

Managing ICTs in South African Schools

A Guide for School Principals

**Developed for School Managers
by SAIDE**

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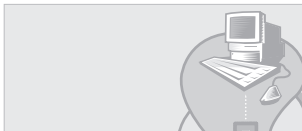
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CONTENTS

	Introduction	6
	Background	6
	Overview of content and structure	6
	Using the guide	11
Chapter One	Why should we have computers in schools?	12
	Computers are part of our daily lives	12
	Computers are linked to social and economic development	13
	The role of education in narrowing the digital divide	14
Chapter Two	How can schools benefit from computers?	16
	Teachers' views: Some of the benefits of having computers in schools	16
Chapter Three	How can computers be used for teaching and learning?	20
	Purposes for which teachers and learners use computers	20
	The role of the teacher in ensuring the effective use of ICT resources	35
Chapter Four	Can all schools use computers in all the possible ways?	38
	Some key decisions that have to be made	38
	Case studies	40
	What can we learn from these case studies?	46
	Making the best of available resources without making do	48
Chapter Five	How can a school build a shared vision for ICT use?	54
	The need for a shared vision	54
	Steps in developing a vision	55
	Developing a shared vision	60
	Analysis of examples of vision statements for integrating computers into schools	62
	Conclusion	66

Chapter Six
**Strategic planning and management:****How do we go about implementing the vision?** 67

Key planning questions 67

Where are we now? Situational analysis 68

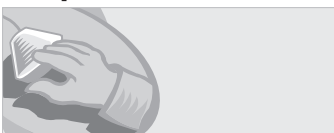
Choosing priority areas 71

Where do we want to be? Setting goals 73

What must we do in order to get to where we want to be? 76

Developing an action plan

Conclusion 79

Chapter Seven**What are some of the practicalities that need be considered?**

80

Financing ICTs: Budgeting realistically 80

Deciding where to put the computers 84

Buying computers and other ICTs 87

Securing computers and ICTs 89

Developing an ICT policy 91

Developing and supporting staff 94

Conclusion 96

Appendix 1:**ICT and curriculum**

97

Appendix 2:**Types of ICT provision and use with associated professional development and support**

100

Glossary of Terms

115

**Some useful resources**

125

**References**

134



INTRODUCTION

Background

During 2002 and 2003, with the support of funding from the Royal Netherlands Embassy, the South African Institute for Distance Education (SAIDE) undertook an extensive research project to investigate the use of computers for teaching and learning in South African schools. On completion of the project, SAIDE published its findings in a research report published in 2003¹. This project, which investigated the use of computers in 21 schools, together with research undertaken by various other organisations, shows that one of the reasons why information and communication technology (ICT) projects in schools do not succeed is that principals are often not properly informed about what ICTs can or cannot do. This often hampers their ability to manage the introduction of ICTs into their schools.

This confirms that there is a need to provide support for principals and other senior managers in managing the integration of computers and related resources into teaching and learning activities in their schools. From this came the idea of consolidating the knowledge that SAIDE had gained during this research project and making the relevant information more widely accessible as a guide for principals on the implementation of ICTs in their schools.

SAIDE developed an outline for the proposed guide, which it presented to a meeting with representatives from the Department of Education and Gauteng-online. SAIDE then convened a workshop with a broader range of participants to conceptualise more fully the content and structure of the guide, and to explore collaboration around the use of existing resources and writing expertise. Representatives from the following organisations and institutions were present at the workshop: SAIDE, Western Cape Education Department, Multichoice, SchoolNet SA, and two principals from the schools that participated in SAIDE's original research project.

Overview of content and structure

Purpose

The purpose of this guide is to give principals and senior school management information on using and managing ICT resources so that they can provide leadership in their schools. The guide also considers some implications of the use of the computer and related resources for teaching and learning. The authors hope that it will also be a valuable resource for other senior members of the school staff, and for School Governing Bodies.

Central ideas

There are a number of important ideas which we have tried to weave through the whole guide. These include the following:

- Take a good, hard look at the ICT situation in your school right now and decide how to make the best use of what you have. It is very important to be realistic about what you can and cannot do.

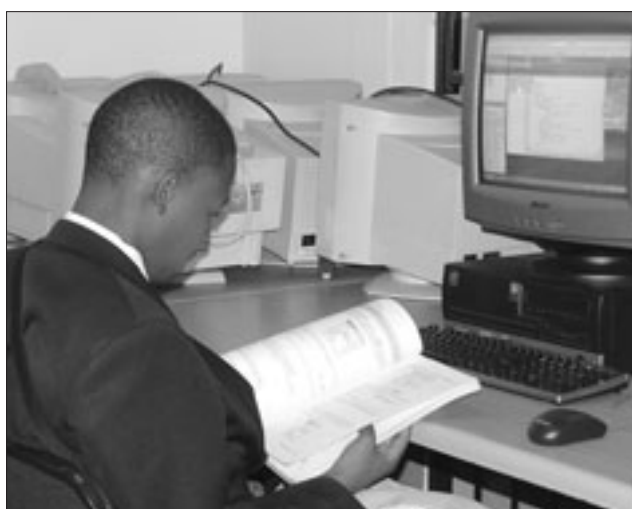
¹ The research report, *The Use of Computers in Schools (2003)* is available on-line at the SAIDE website (www.saide.org.za) and people interested in the resource can make copies of it for themselves.

- Keep your eye on what you want for the future. While planning needs to be rooted in the present, ICT changes so rapidly that you always have to keep in mind where you want to go next .
- Take everyone along with you as you plan for the future. In other words, developing a shared vision and strategic implementation plan for the use of ICTs in your school requires the involvement of all stakeholders.
- Develop systems for monitoring your planning and implementation. This helps to ensure quality.
- Pay attention to sustainability. Without careful planning and consideration of what can realistically be sustained financially and in terms of infrastructure and human resource capacity, there is no chance of successfully integrating the use of ICTs into schooling.

It is not sufficient to have a room full of computers in your school. All of the factors listed above are important for successfully managing the provision and use of computers in a step-by-step, sustainable way.

It is also important to have a realistic idea of what computers can do. Computers will not solve all educational problems. Unfortunately, in this guide we cannot discuss in detail the pedagogic issues surrounding the integration of computers into the curriculum. However, the guide emphasises the need to assist teachers with relevant professional development and support in using computers for teaching and learning, thereby acknowledging the important role of the teacher as mediator. This role is never displaced by the use of a computer or any other form of information technology or software package. The teacher's role in planning, facilitating and evaluating any lesson involving ICTs remains central.

Finally, the guide stresses the importance of using computers to learn how to learn and work better, rather than just using them to become computer literate. In other words, basic computer skills are not enough. It is necessary to learn how to use computers as a tool for learning and for working more efficiently. All training should therefore be contextualised and the skills taught should be related to particular work or particular learning areas.



Content

Each chapter is structured around a key question. The authors hope that this will guide principals in reflecting on their current situation and will then enable them to go beyond this to making more informed decisions about the use and management of ICTs in their schools.

Chapter 1: Why should we have computers in schools?

This chapter contextualises the drive towards providing schools with ICT resources in terms of broad social and economic imperatives. It also considers some of the macro-level arguments for having ICTs in schools.

It covers aspects such as:

- What ICTs are;
- Their role in social and economic development;
- Global and regional patterns and trends;
- The meaning and implications of the digital divide;
- Implications of global trends for schooling;
- South African policy responses regarding ICTs in schools with specific reference to the White Paper on e-Education.

Chapter 2: How can schools benefit from computers?

This chapter describes the range of uses of computers in schools. It moves from the macro-benefits of ICTs in education to the micro-benefits – how learners' and teachers' lives are directly affected by computers in their schools. Benefits at this level might include:

- For school administration – making it faster, more efficient, and more manageable.
- For communication – among and beyond the school community.
- For supporting teaching and learning – including:
 - support for a range of teaching and learning practices;
 - specialised support for learners with special needs;
 - as an energiser of both learners and teachers;
 - as a lever for on-going professional development and for change in teaching and learning practices.
- As a community outreach/social responsibility strategy.

We have used teachers' comments taken from the SAIDE research project into the use of computers in schools to describe these benefits. They are consistent with what is envisaged in the White Paper on e-Education (Department of Education 2004) and elsewhere.

Chapter 3: How can computers be used in teaching and learning?

This chapter focuses on some of the things that teachers and learners can do with computers that lead to the benefits described in Chapter 2. It gives short case studies and examples to illustrate key ways in which computers can be used. It also describes the computer-related resources needed to support each use. It gives a framework for categorising the range of uses and considers how the emphasis on these might change from the Foundation phase to the Further Education and Training (FET) band. It pays attention to how learners with special needs might use computer-related resources. Finally, it describes alternative routes to integrating computer literacy into the curriculum.

The chapter makes clear the limitations of the use of computers, and stresses the role of the teacher's professional judgement in deciding what to use when and for what purpose.

