, taking the gospel of western mathematics to the ignorant. Today the rhetoric is more about collaboration. But, as Atweh and Clarkson (2002a) point out, collaboration itself is problematic in this situation. They take the view that collaboration can be, and often is, a form of colonialism, with ideas of marketing, creating dependence and exploitation not far below the surface, even if unrecognised. They alert such collaborators to be 'transparent, reflective and accountable' in their dealings.

Questions of voice and power should always be up front. Collaboration should be constructed to empower individual countries to be self-reliant rather than to increase their dependency on ideas from more developed nations.

> Exchanges that are simply based on "helping" developed countries (to become like us?) are often based on paternal colonial assumptions and do not contribute to genuine collaboration. Collaborations should be based on mutual respect and trust in the ability of the different partners to contribute different types of learning to the collaborative enterprise.
> (Atweh & Clarkson, 2002a, p. 165, 166)

Several international NGOs have been quite instrumental in promoting change in mathematics education. For example UNESCO was instrumental in spreading the word to African countries about 'new math' back in the 1960s. They have been very active in the spread of mathematics education ever since. UNESCO is behind the 'Mathematics Education Into the 21st Century Project' which is trying to gather the best experience from around the world, and share it, to encourage others to go the same ways.

There is yet another side to 'cultural imperialism'. Mathematics in most countries is now clearly identified with information technology (computers). For many, access to this technology has become a passport to affluence. The West has become an information-based society. But most of SSA remains outside this sphere of opportunity.

Clearly, western mathematics is neither value-free nor innocent in the relationship between those that have its advantages and those that do not. However, for many in all nations, mathematics remains an irrelevant mystery.

3.1.4 Western mathematics: mysterious and irrelevant

Greer and Mukhopadhyay have noted two gaps that are currently getting wider. The gaps refer to the distance between school mathematics as experienced and other aspects.

> Given the pace at which mathematics has been, and is being developed, the gap is increasing between the body of knowledge and what can reasonably be included in school education. At the same time, there is more and more concern about the gap between school mathematics and the lived experience of students and the adults they become.
> (Greer & Mukhopadhyay, 2003, p. 2)

Despite the fact that the uses of mathematics are very widespread in all societies, particularly 'developed' ones, there are very many pupils and ex-pupils who believe it to be quite irrelevant to their lives. The formalism (precise algorithms, clinical diagrams, exact use of language, etc.), absolutism (insistence on one right answer, the most efficient way to work

something out, etc.) and abstraction (lack of clear connection to the world as experienced by the pupil) gives it an air of mystery and irrelevance.

The image often portrayed is that mathematics is a set of procedures invented by someone (certainly white and male) to be memorised, and then forgotten. However mathematics consists not only of its pure theorems and abstract formulas, but also its multitude of real-life applications, through which the world has been organised.

> So mathematics did not just arise out of the world by our sense experience, but also out of our inventions, our economic arrangements, our religious beliefs and cultural arrangements. My argument is that there is almost no evidence in school mathematics that mathematics has any bearing of these issues; in fact it has been almost completely dislocated from children's reality in particular.
> (Volmink, 1994, p. 57)

The omission of real-life experience in the mathematics education process has had a disastrous impact on the participation of girls and women in many forms of mathematics, and this phenomenon, which is well-known in 'developed countries' is even more pronounced in developing countries.

> In mathematics education exclusion has found expression in, among other forms, the creation of a public image of the fields of mathematics, science and technology as a cold, abstract, and external world, a male domain that many are scared to join; the systematic minimal participation of women in the production of mathematics, science and technology in both developed and developing countries; and even the exclusion of girls from possibilities for getting engaged in meaningful mathematical learning.
> (Vithal & Valero, 2003, p. 547)

Bishop notes the extraordinary irrelevance of the application word problems in former colonial texts. For example, in Tanzania word problems included cricket, money (in farthings, half pence and half shillings, and escalators at the Holburn (UK) tube station. 'But then "appropriateness" was entirely judged in terms of cultural transmission' (Bishop, 1990, p. 55).

In the 1960s the ‘mother country’ contexts of practical examples in the mathematics textbooks were replaced by a 'deductive approach' characteristic of the 'new math' period, but still in fashion among some 'pure mathematicians'. This suggested to pupils that mathematics is not related to the reality at any point.

One should not single out either ‘new maths’ or the 1960s for examples of irrelevance. There are many things being taught in secondary mathematics curricula at present in most, if not all, African countries that are totally irrelevant to all pupils and to the society in which they are placed. They are there for reasons of history, tradition, and possibly uncertainty about what should go in their place if irrelevant topics are removed. Every nation needs to consider carefully what is taught in the name of mathematics to primary and secondary pupils.

3.1.5 Possibilities for mathematics education

The previous sub-sections have deliberately challenged the assumptions underlying (Western) mathematics education in Malawi. The research will test whether or not mathematics education in Malawi is guilty on any or all of these charges. But are there any alternatives? What else might be done?

