

2 Technology for Access and Equity in Education

Understanding the Issues

Why Education Matters

Decisions about investing in technology for education are not purely a matter for the Ministry of Education. Such decisions depend on broad national development policies and involve other ministries including Finance, Economic Planning, Telecommunications and Development. It is therefore important to highlight not only key educational issues, but also the development-related arguments that can be used to justify national investment in technology for education. Moreover, in a climate of intense competition for scarce resources, the Education sector cannot assume that its importance is self-evident, nor take it for granted that its goals and priorities are shared by other sectors. Therefore there is a need to build cross-sector support for national investment in technology for education. There is also a need to advocate at the highest levels for top priority to be given to such investments. This is why the Ministers of Education meeting at the 13CCEM in Botswana in 1997 decided to send a message and a plea on these matters to their heads of government who met shortly after in Edinburgh. The case for education and for investment in technology needs to be made repeatedly to various interest groups and stakeholders.

Despite a plethora of problems and widespread criticism, education remains one of the most powerful instruments for human development. It is the prime means through which every society initiates its young into a way of life that defines its heritage and contemporary values, as well as its aspirations for the future. Education is also the fundamental mechanism through which individuals learn many of the skills needed to function successfully in various social and economic roles. In socio-economic terms, education is a proven catalyst that moves individuals and communities out of poverty and ignorance, into an improved quality of life. It is a lifeline of hope for families and communities trapped in conditions of impoverishment and disadvantage. It has been shown to be the most important factor that determines differences in future incomes and lifetime earnings of individuals. It is also widely regarded as a key factor in the competitiveness of communities and nations.

In cultural terms, education serves as a window through which our imagination and curiosity can take flight into the unknown and enhance our creativity. It is the key that unlocks the treasure within every human being, thereby helping individuals to achieve their full development potential. It encompasses the greatest legacy inherited by each new generation, as well as the greatest investment that each succeeding generation can make in its children and to the future of society. It has become the most important single factor that helps each generation to improve on the gains and achievements of its pred-

ecessors. In essence education is an important determinant of life chances and quality of life for individuals, communities and whole nations. It has critical implications for the economic growth, social development and cultural integrity of every nation. It is therefore a highly political and often highly politicised issue in the development debate in most countries.

Access is definitely one of the factors that loom large in the current political debate on education. Providing opportunities for people to participate in and benefit from education is widely regarded as one of the most important duties of governments throughout the world. Such provision has become a government obligation that is particularly strong in the early and formative years of young people. Hence most governments are committed in principle to providing educational opportunities for their school-aged population, up to a certain basic minimum level. Many countries also have legislation which makes it compulsory for children of school age to attend school. Increasingly, this notion of commitment to providing a basic level of education has become enshrined in the social contract between governments and their peoples. Education therefore ranks among the highest priorities of social demand regularly put upon governments. The demand for education, and the obligation to provide for it, rest on the notion of schooling as preparation for life. Individuals, families, communities and governments all have vested interests in preparation for life. This represents one of the main rationales for public as well as private investment in basic schooling. In addition, most governments accord high priority to education because of its role in building human resource capacity for development.

Beyond schooling there is a much broader concept of education which translates as a lifelong process of self-development. Governments tend to be more ambivalent about provision when it comes to this broader concept of education. It is an issue that is fundamental to the distribution of wealth and development opportunities in society, and an underlying cause of much social unrest and protests about social justice. Therefore access to education is portrayed by some advocates as one of the basic human rights in the modern world. Yet despite this common acceptance of the central importance of access to education, it remains a major problem that thwarts community and national development efforts and frustrates individual ambitions.

The Fundamentals of Access

Access is about both provision and uptake of opportunities for education. It is also about much more than initial enrolment in school, which means that basic enrolment data do not tell the full story on access. What is far more important than initial enrolment is the ability to stay in school and complete a prescribed cycle of learning. In this regard, persistence is a key factor in access to education. Ideally the problem of access, for the school-aged population at least, can be dealt with by providing enough school places to accommodate all those in this category. This has proved to be an elusive ideal, even for the developed and wealthy countries. Besides, provision of schools in itself does not guarantee that all learners will make use of them. There are many sound reasons why available opportunities are not always fully utilised. It is therefore becoming clear that different kinds of provisions must be made to meet different requirements of learners. Expansion of the one-size-fits-all model of formal schooling can no longer be regarded as the ultimate solution to the problem of access in any society.

For far too long, access has been narrowly equated with formal school enrolment. There are in fact several fundamental issues relating to the concept of access that need to be clearly understood and appreciated by decision-makers. First, despite the physical origins of the term, 'access' in education is not simply about entering a building or facility that we call a school, and taking part in what goes on inside. Nor is it just about being able to make use of a teacher or facilitator of learning. The core essence of access in education is about *being in a position to acquire knowledge and information*. While we have become used to the convention that this acquisition takes place in institutions and is normally facilitated by teachers, there is nothing sacrosanct about such formal arrangements. Society therefore needs to conceive of educational access in the broadest possible terms, as *enabling individuals to acquire the knowledge and skills that they require or desire for different purposes*.

The second key issue relating to the concept of access stems from the limitations of a focus on institutions (schools, colleges, etc.) as the prime locus for education. In the face of demographic pressures, shortage of teachers and other constraints facing these institutions, it is now evident that there will always be a residual proportion of the population in many Commonwealth countries that cannot be accommodated in these institutions. Indeed in some countries with high percentages of over-aged pupils and high repetition taking up school places, it is unlikely that the whole of the school-age population can be enrolled in schools in the foreseeable future. The gross enrolment ratios (GER) (Table 2.1) and net enrolment ratios (NER) (Table 2.2, page 31) shown for Commonwealth countries, highlight the disparities between countries as well as the persistent under-enrolment in some countries. These figures also show that as we progress from the primary or first level of education there is less systematic and sustained provision for the great majority of citizens. Essentially then, those who are outside the school-age population are in a worse position when it comes to access to the kind of knowledge and information that they require or desire. In most Commonwealth countries, provision for adult and continuing education has very low priority and public resources such as libraries tend to be poorly funded. Therefore, we are confronted with the basic and fundamental issue of *alternative provisions for access to education*. This issue needs to be understood not in terms of make-do solutions or inferior versions of what takes place in formal schools, but in terms of achieving comparable goals through different (and more appropriate) arrangements and means. The goal of enabling individuals to acquire worthwhile knowledge and information should be at the heart of alternative provisions. An important challenge in terms of access is how to ensure that those who are outside the formal system can be provided with alternative means and opportunities for acquiring the knowledge and information they need to realise their full potential for development.

A third, and increasingly important, issue is the need to provide those already within the education system with access to knowledge and information that cannot be found in their institutions. The continuing explosion in knowledge and information means that teachers are no longer the sole purveyors of what learners need to know. Besides, qualified and trained teachers are far from equitably distributed between institutions or between countries. Learners in many institutions and in many countries do not have access to what they need, because they do not have capable teachers. In much the same way, institutions have different levels of teaching and learning resources, so learners do not have equitable access to what they require. However, even the most resourceful

educational institutions can no longer claim to have within their walls all the knowledge and information that their learners need. In fact this has always been recognised by the more progressive schools, in which field trips, outside visits and the use of external resource persons have been a regular feature of the curriculum. As Roy Williams points out in his case study of South Africa (page 43), *'the borders of the school should not be the borders of learning'*. A critical challenge for access in the formal education system, therefore, is to reach out beyond the boundaries of these institutions in order to tap various other sources of knowledge and information, for the benefit of learners.

Table 2.1 Gross Enrolment Ratios for Commonwealth Countries, by Level

<i>Countries</i>	<i>Pre- primary</i>	<i>First level</i>	<i>Second level</i>	<i>Third level</i>
Antigua and Barbuda	— ¹	—	—	—
Australia (1996) ²	78	103	153	75.6
The Bahamas (1995)	10	100	86	—
Bangladesh (1990)	—	69	21	4.4
Barbados (1995)	—	—	—	29.4
Belize (1994)	27	121	49	—
Botswana (1996)	—	112	66	5.8
Britain (1995)	29	116	133	49.5
Brunei Darussalam (1996)	54	107	77	6.6
Cameroon (1994)	11	88	27	—
Canada (1995)	64	106	—	90.2
Cyprus (1995)	60	100	97	20.0
Dominica	—	—	—	—
Fiji (1992)	15	128	64	—
The Gambia (1995)	—	77	25	—
Ghana (1991)	—	76	37	—
Grenada	—	—	—	—
Guyana (1995)	84	95	87	9.7
India (1996)	5	101	49	6.9
Jamaica (1996)	—	107	—	8.1
Kenya (1995)	—	85	24	—
Kiribati	—	—	—	—
Lesotho (1996)	—	97	29	2.4
Malawi (1995)	—	135	16	0.6
Malaysia (1996)	—	91	62	—
Maldives (1997)	61	125	—	—
Malta (1996)	106	110	—	—

Mauritius (1996)	83	107	65	6.5
Mozambique (1995)	–	60	7	0.4
Namibia (1996)	–	131	61	–
Nauru	–	–	–	–
New Zealand (1996)	77	103	120	58.5
Nigeria (1994)	–	89	30	–
Pakistan (1993)	–	74	–	–
Papua New Guinea (1995)	1	80	14	3.2
St Kitts and Nevis	–	–	–	–
St Lucia	–	–	–	–
Samoa (1994)	–	107	–	–
Seychelles	–	–	–	–
Sierra Leone (1990)	–	50	17	1.3
Singapore (1996)	–	94	72	38.5
Solomon Islands (1994)	36	97	17	–
South Africa (1996)	31	116	84	–
Sri Lanka (1996)	–	109	–	–
Swaziland (1996)	–	129	52	6.0
Tanzania (1996)	–	66	5	–
Tonga	–	–	–	–
Trinidad and Tobago (1995)	–	96	72	7.8
Tuvalu	–	–	–	–
Uganda (1995)	–	73	12	1.7
Vanuatu (1992)	35	106	20	–
Zambia (1995)	–	89	–	–
Zimbabwe (1996)	–	113	48	6.5

Note: 1 Blank fields are due to unavailability of data.

2 Years in parenthesis represent the latest years in which the respective figures were collected.

Source: Compiled from the 1998 UNESCO *Statistical Yearbook*.

Table 2.2 Net Enrolment Ratios for Some Commonwealth Countries, by Level

<i>Countries</i>	<i>First level</i>	<i>Second level</i>
Australia (1996) ¹	97	92
The Bahamas (1993)	95	87
Bangladesh (1990)	62	20
Barbados (1991, 1989)	78	75
Belize (1994, 1992)	99	36
Botswana (1996, 1995)	84	45
Britain (1995)	100	92
Brunei Darussalam (1994)	91	68
Canada (1994, 1995)	95	93
Cyprus (1995)	96	93
Fiji (1992)	99	— ²
The Gambia (1995)	65	—
Guyana (1995, 1990)	87	71
Jamaica (1990)	100	62
Lesotho (1996)	63	17
Malawi (1994)	100	—
Malaysia (1994)	91	—
Malta (1996, 95)	100	84
Mauritius (1996)	98	—
Mozambique (1995)	40	6
Namibia (1996)	91	36
New Zealand (1996)	100	97
Samoa (1996)	97	—
Singapore (1995)	94	—
South Africa (1996)	94	51
Sri Lanka	109	—
Swaziland (1996)	95	37
Tanzania (1996)	48	—
Trinidad & Tobago (1995, 1992)	88	64
Vanuatu (1991)	—	17
Zambia (1995, 1994)	75	16

Note: 1 Years in parenthesis represent the latest years in which the respective figures were collected.

2 Blank fields are due to unavailability of data.

Source: Compiled from the 1998 UNESCO Statistical Yearbook.

Why Equity is a Critical Adjunct

Education as a social good cannot be discussed independently of equity concerns. To the extent that it is financed and supported by public resources, questions arise about costs and benefits in relation to individuals, groups and society in general. Equity is so important that it is a root cause of much social unrest and disruption in many countries. Ironically, the more a country succeeds with access, the more glaring and intolerable is the problem of equity. When 40 per cent or less of the eligible age group is enrolled in schools, access is a very serious problem. Equity is not necessarily a big issue, especially if access is limited by lack of resources, rather than by any form of discrimination or exclusion. However, when 90 per cent or more of the age group is enrolled in schools, equity becomes a serious and intense problem because of the relative deprivation of the 10 per cent not in school. Who are these people and why are they not in school when almost everyone else has access to education? This is the sense in which access and equity start to become more widely regarded as matters of fundamental human right.

The Typical Barriers to Access

In the conventional, formal school system, access is limited by various factors including:

- *Specific location:* There is usually a building or some form of sheltered area that is designated as a school. Learners, teachers and the resources needed are brought together in the school for learning to take place. This raises problems of distance to school for those who live far away or in difficult areas. Small children may be particularly disadvantaged in this regard if they have to walk long distances to the school. Allied to distance is the issue of safety in making the daily trip to school. In some areas this is a problem particularly for girls, but it is a general consideration which influences uptake of opportunities for education. Yet another factor related to the specific location of schools is the opportunity cost to families. If learners have to travel daily to a specific location to attend school, then they are not available at home to perform essential tasks. This can be a problem where the learners normally make a vital contribution to housework or income-related activities for the family. Such opportunity costs may be too high for some families, resulting in failure to make use of schooling provision. Another factor that influences the uptake of schooling opportunities is the condition of the building or facility that serves as a school. Some of these may pose health risks if they are of poor quality and lack such basics as water and toilets.
- *Standardised provisions:* In the interest of basic quality there are usually some standard specifications for schools, in terms of classrooms, furniture, equipment and learning materials. This makes it difficult for some countries to provide schools in all areas, since neither the government nor the local communities can afford enough of the standard provisions to provide for the education of all their people.
- *Specific times:* Formal school is organised according to specific times which add up to school periods, days, terms and years. In many developing countries of the Commonwealth, this raises problems of opportunity costs for some groups as regards important seasons for economic activities (fishing, harvest, etc.). There is a rhythm to schooling created by its time-specific nature, and those who cannot fit in with this rhythm tend to drop out sooner or later.

- *Specialist staff*: Formal schools require trained teachers and other staff. This means that in some areas it is difficult to start schools due to lack of specialist staff. This requirement can also pose a threat to the viability of schools in remote and sparsely populated regions, where it may not be economical to assign one teacher to each grade due to the small number of total learners. In some cases rural areas may also be unattractive to qualified teachers if there is no adequate housing.
- *Programmed activities*: The formal school operates on a curriculum in which prescribed learning activities are programmed according to a timetable. Where the prescribed learning activities do not appear to have much relevance to local needs, parents may not be inclined to send their children to school. Lack of flexibility means that those who are frequently absent miss much of what is prescribed and eventually tend to drop out of school.
- *Prescribed age groups*: Because learners are organised into age-related classes and each cohort is expected to progress through the system together, there is a tendency for over-aged learners to drop out of school. Also, wastage of school places often occurs due to repetition and over-aged learners.

These and other similar factors also have critical implications for the issue of equity in the provision, distribution and up-take of opportunities for education.

The Factors Affecting Equitable Access to Education

Political ideology and economic policies set the framework within which issues of equity in education are determined. However, tradition and convention can also play a major role, especially in situations where conscious efforts are not made to question and change established practices in the interest of equity. For historical reasons certain population groups have not had the same degree of access to education as the rest of society. In Commonwealth countries, for example, the introduction and growth of modern education was closely associated with the spread of Christianity; other religious groups, or groups strongly opposed to Christianity, lost out on educational opportunities. Similarly, it is often argued that traditional values in many countries regarding the place of females in the family and in society, are partly to blame for persistent low female access to education. Whatever the reasons, there must be deliberate and determined efforts to help address these broad political, socio-economic and cultural issues, in order to ensure greater equity in access to education.

This is not purely a matter of legislation, although it does make a big difference if the laws of the country provide for freedom of access to educational opportunities. The problem is that countries can always use such legislation to claim that access to education is available on an equitable basis for all groups in society. Legislation without further action can be a smoke-screen for retaining privileges and perpetuating the old inequities. For instance, poor groups cannot overcome economic barriers to access by themselves. They invariably need targeted subsidies to meet the direct cost of schooling and flexible arrangements to address the opportunity costs of dealing with income-generating activities while attending school.

All too often the arrangements for education are inflexible and contribute to preventing equitable access. These factors are summarised in Table 2.3 (page 34).