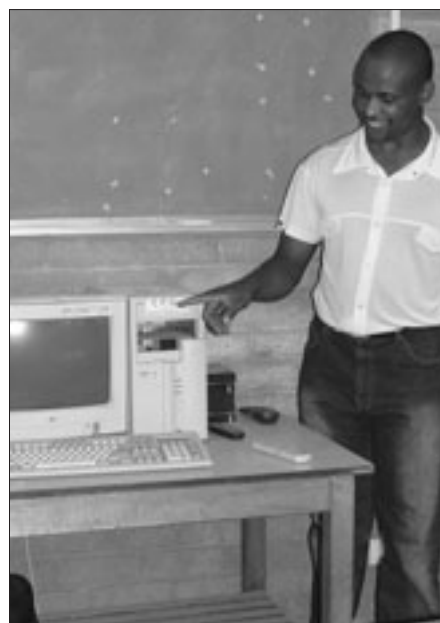
The need for sound pedagogy to underpin ICT use is also highlighted – ICT is only as good as the person using it. If a teacher does not understand how to teach well, then ICT cannot, on its own, solve the problem.

Chapter 4: Can all schools use computers in all the possible ways?

This chapter develops the idea that there are both possibilities and constraints in the use of ICTs. Informed decisions have to be made to make the best use of what is available. These decisions are complex, as a range of options is possible with each set of resources. Much depends on a vision for use and how to match the vision with what is, in fact, possible.

The chapter discusses some of the key issues around the resources that are needed for computers to be used effectively. It uses a set of case studies drawn from the SAIDE research project as examples that highlight key points about what needs to be in place. This includes:

- ***Resources themselves and access to them.*** This chapter consolidates information on the range of resources available, and the implications for the different uses developed in Chapter 3. It makes clear that the number of computers in a school is also an issue, as are the maintenance and security of the resources that do exist.
- ***Staff competence*** – both with regard to ICT literacy itself, and to pedagogical applications.
- ***Staff willingness to accept new technology*** – the importance of buy-in from teachers as well as the need for proper professional and technical support.



The constraints and enabling factors described above impact on things such as:

- The number of learners who can have direct access to ICT resources, and the amount of time they can spend on a computer;
- The number of teachers who will access computer-based resources, and what they can and will actually do with these resources; and
- How the above constraints and enabling factors affect administrative staff.

The chapter ends with a table describing eight types of use of computers in schools and the resources, support and training needed for these uses. It also considers the idea of stages of ICT integration into a school, and makes the point that this is a gradual process which happens over time. The table in the chapter refers to a much more detailed set of tables in Appendix 2.

Chapter 5: How can a school build a shared vision for ICT use?

This chapter looks at the process of vision building as a key component of strategic planning.

Issues included in this chapter are:

- Why a vision is necessary and what it should contain;
- Steps in developing a vision;
- Strategies for creating a shared vision and buy-in from the school community for ICT integration.

In the final section of the chapter, we analyse three different examples of vision statements. We make links between the vision statements and the tables on 'Types of Use of Computers in Schools' in Appendix 2. In addition, the examples illustrate the importance of rooting the vision in the present reality while simultaneously looking to the future.

Chapter 6: How do we go about implementing the vision?

This chapter looks at strategic planning for implementation of ICT in a school and is organised around the key planning questions: Where are we now? Where do we want to be? How do we get there from here?

Topics include:

- Analysing your current situation (SWOT analysis is used as an example);
- Guidelines for choosing priorities;
- Setting goals and objectives;
- Developing an action plan.

Chapter 7: What are some of the practicalities that need to be considered?

This chapter deals with a range of practical matters:

- Financing ICTs – budgeting, fundraising, purchasing, maintaining and upgrading;
- Deciding where to put the computers once they are bought (from a single computer in a single office to many computers in offices, staff rooms and/or a computer centre);
- Making sure that the computers and other ICTs are secure (both from external crime and from problems such as viruses);

- Developing policy for the use of the computers and related equipment;
- Developing and supporting staff, not only in using computers to work more efficiently, but in implementing new pedagogical approaches.

Issues such as how to set up a computer centre or identifying the appropriate staff development strategy are, in fact, essential parts of the planning process. Chapters 6 and 7 are, therefore, linked in important ways.

Appendices:

Appendix 1: ICT and curriculum.

Appendix 2: Types of ICT provisioning and use with associated professional development and support.

Appendix 2 provides a guide for planning and managing ICTs in schools. The eight scenarios given help to illustrate a range of different uses. a summary table reflecting the central issues is to be found at the end of Chapter 4.

Glossary

We explain some of the terms associated with ICT provision – such as those related to computer specifications, software applications and internet access – in the hope of making terminology such as *CD-ROM*, *dial-up access*, and *megabytes* accessible.

Selected resources

This section lists:

- Some of the different packages and resources available;
- Educational resources and where to find them;
- Some useful references for staff development.

References

Using the guide

Schools are all at very different stages with regard to ICT implementation. Each school has to interpret and work within its own context, taking different pathways through it. For some, the current priority may be to consolidate the use of computers for more efficient and effective administration; for some it may be setting up a computer centre to provide learners with basic computer literacy; for others it may be the challenge of developing innovative ways of integrating computers into the curriculum and daily classroom practice.

This guide is intended especially for school principals and school management teams. It is intended to identify and alert you to a number of key issues involved in integrating ICTs into your school and to help you think about these. It offers a framework for planning and suggests solutions and ways forward. In all aspects it draws from the experiences of the South African schools that participated in the original SAIDE research and the directions that they are exploring.

Sharing a vision and debating ideas are the way forward in this complex area.

CHAPTER ONE

Why should we have computers in schools?

The amount of information we have is increasing all the time. So is our need to record it, process it, store it and share it with others often at great distances from us. Computers, either alone or in combination with some other technology, enable us to do all these things quickly and efficiently. The term *information and communication technology* (generally abbreviated to ICT) includes the technologies which together support people's ability to manage and communicate information electronically (see the Glossary for a full definition). ICT includes not only computers, but also equipment (or hardware) such as printers and scanners as well as the software and systems needed for communication, such as the Internet. Video recorders, television, radio and digital cameras are also included, but these technologies are less frequently used in most school contexts. However, the technology that plays a key role in bringing these media together is the computer, and this guide focuses on this form of ICT.

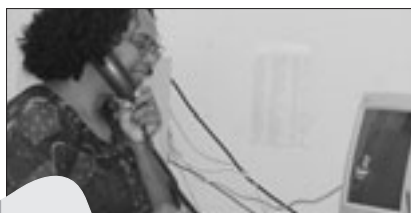
One reason for the focus on computers and the Internet is the role that ICT plays in enhancing learning, especially in the context of recording, processing, storing and sharing information with others. Many studies of the impact of technology on teaching and learning conclude that technology has an important role to play in education at all levels, from Grade 0 to Grade 12, although it will not solve all educational problems. One such study, conducted by the North Central Regional Education Laboratory (NCREL) in the United States of America, suggests in its report entitled *Computer-Based Technology and Learning: Evolving Uses and Expectations*, that technology can:

- Make learning more interactive;
- Enhance the enjoyment of learning;
- Individualise and customise the curriculum to match learners' developmental needs as well as personal interests;
- Capture and store data for informing data-driven decision making;
- Enhance avenues for collaboration among family members and the school community;
- Improve methods of accountability and reporting².

(NCREL Report <http://www.ncrel.org/tplan/cbtl/toc.htm>)

Computers are part of our daily lives

Increasingly, computers are part of our daily lives. Each time a cashier scans a barcode in a shop, a customer uses an ATM to do her banking, or we query an account at the local council offices, a computer is involved. This is the case, too, when we use e-mail to exchange written messages and photographs with friends and family in distant places, or when we look for information, order books and buy airline tickets on the worldwide web. Over the last 30 years, computers have changed from large boxes that were found in only a few research institutes and large organisations, to portable items that are in millions of private homes.



² For more information on the findings regarding the use of computers in schools and the effect on learning see the NCREL Report, *Computer-Based Technology and Learning: Evolving Uses and Expectations*, available on the NCREL website: <http://www.ncrel.org/tplan/cbtl/toc.htm>

Computers are linked to social and economic development

The use of computers is closely linked to levels of economic and social development. Statistics show that in the more developed countries, such as the United States (US), there are many more computers per 1 000 people than in the less developed countries such as those in Africa. In the US there are also many more people with access to the Internet via computers (Table 1). South Africa's status as one of the most developed economies in Africa is clear from the figures shown in Table 1.

Table 1: Personal computers and internet users in selected countries in 2001

	Personal computers per 1000 people	Number of Internet users (thousands)
Angola	1.3	60
Ethiopia	1.1	25
Nigeria	6.8	115
Zimbabwe	12.1	100
South Africa	68.5	3 068
India	5.8	7 000
Brazil	62.9	8 000
United States	625	142 823
Japan	348.8	55 930
Germany	382.2	30 800
World	86.5	501 478

Source: World Bank 2003, section 5.11

The same differences are apparent in our own country. In our more urban and industrial provinces, such as Gauteng, a higher proportion of households have a personal computer than is the case in the more rural provinces, such as Limpopo. These differences are shown in Table 2.