This section can be little more than a list of the many options available. By listing alternatives to the very ‘straight’ Western mathematics that is the entire focus of the Malawian syllabus, I am not here necessarily suggesting that the Malawian syllabus should change. That is a question for the analysis in Chapter 7, after a detailed examination of data.

In the sections above I have surveyed writings that suggest that the ‘international language’ of mathematics might be unsuitable for mass education in Africa – for a wide variety of reasons, including the cultural values it carries with it. Writers have also suggested that ‘mysterious and irrelevant’ mathematics might be unsuitable for the utilitarian aims of working in civil

service, business or commerce. It is thus appropriate to consider what else might be done in the name of numeracy or mathematics education.

In section 2.2.2 on the history of education in Malawi I showed how educational aims in Malawi have taken two seemingly incompatible and competing directions: mass education for life on the land, and preparation for paid employment in the civil service, business and commerce. I also indicated that despite repeated attempts since the 1940s to install a practical form of mass education, the community has insisted on the alternative: 'academic' preparation for a selection examination and a chance to get secondary education and a paid job. To persist with this 'either/or' situation seems futile. Below I present a range of options, from the more straight-forward to the more challenging.

Number sense and computational efficiency

Here is no doubt that both on the land and in paid work, mental computation and a healthy number sense are useful. At least in paid employment it is reasonable to think that a solar calculator can replace much computational drudgery, and that estimation and mental arithmetic might be sufficient for farmers. This is the 'mass education ' alternative that has been frequently recommended, but never been taken up.

Ethnomathematics

Over the last decade or so, ethno-mathematical researchers have been providing culturally relevant examples of the uses of number, logic and space in arts and crafts, vocations and games from many cultures. One of the main agendas of the ethno-mathematical movement is to assist the learning of mathematics (the western kind) through using applications from the cultural experience of the learners. For the majority of the world's learners (children or adults) 'mathematics for life' means genuine mathematics as used in their own culture.

Bishop (1988) has presented six broad areas that constitute mathematical activity and seem to be found in every society: counting, measuring, locating, designing, playing and explaining. With these as a starting point, it is possible to recognise a broad range of activities that may be called mathematical within the everyday life of a society, such as Malawi. The consequence of this kind of identification is to provide the kinds of links to everyday life that are missing in the 'abstract' textbooks. Further, the 'everyday life' should be *genuinely* everyday for the pupils and their families, and not just everyday for those few who make the transition into Western styles of living in the cities.

> Recognizing importance of traditional knowledge, its application to classroom is a key issue in considering the content, and otherwise it cannot promote development as stated. We are burdened with responsibility to realize it in educational practice…
>
> Furthermore, the fact that many children do not learn mathematics in school regardless of mathematics abundant in daily life is a strong motive to reflect present education in terms of out-of-school mathematics.
> (Baba, 2002, p. 4, 5)

Western school mathematics and the problem of transfer of learning to real life

This is the style of mathematics currently being promoted in Malawi and the rest of Africa, and is the dominant style across the rest of the world. The content of textbooks at the same level internationally is amazingly similar, and reflects a lack of cultural awareness and sensitivity. The present trend to include computer technology as part of this style of teaching only dramatically increases the gap between rich and poor. Skemp (1976) makes a clear distinction between 'instrumental understanding' (being able to do mathematics) and 'relational understanding' (being able to do and also to know why). Even the best textbook teaching rarely includes understanding at a 'relational' level.

A common problem across the world is the transfer of mathematics learning between school and life, due in part to its abstractness and lack of an attempt (in textbooks and classrooms) to

show the relationship between the mathematics and its applications. The textbook style is destined to remain disconnected to everyday life.

Concept learning and understanding

One of the major criticisms of school mathematics is its lack of meaning to pupils. An approach that tries to deliver meaning through conceptual teaching methods seems sensible. However an essential ingredient to the success of such a project is a cadre of teachers who themselves have a 'relational understanding' of mathematics.

Critical mathematics education

It is possible to use mathematics as a tool to support social awareness and the development of a social conscience. This position has been well-argued by many, including Ernest (2002), Fasheh (1997) and Schönheimer (1975). To take this position is to move from the supposed politically and culturally neutral position taken by 'abstract' mathematics, although the 'neutrality' of that position has been well challenged by Bishop (1990); see above.

Being critical in a mathematics classroom means focusing on society. Classroom activities will use real social data, pupils will engage in projects that explore their own environment and pupils will use mathematics to explore the reality of the world in which they live. This approach has been promoted by many writers, including Mellin-Olsen, 1987; Skovsmose, 2001; Vithal, 2000, Vithal and Valero, 2003; Frankenstein, 2002; Knijnik, 1999.

In South Africa critical mathematics education appeared theoretically in writing about 'People's Mathematics' (Bopape, 1998). That movement was politely absorbed and then ignored by the new Curriculum 2005 in South Africa (DoE, 1997), suggesting that any approach to curriculum that challenges an establishment is unlikely to have a mainstream future.

Cultural Worldviews and Indigenous Knowledge systems

The alternatives suggested above have all come from outside Africa. They take positions relative to the international view of mathematics and the Western cultural values it involves. The remaining positions entail a far greater awareness of the learners and their cultural heritage. These positions acknowledge that the view of reality embodied in Western science and mathematics, and the English language they use, is foreign to Africans.