Table 2.3 Educational Factors and Issues Affecting Access and Equity

<i>Conventional factors</i>	<i>Issues relating to access</i>	<i>Issues relating to equity</i>
Specific location Typically a school building that is purpose-built, or adapted for the purpose, is designated as the place where education happens.	• Physical distance to school • Safety of journey to school • Quality of school building • Quality of location • Cost of going to school • Inefficient use of facilities	• Isolated population groups • Nomadic populations • Opportunity costs for poor • Inferior facilities for some • Rural locations unattractive • Could be unsafe for girls
Standardised provision Schools are usually defined in terms of classrooms, furniture, equipment and materials used for teaching and learning.	• High costs so fewer schools* • Non-recognition by officials • Over-crowded schools in high density areas	• Sub-standard provision • Cost burden on the poor • No schools in some areas
Designated time blocks Teaching and learning tend to be organised into time blocks designated for specific activities. Periods, school days, terms and years dominate.	• Clash with other priorities • Needs attendance rhythm • Excludes other activities	• Loss of income for poor • Girls' housework pressure • High opportunity cost
Prescribed age-groups Learners are organised by age into classes or stages. Cohorts of learners are expected to flow through the stages together.	• Lack of full school range • Repeaters tend to drop out • No teachers for all grades	• Over-aged mainly poor • Weak control over learning • Older Girls drop out
Programmed activities Education structured in terms of a prescribed curriculum in the form of a programme of learning/teaching activities.	• Lack of relevance to needs • Alienating content • Absentees lose out	• Cultural disadvantages • Lack of home support
Specialist staff Education is the responsibility of specialist professional staff (teachers, etc.) who should be specially trained for the job.	• Shortage of teachers • No local teachers • High pupil/teacher ratio • High salary budget	• Many unqualified teachers • Poor learning achievement • Lack of role models for the disadvantaged groups

Overview of Current Practices

Over the years most countries have achieved some success in addressing the problem of access to education. Generally the emphasis has been on expansion and innovative use of the formal system. Increased social demand for education has led to a rise in innovative measures, in addition to the straightforward expansion of the formal system. Clearly there was an unwritten and underlying assumption that, given sufficient time and effort, the formal system could cope with the growing demand for education. The range of significant policies and strategies that have played a part in the successful expansion and innovative adaptation of the formal system over the years include:

- use of school mapping to ensure that location and distribution of schools match the population distribution pattern;
- use of multiple shift systems to promote greater enrolment for the same number of educational facilities;
- large class sizes that maximise use of existing facilities;
- multi-grade teaching arrangements that enable schools in remote areas with sparse population to remain viable;
- economies of scale achieved through amalgamation of several small schools that are close to each other, but are owned and/or operated by different agencies;
- provision of school bus services to tackle problems of distance and safety on the journey to school for a wide catchment population of learners;
- use of split-site schools to ensure a division that encourages access – for instance, a school may be split into a girls' school and a boys' school component, with each in a different location; similarly where there is pressure on land and facilities, a school may be spread across several locations in a crowded urban area;
- provision of boarding facilities to ease the burden of daily travel to school for learners spread over a wide catchment area, or those from nomadic populations;
- use of the 'feeder schools' concept to provide schooling closer to home for small children during the first three or four grades. These schools are typically small and limited in their range of provision, but they are close to the learners and involve only minimal travel or safety risks in the journey to school. When the learners have completed the three or four grades in these small schools they can transfer to larger schools that take in students from a number of small schools within a catchment area. Thus learners move from their feeder schools into the large school when they are old enough to make the daily journey to school.

The Rise of Non-Formal Alternatives to the School

It has taken a long time, but the old assumption that the formal system will ultimately be able to cope with increased social demand for schooling, is now being seriously questioned in many countries. Against the background of persistent constraints and problems of formal schooling, efforts have been made in these countries to develop alternative provision. The main problem is that such provision is invariably a response to lack of access to the formal system, rather than a bold new initiative that sets out to offer something different. Such efforts often take the form of development initiatives by community groups and NGOs, in which education is seen as having an important role. In such initiatives it is not always possible to work within the many constraints of the formal education system. On the positive side, the success of these initiatives has often led to governments providing support and taking further action to boost alternative provisions. Examples of alternatives include:

- use of mobile classrooms to serve nomadic and pastoral populations;
- introduction of flexi-schooling arrangements to cater for working youth;
- adult and non-formal education;
- distance learning programmes to reach isolated populations;
- open and more flexible learning systems to match learners' circumstances; and
- community schools that serve multiple development purposes.

Over the years developments in technology have contributed to a range of strategies and practices that have helped to overcome some of the barriers to access and equity in education. In this regard it is very important for countries to take stock of, and appreciate the amount of progress that has been made in this area. However, there is no room for complacency, for problems of access and equity are still of paramount importance in education. It is generally agreed that in many ways formal education has been pushed to the limits in terms of access, through such measures as multiple-shift schools, large class sizes, mobile schools and school mapping. Yet substantial population groups still do not have adequate access to education. Escalating demographic pressures; changing lifestyles; increased expectations; the explosion in knowledge and information; greater democratisation and emphasis on individual and community rights have all contributed to the persistence of these problems. A critical paradox that needs to be appreciated by decision-makers is that success in access can accentuate the problem of equity.

Against this background, it has been suggested that what is needed is a fundamental rethinking on the structure and pattern of organisation that have dominated the formal education system for so long. There is a particularly strong feeling that, with recent advances in technology, education no longer has to be constrained in this way. Increasingly, it is possible to extend access to those outside the education system, and to ensure that those within the system are given greater access to an ever-expanding world of information and knowledge. This is a critical point for decision-makers to appreciate. In terms of equity it implies that even as countries strive to provide for those deprived of educational opportunities, they must also ensure that those who already have access to education are not deprived of access to the wealth of information and knowledge that is now available outside the school. This obviously raises some very fundamental dilemmas in terms of equity. It involves reaching the un-reached, while at the same time enriching the reached. Herein lies the great attraction, as well as the great challenge, of distance education.

Distance education is an area in which technology makes an important impact on access to education. In trying to gain a better understanding of distance education, it is worth remembering that the concept is a very old one. What has changed over the years is the range of technologies and what these have made possible in the field of distance education. It is also worth remembering that distance education is not only about reaching those outside the formal system, but also about enriching what is available to those within it. It is equally important to recognise that the technologies involved in distance learning are simply tools, and not the essence of education. Over the years these tools have revolutionised the ways in which we can generate, package, disseminate, store, retrieve and utilise knowledge and information (Table 2.4, page 39). In other words, such tools provide us with an enhanced mechanism for delivering education.

Yet we must not overlook the enduring nature of 'old technology' despite the emergence of 'new technology' in this field. For instance, printing is one of the oldest technologies available, and printed materials are still the most widely used media in standard classrooms as well as in distance learning programmes. The most critical element in any distance learning programme is not so much the technology used to deliver programmes, but the degree to which the materials are *self-instructional* for the target group. Decision-makers need to guard against the dangers of 'fadism' or hankering after the latest technology just to be in fashion. There is a constant tension between embracing new technology and getting old technology to work more efficiently for the education

system. This is often mediated by cost considerations as well as by constraints in current capacity as far as the needs of the new technologies are concerned.

At the tertiary level, distance education is currently one of the fastest growing fields. Its potential is being rapidly exploited to open up access to tertiary education for the great majority of learners who cannot participate through the conventional route. There is also a growing trend in tertiary education of dual institutions, which offer some form of distance education courses in addition to their conventional programmes. In some cases, there is still a preference for separate distance learning institutions, such as the University of South Africa (UNISA) in South Africa, and Open Universities in Tanzania and Zimbabwe, for example. We must not forget that universities have always conducted some form of distance learning programmes, as for instance with their outreach courses and extra-mural studies programmes. What is new is the more systematic and sustained effort to provide university education to a wider population through distance learning. It is increasingly common for people to gain higher education through distance learning while doing other things in life. Higher education is potentially accessible to a much wider range of people than full-time resident university students.

Within the Commonwealth regional universities have been set up to serve a number of small states where it would not be feasible for each to have a university of its own. Prime examples are the University of the West Indies (UWI) and the University of the South Pacific (USP). Both make extensive use of distance learning methodologies for delivering their programmes. In addition to these regional universities, there are a growing number of national open universities in the Commonwealth, which have developed a strong reputation for effective use of distance education to reach a wide student population. Amongst the best known are the Indira Gandhi Open University of India, the Allama Iqbal Open University of Pakistan and UNISA.

Another significant factor in the rise of distance education is the decline in funding for higher education in some Commonwealth countries, which has eroded capacity and standards over the years. This has led to a situation in which higher education institutions, particularly in Africa, are now seeking to make use of external inputs through the modern technologies that promote distance learning at a more interactive level. One of the most promising examples of this is in the African Virtual University (AVU) initiative which is being piloted in several countries with support from the World Bank. The case study from Kenya (page 51) gives a fascinating insight into progress of this initiative. Yet another important source of pressure to link up with external institutions is the increase in franchising efforts by universities in the developed Commonwealth, as part of their income-generating strategy. This pressure is targeted mainly at the newly industrialised Commonwealth countries as well as the richer small states of the Commonwealth. In both cases there is a large potential for courses leading to overseas qualifications, and franchising makes it cheaper to obtain such qualifications locally.

In addition to the growth of distance education at the tertiary level, there is a growing desire to use it for the delivery of secondary education. While there are examples of successful adaptation of secondary curriculum for adult learners through distance learning (for example in South Africa), this is a much more challenging proposition. The main problem is that distance learning presupposes that learners are highly motivated; have adequate language skills and proficiency, and have some familiarity with whatever technology is being used (audio/video tapes, computers, etc.). Unfortunately, this is far from the case for the average secondary-aged learner in many Commonwealth

countries, whether developing or developed. At this age most learners are not yet capable of working largely on their own with minimum supervision. The primary education system does not prepare them for this. It is therefore difficult to use distance education for delivery of the secondary curriculum to students who have just completed primary education. This is not to say that some countries have not attempted to do so in the past. The demise of the Distance Education Centres (DECs) in Malawi bears testimony to the difficulties involved and the unfortunate consequences that can result from such efforts. Hopefully, important lessons can be learned from such attempts. It remains to be seen whether current efforts and investments in secondary distance education in Mozambique will be more successful. In reality, there are no really successful examples of using distance education at secondary level in Commonwealth countries. We may have to await a new kind of primary or basic education which better prepares learners for self learning, before distance secondary education becomes truly feasible.

In general terms, however, distance learning has become increasingly significant as a means of delivering educational programmes for several reasons:

- the exponential expansion in knowledge and information over the years has meant that the walls of formal institutions can no longer contain most of what needs to be learned. Equally, teachers are becoming less purveyors of knowledge and more managers of the learning process. It is therefore inevitable that at various times and for various purposes, learners need to look beyond the formal institution for sources of knowledge and information;
- distance learning methodologies help to promote equity in many situations where formal institutions are very unequally resourced in terms of trained teachers. Through distance education it is possible to use the best teachers to deliver a range of well-planned lessons to all institutions;
- through the use of self-instructional materials, it is possible to conduct teacher training by distance education courses. This has the potential of reducing the cost of teacher training quite dramatically, as well as expanding access to training courses for many more serving teachers who need training;
- individuals for whom conventional education programmes are not suitable can pursue tertiary and even secondary programmes through distance education. Courses can be pursued by people who are in full-time employment, or who are doing other things like taking care of their families.

Despite the growing importance of distance education, it would be wrong to regard it as yet another panacea for the problems of equitable access in education. Certainly it is one of the mechanisms for expanding access, and in certain circumstances it can help to deal with the problem of equity. In the main, however, countries will have to address the much more fundamental questions of re-allocating educational resources and providing targeted subsidies, as well as designing interventions to help groups overcome the various barriers to equitable access in education. When considering the use of technology to promote equitable access, countries should undertake a basic analysis of the ways in which a wide range of technologies could be useful for generating and packaging knowledge, and for the transmission and dissemination of knowledge in the process of delivering education. These and other related properties of the various technologies will determine their usefulness for equitable access in education (Table 2.4).

Table 2.4 Matrix of Technologies and their Properties

<i>Clusters of education-related technology (by level)</i>	<i>Generating and packaging of knowledge and information</i>	<i>Transmission and dissemination of knowledge and information</i>	<i>Storage and retrieval of knowledge and information</i>	<i>Pattern of use and level of accessibility</i>
Level 1 Face-to-face; spoken word;	• Time-bound • Place-bound • Interactive	• Very highly restricted • Unreliable • Gossip and rumour	• Restricted • Fallible • Memory	• Very highly interactive • Low access
Level 2 Manual writing; typewriting	• Place-bound • Not usually interactive • Low level of efficiency	• Usually slow • Reliable • High costs	• Easy to store • Reliable • Recordable • Retrievable	• Reference • Modest level of access • Low level of interaction
Level 3 Printing; photocopying;	• Place-bound • Not usually interactive • Modest level of efficiency	• Usually slow • Reliable • Lower cost	• Easy to store • Reliable • Recordable • Retrievable	• Reference • Good access • Low level of interaction
Level 4 Radio; television;	• Can break time barriers • Can break place barrier • Can be interactive	• Fast/instant • Reliable • Lower cost	• Recordable • Reliable • Retrievable	• High level of access • Good source of news
Level 5 Telephone; fax machine	• Break time and place barriers • Interactive	• Fast/instant • Reliable • High cost	• Reliable • Recordable • Retrievable	• Good access • Good level of interaction
Level 6 Audio/video recording;	• Independent of time and place	• Reliable • High cost	• Reliable • Retrievable • Excellent for storage	• Reference • Source of news • Fair access
Level 7 Computer; electronic mail; www/internet; video conferencing	• Break time and place barriers • Interactive	• Fast/instant • Reliable • High cost	• High storage cost • Easy to store • Recordable • Retrievable	• High level of access • Very highly interactive • Reference • Source of news

Addressing the Challenges

Some of the critical challenges facing governments concerning the use of technology in access to education may be summarised as follows:

- meeting the costs of current provisions and making the investments necessary to extend such provision to reach those excluded to date (sustainability);
- making full and efficient use of existing and old technologies where it is more cost effective or appropriate to do so;
- promoting diversity of educational provision to break down barriers by moving away from the 'one-size-fits-all' notion of formal education.
- restructuring educational financing to reflect a more holistic approach to formal and non-formal provision; maximise equitable access, and promote equality of outcomes.

All governments have to face the major challenge of finding extra resources to meet the need for equitable expansion of education in a manner that is sustainable in the long term. This need goes beyond the capital cost of constructing, furnishing and equipping new classrooms. It involves the short-term cost of training additional teachers for the expanded system, and various other capital costs. However, it is in the area of recurrent costs that governments face the greatest challenge. In many countries the education recurrent budget mainly covers staff salaries, leaving little for pedagogical items.

Often the challenge is to find more efficient ways of spending current resources, and to search for new money to increase the level of the recurrent budget available for education. These two aspects of the challenge are closely inter-related. Ministries of Education need to show that they are using existing resources in the most efficient manner possible before additional resources can be justified for the education system. Conversely, putting additional resources into a very inefficient system is simply wasteful.

In the quest for efficiency the challenges faced by governments include the removal of hidden subsidies that benefit powerful groups in society, and the need to change long-established but inefficient practices and patterns that may have been wrongly associated with 'quality education'. Countries will need to persuade and campaign for this kind of change in education. Change can easily be derailed by powerful interest groups if they are not persuaded to see and appreciate what is in the best interest of the population in general and the nation as a whole. These are sensitive issues and countries need external support to deal with them in a responsible manner.

One of the main challenges relating to new resources is the debt burden faced by many countries. Servicing and repayment of external debts leaves little or no additional resources for investing in sectors like education and health. Developments in the area of debt relief now offer great hope that the highly indebted poor countries (HIPC)s will have substantial resources to channel into education and health.

Formulating Policies and Strategies

It is important for governments to embark on well thought out policies and to engage in feasible strategies to address the question of technology and access to education. These should provide answers to such questions as:

- Who is entitled to participate in the existing education provisions?
- Are specific groups or communities excluded by definition from participating in these provisions?
- Are current provisions adequate to meet the general demand for education?
- Are there problems on the demand side in terms of poor up-take of opportunities provided for basic education?
- What are the main obstacles to education for all?
- How can we best reach those who are not being reached by current provisions?
- What is the trade-off between expanded access and quality of education?

If governments are to meet the demand for equitable access to education, they need to move increasingly towards encouraging a diversity of provision from formal schooling monopolies to a wide range of alternative opportunities and provisions. If these alternatives are to be credible, they must be designed and funded to function as more than 'second rate and last resort' options for those who cannot gain access to the formal system. It is critical that measures are taken to ensure equity of outcomes. Learners may take different routes in terms of access to education, but they should be guaranteed similar outcomes in terms of the learning achievements possible and available to them. This is feasible in principle, but in reality major problems of perception and attitude make it difficult to equate alternative provisions with the main-stream formal education system. These problems impact very strongly on the equity issue, in terms of who has access to what. Almost without exception, the alternative provisions lauded in the literature are targeted at the poor, the disadvantaged and those who for other reasons do not have access to formal, main-stream education. Hence the perception that all forms of alternative provision are inferior and should not be trusted to deliver good quality education. That is why countries must bridge the gap between formal and non-formal education provision, and develop a holistic system that embraces both kinds of provision. This is not a simple challenge, for it would require constructive collaboration between NGOs, community organisations, private providers and governments.

In order to begin to address the many complex issues relating to this notion of equity of outcomes, governments should embark on genuine partnerships with other education providers to:

- develop improved linkages and articulation between the various forms of educational provision;
- work towards a more integrated approach to the provision of educational opportunities, so that learners can have greater flexibility and genuine choice; and
- develop a system for dealing with the management of this integrated diversity of educational provision.