Table 2: Households with computers in South Africa

Province	Percentage of households with computers
Eastern Cape	4
Free State	4.9
Gauteng	15.1
KwaZulu Natal	7.1
Limpopo	2.2
Mpumalanga	4.7
Northern Cape	7.1
North West	3.9
Western Cape	18.2
South Africa	8.6

Source: Statistics SA 2003: 97

Statistics such as these are useful indicators of levels of social and economic development. More important, however, is the fact that computers can contribute to social and economic development. They do this by supporting administration, financial and governance systems, helping to make them more efficient. They enable communities to link more effectively with global and national communication networks, to remain in touch with new and changing knowledge and to participate more successfully in global and national economies. For these reasons, both globally and within our own country, narrowing the 'digital divide' which separates those with access to ICT resources from those without access has become a major target on the development agenda.

The role of education in narrowing the digital divide

Narrowing the digital divide means ICT resources must be provided to those who do not have them, and that their competencies to access and process the knowledge that these resources make possible must be developed. It is generally recognised that programmes to develop ICT capability in a country should give priority to ICT in education. Learners need to develop ICT skills so that they can function effectively in the broader society and can contribute to the sustained use of ICTs within it. With this in mind, the South African Department of Education has defined the following as a key goal in its e-Education policy document (Department of Education 2004):

All South African learners from grades 1-12 will be ICT-capable by 2013. This means that South African learners will be able to use ICT confidently and creatively to develop the skills and knowledge they need both to achieve personal and economic goals and to participate effectively as a member of the global community.

Providing South African schools with ICT resources is a challenging task. At the most basic level, there is a serious shortage of the minimum infrastructure to support ICTs at many schools. Statistics in the 2004 edition of South Africa Survey (South African Institute of Race Relations 2004) reveal that, in 2000, only 64.5% of schools had access to any form of telecommunications, and only 49.3 % had access to electricity. In addition, the number of schools with computers for teaching and learning was very small, with only 3 335 schools, or 12.3% of South African schools, having computers for teaching and learning. There are considerable differences between provinces: Gauteng and Western Cape respectively report ratios of 11 and 9 computers to one school, while Northern Cape has a ratio of four computers to one school, and the other provinces only one or two. Given that these are averages, it is clear that many schools, particularly in the more rural provinces, do not have any computers at all, and that large numbers of teachers and learners have no access to computers at school.

The White Paper on e-Education (Department of Education 2004) acknowledges the magnitude of the task of delivering ICT and the infrastructure required for ICT in schools. It proposes that the integration of ICT into schools should take place over three phases. When the final phase is complete, in 2013:

- all education departments in the country will use ICT for planning management, communication and monitoring and evaluation;
- all schools will have access to a networked computer facility for teaching and learning, and to high quality educational resources;
- all schools, teachers and learners will be confident and competent users of ICT, and ICTs will be integrated into teaching and learning at all schools; and
- communities are involved in ICT developments at all schools.

Even if these ambitious targets are not achieved by 2013, the implications of the White Paper on e-Education (Department of Education 2004) are that, over the next few years, the number of schools with improved ICT resources should increase rapidly. Undoubtedly the emphasis will be on the provision of computers and associated technologies such as CD-ROMs and Internet connectivity. Already, in certain provinces, large-scale roll-out of computer provision has begun. The Gauteng-on-line project of the Gauteng Department of Education and the Khanya project of the Western Cape Education Department are examples of two major government-funded initiatives in this regard. Large corporations, such as Sentech and Telkom, have been drawn into the initiatives, and many schools have undertaken fund-raising drives in order to obtain funds for the purchase of computers, or donations of new or refurbished second-hand equipment³.

However, in addition to the challenge of obtaining ICT and the infrastructure to support it, schools face the equally important challenge of how to make the best use of these resources in their particular contexts. School principals and other senior managers have a critical role to play in introducing ICT into the administration and teaching work of their schools. The rest of this guide attempts to provide information that will be of direct use to you in this regard. Examples reflecting the key ways in which computers and computer-related resources can be used are given, and a useful framework for categorising the range of uses is provided at the end of Chapter 4.



³ When second-hand computers are refurbished previous data and applications are cleaned from the computer memory.

CHAPTER TWO

How can schools benefit from computers?

Policymakers are concerned about how computers in education will benefit society at large, both strategically and in terms of development. In schools, however, most teachers and learners are more interested in the direct impact that computers make on their daily lives.

Teachers' views: Some benefits of having computers in schools

The comments below identify some of the benefits of having computers in their schools noted by about 60 teachers in 21 schools in rural and urban schools in KwaZulu-Natal, Gauteng and the Western Cape in interviews held with them in 2002 and 2003 (SAIDE 2003). We have organised the teachers' comments into groups to support some of the main points that they made. They talked about benefits for themselves, their learners, the school and the community as a whole.

A. Teachers feel they have benefited from their use of computers

1. Computers save them time, and enable them to do their work faster, more neatly, and more efficiently.

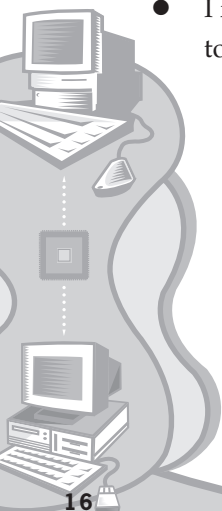
- It's made my work easier. I can work faster, and store things to use again.
- I have found using e-mail a great help. I am responsible for the netball team – and it halved my time getting hold of everyone else.
- I can present my work better – my mark sheets are now neat and tidy, and so are my reports.

2. They enjoy the challenge of the computer, and find they have a new enthusiasm for their work.

- I was getting very bored with teaching. But since we got the computers, I feel new areas to explore have been opened up, and I am excited.
- I love working on the computer. It's fun, and I find out new things all the time.

3. They enjoy the increased control over their preparation, and feel greater pride in it as a result – and more confidence.

- I like making my own worksheets. I can prepare work that is just right for my learners. I feel empowered!
- I can make my work easier to read and more interesting for the learners. I have found out how to make borders, and how to insert clip art.
- I feel proud of my work now. It looks so much better.
- I feel more confident about what I know. I have been able to look up information that was not available to me before.



4. *Computers give them access to information in different ways.*

- It's amazing how much more information you can find if you have a computer. Just having the ENCARTA CD has made my prep much easier, and with the Internet ...!
- I am in touch with colleagues at other schools via e-mail. We often share ideas, and swap test papers and worksheets.

B. Teachers feel that their use of computers benefits their learners

- Sometimes I set up a data projector, and learners use it to share their knowledge by presenting their work to the rest of the class.
- I have found a lot of information on good teaching practice, and am trying some new ideas with my learners. Most of the ideas have worked well, and lessons have been more interesting for them.
- I have several poorly sighted learners in my class. I can type up worksheets with a big font to help them read more easily.
- I think my lessons are now more interesting, and so learners enjoy them more and learn better.

C. Teachers feel learners benefit from using computers themselves

1. *They gain confidence, self-esteem and renewed motivation.*

- They have gained confidence. Many find they can do things that they have never tried before, and they feel pleased.
- Learners love working on computers. They are much better behaved in the computer centre, and the absenteeism rate has dropped!
- Learners feel empowered. They often know how to do things better than I do, and also often know more about a topic than I do.
- They learn well on the computer – it seems to hold their attention. They especially like the programs that give them feedback, and also which show them how things work. They can see and hear things that I cannot show them in an ordinary lesson.

2. *They learn to work more independently.*

- Learners are more in charge of their work. They work more independently, and try to solve problems themselves rather than sitting back and waiting for me to help all the time.

3. *They learn to work collaboratively.*

- They are learning to work together. They help each other with computer skills, and solve problems they encounter together.

4. They gain knowledge and a variety of academic skills.

- Our school is poorly resourced and far from a good library. The Internet and CDs have made knowledge accessible to these learners.
- Learners are taking more pride in their work. They have developed presentation skills, and take trouble to make their work look as good as possible.
- Some of the software encourages learners to think about the structure of their ideas, and to present them logically. They can move things around so easily, and try things in different ways until they are satisfied they have got it all right.
- The Maths software we have installed is a great help. Many learners have a poor background in Maths, and this material helps them catch up. They get lots of practice in a structured way.

5. Their world view broadens.

- This is a poor community. Many learners do not even have a TV at home. At school, now, they feel part of the modern world, as if they have a chance, and some hope of moving forward.
- Their views have broadened. They have been exchanging information via e-mail with learners in other parts of the world about life in their country.

6. They have more subject choices and career opportunities

- Some have found jobs with the computer skills they have learnt at schools. At least two have weekend work at a local business now.
- Our learners can now take Computyping for matric. Before we had computers, this subject was simply not available to them.
- Of course it is very important to have computer skills for almost every kind of job these days – not just for jobs directly related to IT. Computer skills therefore increase one's opportunity to find work.