Breidid (2004) lists the following words to characterise Indigenous knowledge systems: holistic, organic, non-dominating, non-manipulative, non-mechanical, social, people-centred, relational and metaphysical.

In contrast, Bishop (1990) presents the following values as the heart of the modern 'maths-science-technology' knowledge system:

> First there is the area of rationalism, which is at the very heart of western mathematics. …
>
> Second, … objectism, a way of perceiving the world as if it were composed of discrete objects, able to be removed and abstracted, so to speak, from their context…
>
> A third set of values concerns the power and control aspect of western mathematics. …
>
> An awareness of the values of control allied to the rational analysis of problems feeds a complementary value of rational progress, and so there is a concern to question, to doubt and to enquire into alternatives.
> (Bishop, 1990, p. 56–58)

This is not just a theoretical problem. Back in the early 1950s, the Binns Commission to Malawi wrote:

> Education was effective in breaking up the old tribal life, but not in adapting its pupils to the conditions of the new.
> (Binns Report, 1953, p. 5)

Mathematics and the two-cultures problem

One approach to providing mathematical education while respecting non-Western cultural values has been explored in Indigenous Australian educational circles. Harris (1990) proposed 'Two-way Aboriginal Schooling', a deliberate construction of education that respected both cultures, and children would learn to live in both. An alternative to this, called 'Both Ways' has tried to find genuine links between the two cultures, and to construct bridges. It is not clear that either approach actually works, despite the best efforts of both white and black educators to achieve them.

Some questions

- Has western mathematics been accepted as the only relevant mathematics in Malawian education?
- To what extent is western mathematics undermining the values of Malawian society?
- What alternatives might be considered and do they have any possibility of acceptance?
- In particular does some form of practical numeracy have a future in Malawian education?

These questions lead, in part, to the research variable *The purpose and relevance of mathematics education*. Some implications are addressed in section 8.1.5: Professional learning for mathematics teaching.

3.2 The purpose of primary education in majority world countries

The literature reviewed thus far is focused on the health of the education system itself – the schools, teachers, conditions, teacher training, and the content of the curriculum, particularly in mathematics. In this section I examine some of the literature that reflects on the purpose of it all: what is education for? In fact there are many competing purposes, and in resource-poor nations those competing purposes become highly politicised.

It is a common assumption that education is one of the prime methods for alleviating poverty, particularly of the rural poor. In this section I make a case that education seems to increase the wealth of those *not* on the land, and increase inequality of wealth distribution.

3.2.1 Does education alleviate poverty?

The recent Education For All Global Monitoring Report (UNESCO, 2005) makes the claim that there is a strong relationship between long-term personal income and education (p. 40). The report fails to demonstrate that education is a cause and not an effect. Families with more income usually make certain that their offspring get more educational opportunities; that is, the cause in the relationship may well be that more income enables more education. At the very least it is a mutually reinforcing relationship.

Lopez & Valdes (2001) provide an interesting definition of rural poverty and some partial explanation of its cause. They see rural poverty as an inevitable short-term consequence of 'the early stages of growth'. It results from the increased employment opportunities in the cities for workers with some education – and the 'relative immobility of the disadvantaged segments of the rural population.' They point out that those who remain farmers get little return for time spent in education, but

> The main contribution of education in rural areas appears to be to prepare people to emigrate to urban areas and towns.
> (Lopez & Valdes, 2001, p. 209)

Another effect of education is that educated parents, particularly women, have smaller families. This has the effect of increasing the income per capita among educated families,

even if the actual incomes are not higher (Lopez & Valdes, 2000; Wodon et al, 2001). This clearly argues for increased education of girls and women.

A further argument for women's education is supplied by Woden et al (2001). Their summary of research in 13 Latin American countries shows that at least two wage incomes (usually both parents) are needed for a poor household to escape poverty.

> … a better education helps in escaping poverty, but it is not enough if only one household member is working. That is, over the life cycle, one working adult with primary or even secondary education is not enough in most countries to help the household emerge from poverty when a typical increase in family size is taken into account to estimate basic needs.
> (Wodon et al, 2001, section 3.3)

In the Global Monitoring Report (UNESCO, 2005) the claim is made that years of education combined with levels of literacy and numeracy impact on 'income enhancement', 'improved productivity in both rural non-farm and urban environments', and in 'household behaviour and family life' (p. 43). Aside from the lack of evidence of causality, this *specifically excludes farming*, i.e. agriculture, the major activity of the rural poor in Malawi.

The payoff for increased education is not for farmers, but for 'non-farm rural' workers and urban workers (Lopez & Valdes, 2000; Appleton, 2001). Appleton's analysis of education and poverty in Uganda in the 1990s showed that the benefits to agriculture were minimal (3.5%), but the increase in income due to an extra year of primary education was 12.7% for 'self-employment' and 15.6% for 'Wage-employment' (Appleton, 2001, p. 35).