In situations where equity is affected by the exclusion of certain groups from main-stream education, it is important that governments take special measures to tackle the problem. For instance, in a number of Commonwealth African countries the problem of providing education for nomadic populations has entailed the use of special measures such as mobile schools and flexible schedules for schooling.

Perhaps the most important area for policies and strategies to impact on equitable access is in the re-allocation of resources. Even the poorest countries currently spend a

significant proportion of government budget and GDP on education. This fact, more than anything else, suggests that the solution to the problem of equitable access is not fundamentally one of new resources. Political decisions need to be made about who should pay what for education, in a manner that would allow governments to use existing resources to promote equitable access as one of their main objectives. Already the indications are that choices have to be made between levels of education, kinds of education and groups of learners. Support for basic education for all is one of the commitments that most governments have made since the World Conference on Education for All at Jomtien in 1990. Even so, blanket subsidies implied in declarations of free basic education cannot be fully justified. Governments need to be more selective in targeting subsidies to those most in need and who face the greatest obstacles in terms of access to basic education. At secondary and higher levels of education the argument for subsidies is even more complex. In essence, subsidies should be used mainly to support and give leverage to the government's education policies and strategies. The same is true of technical and vocational education and other kinds of employment-related training. The key issue is partnership between governments, the private sector, NGOs, local communities and beneficiaries of the educational provision in society.

Clearly there is no simple technology fix that can address the critical issues related to equitable access to education. There are complex considerations which require well-thought-out policies, carefully designed strategies and bold measures in implementation. Technology has a role to play, but it should not be considered in isolation as some sort of *deus ex machina*!

Case Study 1: Closing the Gap Between Information Rich and Poor in South African Schools

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Introduction

The impact of new technologies is exciting as well as a cause for concern. The pessimists say that new technologies 'always tend to increase differences in power and access to facilities', and that is often the case. ICT (Information and Communication Technology) has enormous potential to assist in development and, in particular, in the provision of schooling and education. We are told that we should all be moving into an *information society*, composed of *learning organisations*, connected to a *world-wide network of global e-mail and e-commerce and instant international web-based information*.

Various countries have made a commitment to the information society, as well as to equity in education. The President of South Africa, Thabo Mbeki, first made a commitment to developing ICT in 1996 at the G7 (Group of Seven Developed Countries) Conference held in Johannesburg, and the South African Constitution guarantees the equivalent of ten years of free schooling to both adults and children. The Prime Minister of the UK, Tony Blair, has made commitments to ICT across the economy, and his Department for International Development (DfID) has reformulated its policy goals in terms of a radical reduction in poverty.

The question is whether these two objectives can be reconciled. This study will examine various processes in ICT policy and implementation in South Africa, and the way in which the potential for schooling can be realised. This is relevant not only to South Africa, but also to a number of other countries. Many of the issues arise out of my own experience and involvement in these processes, and some of them form the basis for ongoing project design and project work.

Education and Poverty

Oxfam has recently published figures which show that increasing access to education has a direct correlation with development – in health, agriculture and business. There are two related concerns in terms of the relationship between education, poverty and ICT: first, what exactly does ICT have to offer to education – particularly to schools that have so many other problems in other areas? Second, how can poorly resourced schools benefit from ICT, without losing all their best teachers and pupils to rich metropolitan schools? In other words, will the introduction of ICT in poorly resourced schools simply mean that the best people in those schools are creamed off into the cities, leaving the schools increasingly poorer in human resources, and more marginalised within the economy?

Policy Developments in South Africa

In November 1995, the South African Ministry of Education held a national workshop on what it termed 'technology enhanced learning'. This term was formulated very deliberately to prioritise learning, and to ensure that technology served learning, and not vice versa.

In 1996 a team of consultants and stakeholders, from South Africa as well as from several other countries, met over a period of three months to research and produce a proposal for Technology Enhanced Learning (TELI) for the Minister of Education. The team decided that there was no uniform 'learning environment' in South Africa, for which a uniform and standardised set of recommendations could be determined. And on evaluating a number of case studies in South Africa, it became clear that the application of ICT and other technologies to enhance learning varied, and had to vary, from context to context, depending on the particular need that had to be addressed.

Consequently the discussion paper prepared for the Minister took on a unique form: it developed a decision-making framework for educators, rather than a set of recommendations for bureaucrats. It started with analyses of trends in education, technology and development. It stated quite clearly that there was no way in which the current best practices in South African education could be multiplied and made available to all – the numbers did not add up, and they will not in future either.

This means, first, that if equity and quality in education are to be achieved, the new economies of scale of the new technologies will have to be used. Second, the fact that the 'learning environment' – quite simply those places, facilities and people who enable learning to take place – is expanding rapidly beyond the school walls should be welcomed and not resisted. For it is only by harnessing and co-ordinating the varied resources inside and outside of the school walls that education for all will be attainable. The education sector alone will not have the resources to do it. Third, it is the enduring human resource – the teachers – who must be supported first and foremost. Of course learners must have access to the best tools and techniques to enhance their learning. But the teachers must remain central to learning: they must be ahead of the learners, which means that they must become learners too – both in terms of mastering the technology, and in terms of welcoming the opportunities to learn from rapidly developing world-wide information resources. And they must embrace the new 'flatter', non-hierarchical relationships to knowledge and expertise.

After completing the analyses of trends in learning, technology and development, the TELI team developed a decision-making framework, which consists of four parts, all of which are essential to good decisions about TELI, but which can be approached in any order. This is a departure from previous approaches to decision-making, and to the management of educational resources.

Its most important feature is that it is a decision-making process which *depends on the context*, and within that context, on learning needs and goals; existing resources and skills; levels of professional and technical support available, and competing claims for resources. In short, it proposes 'contingency based' decision-making. Another way of putting this is that 'administering standardised procedures' has been replaced by 'managing contingent needs and priorities'. This requires no less than *a change in the organisational culture of education*: from the 'bureaucratic administration' of the past, which was the basis of the *modernist* 'civil service', to a more *post-modernist* 'executive management' that is now required, and which in the past was exclusive to the private

sector. What this means is that people in Education will have to learn to make *different decisions within the same framework* – a far cry from the days when all you had to do was to carry out the same directives from the Department of Education in the same way.

After the Minister of Education published the TELI report, a number of public consultations were held in late 1996 and early 1997. The Ministry then set up a second phase, charged with producing a strategic plan for the country. This was done, and some overall programme and financial planning was tabled in 1997. It prioritised

- curriculum development in three key areas in Grade 8;
- delivering technical education in three priority areas;
- developing generic ICT literacy courses;
- professional development of educators;
- training and support of managers;
- pilot projects to test the new approach.

This was a mixed blessing. On the one hand, it included pilot projects to test the new approach, and training and support for managers, who needed to make no less than a cultural shift to implement it. It also included some of the generic resources, such as ICT literacy, which are necessary in any situation of this kind.

On the other hand, by prioritising six large, nationally targeted, undifferentiated mass application programmes, it was in danger of defaulting back to the strengths of the past – large, standardised applications – rather than grasping the challenge of the future, in which not only the *learning environment* but also the *educational management environment* will be characterised by far less certainty, and will require many more on-the-spot, contextually-determined applications. There is, of course, a middle way, in which a multi-faceted and flexible approach, *resource-based learning*, can be used within nationally targeted development areas. It remains to be seen which approach is adopted.

At the same time, the Telecommunications and Broadcasting sectors (in one Ministry), the vocational training sector (in another Ministry: Labour), and a number of initiatives in ICT in yet another Ministry (Arts and Culture), as well as the State broadcaster SABC (South African Broadcasting Corporation), were being developed. With the exception of a joint initiative between the SABC and the Ministry of Education, they were not co-ordinated to any substantial extent. In addition, many of the large educational institutions in the State sector – mainly tertiary education institutions such as the national distance education institutions UNISA (University of South Africa) and TSA (Technikon South Africa), as well as some of the residential universities – were all establishing their own learning support centres, as was the Universal Service Agency in the Ministry of Telecommunications (but attached to the Telecoms regulator, SATRA).

Clearly a great deal of activity is taking place. However, without real co-ordination in the State sector (to say nothing of private initiatives such as M-WEB within the M-NET broadcasting company), the more ICT is developed for learning, the more it might lead to duplication and inefficiency, in everyone's rush to get on board first.

The issue is not amenable to easy solutions. The several State Ministries and semi-autonomous institutions all have their own separate targets and goals to pursue. And although much money is spent on the nine Provincial administrations and legislatures, they do not have any authority over many of the activities of the national institutions

in their provinces. The situation is very different from the kind of services offered by Posts and/or Telecommunications in the past, in which the service and the service providers were unified in one 'PTT' (Post and Telecommunications Territory), and in which they held a total monopoly on services.

Nowadays there are several networks – land-line telephones, cell phones, satellite and broadcasting communications, and a vast mix of service providers – each with their own lines of responsibility. The sector is starting to look as if it is regulated by 'market'-type forces, rather than by public policy and public service, but at the moment it looks like neither the one nor the other. However, there is neither the desire nor the political will to move education into a 'regulated–partly privatised' sector, as has happened in broadcasting and telecommunications. The South African paper at the G7 Conference in 1996 provided the framework, but not the detail, for an overall approach to ICT development, although it has not yet resulted in a co-ordinated approach. The South African position paper at that conference identified the priorities as:

- centres of excellence to develop applications;
- multi-purpose community centres for universal access;
- Government-online;
- a national IT qualifications framework; and
- a contemporary music and arts archive.

The TELI initiative has subsequently been expanded in policy terms to include Southern Africa, and the first TELISA centre was established in late 1998 in Maseru, Lesotho.

Developments in Education

During this time a number of initiatives have taken place in schools. The Western Cape Schools Net has been extrapolated to the SA (South African) Schools Net, to expand access to the network. The Canadians (IDRC – International Development Research Centre) have been working throughout the period covered in this study (1994–8) to assist in building facilities in Africa for development, including education. The World Bank has been giving support to the Soweto Technology Project since 1997. The best network, UNINET, has been developed for the tertiary education sector, based at the Foundation for Research Development in Pretoria. This could be expanded for all education. There is also a very promising pilot project which is using a 'CIDS' 2 Megahertz two-way microwave link between St Albans School and Mamelodi Education Centre in Pretoria.

Associated with a project to develop content for ICT applications in education, under the auspices of the Telematics for African Development, a group of people formed the Schools Hypermedia Working Group, and met during 1997 and 1998 to exchange ideas and develop best practices.

Several issues arose out of this work, which have general relevance for educational applications and development of ICT. Many South African schools are poorly resourced – many lack just about everything, from running water and sewage facilities upwards. But they also lack educational materials – textbooks and resource materials for learning. This is partly because the new 'outcomes-based' approach is premised on using a variety of resources, and partly because the transition from apartheid education, in particular

the deployment of teachers, was badly handled. Teachers were offered voluntary redundancy, and many of the best teachers took the offer from the State, and moved to the rapidly growing private sector, in which many schools are starting to offer foreign-accredited courses. As a result, the Education Department had to cut back on funds for textbooks, and publishers reduced their staff by up to 50 per cent in 1998.

However, there are ways in which ICT can be used in poorly resourced schools which strengthen those schools; provide learning and professional opportunities for teachers; improve education for the pupils; provide some economic opportunities for the schools and their communities, and make resource materials available which are appropriate for the context and culture of that community.

There are several broad considerations. Most important is that the exercise of providing ICT support to enhance learning must be both conservative and radical at the same time. This might sound strange, but it is important to understand these issues.

During apartheid, and particularly in the 1980s, a very strong 'progressive' education sector developed – much of it feeding into the NEPI (National Education Policy Initiative) and the policy and planning that followed during and after the first democratic election. Many people within the progressive sector of education feel very strongly that only the best, most progressive methodologies must be supported. This makes sense at one level. But it does not take account of the fact that however much effort is put into upgrading teachers, it will take a long time – years and years – and in the meantime teachers have to get on with providing learning opportunities for their pupils. In practical terms, this means that teachers must, first, be supported in what they are already doing. And if that means getting them better notes to write on the blackboard, for everyone to copy down, day after day, and calling it teaching, then that is a start. It would also demonstrate to teachers that the notion that TELI supports their needs can be taken at face value, and it would give them immediate value added, which is recognisably theirs.

The notes that teachers currently use can be upgraded by e-mailing them to a 'moderation and editing' centre, where they can be improved, and sent back – in the same format in which they arrived (probably A4). Then these same notes can be used as the basis for much more radical developments. They could be the basis for hypertext notes, for multimedia, for student collaboration, and so on. In an ICT world, it does not matter if the same materials are made available in many different versions. Storage is no longer expensive, and schools can choose which versions they want to use and print out.

In this way a number of different formats of materials can be developed, using ideas from outside the school, as well as materials from teachers who know what is appropriate for their learners. The most radical and the most conservative enhancements of learning can, and should, be developed alongside each other. We no longer live in a single-track modernist world, and education can benefit from multiple format resources.

There are a number of more detailed parameters that would allow this to happen:

- *The borders of the school should not be the borders of learning.* Whether teachers, pupils or parents are using ICT resources, the school must not, and cannot any longer, define the borders of learning. Low-cost connections to people, texts, projects and communities must be exploited to the full, and the school should be developed into *one of the best places from which to access learning*, instead of the *only place to go to receive teaching*. Creative ways of doing this without running

up exorbitant telephone bills are readily available – various permutations of Web-CDs, intranets, extranets and virtual internets, using a variety of communication technologies to transmit information, can be used.

- *Use a variety of media and resources, and never let particular technologies dictate what you do.* Useful as ICT is, it is not the only game in town, and paper, live interaction, radio, television and tape-recorders will all still have their place. Paper magazines are one of the most popular media in many poor communities, and people's existing media consumption patterns should be capitalised on, not ignored.
- *Teachers rather than pupils need to be the primary beneficiaries.* This does not exclude pupils from using ICT, but it does argue for leverage into education through improving the key and enduring resource in schools – the teachers. It also makes sure that the teachers are valued, and see themselves as valuable resources, instead of feeling threatened and marginalised. In the end teachers will have to ensure that ICT works in schools. We will never get to the point where we will hold individual children solely responsible for their learning – teachers and schools will always be expected to bear overall responsibility.

In most poor communities in the world, and in most poorly resourced schools, it will not be possible for every child to get open access to ICT in the next ten years. However, it is entirely feasible for every teacher to have sufficient and useful access to ICT via teachers' centres – at schools or in other buildings – and to slowly build up access for pupils.

- *Start with familiar practices, proven needs, and existing information flows.* Teachers in all schools have information – texts – which they use in their classrooms. These are familiar, and are used in familiar ways. The content, design and presentation, and the educational methodology might be less than perfect, but what is important is that they are often phrased in a language, and make use of examples, that speak directly to the pupils in that context and that culture.
- *Improve teachers' own resources and texts, and feed them back quickly to the teachers.* All that is required is to let some of them input their texts into a computer, feed it into an e-mail network, and for someone at a central point to provide an editing and mediation service, and send them out again.

The mediation part of the centre would provide the human interface so that teachers do not have to spend a lot of time and money browsing the internet – they can be pointed in the right direction, and given advice on what is useful.

The editing centre would revise these texts, and improve the language, layout and design, add detail and related examples, offer ideas for practical and collaborative work, and links to other resources. A system of portable document formatting (pdf) allows documents to be transported between computers, whatever the platform.

The texts could then be fed back quickly to the teachers in a such a way that they would:

- remain recognisably *theirs* – so that they own and are proud of the material they have produced, and which others can use;
- be available in the form with which they are most familiar – probably an A4 print-out, and in lesson-sized chunks;

- also be available in web-format, with useful links to many other resources; and
- be made available, in principle, to all other teachers.
- *Establish cost-effective ways of making the resources available.* It would be wonderful if it were possible to give everyone access to the world-wide web, 24 hours a day, but this will remain prohibitively expensive to most poor communities for years to come. However, there are ways to get around telephone line costs: from sending updates on CD-ROM or even diskettes, to using computer network *mirroring techniques*. In this way simulated or virtual access to the information can be provided.
- *Develop cost-effective knowledge bases for learners.* Teachers' notes can be upgraded for teachers. But they can also provide opportunities for students to
 - compile and author their own knowledge base of notes and resources, whether in paper or digital form.
 - compile their own hypermedia resources, which could be made available to the next class of pupils doing that course.
- *Provide rewards and ownership.* Resources produced by teachers and pupils should be *theirs*, but they should also be available to others. There are ways to define and share copyright, so that everyone in the system benefits. ICT enthusiasts will put extraordinary amounts of effort into developing resources, but they will migrate to commercial publishing houses in the cities very quickly if their time and effort is not recognised.

The school also needs to be able to rearrange duties and responsibilities, and manage a number of new ways in which particular teachers can contribute to ICT-enhanced learning – not only in their school, but in a broader educational setting. Educational management must adjust to these changes, or lose its best resources.