7. Computers have particularly helped some learners with special needs.

- Some of my 'non-writers' have benefited enormously. They find typing much easier than trying to hold a pen, and now feel proud of the work they hand in.

D. The computer has had an impact on the school as a whole, and on its broader community.

- We have set up a website about our school. Parents can now keep up to date with what is happening here.
- We use the computer centre after hours to give computer literacy lessons to adults in the community. This has enabled us to earn money, and to use our resources for the benefit of people beyond the school.
- We came up with the idea of contracting a local person with a small business to maintain our computers. We benefit from lower rates, and she gets a boost for her business!

In summary, the teachers at these schools suggested that computers in school can:

- Support and enhance teaching and learning;
- Provide learners with skills that are useful for entry into the workplace, or for further study;
- Improve administrative and management efficiency;
- Generate funds for the school; and
- Support community development.

All of these benefits are consistent with what is envisaged in the White Paper on e-Education (Department of Education 2004) and the potential benefits from the use of computers in schools that are described elsewhere. In addition to these specific benefits, both the White Paper and the SCANS report prepared by the American CEO Forum on Education and Technology⁴ refer to the broader educational benefit of ICT in schools. According to the SCANS report, the American workplace requires students who “must learn how to learn, learn how to think, and have a solid understanding of what it (technology) can do” (STaR Report, <http://www.ceoforum.org/>).

In this guide, we are going to focus on the use of computers for teaching and learning, and one of the central ideas we want to communicate is the understanding that computers are a tool that help us ‘learn how to learn’. This is central to learning in the schooling context as well as in all other spheres of life.



⁴ The CEO Forum on Education and Technology was founded in 1996 to help ensure that America's schools effectively prepare all students to be contributing citizens and productive workers in the 21st century. To meet this objective, the Forum issued an annual assessment of the nation's progress towards integrating technology into American classrooms. For more information on the findings and recommendations of the SCANS report see the CEO Forum website: <http://www.ceoforum.org/>

CHAPTER THREE

How can computers be used in teaching and learning?

In Chapter 2 we described a range of benefits for teachers and learners from their use of computers at South African schools. The administrative and management staff of schools benefit greatly from the increased efficiency that computers and e-mail given them. Computers are extremely useful in managing correspondence, keeping databases up to date (such as databases for learners and for stock), budgeting, timetabling and the many other tasks that are part of their work. However, classroom teachers and their learners also benefit from the use of computers. In this chapter we consider how teachers and learners can use computers and related resources for teaching and learning; the different ways computers can be used at different levels in the schooling system and the role of the teacher in ensuring that computers add value to teaching and learning.

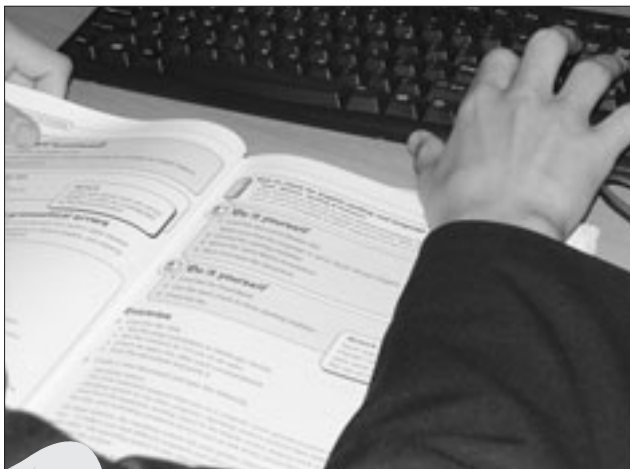
Purposes for which teachers and learners use computers

Teachers' use of computers

Teachers use computers to support their work in a number of ways. These can be structured around all seven roles of the educator, described in the *Norms and Standards for Educators* (Department of Education 2000:13–14), as follows:

1. Learning mediator
2. Interpreter and designer of learning programmes and materials
3. Leader, administrator and manager
4. Scholar, researcher and lifelong learner
5. Community, citizenship and pastoral role
6. Assessor
7. Learning area/subject/discipline/phase specialist.

For the sake of simplicity, the seven roles can broadly be combined into two main categories of use by teachers. These are to assist with their administrative work, and to support their teaching and learning activities, including teaching preparation, actual teaching and assessment. We explore each of these dimensions a little more fully before we consider learners' use of computers.



Computers as support for administration

The use of computers for a broad range of administrative purposes links directly with the role of the teacher as *leader, administrator and manager* (role 3) and with the *community, citizenship and pastoral* role (role 5). These roles may involve a range of extramural activities and other community involvement.

In their working day, teachers have to do a lot of administrative work. This work can be roughly divided into three broad categories:

1. Work related directly to their teaching responsibilities – such as drawing up class lists, taking registers, keeping a mark book and writing report cards.
2. Work related to the administrative requirements of the provincial education authorities – such as filling in forms sent by the department (for example, school numbers on the tenth school day, inventories of equipment and subject choices of candidates for the matric examination).
3. Work related to their extramural activities and the general life of the school and the community – tasks such as drawing up agendas and programmes; booking transport and venues; liaising with colleagues at their own school and elsewhere; compiling, displaying and sending out notices; and collecting and accounting for money.

A range of software packages is available for tasks such as these. Some packages are, in fact, tailor-made for needs that are specific to schools. However, even if teachers are only able to use the fairly standard word-processing, spreadsheet and e-mail packages, all this work will be much easier. Table 3 shows a range of administrative (and teaching) tasks that can be carried out using the Microsoft Office suite of programs. (See the section on Selected Resources for information on how to obtain free Microsoft software.)



Table 3: Software uses for teachers from the Microsoft Office suite

Administration, teaching and other general functions	Applications					
	Word	Excel	Power Point	Access	Publisher	Outlook
1. Advertising	✓				✓	
2. Amending forms	✓	✓				
3. Assessment forms	✓					
4. Assignments			✓			
5. Budgets		✓				
6. Certificates	✓				✓	
7. Checklists		✓				
8. Class discussions						✓
9. Class lists	✓	✓				
10. Classifying data		✓				
11. Creating web pages					✓	
12. Dealing with money		✓				
13. Drawing graphs		✓				
14. Exam papers	✓					
15. Flyers					✓	
16. Forms	✓	✓				
17. Interactive worksheets	✓					
18. Invitations	✓				✓	
19. Lessons plans	✓					
20. Letters	✓					
21. Lists		✓				
22. Mark sheets		✓				
23. Mass mail						✓
24. Minute taking	✓					
25. Networking with teachers						✓
26. Newsletters					✓	
27. Notes	✓					
28. Organising	✓					
29. Planning documents						✓
30. Posters	✓				✓	
31. Presentations			✓			
32. Registers		✓				
33. Report cards				✓		
34. Requisition forms	✓					
35. Research						✓
36. Rubrics (assessment)	✓	✓				
37. Schedules	✓	✓				
38. School records				✓		
39. Stock control		✓				
40. Submitting EMIS reports				✓		
41. Templates	✓			✓		
42. Worksheets	✓					

Computers as support for teaching and learning

The use of computers to support a broad range of teaching and learning purposes links directly with the roles of the teacher as *learning mediator* (role 1), as *interpreter and designer of learning programmes and materials* (role 2), as *scholar, researcher and lifelong learner* (role 4), as *assessor* (role 6) and as *learning area/subject/discipline/phase specialist* (role 7).

Many teachers who do not have access to computers do good work and succeed in fulfilling the roles described above. They research the content that they have to teach and they keep up to date in their fields – with developments in theories of teaching and learning, with new approaches in methodology and with developments in education policy. In short, they remain on a path of continuing professional development. They design well-structured learning programmes and plan lessons with meaningful, resource-based activities to support learning. In creating these activities they are imaginative in their use of print materials such as textbooks, videos and other learning resource materials, in ways that allow for learners' diverse needs to be met. They manage their classes well, challenge learners' thinking and mediate learning effectively. Assessment is an integral part of teaching and learning in their classes, and they use information from assessment to support their learners and to improve their own practice.

A computer cannot do any of these things for teachers. Nor can a computer or computer-related resources compensate for poor teaching. However, there is no doubt that access to a computer, to the Internet, to software packages and resources and to other technology (such as a scanner or digital projector) can greatly support teachers' work, and add value to it. We describe below some of the ways in which computers can support the various roles of the teacher.

To prepare printed material for learners

All teachers, except those in the first grades of school, regularly have to prepare test and exam papers for their learners (teacher as *assessor*). In addition, many teachers enjoy creating their own notes, worksheets and display material. They might simply write a set of questions on a handout for a discussion group, or some instructions for a group to follow in doing a practical activity. They often photocopy pictures, diagrams and maps from printed sources and use scissors and glue to 'cut and paste' these resources to make handouts specifically suited to their purposes and their learners' needs, or to create a wall chart for display (teacher as *material designer*).