The UNESCO (2005) 'Global Monitoring Report' describes SACMEQ studies in 15 African countries, studying the economic factors that led to higher educational achievement. In so doing they demonstrate that greater wealth leads to better test performance. And it is this that leads to more education, through the familiar selection processes.

> In nearly all education systems, pupils' home background was found to be important. Those from higher socio-economic backgrounds … tended to perform better than those from poorer homes.
> (UNESCO, 2005, p. 47)

One of the consequences of educating the population is an increase in inequality of wealth. Those who have more wealth can stay at school longer, get more education, leave the land (if they are in rural areas), earn more, have smaller families and thus a larger per capita income. Teal (2001) found that, although the level of education of the general population in Ghana increase by 27% in the 1990s, yet 'with the exception of male wage workers, there was no significant rise in underlying incomes' (Teal, 2001, p. 12). However, 'the faster growing group of workers, which is the non-agricultural self-employed, experienced a decline in underlying incomes of 22 per cent over this decade' (p. 13).

A SADC research proposal, Poverty Alleviation Strategies in Education (Lefoka et al, 2003), might be expected to be more precise about exactly how education can make a link to this all important national (and international) goal. The authors quote Omari (1999) who asks 'exactly what does the school system provide that would be considered as relevant to efforts aimed at alleviating poverty?' They point out the dream for poor people: 'education is deemed to be one of the few means available to their children to escape poverty' (p. 10). But they also remind us of the reality: 'for poor children the pressures to leave school entirely for work are intense, and dropout rates are exceptionally high' (p. 10). The authors explore many of the related issues, including types of poverty, but fall into what I am convinced is a trap of believing the dream – that 'education is an equaliser' – and therefore that more education of any kind is necessarily a 'good thing'.

> Education is described as an equaliser. Equity is an important factor in relating education to poverty. *Societies recognise and reward intellectual excellence and superior performance in the race for status, power, occupation and income*.
> (Lefoka et al, 2003, p. 11, emphasis in the original)

The evidence in Malawi supports the truth of the sentence in italics. The reason that education is *not* an equaliser is that those most able to win 'the race for status, power, occupation and income' are not the poor, but the relatively wealthy. So at least at this stage in the growth of the economy, education provides far greater benefits to the better off, and encourages movement towards cities looking for paid work. Those left in subsistence farming on the land are likely to become even poorer than before, particularly relative to their working compatriots.

> The fact that rural poverty is in part a temporary result of the early stages of growth reduces the scope for poverty reduction strategies directed exclusively to the rural sector.
> (Lopez & Valdes, 2000, p. 209)

To return to Malawi, the stated goal for education is 'poverty alleviation', and yet the research described above strongly suggests that it is only the relatively well-off who actually benefit from the education system. If this is really happening, what can be done about it?

Some questions

- Does education alleviate poverty in Malawi?
- Do the present types of mathematics education in primary schools contribute towards alleviation of poverty for the majority of pupils?
- How does/can mathematics education assist: farmers? labourers working for someone else? small business owners?

These questions lead, in part, to the research variable *The purpose and relevance of mathematics education*. Some implications are addressed in sections 8.1.1: Poverty alleviation and 8.1.5: Professional learning for mathematics teaching.

3.2.2 What type of education can alleviate poverty?

In all of this the question of the type of education is unasked. I have shown that the type of education prevalent in Malawi, and also in the rest of Africa, is academic, not practical. It is clearly and obviously directed towards weeding out the less able – who also frequently happen to be poor and female, and the major tool for this is the use of selection examinations at all levels, particularly at the end of primary school.

The question arises: Is it possible to conceive of an education that leads to success at secondary school at university and also has the effects at the lower levels of reducing rural poverty? What might such an education be like?

The tension between these two views of the purpose of education – reducing poverty of the rural poor and 'global competitiveness' (or the development of the national economy) – is addressed by Tikly et al (2003). They suggest various ways in which this tension reveals itself in policy. This includes meeting EFA targets at primary level vs. bolstering secondary, technical and tertiary education, and literacy and numeracy vs. 'making short to medium term investments in human resources', including management and leadership (Tikly et al, 2003, p. 107).

After outlining the alternatives as 'either-or', they make the point that a country needs both.

> … at the end of the day the two goals are inter-dependent. Economic growth depends upon stability, cohesion and a sense of well-being amongst the population whilst poverty reduction can only really be achieved on the basis of long term economic growth.
> (Tikly et al, 2003, p. 108)

Their recommendations involve strong support for a broader concept of basic education. They include capacity building for management and leadership at all levels of education and training, mainstreaming gender issues, and a broader definition of what is basic education. This includes the following list:

- Agricultural skills
- Food processing and packaging
- Technical skills such as car mechanics, micro-electronics, electrical, carpentry and hairdressing
- Basic computing skills
- Basic business skills relevant to micro-business, cottage industries and cooperatives …
- Hotel management and tourism
- Craft and traditional skills
  (Tikly et al, 2003, p. 135)

In order to allow for training to occur to make this happen, they also strongly recommend curriculum reform 'as a basis for poverty alleviation'.