- *Provide economic opportunities for poor communities.* In the early stages, teachers would input texts and receive revised texts. Later on, they could develop editing skills, become part of the editing network, and be paid for it. They could also become *e-mail tutors* for pupils from other schools – this should be a key part of a learning network, and it also requires changes in educational management.
- These opportunities can, in a small way, start to provide economic input into poor communities. If the teachers could stay in the communities, and at the same time develop their professional skills and increase their earning power, they would spend some of that money in those poorer areas. It would be possible to draw up project guidelines which require the increasing use of teachers in poor schools for increasingly more responsible jobs in the network.
- *Maximise choice.* One of the most impressive things about ICT is that information resources can be stored and communicated at ever decreasing costs, and this trend will continue for years to come. This means that there does not have to be one way of doing or presenting anything. Many versions of the same lesson, description, report, or text, are possible, and it should not matter which ones the pupils and teachers use. They will have to learn to be more discerning, but that is a useful life-skill to develop anyway.
 - *Provide guidance and navigation in resource bases.* The downside of ICT is that it provides even more information in a world which already suffers from information overload. It is possible to provide tracking and guidance within an ICT resource base, which would greatly enhance the user-friendliness of the resources.

For instance, different schools and teachers can tag or mark their texts according to their learners and the contexts in which they find themselves. People using the system will be free to use whatever parts they like, but they could choose to tailor their searches and use of the resources in ways that more closely mirror the profiles of their learners. Customised learning resources are possible – both in the sense of choosing between different sets of materials on the same topic, and in terms of teachers further customising those resources as they become adept at manipulating the information and tools.

Conclusion

In this way, poorly resourced schools can provide learning and professional opportunities for teachers; improve the education available for the pupils; provide some economic opportunities for the schools and their communities, and make available resource materials which are appropriate for the context and culture of particular communities.

These schools can also be part of a much broader collaboration, in which all schools contribute to educational development. This model can be implemented specifically for poorly resourced schools. It can also provide opportunities for all other schools – both to contribute to, and to benefit from, a wide choice of educational ideas, resources, and personal and professional contacts.

There are technical, curriculum, materials development, and broad management issues to be solved. They can be solved, and the investment of time and effort will yield demonstrative benefits.

It is important that people and countries who are thinking of developing ICT resources for schools should understand, and think through, the policy, decision-making and management, cost, and plain usefulness in the classroom of ICT before going ahead. But there is no doubt that 'ICT' is exciting, and offers particular economies of scale and opportunities hitherto unimagined, if only we keep in mind the people who would like it to be useful and easy to use in their day-to-day lives.

Note

There are three main sources of information about ICT in South Africa, each of which has many links to other sites:

- 1 Sangonet: www.sn.apc.org
- 2 Africa Internet Connectivity: www3.sn.apc.org/Africa
- 3 SAIDE (SA Institute for Distance Education): www.SAIDE.org.za, particularly a paper by Neil Butcher (1998): *The possibilities and pitfalls of harnessing ICTs to accelerate social development: a South African perspective*, which is as encyclopaedic as its name, but nevertheless very useful.

Case Study 2: The African Virtual University (AVU) – Kenyatta University, Kenya

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Introduction

African higher education has witnessed unprecedented expansion in the past several decades. Many African countries which had a single university at independence now (1998) have several universities and colleges. With the achievement of independence in the 1960s by most African countries, the rate of expansion has averaged 11 per cent per year for the past 30 years, with enrolment increasing from around 21,000 in 1960 to around 500,000 by the mid 1980s.

Kenya is among the countries that have experienced an explosive growth in university education in the last 20 years or so. From one university (the University of Nairobi) with a student population of 2,786 in 1970, there are now five public universities in Kenya – namely, Nairobi, Kenyatta, Moi, Egerton and Jomo Kenyatta University of Agriculture and Technology. The student enrolment rose to around 40,000 in the 1991–92 academic year. In the 1996–97 academic year, enrolment declined significantly by 5.2 per cent to stand at 37,973 against 40,065 students in the 1995–96 academic year. The drop is explained partly by the gradual graduation of the double intake of students admitted in the 1990–91 academic year, and partly by the inability of some parents to pay college fees (Republic of Kenya, 1997:201).

The rise in student numbers has also meant growth in the teaching staff. The size of the university teaching staff quadrupled from 434 in 1970 to 1,800 in 1989, coinciding with a significant rise in student enrolments during this time. Although the proportion of Kenyans on the academic staff is over 80 per cent, poor remuneration compared with other sectors has resulted in many vacancies and the hiring of less qualified staff. A high proportion of staff are Master's degree holders. Competition for qualified staff among the public universities has also resulted in uneven promotion criteria.

The growth in enrolment is mainly a consequence of the insatiable public demand for higher and higher levels of education, as primary and secondary levels can no longer guarantee modern sector wage employment. Related to this is the nature of Kenya's reward structure which favours those with formal education qualifications who are engaged in wage employment in general and professional employment in particular. However, public demand has been an important factor influencing university growth, mainly because university education has experienced increasing politicisation. Thus the main initial justification for university expansion – the need for the generation of skilled, high-level manpower – has been replaced with a political one in which university expansion is seen more in terms of its political potentials to equalise economic opportunities at both the individual and regional levels (Sifuna, 1997).

With regard to funding, in recent years higher education has been funded more substantially than any other level of education. Higher education's share of the

1992–93 Government allocation, for example, amounted to 19 per cent of the national recurrent budget for education and over 56 per cent of the Government's development budget (funds for building, equipment and other capital investments). National recurrent budget expenditures per student in public universities for 1992–93 were 46 times higher than those for each primary school pupil. In other words, higher education is mainly funded by the Government. Students are required to pay nominal fees, amounting to roughly 10 per cent of the total Government recurrent expenditure for higher education.

Despite the astronomical Government expenditure on higher education, the rapid expansion of university education and increased enrolment have not been accompanied by a commensurate rise in the level of Government funding, to ensure a high quality of instruction. There are therefore serious problems in the public universities related to instructional quality, class sizes and availability of materials and facilities.

This state of affairs prevails in the five public universities, although each of them has its own peculiar problems. For example, enrolment at Kenyatta University went up by 5 per cent to 8,574 students in the 1996–97 academic year. In this period the University enrolled a total of 294 postgraduate students, of whom 133 were pursuing doctoral degrees (Republic of Kenya, 1997:292). These student numbers were not matched with the provision of teaching facilities and resources, especially in Science where laboratories and equipment intended for 30 students were now used by ten times that number. The calibre of the teaching staff did not improve the situation.

Background to the African Virtual University (AVU)

The essential problem confronted by university managers, academic staff, Government policy makers, graduate employers, students and their families is that the quality of university education in Africa has declined significantly. This is true regardless of how quality is defined: student performance on standardised test; academic staff credentials; student exposure to current knowledge and information; relevance of learning to labour market requirements, and academic capacities for development in Africa – on the whole, all have been declining. A significant opportunity is created by AVU to catalyse constructive action in this arena. The AVU model will assist in tapping the potential offered by new technologies to overcome some of the financial, physical and information barriers that prevent increased access to high quality education in Sub-Saharan Africa.

Furthermore, the emergence of the virtual university model presents an exciting opportunity. For instance, the growth of new technologies makes possible the creation of virtual universities where quality professors, libraries and laboratories can be shared by people and organisations in physically unconnected places. The pedagogical advantages afforded by the model of virtual universities are even more significant: they enable the creation of more current programmes of studies and curriculum content at Kenyatta University in fields such as computer science and computer engineering which do not exist as programmes of study in the University. The introduction of short courses – Internet Access; C++ Computer Programming; Computer Architecture and Design; Introduction to Engineering and the virtual seminars add a new dimension in augmenting and supplementing current university programmes. The new courses provided by the AVU model adapt to demand and keep up with the latest advances in disciplines of studies.

Essentially, AVU is a concept or model of distance education that uses a technological mode of instructional delivery. It is the first of its kind – an interactive, instructional telecommunications network – established to serve countries of Sub-Saharan Africa. It is funded by the World Bank, with headquarters in Washington DC. AVU's mission is to use the power of modern information technologies to increase access to educational resources throughout Sub-Saharan Africa. Its objective is to build world-class degree programmes that support economic development by the education and training of world-class scientists, technicians, engineers, business managers, health care providers, and other professionals.

The Implementation and Current Status of AVU

AVU is being developed and implemented in three phases. First, the prototype/pilot phase, which was implemented in 1997–98. The purpose of this phase was to establish partnerships with institutions of higher education throughout Sub-Saharan Africa, in order to offer technology-based credit courses and non-credit seminars using digital-satellite technology.

A successful prototype service phase will provide the foundation for the second phase of AVU, which will include offering complete undergraduate degree programmes from leading universities world-wide, beginning in 1999.

The third phase of AVU will follow with the development and offering of science and technology curricula from one or more partner institutions in Sub-Saharan Africa. The full implementation of the third phase will be resource sharing of technology-based degree programmes among institutions of higher education throughout Sub-Saharan Africa.

For the 1998–99 academic year, the following 27 institutions will offer AVU courses:

- Addis Ababa University, Ethiopia
- Cape Verde Higher Education Institute, Cape Verde
- Egerton University, Kenya
- Kenyatta University, Kenya
- Kigali Institute of Science and Technology, Rwanda
- Loko Vocational School, Ivory Coast
- Makerere University, Uganda
- National University of Rwanda, Rwanda
- National University of Science and Technology, Zimbabwe (NUST)
- Open University of Tanzania, Dar-es-Salaam, Tanzania
- Togo University, Benin
- Uganda Martyrs University, Uganda
- Uganda Polytechnic, Uganda
- University of Abidjan, Ivory Coast
- University of Abou Moumouny of Niamey, Niger
- University of Benin, Benin
- University of Cape Coast, Ghana
- University of Cheikh Anta Diop, Senegal
- University of Dar-es-Salaam, Tanzania

- University of Eduardo Mondlane, Mozambique
- University of Ghana, Ghana
- University of Mozambique, Mozambique
- University of Namibia, Namibia
- University of Noukchott, Mauritania
- University of Ouagadougou, Bokina Faso
- University of Science and Technology, Ghana (UST)
- University of Zimbabwe, Zimbabwe

The Implementation of AVU at Kenyatta University

As a distance educator I was sponsored by Kenyatta University to attend a conference on Distance Education in Washington DC in October 1996. Etienne Baranshamaje, architect of the AVU model, presented a paper at the conference and, surprisingly, Kenya had been excluded from countries listed to participate in the project. I discussed with Mr Baranshamaje the possible involvement of Kenya – particularly Kenyatta University – in the project. After the conference, I briefed our Vice Chancellor on the possibility of Kenyatta's involvement, and he quickly contacted the World Bank, which readily incorporated Kenya, and Kenyatta University in the pilot phase.

The AVU inaugural workshop in Addis Ababa in February 1997 was attended by a contingent of five people from Kenyatta University. Soon after, the contract was signed between the Kenya Government, the World Bank and COMSAT – the supplier of satellite equipment. Preparations for installations and renovations were completed, and the Satellite Receive Terminal was installed in June 1997. For Kenyatta University, AVU has come at an opportune moment to revitalise and supplement existing academic courses. The main goals and objectives of AVU are as follows:

- To provide quality and relevant courses in science, engineering and computer science, and short-term courses in related fields.
- To increase enrolment of students in highly demanded science and technology fields.
- To provide university education to deserving students who may have missed admission due to limited opportunities.
- To provide high quality and relevant professional courses and seminars to top-level managers, journalists, and teachers in relevant areas.
- To offer a structure that can generate income and revitalise some of the financial hardships experienced at the university.
- Capacity building for professors, lecturers and students in computer skills.

The AVU Network

Content production

The AVU network configuration originates at the studio location on the premises of the content-producing institution, or in a nearby facility leased by the institution. Each content site includes all equipment necessary for the origination of both live and pre-recorded instructional programmes, and for the provision of these programmes to either

a local or a remote INTELSAT-compatible uplink earth station. The studio also includes equipment necessary to provide certain levels and kinds of interactivity, such as audio talkback for live programmes, and to facilitate such other related functions as satellite files. The personnel on location consist of the professor or lecturer and, typically, a programme technician. The broadcast can be either live or videotaped.

Satellite transmission

The signal from the content site is transmitted via a local provider, currently the Indiana State University system, to an uplink facility in Washington DC. AVU is currently contracted with COMSAT to relay the signal from Washington DC to Africa by way of the INTELSAT satellite system. AVU currently enjoys unlimited usage with INTELSAT who, in the pilot phase, has donated the equivalent of US\$2,000,000 of satellite capacity to the project. The Technical Officer of AVU manages the network system.

Local support

Each SSA (Sub-Saharan Africa) partner institution is provided with all the equipment necessary to receive digital satellite transmission and a full complement of AVU programmes and services. The current funding source (roughly equivalent to US\$54,000 per university) is the World Bank. In the future, funding for local infrastructure will be provided by the AVU franchise centres. The outdoor equipment provided by AVU includes the receive-only satellite antenna and necessary electronic equipment, integration hardware, and cabling. The indoor classroom equipment is designed to be 'user-friendly' and to enable maximum flexibility in the use of AVU programmes and services.

The indoor equipment unit includes two or more digital video receiver-decoders; one or more television monitors; one or more video cassette recorders; two multimedia personal computer systems; a push-to-talk telephone; a printer; a facsimile machine; a monitor and control (M&C) unit; a custom-designed equipment cabinet, and other miscellaneous components to help ensure ease of operation and uninterrupted programme reception. A comprehensive data handling and communications system has been designed to receive, store and process incoming high-speed broadcast data channels, and to provide each receiving site with an outbound data/audio talk-back link.

Classroom

The typical AVU classroom has been between 30 and 40 students, sitting at their desks watching the videotaped or live broadcast on a television monitor. During live broadcasts, students have the opportunity for real-time two-way interactivity with the instructor and the ability to collaborate with other students.

The AVU Pilot Programmes in Kenyatta University

During the pilot phase, AVU had three semesters during which courses were transmitted from universities in Canada, Europe and America (Table 2.5, page 56).

All the students registered for these AVU courses were regular, on-campus students from departments of physics, mathematics, chemistry, and appropriate technology, which are part of the Faculty of Science. However, some of the core courses, including

Introduction to Engineering, Computer Architecture and Design, and Introduction to Internet are not offered in Kenyatta University.

Table 2.5 AVU Courses During the Pilot Phase

<i>Course</i>	<i>Origination</i>
Calculus I	New Jersey Institute of Technology (USA)
Calculus II	New Jersey Institute of Technology (USA)
Computer Organisation and Architecture	Colorado State University (USA)
Differential Equations	New Jersey Institute of Technology (USA)
Introduction to C++ Programming	Mount Saint Vincent University (Canada)
Introduction to Computing	University of Massachusetts (USA)
Introduction to Engineering	Georgia Institute of Technology (USA)
Introduction to Internet	University of Massachusetts (USA)
Organic Chemistry	Laurentian University (Canada)
Physics	Carleton University (Canada)

An Analysis of University Courses Offered through AVU Satellite

Table 2.6 Enrolment in University Units and Courses Offered through AVU's Satellite

<i>Course</i>	<i>Number of students enrolled</i>			
	<i>Summer semester</i>	<i>Semester 1 1997</i>	<i>Semester 2 1998</i>	<i>Total</i>
Calculus I	28	41	41	110
Calculus II	—	55	57	112
Computer Architecture and Organisation	—	—	41	41
Differential Equations	—	—	12	12
Introduction to C++ Programming	—	—	28	28
Introduction to Computing	—	—	20	20
Introduction to Engineering	—	—	20	20
Introduction to Internet	—	47	26	73
Organic Chemistry	—	—	31	31
Physics	—	24	23	47
Total	28	167	299	494

Enrolment has been increasing since the first courses were offered in the 1996–97 academic year. The trend in total number of students who did their units through the AVU's satellite facility is reflected in Table 2.6 (page 56) and Figure 2.1 (page 58).

Gender disparity is evident, with males outnumbering females in almost all the units, as shown in Tables 2.7, 2.8 and 2.9 (page 59). Figures 2.2, 2.3 (pages 58 and 59) and 2.4 (page 61) represent this information graphically.

*Table 2.7 Enrolment of Students in the First AVU Semester,
1 October –23 December 1997*

Course	Number of students			
	Females	Males	Total	Dropouts
Calculus I	13	28	41	11
Calculus II	9	46	55	22
Introduction to Internet	6	41	47	6
Physics	0	24	24	3
Total	28	139	167	42

*Table 2.8 Enrolment of Students in the Second AVU Semester,
26 January –15 May 1998*

Course	Number of students			
	Females	Males	Dropouts	Total
Calculus I	10	20	11	41
Calculus II	7	26	24	57
Computer Architecture and Organisation	3	34	4	41
Differential Equations	3	9	–	12
Introduction to C++ Programming	2	26	7	28
Introduction to Computing	4	16	–	20
Introduction to Engineering	2	18	–	20
Introduction to Internet	5	21	–	26
Organic Chemistry	1	29	1	31
Physics	0	17	6	23
Total	30	169	46	245

Women's participation in AVU courses is no different from the national representation of girls in university, where less than 30 per cent are women. The picture is worse in facilities such as engineering and computer science. For instance, in Kenyatta University, women constitute 23 per cent in the Faculty of Science. This means that a relatively small number of women opt for AVU courses, as compared with men. This

imbalance does not start at university, but at primary level. Studies indicate that Science and Mathematics are generally perceived to be 'masculine' subjects. The negative perception about girls' ability to study sciences, and other factors related to cultural attitudes, poverty and poor performance, contribute to the low level of participation of girls in science subjects at tertiary level.