A computer, and associated technology, can make this sort of work much easier. Even if they only have access to a word-processing and spreadsheet package, teachers can do a lot. Most computers have packages like these available as standard items. Word processors allow users to edit their work, and to add various effects, such as different font sizes and styles, borders and colours. Tables of data can be neatly presented or converted to graphs of various kinds and placed in the text. Many standard computer packages include clip art – a range of images that teachers can use to illustrate their work. Teachers with access to a scanner can scan a wide range of images into their work, rather than pasting them in on a printed version. They can move the images around

and change their size and shape much more easily than they can when using scissors and paper. If a teacher also has access to CD resources or to the Internet, she can take material she finds there and copy it electronically straight into her materials. Once she is pleased with what she has done, she can simply print the final product.

The range of computer-related resources available influences what a teacher can do to develop and reproduce the material she designs. It is helpful to have Internet access, a scanner and even a colour printer, but these all come at an increased cost – not only for initial purchase and installation, but also for ongoing use. However, the greatest value in materials generated by the teacher is that they can be tailor-made for the particular needs of a certain group of learners. Using a computer with standard software (see Table 3) and a black and white printer can make it far easier to produce these materials.

To project information for learners

Teachers can project material from a computer onto a screen using a data projector. The material can come from various sources. It might be a document stored in the computer, a piece of text the teacher has written or a table or graph he has drawn. It might be something the class is working on together, and which the teacher – or learners – can add to on the computer, while the whole class watches. It might even be material from a digital camera, a CD-ROM or the Internet. The material might be in the form of slides, using a program such as PowerPoint, with integrated text and graphics, or even video material. In schools where learners themselves do not have ready access to computer-based resources, a data projector can assist in giving them access to these, although on a class rather than an individual basis.

Turning to the learning and teaching process, a data projector adds value by allowing the whole class to participate in editing documents or adding colour and other components to documents, and to experience the interactive process of working with projected electronic documents (the teacher as *learning mediator*). Simply projecting information can just as easily be done on an overhead projector, but the opportunity to engage learners interactively is greatly lessened.

To do research

Both CD-ROMs and the Internet allow teachers to access a wealth of material – policy documents; information from both the national and provincial departments of education (and others); information on the topics they are teaching; and ideas for teaching in general, and for teaching certain topics in particular. In order to do this sort of research, a teacher obviously needs access to a computer with a CD-ROM, or one which is linked to a network in such a way that she can read a CD-ROM and/or access the Internet to browse the worldwide web (teacher as *scholar, researcher and lifelong learner*).

To share ideas and information

In addition to the research possibilities described above, Internet access makes e-mail possible, and with e-mail teachers can make contact with people in a various places to ask for information. They can contact other teachers or people not directly involved in teaching to ask for advice or information – and also to share ideas with them. For example, teachers might exchange worksheets and tests which they have prepared; they might ask for and offer help on discipline problems, or how to set up a drugs policy at their school; they might let each other know of useful websites for certain sections of the curriculum. In a way, this is a form of research – but one which is more interactive than that described above.

In both this and the research work described above, the teacher enriches himself or herself, and learners benefit by his/her access to a greater range of information and ideas.

E-mail is the most common form of communication using computers, but there are other possibilities, such as creating a website for a school, a subject department or extramural activity, or making use of a ‘chat room’⁵.

Even where teachers do not have access to the Internet, resources can be shared electronically if the school computers are linked to a network (or ‘networked’). Teachers will not be able to communicate with people anywhere in the country or the world, but they will be able to communicate with any other computer on the network. A network gives a large number of users access to a shared store of material, which they can both contribute to and make use of.

Even if the school’s computers are not networked, teachers can store material on a removable ‘stiffy’, USB memory stick or CD-ROM disk, and share it with others. This means work can be saved, improved collaboratively and revised to suit different needs and purposes. The ease with which changes can be made electronically is a great incentive to revise and improve materials – you just make the changes, save them and then print.

Facilities for teachers to interact and share information and materials are available on Thutong, the National Educational Portal, where a range of curriculum and other educational materials are freely available. (See details of the Thutong website in the Selected Resources section of this guide.)

⁵ Internet relay chat (IRC) takes place in chat rooms which is a method of ensuring immediate or ‘real-time’ communication by a number of people at the same time. When internet users are on line simultaneously, they can communicate by sending typed text messages which are read almost as quickly as they are sent – i.e., on a par with normal face-to-face conversation.

To prepare material for learners to use on a local area network

Even if learners themselves do not use computers, everything described above makes teaching more effective. But if learners do have access to computers, and the school computers are networked (in other words, if there is a local area network, or LAN), the teachers can also prepare material for learners to use (teacher as *interpreter and designer of learning programmes and materials*). There are a number of ways in which they can do this, for instance:

- Download material from a website (or even download an entire website) for learners to access to do their own research (this saves costs as learners do not spend time online).
- Prepare a webpage, with their own information and tasks, as well as links to websites and other resources which learners access from the website the teacher has made for them.
- Access databanks of multiple-choice and other test items, select from these the items most suitable for learners at a particular time, and then ask learners to answer the questions and obtain feedback online.

Such services also usually allow teachers to monitor each learner's work and automatically compile a record of their achievement. In addition, if learners are able to work online, it is possible for teachers to give feedback electronically to each learner, marking places in their submissions which need improvement, or which have been particularly well done, using comments which can be inserted into work electronically.

Learners' use of computers

In school, learners use computers for a range of purposes, depending on the resources available and the school policies that guide their use of these resources. Some of these purposes are discussed in this section.

Developing computer literacy

Probably the most widespread use of the computer in schools is to teach computer literacy; that is, use of the common (or generic) applications available on a computer and the software packages that allow users to use the applications.

Table 4: Examples of commonly available software

Generic application	Examples of software packages
Word processor	MSWord; Corel Word Perfect
Spreadsheet	MS Excel; Quattro Pro
Presentation software	MS PowerPoint
Database	MS Access
Graphics package	MS Paint; Corel Draw
E-mail client	Outlook; Pegasus Mail
Web browser	Internet Explorer; Netscape; Opera
Group ware	MS Outlook

Source: SchoolNet SA - SCOPE 2002

There are two approaches to the development of computer literacy. In the first approach, learners learn basic skills in a computer literacy class. They may or may not apply these skills to work they do in other classes, and they may or may not use them in an informal way, such as by choosing to type up an essay in the computer centre in their own time, or to search for information on the web outside class time if the opportunity presents itself. However, even in the most poorly resourced schools, it is important that learning ICT skills takes place in a context that is meaningful to the learners – to their personal circumstances as learners or as members of the community. This context may not necessarily be related to their subjects, but it must be meaningful and not contrived or, worse still, absent. The belief that acquiring certain skills is an end in itself and that individual ICT skills can be taught without integration is now generally regarded as an outdated approach⁶.

In the second approach, computer literacy is seen as something learners will acquire through using the computer in order to learn a subject. For example, learners use a computer to write an English essay, and in the process they learn what they need to know about using a word processor. This approach is sometimes called ‘just-in-time’ learning, as learners acquire the skills they need at the time they need them for an applied purpose.

In practice, where computers are well integrated into teaching and learning in a school, these two approaches are combined, so that learners have an initial introduction to the computer and acquire some basic skills in a computer literacy class, but there is continuing follow-up and specific skills are developed in the context of subject-based learning. Which of these two approaches is emphasised depends on the school’s approach to the integration of computers across the curriculum and on what is possible at the school. Generally, the fewer the school’s resources (and therefore the more restricted the learners’ access to computer resources), and the less competent and confident subject teachers are in the use of computers in their work, the less computer literacy will be integrated into subjects across the curriculum. Whatever the circumstances, however, it is important that teachers should strive for the highest degree of integration possible. The school’s leadership needs to think about creative ways of offering support to teachers to achieve this. If the school does have a ‘computer teacher’, she or he may work in co-operation with the subject or learning area teacher. If there is no ‘computer teacher’, the school could ask another skilled staff member or parent to assist.

Supporting subjects directly based on a knowledge of the computer

In the national curriculum for the Further Education and Training Certificate, there are two subjects which rely directly on learners having access to computers, and associated resources such as the Internet. These are Computer Applications Technology (previously Computer Studies – Standard Grade), which requires learners to become competent in the use of the standard software usually supplied with a computer; and Information Technology (previously Computer Studies – Higher Grade), which, in addition to this, requires learners to develop basic programming and data-handling skills.

⁶ The importance of learning ICT skills in context is well set out in the reading from p 45 of the SchoolNet Toolkit: <http://www.unescobkk.org/education/ict/resources/JFIT/schoolnet/toolkit/guidebook2.pdf>

Supporting learning in subjects across the curriculum

There is a huge range of ways in which learners can use computers to support their cross-curriculum learning. The following broad categories include many of them:

Computer-aided instruction

Computer-aided instruction (CAI) requires the use of software that is usually developed commercially, but may also be developed by a teacher for his particular learners. This software is designed to give learners a chance to develop and consolidate basic skills, facts and concepts related to particular subject matter. Most of these programs have some interactive quality: the learner responds to a question on the computer, and receives feedback in some way about the accuracy of her or his answer. These activities are sometimes referred to as 'drill and practise' activities. They may be short and stand-alone, so that learners can move from one to another at random, or they may constitute a carefully constructed sequence, building a learning programme. Such programs have been developed for learners in all grades. Unfortunately the word 'interactive' in this context is often a problem that schools should be alerted to. Software producers call software 'interactive' (as a selling strategy) when it simply requires user input (followed by one simple software response). 'Interactive' should refer to a more complex interaction between the user and the computer that is largely centred on the learner's choices of variables.