> For example, the primary curriculum can be made more relevant to poverty reduction through an increased emphasis on basic agricultural concepts and skills as well as life skills including HIV/AIDS prevention, parenting skills and political citizenship skills aimed at national unity…
> (Tikly et al, 2003, p. 138)

A survey of out-of-school youth (Kadzamira, 2005) explored their choices for a curriculum of non-formal education. Their choices, in order, were: literacy, farming/agriculture skills, business management skills, numeracy, health and recreation. Specific vocational skills were chosen by boys only: tailoring, carpentry, bricklaying and mechanics. Girls were interested in knitting and sewing 'in order to enhance their livelihoods' (p. 42, 43). This suggests that there is an interest in 'practical' education for those who have dropped out of the formal system.

Some questions

- Can mathematics education contribute to the two educational goals: mass rural education and preparation for a scientific and mathematical future?
- Is it possible to devise and implement a mathematics education that helps reduce rural poverty and *also* contributes to the development of the national economy?

These questions lead, in part, to the research variable *The purpose and relevance of mathematics education*. Some implications are addressed in sections 8.1.1: Poverty alleviation and 8.1.5: Professional learning for mathematics teaching.

3.2.3 Real life relevance at secondary maths level

Curriculum relevant to real Malawian life is the official direction of formal education in Malawi. But, as explained above, it appears that the actual type of formal education is academic and irrelevant. Have there been any experiments that 'tested the waters', and tried to make education 'relevant to real Malawian life'? Not at primary level, but below I report one from the secondary mathematics curriculum.

In 1997 Mwakapenda (2000) 'investigated the extent to which everyday experiences can be used as a vehicle for changing the learning and teaching of secondary mathematics in Malawi.' His investigation was in collaboration with three secondary teachers in 'severely over-crowded and poorly-resourced classes in two schools.' Over five months Mwakapenda worked alongside these three teachers, planning, observing and sometimes teaching. In fact the

> changes to student learning and teachers' teaching practices noted during the investigation were limited. This was attributed to the limited time frame of the study and institutional constraints in the participating schools.
> (Mwakapenda, 2000)

The reasons for this failure are significant and explored further below. Mwakapenda (2000) found that the students genuinely believed that mathematics was going to be useful in their future lives.

> The students involved in this study had very utilitarian views of mathematics. They viewed mathematics as being useful and important to learn so that they could gain future employment and participate effectively in their everyday activities. The utility of mathematics seems to be the main reason why most of the students found it important to learn mathematics despite their lack of success in it. This is an important finding since it signals a group of students who want to learn mathematics only if it is useful and who might find mathematics more enjoyable if it is taught in way that shows it to be useful.
> (Mwakapenda, 2000)

Two of the three teachers genuinely believed that they were able to connect some mathematics relevant to real life for their students. One thought that doing so would enable her to get through the content faster, and the other was prepared even to raise with her pupils the genuine irrelevance of some of the material in the course.

> For example, when introducing particular topics in lessons, teachers made an attempt to ask students questions such as "Do you see logarithms being used in everyday life? Do people use four-figure tables in everyday life?" In so doing, the teachers considered the mathematics content presented in textbooks as problematic. They found it important to ask the question: Why should students be learning about logarithm tables, and what other aspects should they be learning about instead?
> (Mwakapenda, 2000)

These are good questions. The irrelevance of curriculum has been raised as a general point by the Malawian Poverty Reduction Strategy, at both primary and secondary levels (p. 50, 54).

> In order to improve the relevance of education, the teacher and secondary education curricula will be revised so that they meet the needs of students, potential employers and the nation. Students should be offered a curriculum that will equip them with knowledge of life skills, such as technical, entrepreneurial, and agricultural skills.
> (GoM, 2002, p. 54)

Mwakapenda (2000) found that by far the greatest constraint is the looming presence of the final MSCE (Form 4) examination. For both teachers and students this is the dominant reason they are struggling with a mathematics curriculum, no matter how relevant or irrelevant to life it may be. One teacher 'was ready to appreciate the value of using everyday experiences if they improved students' performance in the final examinations.'

Mwakapenda's research is the only example we have where the Malawian constraints to making mathematics more relevant have been studied in depth. It suggests that in Malawi the tension between 'practical' poverty alleviation and 'academic' global competitiveness described in section 3.1.2 is being won by the academic option.

Some questions

- Is it true at primary level that teachers and the general public are overwhelmingly interested in whatever will increase success in the examinations – as Mwakapenda discovered at secondary level?
- Does the mathematics curriculum at primary level include irrelevant material as was the case at secondary level?

These questions lead, in part, to the research variable *The purpose and relevance of mathematics education*. Some implications are addressed in sections 8.1.1: Poverty alleviation and 8.1.5: Professional learning for mathematics teaching.

3.2.4 Education and culture

In section 3.2.1 it was suggested that education is biased towards westernisation or 'global competitiveness', and fails to alleviate the poverty of those in subsistence agriculture. By supporting westernisation education also undermines many cultural norms and values.