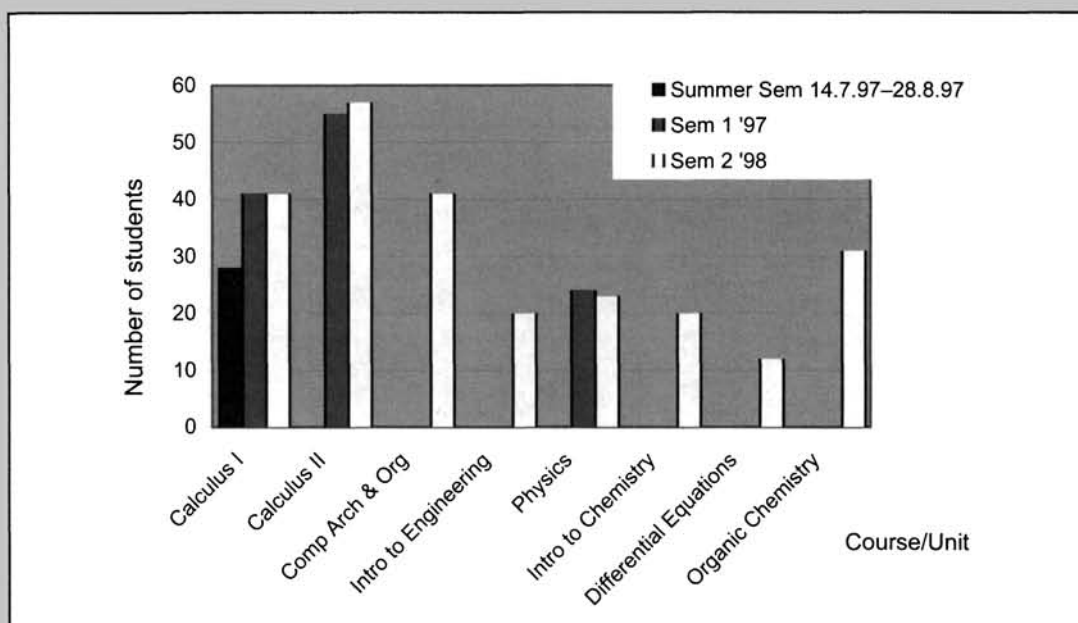


Figure 2.1 Enrolment in University Units and Courses Offered through AVU's Satellite, 1997-98

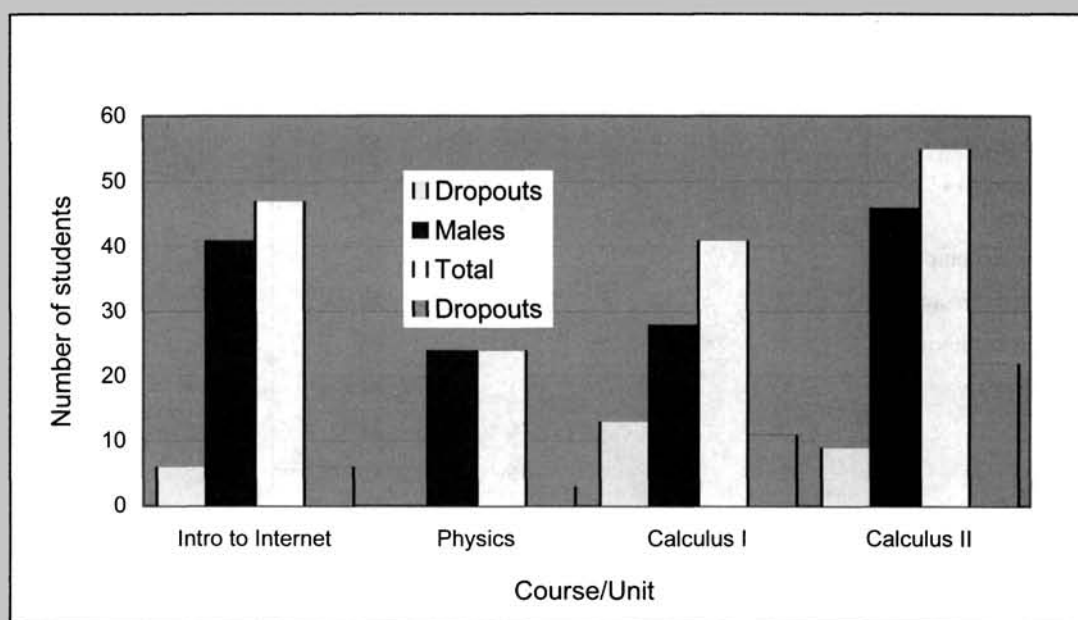


Figure 2.2 Enrolment in University Units and Courses Offered through AVU's Satellite, 1997-98, by Gender

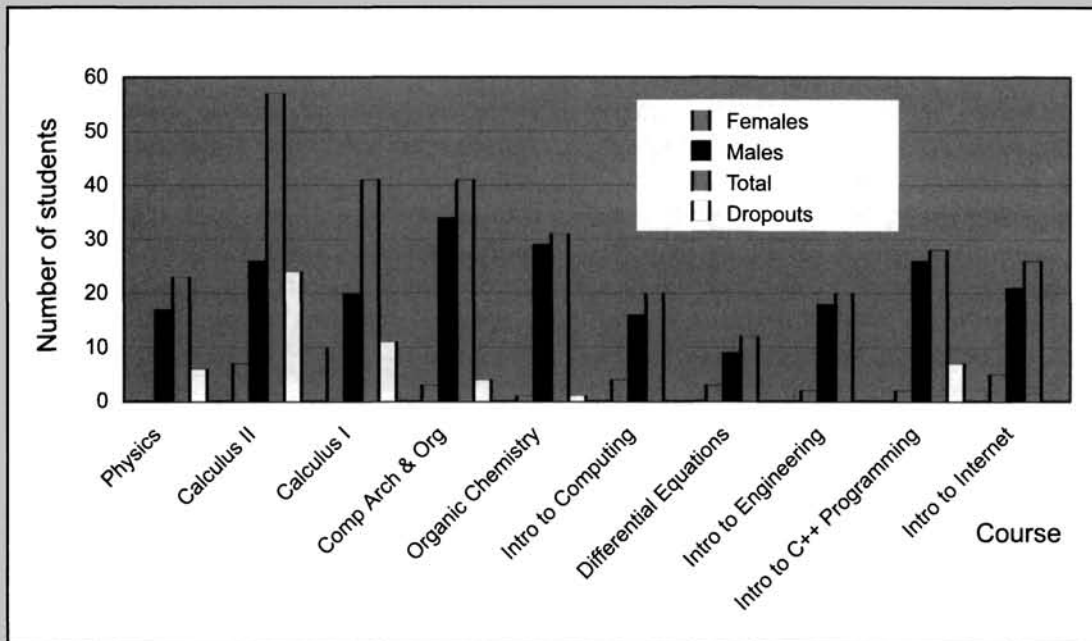


Figure 2.3 Enrolment in AVU Units and Courses, Second Semester, 26 January–15 May 1998, by Gender

Calculus I

Twenty-eight students from the Department of Mathematics at Kenyatta University registered for the AVU Summer Semester opted for an AVU course in Mathematics, Calculus I, originating from New Jersey Institute of Technology (NJIT), USA, and delivered by Professor Rose Dios (Table 2.9). Students' comments about the course, reproduced here and on page 60, show how much they enjoyed these lectures.

Table 2.9 Enrolment in AVU's 'Calculus I' Course, Summer Semester, 1997

Course	Number of students		
	Females	Males	Total
Calculus I	6	22	28

The other Mathematics students continued with their traditional Kenyatta University lecturer during the summer semester. Two continuous assessment tests and one final examination were given at the end of the semester. The local AVU instructor from the Mathematics Department set and marked the examination, which experienced a pass rate of 80 per cent compared with a mere 40 per cent in the traditional mode of delivery (which, as pointed out by the teacher who taught both courses, consists of lectures and a few demonstrations).

It is important to mention that for all courses except for Internet and Introduction to Computing, interested students from related departments at the University register for AVU courses. Before AVU was adopted at Kenyatta University, the Senate approved the integration

'Professor Dios is a very good teacher because her lectures start with simple examples and build slowly to complex examples (i.e.) from 'known to unknown'. This approach enables me to understand and enjoy Mathematics.'
(Personal interview, first Calculus I student)

'It has taken me two times to retake Calculus I examination without passing. I had given up on Calculus I if it were not for AVU Calculus I course which I managed to pass. It was possible to pass because AVU courses provide textbooks, comprehensive notes, tutorial sessions, interaction with an instructor in America and a local university lecturer who always explains concepts during tutorials. During revision, we get pre-recorded videotapes to review lectures. Therefore, all these benefits enabled me to pass.'
(Female student, personal interview)

The First AVU Semester (1 October – 23 December 1997)

The full semester of the pilot phase started in October. The registration of students is shown in Table 2.7 (page 57 above).

'Before I joined AVU courses, I had never seen a computer nor sat before a keyboard, but from the Internet course, I have known how to use the computer, send e-mail, design websites and access courses, data etc. from the websites.' (Personal interview, AVU student)

'I am only a third year Physics student, from very poor family background, struggling to complete fourth year fees for January 1998. Fortunately, after my Internet examination in December 1997, I managed to apply for a job with Commercial Bank of Africa, Nairobi, attended an interview, performed very well in both theory and practicals, and was employed even before completing my degree course in Physics and Mathematics. The AVU Internet course has earned me a job!!' (Interview, AVU student, December 1997)

of AVU pilot phase courses in the Kenyatta University curriculum. Therefore semester grades from AVU courses were computed along with other grades in the respective departments. Two groups of students, one taking the traditional course and the other the AVU course, provide an opportunity for comparison in terms of participation and performance.

Introduction to Internet

This course generated a great deal of enthusiasm from students, faculty members and the general public (as is demonstrated by the comments on this page). It was over-subscribed, with more than 400 students registering, but due to limited facilities only 40 students were admitted to the course. A loan of Ksh 5 million (US\$86,000) from the University was given to AVU to purchase 20 computers and one projector for internet training, and a separate laboratory was created for training. AVU-Kenyatta instituted income-generating measures to offset the loan and meet some of the running costs of AVU. Students paid Ksh 15,000 (US\$280) per semester for the Internet course.

Of the first Internet class, 22 students have been employed by companies in Nairobi.

Performance in AVU Courses

Performance in AVU courses and units has been good, except for Calculus I and Computer Architecture and Organisation, whose average scores were below 50 per cent during the Summer semester and the Second semester in 1998. Performance has been particularly good in computer-related courses, with average scores of over 70 per cent for the last two semesters (Table 2.10 and Figure 2.4).

Table 2.10 AVU Course Performance, by Semester

Course	Average marks		
	Summer sem. 1997	Semester 1 1998	Semester 2 1998
Calculus I	46	51	–
Calculus II	–	–	51
Computer Architecture and Organisation	–	–	46
Differential Equations	–	–	63
Introduction to C++ Programming	–	–	76
Introduction to Computing	–	–	78
Introduction to Engineering	–	–	61
Introduction to Internet	–	77	74
Organic Chemistry	–	–	62
Physics	–	56	–

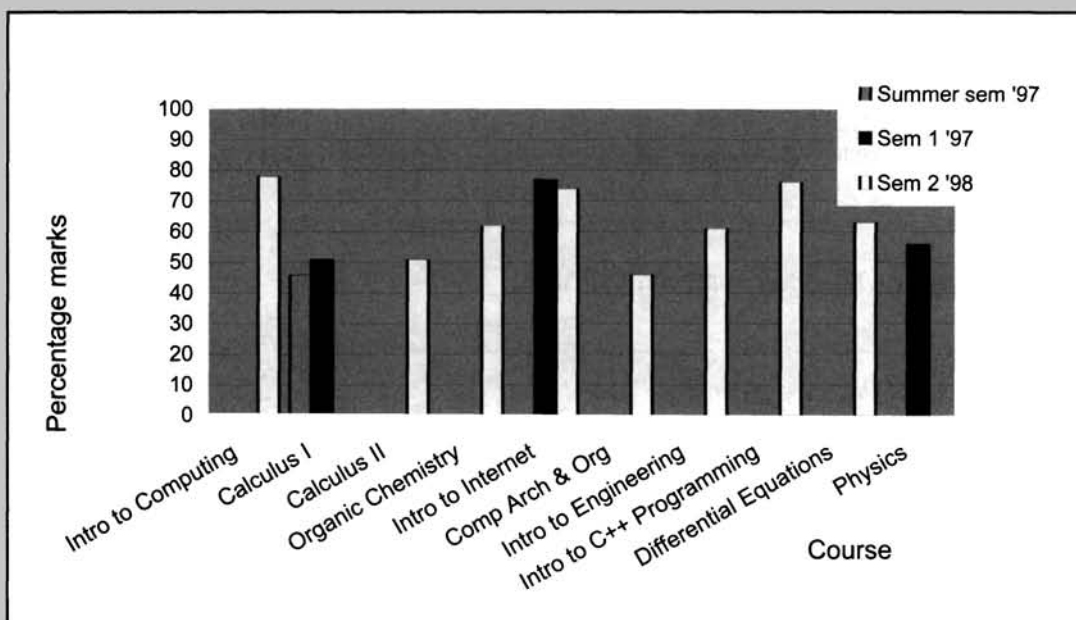


Figure 2.4 AVU Course Performance, by Semester

Apart from AVU semester programmes, which targeted campus students, there are short computer courses (Table 2.11, page 62) lasting from two weeks to one or two months, depending on the nature of the course. These courses run from 0800 hours to 2200 hours and are open to the public for professional upgrading and continuous

learning. The target groups include civil servants, people working for organisations such as banks, ministries, parastatals and universities, graduates, doctors and school leavers. Enrolment figures for these courses are shown in Tables 2.12 and 2.13.

Table 2.11 AVU Short Computer Courses

<i>Code</i>	<i>Title</i>
AVU 01	Introduction to Microcomputers and MS-DOS
AVU 02	Windows '95
AVU 03	MS Word '97
AVU 04	MS Access '97
AVU 05	MS Excel '97
AVU 21	Using Internet
AVU 22	Advanced Internet
AVU 31	C++ Programming
AVU 34	Visual Basic Programming

Table 2.12 Enrolment in AVU Short Computer Courses, by Phase

	<i>Duration</i>	<i>Females</i>	<i>Males</i>	<i>Total</i>
Phase 1	29 May 1998 to 24 July 1998	87	189	276
Phase 2	27 July 1998 to 2 October 1998	125	337	462
Phase 3	12 October 1998 to 18 December 1998	106	125	251

Table 2.13 Enrolment in AVU Short Computer Courses per Phase, by Course

	<i>Phase 1</i>	<i>Phase 2</i>	<i>Phase 3</i>	<i>Total</i>
AVU 01	57	116	105	278
AVU 02	62	97	92	251
AVU 03	45	67	—	112
AVU 04	41	66	—	107
AVU 05	40	65	—	105
AVU 21	13	23	21	57
AVU 22	10	20	14	44
AVU 31	8	8	—	16
AVU 34	—	—	19	19
Total	276	462	251	989

Statistics and the summary graphs show that enrolment in the AVU short computer courses has been very good. The most popular course, Introduction to Microcomputers and Ms-Dos, enrolled more than 100 students in the last two phases. Enrolment has been higher for males than for females, but this discrepancy is decreasing with time, as reflected in Figures 2.5, 2.6 and 2.7 (page 64).