Nevertheless, much software of this type is useful in that it allows learners to practise at their own pace, and to choose and work at their own level. It can offer a convenient way of giving support to learners who need additional practise. Very often, at lower grades in particular, the programs look like a game, and often have colourful graphics, cartoon characters and sound effects.

However, the central importance of the teacher as mediator may once again not be sidestepped. It is generally not wise to allow learners to use any software without the teacher's facilitation, since the software simply diagnoses a problem instance. It remains up to the teacher to provide the remedial support to overcome the problem.

When purchasing software packages, teachers need to know exactly what the software does. Table 5, dealing with types of ICT uses, highlights the importance of professional development and support for teachers that match the type of ICT provisioning and range of uses in any given school. This includes skilling teachers in evaluating software.

If, for example, a given software package claims to give learners the opportunity to drill and practise certain mathematical concepts, it is vital that the teacher has a clear understanding of exactly what drill and practise the software will get the learners to do. CAI normally refers to drill and practise software (e.g. Maths). However, while providing the drill and the opportunity to practise, this type of software still relies on the teacher to teach and to ensure that learners stay focused on the task.

Software that does more ‘teaching/tutoring’ falls under a category sometimes referred to as CBT (Computer-based training). Master Maths software is an example of this. In this instance, the teacher’s role changes – she monitors the learners as they work at their own pace, rather than being completely involved with the activities they do.

Using generic software to support learning in a subject

Learners can also use commonly provided (or ‘generic’) software packages to support their work in a range of subjects. They might use such software in class or in their own time – even at home, depending on when they have access to a computer. Here learners might use the computer in a number of different ways.

For example, learners (in the same way as teachers) could use:

- a word-processing package to type up and edit material for submission to their teacher, or for presentation to the class;
- a spreadsheet package to process numerical data or draw graphs to show data they have gathered or been given, and integrate this into written work;
- PowerPoint to present ideas to the class;
- a CD-ROM or web browser to obtain all kinds of information (text, graphic and sound); and
- e-mail to contact external resources.

Computers offer a range of benefits to learners, and as they use computers in an on-going way, they develop a number of skills, for example, file and folder management. Partly because of the graphic representation of the arrangement of files and folders, the computer can play a major part in helping learners organise their work systematically and in developing their understanding of the relationships between different levels of organisation. In addition, certain software packages allow learners to build mind maps and spray diagrams, and to show their conceptual understandings of how information is organised graphically.

In many subjects, even the use of simple and commonly available spreadsheets allows data processing to be done speedily and accurately, leaving more time for conceptual development and the consideration of ideas and hypotheses. In Social Sciences, for example, interviews to gather opinions on social issues can be converted into data which can be processed through the computer much faster than if responses had to be added up and graphs drawn by hand. This leaves more time to think about the conclusions that can be drawn from the data.

As communication devices, computers assist in breaking down the barriers of classroom walls, and allow learners to communicate with peers and others all over the world. This means that learners can gain access to the best advice, expert opinion, current events and research findings through e-mail, Internet sites and online conferencing. They can share ideas, and evaluate and redefine their own ideas, values and attitudes by exchanging views and opinions with others beyond their immediate environment – building and participating in a communications network not limited by geographical boundaries. Taking learners beyond their spatial

limits can be a powerful trigger to the process of understanding that we are a global village, and that we can learn to talk and listen to each other.

Access to the Internet gives access to resources that would otherwise be unavailable to many learners, especially in poorly resourced and remote schools. It is important, however, that learners acquire the skills to assess which material is good, and which is not, as much of what is available is of doubtful value. They also need the ability to process, combine and use the information appropriately. The temptation to cut and paste large chunks of material directly from the Internet or other electronic material is enormous, and teachers need to help learners to integrate information and make it their own.

Teachers therefore have the responsibility to set tasks that require learners to process information. For example, tasks should be based on open questions that require learners to identify the information they need; gather the information; analyse, integrate and/or evaluate it; and present conclusions – this is the most effective strategy to combat mindless copying and pasting.

The computer, through programs such as PowerPoint, allows text and images to be combined, assisting learners in developing modern presentation practices that will be useful beyond the school environment. The spelling and grammar check facilities and the ease with which drafts can be changed encourage a culture of editing before submission. In addition, multimedia presentations – sophisticated combinations of text, image and sound – can stimulate huge creative activity and excitement, and can foster skills of co-operative interaction if these presentations are developed collaboratively.

One of the key features of the computer is its interactive nature. This is particularly evident in spreadsheets, in games such as strategy games and in the creation of multimedia presentations, where the ‘what if’ question guides the thinking of the person creating the multimedia activity. ‘What if I make the background green?’ And then immediately thereafter, ‘No, I don’t like that, I’ll make it orange instead.’ Or, ‘I wonder what will happen if I build the factory here?’, with the opportunity to implement the idea and test the impact. The capacity of computers to answer ‘what if’ questions speedily means that the learner can interact with the computer, explore variations, evaluate them and come to a final conclusion, all of which are higher order thinking skills.

Using special packages and tools for a particular subject or learning area

Increasingly, a range of software and tools is becoming available that is of particular relevance to certain subjects, where they support learning. In some subjects, such as Science and Geography, there are simulation games and problem-solving activities that give some of the benefits of interactivity noted above. Accounting packages are mentioned as optional in achieving learning outcomes in the Revised National Curriculum Statements in the FET band, and in Maths, there are packages designed specifically to support understanding in geometry.

The computer can also play a role as a data capturer in certain contexts. Central to the scientific method is the gathering together of data or evidence which allows for the development of hypotheses, and then the testing

of such hypotheses. The process of gathering the data using traditional equipment can be slow and time consuming, and it is frequently hampered by human error and inaccuracies. With the development of probes and sensors which can be connected to a computer, it is now possible to gather data quickly and accurately. Experiments which relied on hand-held thermometers or timing devices can now be done using probes connected to computers, with software which allows the data being gathered to be immediately entered into spreadsheets and then presented as graphs. With the much higher accuracy of these probes and sensors, learners can give much better quality consideration to the conceptual side of the process. GIS systems are an example worth mentioning: they not only provide an extensive database of geographical information, but also form the basis for data collection in the field and subsequent analysis.

Using software and other resources designed for learners with special needs

The use of computers for learners with special needs is an important aspect of the use of computers in teaching and learning, although it is not yet well integrated into mainstream schools.

At one end of the spectrum are high achievers who need extension opportunities over and above those provided for most of their peers. These learners can be extended by access to interactive multimedia packages and resources for extensive research, creative presentation opportunities as well as the possibilities the computer opens up for learners to work independently at their own pace.

At the other end of the spectrum, those with special learning difficulties can also benefit from appropriate multimedia packages which enrich and reinforce concepts, and from the opportunity to work at their own pace, and on materials adjusted for their needs. Learners with poorly developed handwriting skills, who are often penalised in assessments based on written material, can obviously benefit by the use of the computer as a word processor.

In addition, there are many ways of adapting computers to assist learners with particular problems. For example, it is possible to acquire software which can convert electronic text into speech, and so a learner with reading difficulties can have his work 'read' to him by the computer, at a pace and in passages decided by him. Equally, when a teacher is assessing the completed work of a learner with reading difficulties, she can use the computer to produce spoken comments on his work, instead of giving him written comments which he would find difficult to read.



In summary, the ways in which a computer can be used for teaching and learning are represented in the framework shown in Figure 1.