> There is undoubtedly a cultural tension between the demands of an economic system that is basically predicated on a mechanism of individual self-interest (extended at most to a limited concept of family) and traditions of mutual inter-dependence and responsibility (which may nonetheless be limited to a broader concept of family or to a notion of local community), often associated with hierarchies of power based on age and gender. These tensions often manifest themselves in the differences between

> urban and rural cultures …
> (Tikly et al, 2003, p. 120)

Extended families are a very important part of the 'social security' network in an African context, and are necessary to support the many individuals or nuclear families are crisis. The tension might occur, for example, when a wage earner cannot use money earned to improve his or her position and possibly earn more; instead the money must be shared with an extended family or possibly many others in a village.

Tikly et al summarise the results of many interviews in Tanzania and Rwanda by describing an underlying tension fed by education, television and the internet:

> This tension is essentially between the recognition that certain cultural values and practices are incompatible with the demands of economic and social development and the desire to retain what are perceived as valuable aspects of traditional culture and thereby to ensure cultural continuity and a distinct cultural identity.
> (Tikly et al, 2003, p. 121)

They describe a tension between traditional dependency (on the government and recently on donors) and entrepreneurship, and in the general sense see education as presenting 'moral challenges' (p. 123).

In the Malawian context, the tension between traditional African culture and westernisation (supported by education), is described by Kaunda and Kendall (2001). They begin their article with this quote from a head teacher from southern Malawi.

> Democracy and culture will never be at peace with one another. In fact, they are at war. Democracy is winning right now, and we are seeing a breakdown of people's behavior. But we can never be happy without our culture. We cannot just destroy it for democracy. We must find a balance, times when democracy wins, times when culture wins.
> (Kaunda & Kendall, 2001, p. 1)

Their view is that education is undermining traditional African culture, through misunderstandings of the true meaning of democracy. They urge changes in teaching methods, a recognition of African values and taking on some of the ways of non-formal education.

> The formal schools' greatest strengths for educating for democracy lie in their direct relationship to the state and its vast (in comparison to non-formal education institutions) human and material resources. Their weaknesses rest in their frequent conflicts with local ways of knowing, their historical roots, dependence on the state, and relative inability at this time to carry out their existing functions (Jere et al, 2001).
> (Kaunda & Kendall, 2001, p. 9)

Summary

Section 3.2 has looked at the purposes of education, and the effect of a westernised education on an African culture. There seem to be two competing purposes for education: a westernised one for examination and academic success, leading to the preparation of an elite who can manage and develop the economy and national life, the other for alleviating the poverty of the rural poor. The literature suggests that the formal education system in Malawi operates using the first goal, despite its official statement of purpose as 'poverty alleviation'.

The literature also suggests that formal westernised education:

- improves the incomes of those engaged in non-agricultural and wage earning jobs, but not those on the land;
- tends to undermine rural village life, as the more educated youth make their way to towns and cities looking for income-earning jobs;
- creates tensions ('moral challenges') between traditional culture and westernised expectations;

- introduces values and ways of thinking that are opposed in many ways to African cultural values, and this is particularly true of mathematics and science (see section 3.1).

Mwakapenda's research suggests that the pressures of examinations and hopes of academic success leading to a wage have the potential to undermine any attempt to make education more 'practical', particularly for the rural poor. I have shown that the problem appears to be one of policy: what is written is not what is practised.

Some questions

- Is there awareness of this tension of purpose among teachers and educators?
- Which purpose seems to be winning the battle?

These questions lead, in part, to the research variables *The purpose of primary schooling* and *The purpose and relevance of mathematics education*. Some implications are addressed in sections 8.1.1: Poverty alleviation and 8.1.5: Professional learning for mathematics teaching.

3.3 Policy and some obstacles to its implementation

In this section I look at the challenge of making and implementing educational policy. It is through making and carrying through the right decisions that inadequacies in the present system can be changed. This research aims to examine the interaction between policy and practice in mathematics education in Malawian primary schools. In the context of this study, 'policy' will be official statements, usually in writing, relating to how schools are to operate. Section 2.5 previously introduced the PIF, the Policy and Investment Framework and other policy documents in Malawi.

This section reviews literature about traps leading to policy failure. I explore what the literature has to say about the policy vs. practice dilemma, and the idea the links the two – implementation.

3.3.1 Policy and implementation are political

Educational policy is political. Decisions depend on who is in power and needs to be pleased (Ward et al, 2003). More charitably, often very many well-meaning policies are written down, but not prioritised, so the implementers don't know where to start. On many occasions the implementers (officials, principals, administrators) were not present at the formulation stage, so they run their own political agendas when working towards implementation. 'Implementing public policy in most African countries is a process of resolving competing political priorities.' (Moulton et al, 2001, p. 61, 62).

Many programs are created and policies formulated in the environment of donor country aid, and there is pressure, sometimes not subtle, on the recipient country to follow the current policy line expressed by the donors. A 2003 ADEA report on implementation showed how compromises made at the policy formation stage, or policies deliberately given a 'flexibility of meaning' to achieve some form of consensus, can create immense problems at the implementation stage (Bal-Lalya & Sack, 2003, p. 20).