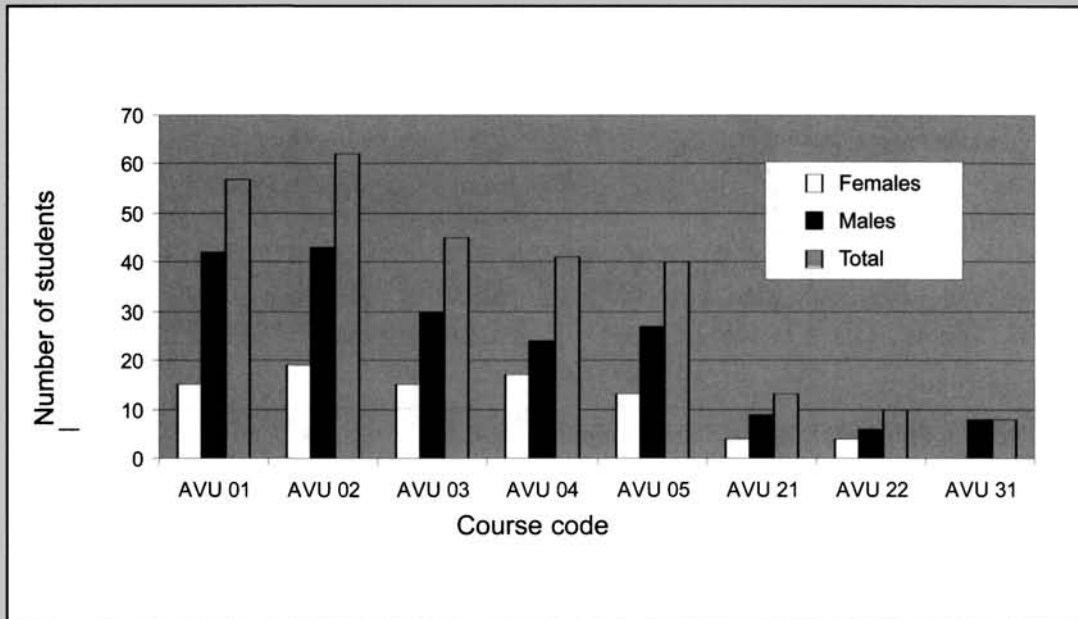


Figure 2.5 Phase 1: Enrolment in AVU Short Computer Courses

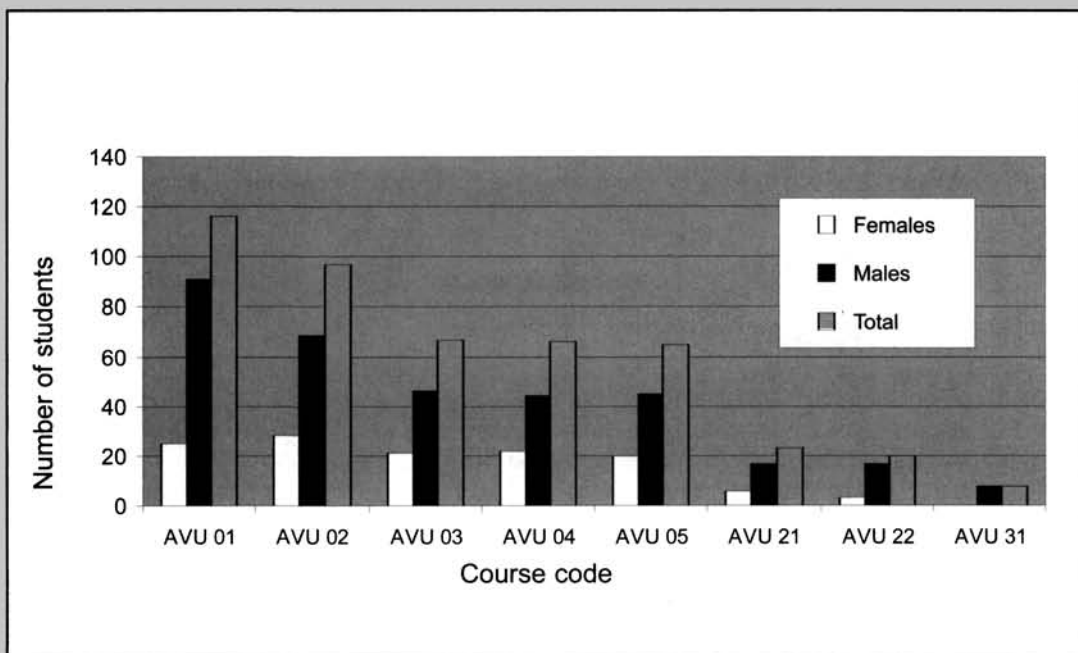


Figure 2.6 Phase 2: Enrolment in AVU Short Computer Courses

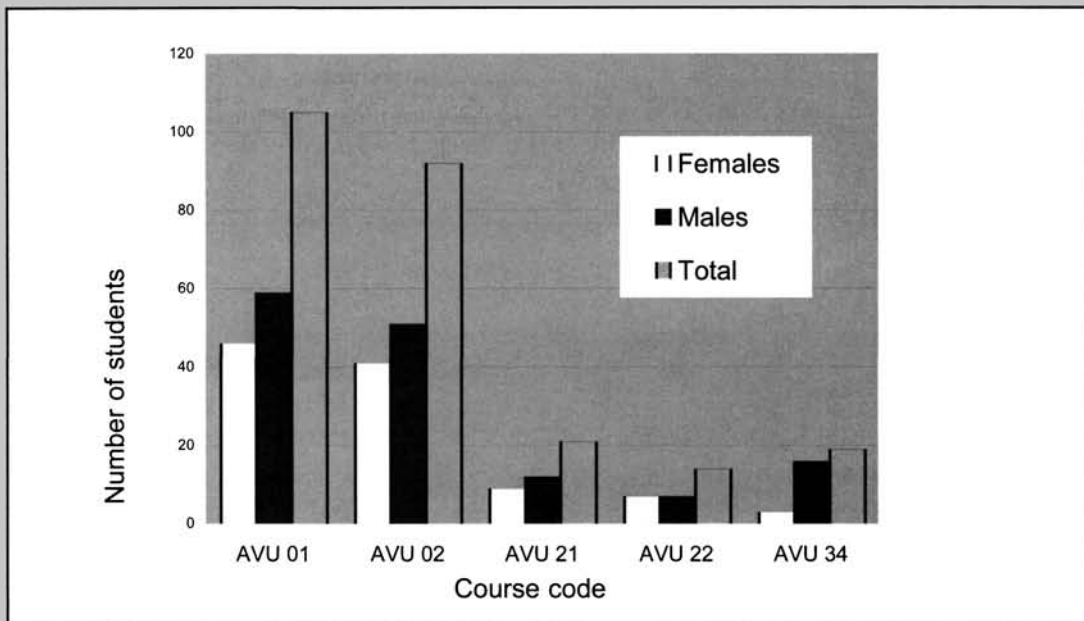


Figure 2.7 Phase 3: Enrolment in AVU Short Computer Courses

Phase 2 recorded the highest number of students in most of the courses, but a valid conclusion about the enrolment trend can only be made after Phase 3. We can only note that there is a slight decline in enrolment, as reflected in Figure 2.8.

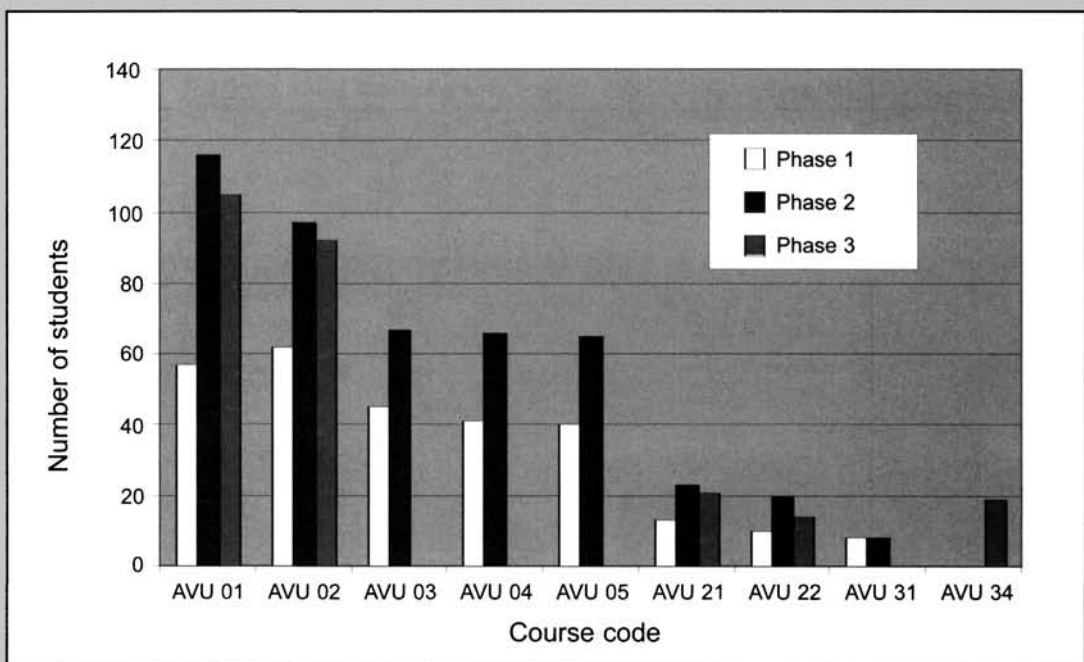


Figure 2.8 All Phases: Enrolment in AVU Short Computer Courses

Figure 2.9 reveals that performance in these computer courses has been very good, with mean scores of over 70 per cent in all courses.

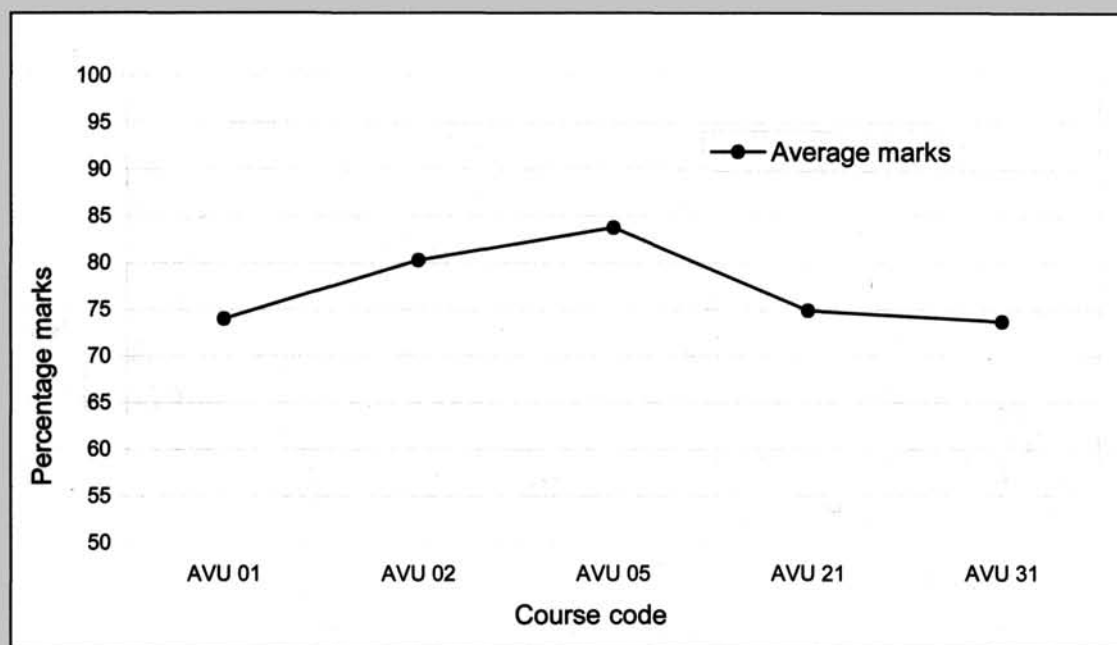


Figure 2.9 Average Scores in AVU Short Computer Courses, 29 May–24 July 1998

AVU's Pre-University Programme

The computer certificate courses have been extremely popular and generated a good income for the last six months. Although AVU's pilot phase is drawing to an end, short, high quality computer courses will be delivered continuously to interested people.

Programmes such as pre-university have been put in place to prepare students for university degree courses. After advertisement, selection and enrolment, 105 students were admitted to this two-semester programme, with a view to embarking on an AVU degree course in October 1999. Table 2.14 shows the courses offered and the distribu-

Table 2.14 Enrolment in AVU's Pre-University Programme

Course	Number of students				
	Females	Males	Dropouts	Incomplete	Total
Calculus I (Math III)	19	79	4	3	105
Chemistry 100	19	80	4	2	105
Introduction to Computer Science	18	78	4	5	105
Physics 105	20	81	4	0	105

tion of students; Figure 2.10 (page 66) shows enrolment by gender. Figure 2.11 (page 66) represents performance in each course, and shows clearly that Chemistry 100 had the highest mean score, while Introduction to Computer Science had the lowest, falling below average (50 per cent).

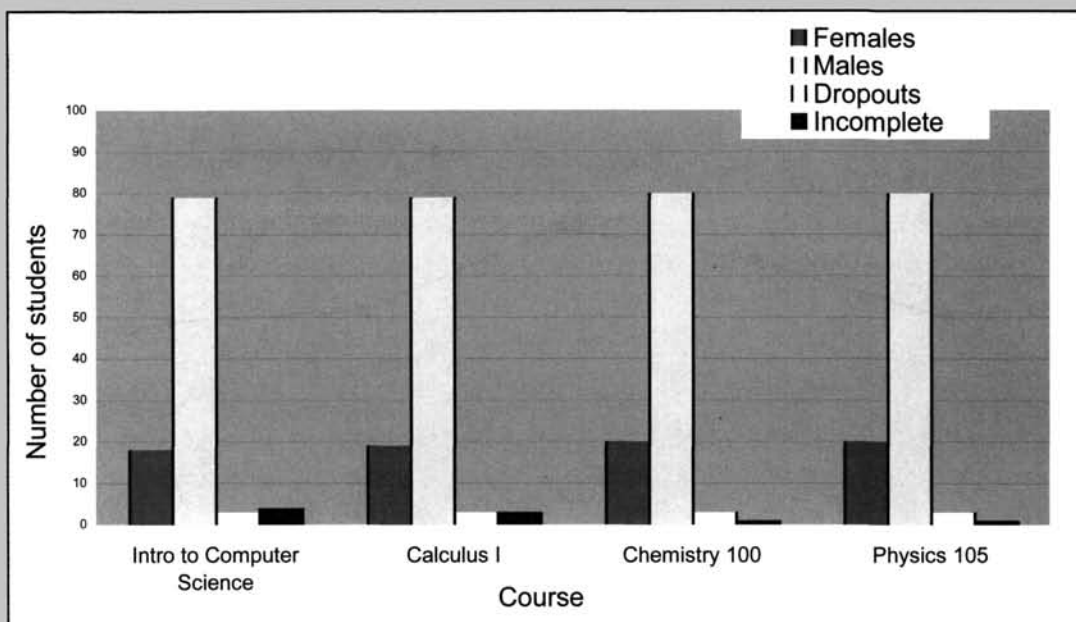


Figure 2.10 Enrolment in AVU's Pre-University Programme, by Gender

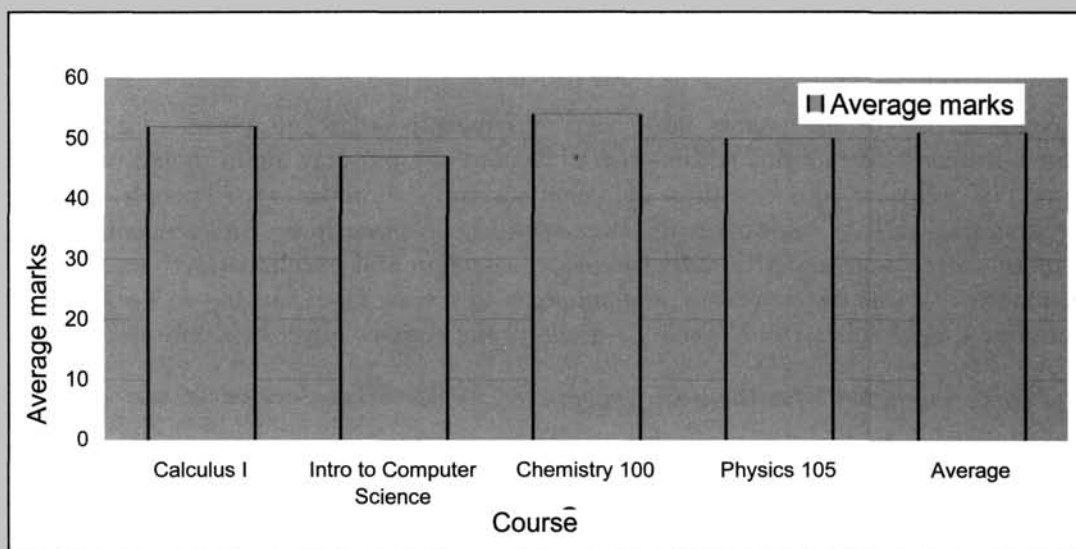


Figure 2.11 AVU Pre-University Programme, Performance by Course

A summary of marks obtained by each student for all the courses offered is given in Figure 2.12. Some students did not sit for all the papers, and so some points are missing against their registration numbers in this graph.

Figures 2.13–2.16 (pages 67–9) are for each course and each student's mark is plotted correspondingly. (Note that the line graphs are broken at the point(s) where the corresponding student did not sit the paper.) With a pass mark of 40 per cent, ten students failed (one scored below 30 per cent in average), and three students scored above 70 per cent, which is grade A. The distribution of scores is given in Table 2.15 (page 69).