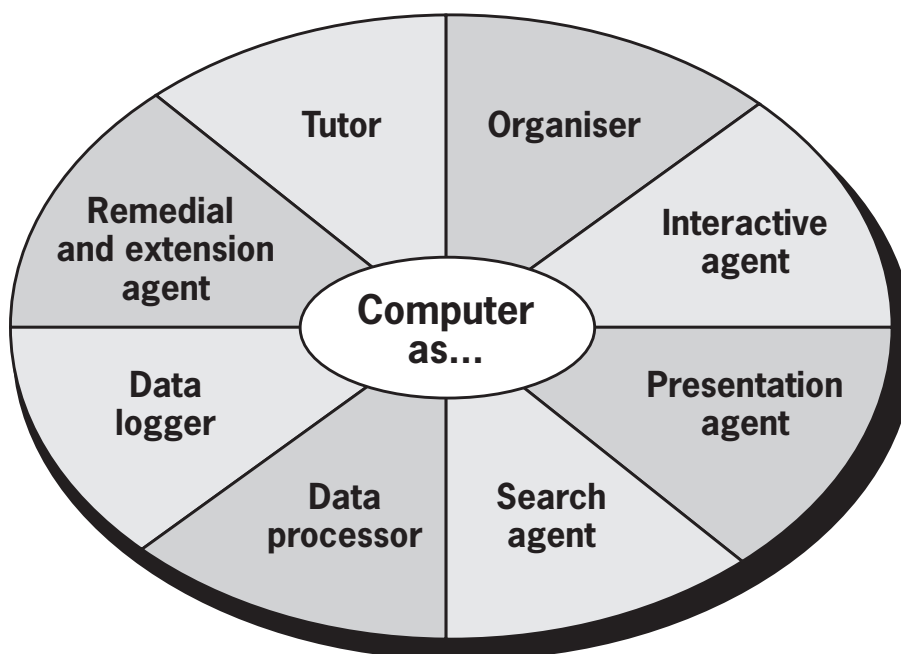


Figure 1: Framework summarising the ways of using a computer in teaching and learning

Ways of integrating the use of computers into subject learning

The use of computers can be integrated into subject learning in various ways, depending on what learners actually do with the resources. This integration operates on three levels, as described below.

Functional practice

This is the first level: learners use the computer in basic and functional ways to do the things that the computer can do well – such as word processing, document presentation, spreadsheets, producing graphs and searching for information on the Internet.

Teachers might ask learners working at this level to type up a report of a field trip, to present a budget on an Excel spreadsheet or to visit a website to find specific information. Learners use the computer as an aid to assist in a task that they would previously have done in some other way, but which they can do more efficiently on the computer.

Integrative practice

At this level, the teacher begins integrating her purpose with the activities of the computer, and new ways of teaching and learning emerge. For example, writing a composition without a computer probably does not involve much editing and redrafting. However, word-processing packages on computers have a number of functions that facilitate editing and revision. So, when working with computers, learners are likely to start changing their understanding of the writing process from a once-off activity to a process of drafting and re-drafting. The teacher needs to be open to this and at the same time needs to change her expectations of learners' writing.

Transformational practice

The third level is characterised by learning which occurs as a result of activities and opportunities which do not exist in computer-less environments. Projects on the worldwide web, when learners from different schools in different countries combine in a collaborative creation, produce learning at a sophisticated and challenging level. Chat room discussion on sensitive topics, such as ideas and attitudes related to HIV/AIDS, even if they just take place among learners in one class, open up possibilities for participation and response that might not exist in the face-to-face setting of the normal classroom. In a different way, the ability of learners to use sophisticated probes to collect environmental data (such as pressure and humidity readings), feed them into the computer electronically and process them with ease, makes it possible for them to reflect on the underlying principles which shaped the numbers in the first place. In processes such as these, classroom practices become transformational.

Changes in the purposes of computer use at different levels in the school

In general, the purposes for which computers can be used are the same throughout all the phases of schooling. Computers add immense value at all levels of general and further education, and teachers and learners at all levels benefit from:

- access to information and the skills required for managing and presenting relevant information;
- interactive, multimedia illustration of concepts, information and processes;
- development of analytical and creative thinking and problem-solving skills;
- interactive simulations to fill gaps in learners' experience and prepare them for real-life processes; and
- remediation for cognitive and affective deficits and learning problems.

However, by and large, the importance of access to computers increases with the seniority of learners, both for vocational reasons and as a learning tool. This is especially true where the school has access to the worldwide web and e-mail. In very broad terms, the value of different benefits from the use of computers changes through the school, as is briefly outlined in the sections following.

Foundation Phase

Learners at this phase need to spend most of their time learning concepts and basic skills by using concrete objects, and learning spatial concepts with physical reference to themselves and the world around them. Nonetheless, by carefully selecting the relevant software, computers can be valuable tools in the acquisition of basic numeracy and literacy as well as other cognitive skills in the Foundation Phase. Some of the reasons for this are the following:

- Computer feedback is immediate and affirmative, and can provide helpful hints to wrong answers so that learners' further attempts are informed.
- Computers provide engaging opportunities for repetition, practise and reinforcement where necessary.
- Progress can be adapted to the pace of each learner.
- In a single class with learners at different levels, learners can use different programs at the same time to address individual needs.
- Simulations can provide relevant contexts for problem solving, categorisation and analytical and creative thinking.
- 'Talking book' software can help learners to associate sounds with letters, and to make meaning of text and graphics when learning to read.
- Number and spatial concepts can be established and enhanced by good interactive, multimedia software.
- Specially designed remediation software for learners with special learning needs can help them to achieve their potential.
- Supportive and adaptive technologies allow access to the curriculum for learners with special educational needs, for example, brail keyboards.

Intermediate Phase

In the Intermediate Phase, learners have usually achieved the basic numeracy and literacy concepts and skills. They can extend their learning further into the other learning areas, and they need to spend time developing information-handling skills. Good computer software and equipment can also help learners to make the shift more easily from concrete operations towards abstract modes of thinking.

Computers in this phase are valuable learning tools for the following reasons:

- They can be used to fast-track learners with learning deficits from the Foundation Phase.
- They can enhance the development of cognitive and research skills, a major focus in this phase.
- They make it possible to introduce and develop information literacy and data-handling easily and understandably.
- Differentiated programs and levels cater simultaneously for different learning needs in the same classroom.
- Supportive and adaptive technologies allow access to the curriculum for learners with special educational needs.

Senior Phase and FET band

Learners in both the Senior Phase and the FET band are looking towards higher education and/or the world of work. For them, competent computer use is critical for progress.

Computer access in the school environment is essential for the following reasons:

- Each learner must develop a twenty-first century mindset, which is necessary to succeed in contemporary South Africa, Africa and the world.
- While the only subjects in the National Curriculum Statement at Further Education and Training (FET) level that formally require the use of computers to achieve the learning outcomes are Information Technology and Computer Applications Technology, many other subjects recommend the use of ICT as another way of achieving learning outcomes.
- Together with the worldwide web, computers are irreplaceable in the enhancement of information literacy; the collection of data; and data-handling, research and presentation skills in all subjects.
- Differentiated programmes and levels cater simultaneously for different subjects and learning needs in the same classroom.
- Computers can be used to fast-track learners with learning deficits and provide opportunities for learners to proceed at different individual rates.
- Interactive simulations and computer modelling allow for hypothesis testing, enable learners to experience situations which would normally be beyond their reach, and introduce the world of work.
- Supportive and adaptive technologies allow access to the curriculum for learners with special educational needs.

The role of the teacher in ensuring the effective use of ICT resources

As we pointed out earlier, computers and related resources in teaching and learning are only as useful as the quality of preparation and mediation provided by the teacher. While there are, of course, unanticipated benefits from allowing learners to ‘play around’ on a computer, this is not the same as using resources purposefully, in a structured way. In other words, while computers have enormous potential as teaching and learning resources, the teacher must manage that potential and should ensure that the use of these resources is always underpinned by sound methodology. If care is not taken, learners can waste many hours finding and copying meaningless facts instead of actively looking for and processing information from carefully selected resources to answer specific and purposefully set questions. Or they can be kept busy for hours playing interactive games that do not give enough feedback on options selected and need the mediation of a teacher to have any real impact on learning.

In working with computers and related resources, the key roles of the teacher in the process of teaching and learning remain unchanged, namely:

- Designing the learning programme;
- Selecting and conceptualising the best use of resources for specific purposes;

- Managing the use of the resources so that learning is supported; and
- Facilitating and mediating learning during use; planning and managing follow-up work; and integrating assessment.

The teacher needs to be mindful of the limitations of computers, particularly with regard to some dimensions of social interaction in classrooms. Sometimes outcomes can be better achieved without a computer.

Clearly, if teachers are to make the best use of computer and associated resources, most of them will need substantial support in a range of competencies, including the following:

1. Teachers need support in developing their own computer literacy to include, initially, the following key areas (depending partly on what is available at the school):
 - The use of a computer, demonstrating an understanding of the concepts related to ICT;
 - How to log on to a network and access various drives on the system;
 - File management: how to store material and arrange it so that it can be easily retrieved when needed;
 - Word processing: inputting, working within the word processor, printing, saving the materials in files;
 - Spreadsheets: entering numbers, arranging formulae to operate on the numbers (useful both for administrative and educational purposes), producing graphs (if appropriate for needs);
 - Browsing the worldwide web using web browsers;
 - Presentation programs such as PowerPoint, for teaching with a data projector; and
 - More advanced skills, such as authoring a webpage and using sound and picture editors.
2. Teachers need knowledge of the ways in which they and their learners can use computers to support their administrative work, and to assist with teaching and learning in general and in their subject in particular. They also need an understanding of the limitations of computers for these purposes, together with the ability to make appropriate choices based on the resources available to them and the needs of their learners.
3. Teachers need knowledge of the software resources that are available and of significant websites. They also need to be able to evaluate these for a number of purposes.