Some questions

- How does the political nature of policy, involving donors and many competing agendas in the community, influence the clarity of the policy and the planning for its implementation?
- Can the donor countries learn to cooperate and to support the best in policy making and implementation planning rather than running their own agendas?

These questions are revisited in section 8.6.1, and illustrated with Malawian examples I have met in my research.

3.3.2 Policies are too ambitious or too vague

In their eagerness to create a vision for the future, policy makers tend to get very ambitious about what might happen, setting targets (often quite unrealistic) rather than determining realistic stages and detailed methods by which those targets might be achieved (Moulton et al, 2001, p. 9, 16). Often there are so very many policies and their relationships are not clear. For example, it is possibly not realised that reducing a dropout rate will increase class sizes, necessarily requiring more classrooms, teachers and school books, as well as a larger teacher salary bill.

The advantage of vagueness of policies at the formulation stage is that the many parties who have to agree on the policy can each see their own agendas being met. But at the implementation stage they begin to disagree about what the policy actually meant. Moulton et al (2001) give an example of 'educational reform', seemingly a good idea, but one that has multiple meanings and therefore provides the potential for many tensions and clashes during implementation.

Some questions

- Do Malawian policy makers create policies that are over-ambitious or too vague?
- Does this lead to a lack of priority?
- Are all the implications of implementing policies taken into account?
- Are policies clearly spelled out with detailed and realistic action plans?

These questions are revisited in section 8.6.2, and illustrated with Malawian examples I have met in my research.

3.3.3 Policies are not understood or ignored

There is a tendency for some officials to believe that if a policy is 'proclaimed' it will therefore 'be implemented', particularly if stated in writing. Wolf et al (1999, p. 59) illustrate this with the repetition policy in Malawi at Standard 8, whereby the chances of selection for secondary school are decreased with increasing repetition. Their interviews revealed many officials, teachers and parents who either didn't know of the policy or were thoroughly confused about it, though 'the letter had been sent'.

Oft-times policies are mandated or proclaimed, and there is no follow up. This either suggests that the policy was not serious (possibly simply following the directions of a donor) or that the capacity to make sure directions were being followed was not present. The pregnancy and repetition policies in Malawi followed these lines: mandate and no follow up. Moulton et al (2001) reports that 'the mandates had little effect at the school level except where they coincided with what school officials wanted to do anyway.' (p. 58).

There are examples of policies that have failed to take hold at the implementation stage because of a lack of understanding. Sometimes the bureaucrats who have to carry out the policy intentions will undermine the intentions because they do not have a clear idea of what they are expected to do. Maybe a school principal fails to realise that he (rarely she) must do something as a result of a particular circular letter that has arrived. Sometimes the letter doesn't arrive. Sometimes the letter is not understood (Wolf et al, 1999). Each of these is an example of insufficient care with communication.

Sometimes the policy is understood but is perceived as an error, or failure of head office to understand the realities of the chalkface. This time the implementation fails because the policy is rejected. Wolf et al (1999) suggest that maybe the creators of the policies do not see the implementation plans as part of their role, and therefore do not take the time to look into

possible causes of resistance. Examples quoted have included the 'revised' pregnancy policy in Malawi, which was resisted on moral grounds by teachers and some of the community. See section 2.2.5.

The 2003 ADEA report on implementation suggests that part of policy making must include the responsibility to think through the process of how it is going to be made to work in practice. They describe the complexity of the total public situation in which any policy is to be implemented with its myriad of actors with conflicting agendas and levels of understanding (Bal-Lalya & Sack, 2003, p. 22).

Some questions

- Are policies well-communicated in Malawi?
- Can teachers and the public recognise the difference between politically motivated pronouncements (with no serious attempt to follow up) and genuine policy?
- Are the community, teachers and other government departments involved in the relevant steps of policy making so that they can understand, support and implement the policy?

These questions are revisited in section 8.6.3, and illustrated with Malawian examples I have met in my research.

3.3.4 Policies are not costed properly

Part of the enthusiastic optimism that seems to accompany the creation of idealistic 'policy dreams' is the failure to realize the costs involved. Examples have been the 'free primary education' offered by Malawi and Uganda, without realizing the massive costs involved in supporting so many pupils in schools – teachers, classrooms, resources, books, management, etc. Often the policies are backed up with over-optimistic expectations about growth in other areas, or unrealistic expectations about private sector support and management efficiency, or expectations that donors will come to the rescue whenever needed (Moulton et al, 2001).

The relationship with the range of donors falls into this category. Moulton et al point out the way in which donors operated with competing agendas for years, until they recognized the futility of that approach. An example of how funding agency support is critical has been the Malawian MSSSP program, widely recognized as one of the most successful models of inservice education in Africa, but it created no plans for continuing once the funds ran out.

Some questions

- Are policies realistically planned and costed?
- Do policy makers understand that policies are only stated goals, and that they are also responsible for planning the implementation steps to achieve that goal?
- Are policies being realistically costed, sources of money identified and timelines established?
- Since not every dream can be realised, have priorities been established and are they realistically achievable?
- Do donors work cooperatively and closely with the Ministry of Education?