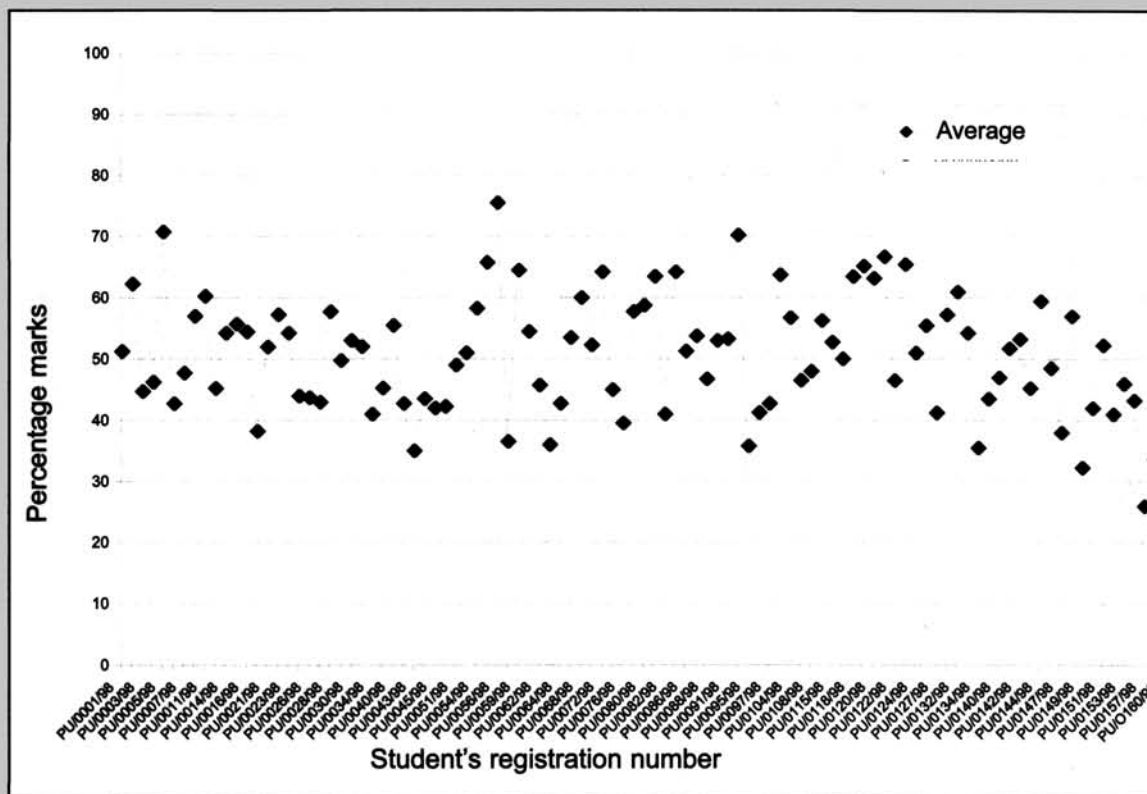


Figure 2.12 AVU Pre-University Results, Students' Overall Average

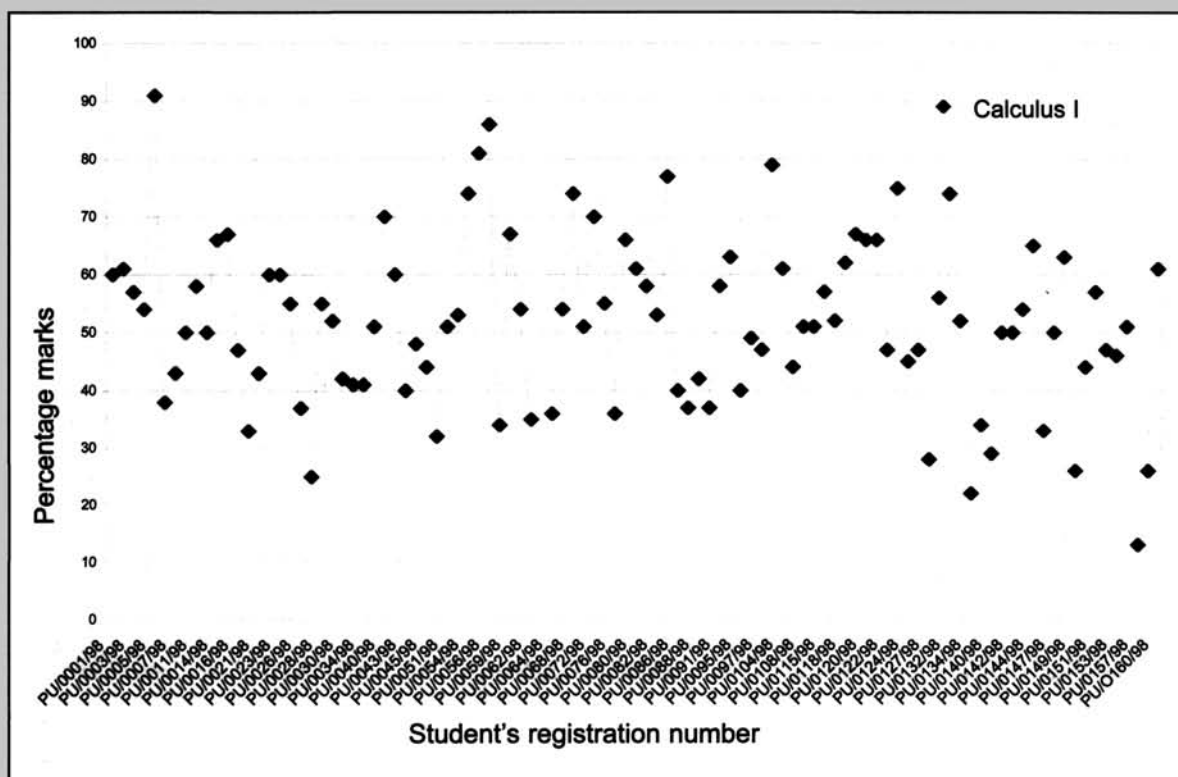


Figure 2.13 AVU Pre-University Calculus I Results

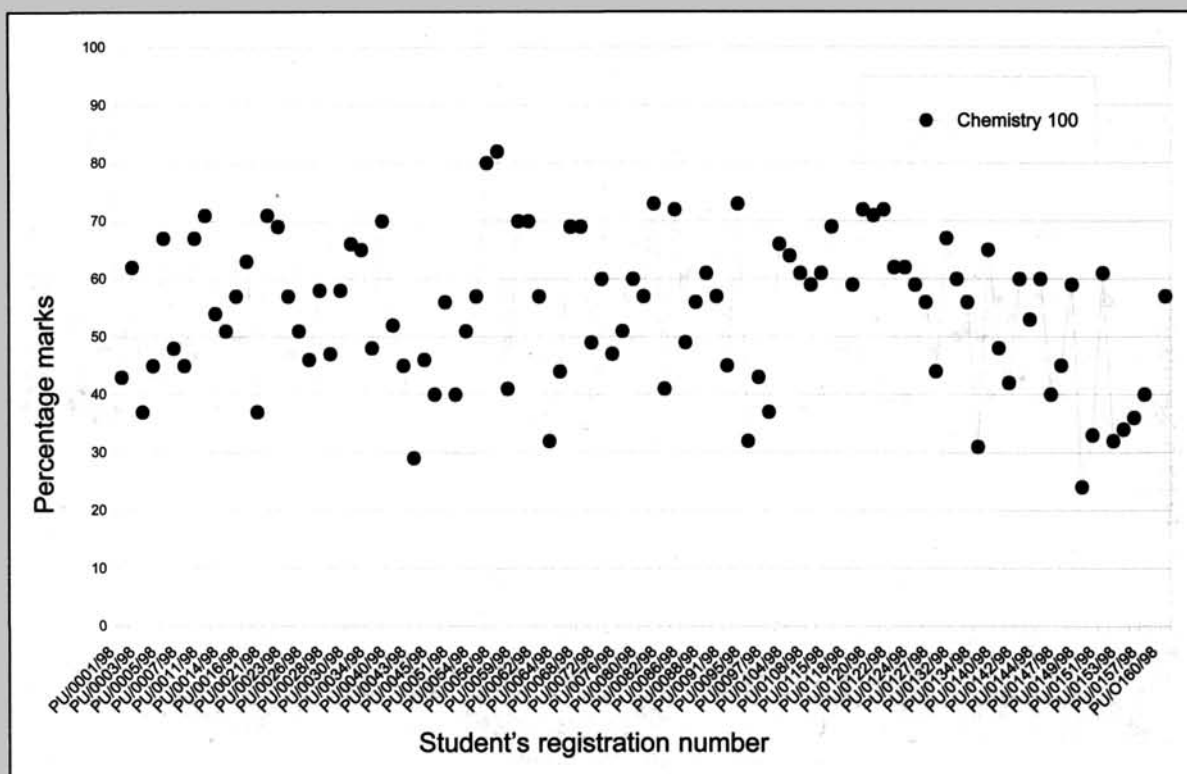


Figure 2.14 AVU Pre-University Chemistry 100 Results

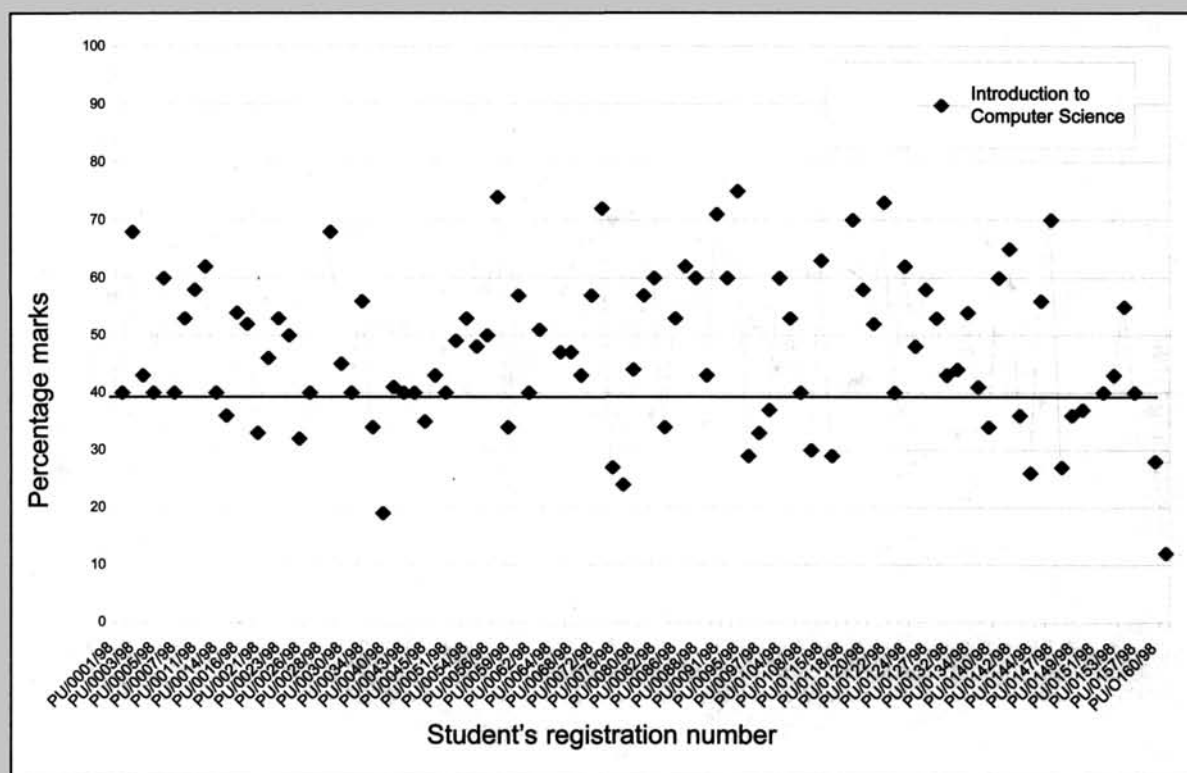


Figure 2.15 AVU Pre-University Introduction to Computer Science Results

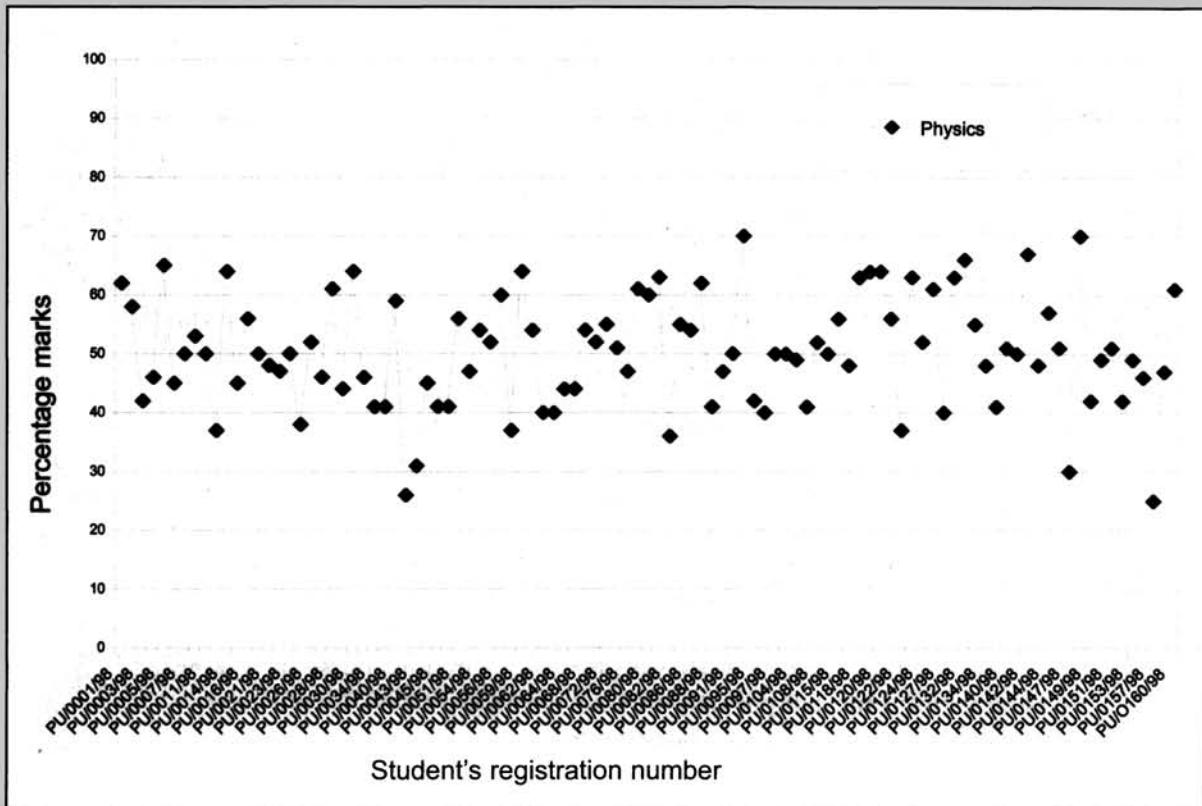


Figure 2.16 AVU Pre-University Physics Results

Table 2.15 AVU Pre-University Programme: Distribution of Scores by Course

Course		Calculus I (Math III)	Chemistry 100	Introduction to Computer Science	Physics 105	
Range	Grade					Average
Above 70%	A	11	11	7	2	3
60–69%	B	17	28	13	20	15
50–59%	C	30	23	22	32	36
40–49%	D	21	25	31	38	37
Below 40%	E	19	12	23	9	10
	Total	98	99	96	101	101
Incomplete cases		3	2	5	–	–

The Management of AVU

With outsourcing the preferred mode of operation during the beta phase, the management staff of AVU consists of a small nucleus of full-time employees and a number of short-term, specialist consultants. Accounting and other office support are currently provided by the World Bank. Most of the organisational functions are outsourced in

order to keep the organisation lean and focused, and the overhead costs low. Currently AVU management includes: Founder and Chief Executive Officer, Academic Director and Technical Director.

At each participating university, a campus co-ordinator assumes overall responsibility for local implementation of the AVU network. The co-ordinator provides leadership and guidance to faculty and staff members officially assigned to the positions of Course Moderator, Course Facilitator, and Technical Co-ordinator, and to others who assist in day-to-day implementation of the AVU network. Each course is moderated by a local instructor (expert in the discipline) who has the following responsibilities:

- serving as the primary liaison with AVU academic staff;
- grading homework and examinations;
- tutoring and advising students;
- serving as a faculty member to record and assign grades for students registered on the course;
- reviewing and reporting student academic and/discipline problems;
- providing guidance and counselling to students, and support to the course facilitator;
- reviewing the forms, logs and surveys forwarded by the course facilitator, and sending them to the campus co-ordinator for return to AVU; and
- attending training sessions provided by AVU.

The local course moderator is assisted by a junior graduate assistant course facilitator whose responsibilities are:

- facilitating instruction by following schedules, homework, examinations and laboratory work;
- retrieving course materials sent electronically or by other means, and making the required number for class registrants;
- turning and checking the equipment prior to the class;
- recording attendance at each class.

The facilitator assists the course moderator in tutoring and advising students.

AVU Seminars

After adequate marketing of AVU seminars among the business community in Nairobi, 40 executive managers from companies such as Barclays Bank, Standard Chartered Bank, Central Bank, Kenya Commercial Bank, Commercial Bank of Africa and Kenya

'It is unbelievable that a virtual typical of situations in America is taking a place in Kenya. This is the first time in my life to participate in a seminar of this nature.'

Breweries attended a seminar on 'Purchasing Policies and Practices' transmitted 'live' from Virginia Technology, USA, on 14 and 21 August 1997. There was an overwhelming response from the business community. During the live seminar, participants interacted with Professor Murphy from Virginia Technology and their counterparts from Uganda, Zimbabwe and Ethiopia. The virtual seminar was extremely exciting, and drew favourable comments from participants, some of which are reproduced here.

Commenting on the technology, one participant emphasised that, 'The use of modern technology enhanced proper learning and sustained our span of concentration.'