These questions are revisited in section 8.6.4, and illustrated with Malawian examples I have met in my research.

3.3.5 Policies are poorly managed

Psacharopolous (1990) points out the inadequacy of the education ministry officials to continue managing their system with all its present crises and at the same time to cope with the demands of implementing policies to change it. Capacity building frequently gets mentioned in these reports as a great need, particularly in bureaucracies, where the officials

are invariably former teachers with no experience or expertise in management (Moulton et al, 2001, Bal-Lalya & Sack, 2003).

Kadyoma (2004) uses a vivid image of a noisy and violent storm to represent the uncoordinated efforts of those many parties trying to improve teaching methods in Malawi. The storm produces a lot of noise and light, but no rain. In the same way, teachers are urged to change, are provided with varieties of training, but it is having no effect. It is not being managed, rather each small project is going for a 'quick fix', and none actually work.

Wolf (1999, p. 41) draws attention to the relative ease of managing a policy in an urban area compared to a remote rural school. It is not only the mode of communication that needs to differ, but sometimes the details of the policy need to be modified to the differing circumstances. This need for flexibility in implementation is rarely recognized in the planning stages.

These issues are central to this research. Many educators are frustrated that their well-intentioned policies appear to get nowhere, and that poor practice continues despite the alternative having been clearly described. Only a few of the examples illustrating the five policy traps above are from Malawi, and this research aims to clarify the particular reasons that Malawian policy fails to be implemented.

Some questions

- Many of the possible problems highlighted above arise due to over-worked and under-trained management. Is Malawian capacity-building adequate in these areas?
- Despite the many problems in the education system, there are also very many teachers who are doing their best to improve education. How can policy be drawn up that will make the best use of the goodwill and dedication of so many teachers?

These questions are revisited in section 8.6.5, and illustrated with Malawian examples I have met in my research.

3.4 A summary of the literature review (Chapters 2 and 3)

The picture this review has painted is not rosy. For many reasons, largely historical, Malawi is the ninth poorest country in the world, has frequent and severe food shortages and severe health problems including malaria and HIV/AIDS.

Its education system, inherited from Scotland, is the only possible route to the money economy for most pupils. Yet education is not working in the interests of most pupils; far more drop out than finish primary school, and many drop out before achieving literacy in their own language. Because education is now 'free' but not compulsory, class sizes are far too large for effective education to take place, and there is a critical shortage of teachers, qualified or not. Teachers are not evenly deployed; teachers, particularly females, prefer urban postings, and rural schools miss out. Teacher education is still in recovery mode from its critical shortage at the implementation of Free Primary Education in 1995.

Adding to this, traditions within African society – such as gender bias and many languages – make a mockery of equal opportunity for achievement. Yet educational success is measured principally by one set of examinations in the foreign language of English at the end of Standard 8; for the stayers this can open doors to employment or secondary education, or slam them shut. Again few succeed and many fall by the wayside before that final test of primary schooling.

An outsider might seriously question the usefulness of an education system that has this effect on the majority of its starters. In mathematics education the choice is particularly clear between academic mathematics and practical numeracy. Yet of the two major competing

roads for education the Malawian public has seemingly chosen the academic route. Education leading to survival and success in micro-business, farming and rural life has been considered second-rate at least since the 1940s.

We normally look to the implementation of sensible policies to overcome some of these problems. But across Africa the evidence about educational policy-making is disappointing; too often it is a wish-list, based on political compromise, poorly conceived, with little or no planning or costing for implementation. Implementation fails for many reasons, from communication to management.

Research question

Many of the questions that conclude previous sections are drawn together in this single research question. This question leads to the creation of a number of variables for exploration in the Malawian context. These are explored in chapter 4.

- *How do policy and practice interact in Malawian primary education, in the case of mathematics teaching?*

Towards research variables

The literature review (Chapters 2 and 3) has led to many questions about the situation in Malawi. These questions can be grouped as follows:

- **The purpose of primary education** – see the end of sections 2.2.1, 2.2.2, 2.2.3
- **Gender** – see the end of sections 2.2.4, 2.2.5
- **Meeting the needs of all pupils** – see the end of sections 2.2.6, 2.2.7, 2.2.9
- **Language** – see the end of sections 2.2.8, 2.3.4
- **Teaching style** – see the end of sections 2.2.10, 2.2.11, 2.4.1, 2.4.2, 2.4.3
- **Assessment** – see the end of section 2.2.12, 2.2.14
- **Mathematics teaching and learning** – see the end of section 3.1.
- **The purpose of mathematics education** – see the end of sections 2.2.13, 2.3.1, 2.3.2, 2.3.3 and 3.1, 3.2.1, 3.2.2, 3.2.3, 3.2.4
- **Policy** – see the end of sections 2.5.1 and 3.3.1, 3.3.2, 3.3.3, 3.3.4, 3.3.5.

In chapter 4 the first eight become the research variables, and in Chapter 8 are separated into Constraints and Challenges. The material on policy relates to each of the other eight variables, providing a counterpoint to practice, sometimes in harmony – and sometimes not.