This was a very successful seminar which indicated collaboration between the business community and the University. Such support augurs well for sustainability of the project, since participants will be expected to pay for such courses in future.

In addition to the Virginia Technology Seminar, a series of training seminars was organised by the Economic Development Institute (EDI) of the World Bank. Starting on 31 March 1998, 30 journalists from Kenya attended 14 weekly seminars (from 1900 hours to 2200 hours), delivered by live satellite transmission at Kenyatta University AVU.

The EDI seminars were an income-generating venture – EDI paid AVU-Kenyatta University a total of US\$5,000 for using the AVU infrastructure to transmit courses to journalists. Several other important seminars have been held at AVU-Kenyatta, including YK2000 seminars; Balanced Score Card, and Strategy and Innovation.

'The case study approach gave solutions to practical problems in an organisation.'

'The seminar was very educative, informative, and enriched what I already knew on purchasing.'

*'I feel like I am in Washington D.C. attending EDI seminar, we can ask questions easily and interact clearly with course instructions as if the delivery was face to face. It is so 'real' that I cannot believe we are in Kenya'.
(Participant at first AVU transmission)*

The Impact of AVU on Kenyatta University

For the seventeen months (from June 1997) that AVU has existed in Kenya, it has had considerable impact on students, faculty members and the entire community. The following achievements have been experienced:

- **Provision of educational resources.** One hundred and twenty computers for the AVU enable students to participate effectively in computer courses – Internet Access, Introduction to Computing, Computer Programming C++, Computer Architecture and Organisation. Before the emergence of AVU, the University had extremely limited resources of computers – the Computer Centre had only four computers, and the Mathematics Department three –which were inadequate for courses. Students who enroll for AVU courses are provided with textbooks and notes. The trickle effects of AVU resources have permeated the entire University Science students' community. Internet facilities provided by AVU are utilised by everyone interested in accessing e-mail and internet search. Thus, e-mail facility has modernised the university environment.
- **Introduction of new courses.** Computer science as a discipline has never existed in Kenyatta University, but with the emergence of AVU, many computer-based courses have become very popular. The Internet course, for instance, is very new and students find it lucrative since it opens up job-prospects. As a result of these new information technologies the University, assisted by AVU students, has created a website.
- **Capacity building.** A culture of continuing education has been perpetuated through AVU computer-related courses, among professors, lecturers, students and the

public. Seminars and workshops have attracted the executive cadre of the business community who find relevant courses via satellite very 'educative and refreshing', especially teleconferencing – interactive technology which empowers them to communicate with their counterparts in Africa and Europe. Enhancement of local capacities to participate in activities within the country and in Africa offers an opportunity for sharing expertise within the region. For instance, qualified engineers – the technical co-ordinator of AVU and the campus co-ordinator – effectively assist in setting up satellite technology in other African countries. This means that Kenyatta University experts assist other countries and enhance sustainability and maintenance of AVU within Africa.

With regard to courses, AVU will make a significant impact by providing training opportunities to secondary school leavers. Currently, of the estimated 150,000 students who complete secondary school annually, about 7–8 per cent are admitted to universities, and a further 15–20 per cent to other tertiary institutions, leaving over 30 per cent of qualified students without places.

- **Income-generating and increase in enrolment.** Through AVU, Kenyatta University will increase its enrolment with students who will pay for AVU degree courses. Currently, interested members of the public pay for short AVU courses in computer-related fields – for example the EDI seminar for journalists generated income for the University. Income generated through AVU courses in 1998 is reflected in Figure 2.17. Figure 2.18 shows total AVU expenditure for that period.
- **Digital library.** AVU maintains a sophisticated internet-based digital library of journals, academic studies and textbooks that allows students and staff to access the world database of information. This web-based resource provides a one-stop-shop for current research materials unavailable in local libraries. Users of the AVU digital library can log on to the database by providing a user name and password in order to connect to various articles, journals and abstracts. The AVU digital library enables accessibility to over 1,700 current journals and texts. However, no part of such material shall be published, stored in a retrieval system or transmitted in any form or by any means, without permission from copyright

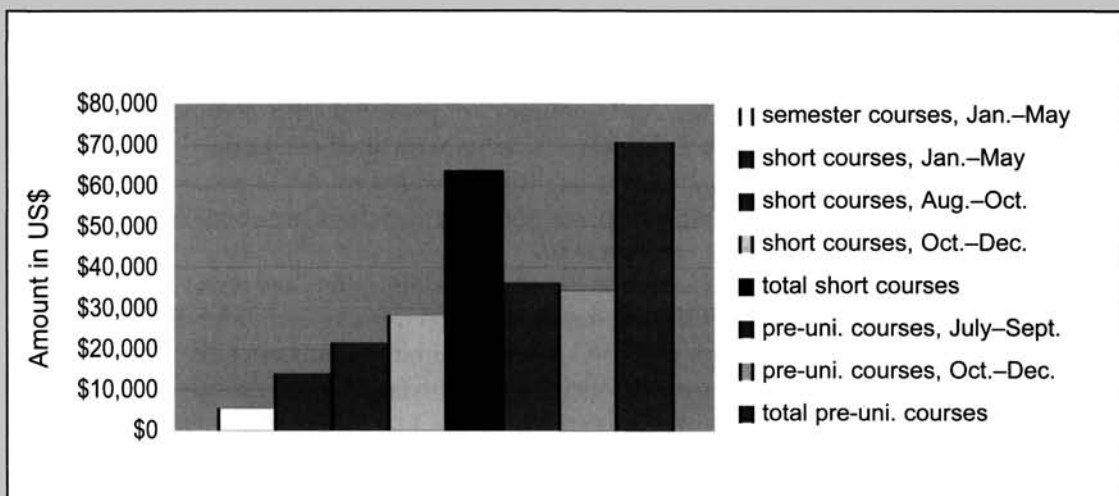


Figure 2.17 Income Generated through AVU-Kenyatta Courses, January–December 1998

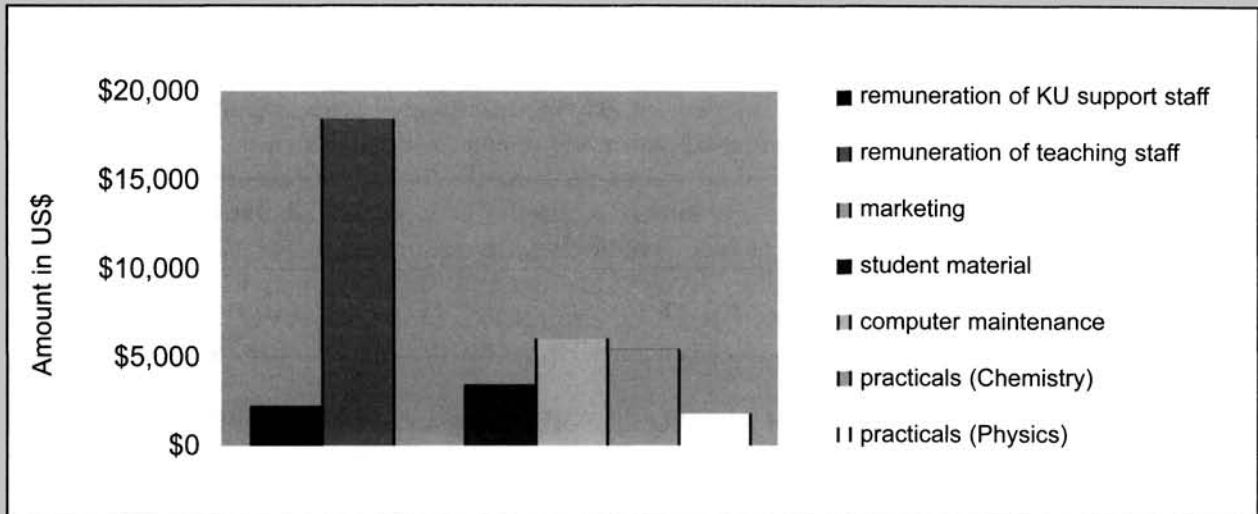


Figure 2.18 AVU-Kenyatta Total Expenditure, January–December 1998

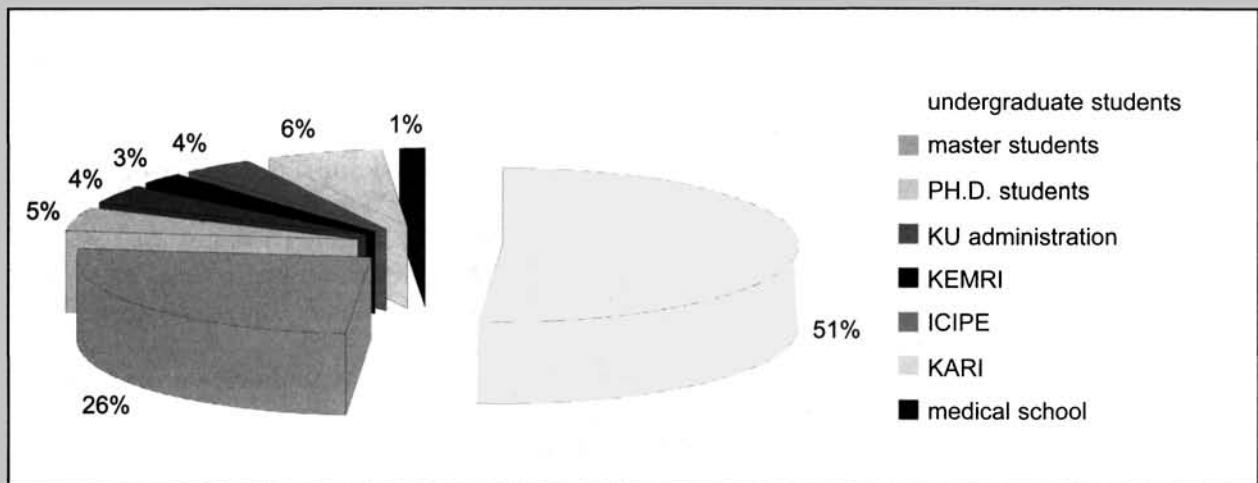


Figure 2.19 The Use of AVU Digital Library, July–December 1998

owners. Library users have access to the database and the opportunity to copy documents within the copyright regulations. Library search is done for those unable to use the internet access facility, at a small fee. At the time of writing, the digital library has been in use for six months. Figure 2.19 shows the proportions of students, lecturers and researchers who have used it.

- **Challenge to University faculty members.** The AVU mode of delivery has challenged some lecturers and unconsciously improved their teaching strategies. The observations of one physics course moderator are reproduced here.

'I used to think that I was one of the best Physics lecturers in the world. But listening to professors from America, and their teaching approaches, I have had to evaluate myself and rate my competence! In essence, I have borrowed some of their case study approaches in teaching, which seems to appeal to my students.'

The video cassettes recorded during AVU sessions are used by non-AVU students both for revision and learning new concepts.

- *AVU virtual laboratories supplement existing resources.* Faculty members and students share modern virtual laboratory equipment and experiments. Current University laboratories are poorly equipped, and due to lack of resources students have difficulty perform experiments as required. AVU virtual laboratories have come as a 'saviour' to supplement existing scanty resources.
- *Networking.* Kenyatta University AVU assists and works together with the Universities of Nairobi and Egerton. Egerton will soon launch AVU. Such collaboration and sharing of resources is a cornerstone for the success of the AVU 'family' in Africa.
- *Participatory Advocacy of AVU.* Unlike other projects of the World Bank, where officials initiate a project in Africa and influence its implementation, AVU has a different approach, where participants advocate for its acceptance. Kenyatta AVU is 'our project', not the 'World Bank's Project'.

The Challenges

There are pertinent challenges which impinge on operations of AVU in Africa. The following challenges are significant, particularly to Kenya:

- *Electricity interruptions.* Power fluctuations in Africa tend to affect satellite receive terminal, particularly computers. The power 'black outs' or 'change of power' in the case of generators, tend to damage hard disks and sometimes the system boards of computers. For instance, the DELL computers (Seagate) used at AVU-Kenyatta have a lower quality hard disk, which is susceptible in times of irregular power supply, than the QUANTUM, whose hard disk is more resilient and can recover after a black out.
- *Lack of a clear national communications policy in Kenya.* Communication services are strategic infrastructure; therefore private ownership of Kenya's telecommunications services is limited. Privatisation and liberalisation go hand-in-hand with ownership, and multinationals have not been given that kind of ownership in Kenya. Telecommunications services are very expensive, for two main reasons: first, Kenya Posts and Telecommunications (KPTC) has a monopoly on services; second, Kenya does not yet own an internet 'hub', and so local internet service providers have hubs in the USA, Canada and Europe. The cost of international links is very high, resulting in expensive internet services for local consumers. AVU relies heavily on the internet and e-mail.
- *Slow internet connectivity at AVU-Kenyatta.* Internet access is very slow, due to the mode of connection which is 'dial-up' using a telephone line. The following reasons contribute to slow access:
 - The band width for signal over the telephone lines in Kenya is normally very slow, with the highest rate of transfer averaging 19.2 kbps (kilo bits per second).
 - The telephone line signal is of very poor quality, resulting in average signal loss and errors. AVU therefore suffers from connection cuts and loss of link which make sending and receiving mail frustrating.

- Heavy access of the internet by users in the Western world creates ‘traffic jams’. This happens during the day, interrupting internet courses at the AVU.
- Frequent ‘link’ breakdowns due to natural or physical calamities (such as flooding of cables), including breakdown at the KPTC Satellite Earth Station which may last one day, cutting off all forms of telecommunication between the whole country and the outside world; frequent maintenance of KPTC telecommunications equipment, resulting sometimes in loss of communication for a day or two; telephone problems due to breakdown at the University exchange, blocking out phone calls for hours, and occasional cases of the Internet Service Provider (ISP) pilot telephone line going out of order and causing frustration and anxiety as dialling and connection become very difficult.

These challenges do not in any way undermine the effectiveness and impact of AVU in Kenya. Rather they have influenced AVU Kenyatta to try to overcome the obstacles. At the national level, a bill on Kenya’s posts and telecommunications policy is soon to be tabled in Parliament. It is hoped that with a policy framework, postal and communications services will be liberalised and better services ensured.

KPTC is expected to launch a national hub or ‘backbone’ by end of December 1998. This should facilitate fast and affordable internet access by higher learning institutions.

The Way Forward for the AVU Project at Kenyatta University

The on-going pilot phase generated much enthusiasm and viable prospects for the operational phase, which will start in October 1999. The following measures are being put in place to accommodate the onset of full degree courses during the operational phase:

- *AVU curriculum development.* African scholars with expertise in computer science, engineering, physics, chemistry, mathematics and computer engineering were selected to participate in an AVU curriculum development and design workshop in Washington DC in May 1998. Courses have been developed by both African scholars and their counterparts in America, Europe and Canada.
- *Management and Sustainability of AVU.* For the operational phase and future sustainability of the project, AVU is to be managed in a business-like manner. Each site will form a business company with limited liabilities. Kenyatta AVU is in the process of forming a company in which the University will have shares. The company will be responsible for generating income and meeting its loan and recurrent costs. The following income-generating courses and activities will be offered at AVU Kenyatta:
 - *Degree courses:* Computer Science, Computer Engineering, and a MBA course;
 - *Diploma courses:* Introduction to Computing and Computer Programming C++;
 - *Certificate short courses:* top-executive seminars in business management; school teachers’ seminars in computer education; virtual seminars for journalists; virtual seminars for army officers, etc.;
 - *In-service courses:* professional development courses for professors, lecturers, etc. in computer science, and for secondary- and primary-school teachers;
 - *Digital AVU libraries:* minimal fee charge for faculty members to access information, and (as part of their AVU fees) for students.

- *Cyber café*: open to students and faculty members at a fee;
- *Business facility centre*;
- *Photocopying*: e-mail and fax;
- *Internet Service provider (ISP)*: Kenyatta will soon access a server, and modalities for the service are being put in place. Companies around Nairobi will subscribe to the AVU internet provider;
- *Consultancy section*: consultancy proposals will be presented to business companies for funding, and projects will be undertaken by the AVU to generate income.

Summary and Conclusions

The rapid expansion of university education and increased enrolment in Kenya and elsewhere in sub-Saharan Africa have not been accompanied by a commensurate rise in the level of government funding, to ensure a high quality of instruction. In many universities there are therefore serious problems related to instructional quality, class sizes and availability of facilities and materials. The AVU, supported by the World Bank, has been initiated to offer new technologies to overcome such barriers. Through the use of digital-satellite technology, programmes in some science subjects are being transmitted from several universities in the North, and these have been well received by both students and staff at Kenyatta University, which is one of the participating universities. The programmes have a high potential for expansion, capacity building, income generation, and networking among universities in sub-Saharan Africa.

Although the AVU programme appears to be a promising innovation, pertinent issues relating to sustainability require serious consideration. Among them is that of cost. The programme is heavily capital intensive, particularly in the purchase and maintenance of the satellite receive terminal equipment which host universities will have to shoulder after World Bank assistance is phased out.

With proper management, accountability, strategic planning and marketing of AVU programmes, there is great hope and promise for AVU in revitalising university systems in Kenyatta and inculcating the notion of income-generation and self-reliance in university management.

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