While some of this learning might happen spontaneously among certain motivated members of staff, school management will undoubtedly need to make a more direct intervention in order to motivate others in the use of computers and related resources in their work. This will involve planning an advocacy and professional development strategy to support the integration of computers and related resources into the working life of the school. We consider this more fully in Chapters 5, 6 and 7.

However, in the light of the e-Education White Paper (2004) and the fact that ICT Integration qualifications have already been established to achieve teacher competencies, we thought it would be useful to provide a list of teacher competencies that are achievable and understandable in a South African context. Competencies of those in management positions are included in the list. We hope that this will be a useful guide in deciding on priorities regarding the professional development of staff.

Educators' competencies

Educators should have the competence to do the following, in the following areas:

Professional competence with ICT

1. Draw on appropriate ICT applications to enhance personal and professional effectiveness
 - Fulfilling the seven roles of the educator;
 - Fulfilling school and district management roles.
2. Access and use electronic information and communications resources such as the Internet and e-mail, for the benefit of both the manager, the educator and the learner
 - Participate and contribute to professional online communities;
 - Facilitate collaborative learning between classes.
3. Reflect on practice with ICT in learning, then plan and implement appropriate, manageable changes in practice
Nurture the development of learners' ICT competence to use ICT as a tool in the educational context.

Integrating ICT with the curriculum

4. Be aware of and model best practice in health, legal and ethical issues regarding the use of ICT in the classroom.
5. Apply outcomes-based assessment strategies using the contributions ICT can make.
6. Identify and use ICT resources that could most benefit teaching and learning in the learning area and phase
 - Evaluation of learning resources;
 - Achieving learning outcomes;
 - Apply teaching strategies where ICT supports teaching and learning.
7. Organise the class and the classroom when using ICT to achieve learning outcomes.
8. Display a knowledge and understanding of the characteristics of information and its role in learning.
9. Be aware of and plan for both diversity and uniqueness of learners through the use of ICT in learning
 - Inclusive education;
 - Relevance to age range and phase;
 - Diverse backgrounds.

Management and leadership with ICT

10. Apply knowledge and understanding of ICT integration when appropriate in fulfilling roles as an educator.
11. Provide a facilitative and mentoring role to other educators regarding the integration of ICT.
12. Participate in the development and evaluation of educational ICT policy at institutional and/or district level.
13. Use opportunities to make innovative use of ICT in one or more roles as an educator.

Source: SchoolNet SA - SCOPE 2002

This chapter has attempted to provide a broad overview of some of the purposes for which computers can be used to support teachers in their work, and to enhance learning. For guidance on professional development of teachers for ICT integration, see Appendix 1: ICT and curriculum. It is clear that it is the teacher's decision-making about the use of computers that will, to a large extent, determine the value that they add. It is also clear that different uses are made possible by different types of resource provision. We will consider the implications of this more fully in Chapter 4.

CHAPTER FOUR

Can all schools use computers in all the possible ways?

In Chapter 3 we made it clear that computers can be used for a wide range of purposes in teaching and learning, and that they can be integrated into the curriculum in many different ways. Making decisions about exactly how computers will fit into the curriculum is a major task of the management of any school.

Some key decisions that have to be made

- Which groups in the school will use the computers? For example, they might only be used to by the principal and administration staff to support the administrative work of the school's management. Maybe teachers but not learners will have access to computers. Maybe certain groups of learners will use computers – such as those doing Information Technology, or those in Grade 10.
- How will the use of computers be integrated into the school's teaching and learning processes? If the emphasis is on enabling learners to acquire computer literacy skills in a separate period set aside for this purpose, what is the best way of contextualising this so as to make the learning experience meaningful and relevant to the learner's life experience? Will learners develop computer literacy skills as they need them to do certain things (for example, edit their writing in English, or create a table of rainfall data and convert it into a graph in Geography)? What needs to be put in place – what professional support is needed to work towards achieving best practice?
- Will teachers use computers to prepare printed materials, like worksheets and exam papers, or will they also use them to access the Internet and find information to enrich their subject knowledge and get new ideas for teaching? Will they use computers only for their administrative work, and thus only for things such as keeping class marks and preparing reports?
- Will learners use only the standard packages, or will they use software that gives them practice in certain skills, provides a programme of structured learning or offers them simulation games that allow them to develop their problem-solving skills and test their ability to apply their knowledge? Will they have access to the Internet, and if so, will they use it to find subject-based information on selected websites, or as a communication medium via e-mail?

Clearly, a range of options is available. Which option is selected will depend, in turn, on a range of factors, including the following:

- What would be ideal for the school in terms of its broad educational intentions, approaches and context? Are Maths and Science seen as the most important subjects, and thus in need of priority treatment? Is the ideal for the school that all teachers and learners should use computers as an integrated part of their daily work?
- What is needed to put the ideal into practice? If only the administration staff are to use computers, then just a few computers will be sufficient. If Maths and Science teachers and learners are to use them, then the needs increase. If all teachers and learners are to have access at most times, then there must be sufficient computers for them to be available for many classes at one time in the day, and they need to be in more than one venue. In addition, teachers will need high levels of computer literacy themselves, and should feel confident in this ability. They should also have knowledge about how best to use computer-based resources to support learning in their subject.



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- Which of the elements needed to implement the ideal are in place? If, for example, learners are to use computers to develop their competence in Maths, does the school have appropriate software packages to support specialised learning in this subject? If a key target is to develop research skills across the curriculum, can the school afford more or less unlimited access to the Internet, and does it have a large collection of appropriate CD material? Just as important, do all teachers have the expertise to support this initiative?
 - Can the necessary elements be put in place? How? And over what time period? Has the school, for example, planned any fund-raising activities? Are the elements needed part of a provincial roll-out plan? Can some teachers be sent on a training course? Are there programmes that can develop professional competence online, and will time be made available to teachers to develop the knowledge and skills they will need?
 - What is the best possible 'fit' between the ideal and what is available to realise the ideal at present? If, for example, there are very few computers, perhaps it is best to accept that learners will not benefit much from the very limited use that is possible and to use them rather to support the schools' administrative work. If there is only one small computer centre, perhaps the best way to use it is to give all Grade 12s a well-contextualised introduction to computer literacy, to prepare them for the world of work and further study.
 - How can resources be organised to make the best possible use of them in achieving the ideal? If the school hopes that teachers will use computers for research, should some of the computers located in a computer centre be moved to the staff room so that they are available to teachers in their free periods, when the computer centre is in use by learners? If the school only has computers in the administrative offices, could teachers have access to them at certain times? If access to the Internet is limited, do teachers have the skill to download and store website material for their learners to use offline? Could some training in this regard be provided? And, if teachers are to integrate their learners' use of computers into their subject work, can they have informal and more structured support in this regard – including time to develop the skills required? Could the computer centre be opened in the afternoons, and on Saturdays?

In any school, how computers are used reflects a response to the circumstances at the particular school at the time. Each school needs to balance what it wants to achieve with what it can achieve with the resources available at the time. There is no doubt that, for almost all schools, computer-related resources and staff expertise are factors that may limit the achievement of their ideals. However, there are alternatives for use within each set of constraints, and possibilities for managing the resources in different ways. The descriptions that follow are drawn from four schools. They illustrate some of the complexities of integrating computers into the curriculum, and some of the strategic choices that schools have made. They show various ways in which schools have balanced the ideal use of computers with what they have found possible in their circumstances. Of course, different people in the same circumstances might have made different choices.

CASE STUDIES

School A: A primary school in North West Province

Details: 750 learners, 7 computers (4 computers in the staff room, 3 in the administrative offices).

At this school, no learners ever used the computer. Teachers did, however, make some use of computers to do some of their administrative work, such as typing up mark sheets and drafting notices. They also used the word-processing package to prepare notes and worksheets which they printed out for their learners. The computers did not have a CD-ROM drive⁷, and the teachers could not access the Internet, so they were unable to access electronic material to include in their material. Nor was there a scanner, so they could not scan print-based pictures or other material into their worksheets electronically. They did, however, do some 'cut and paste' on the hard copy before photocopying the material so that their final products included pictures, maps and diagrams where appropriate. They also made good use of the range of fonts, drawing tools and clip art available to them as part of the software on their computers.

The principal's comments

We would love to give our learners a chance to learn about computers. All South Africans of the future will need to be computer literate. But it is just not possible with our limited resources. We have plans to raise money to buy more computers soon. So, in the meanwhile, we thought we should make a start with the staff. I have insisted that everyone submit mark sheets electronically. Some were really afraid of the technology, but they have helped each other, and got going. Now many wonder how they did this tedious job before!

And many, having made a start in their administration work, have also begun to use the computer to prepare worksheets. They find this enjoyable, and think that their learners are benefiting – so are encouraging others to do the same. We have had some very good workshops, and motivated each other. It is a small start – but it is a start! I hope to get connected to the Internet soon – I think that will help my teachers with their research – and e-mail will help us all a great deal. But the Internet is expensive and we also do not have very reliable technical support, so maybe we should rather spend our money on a scanner and a good collection of CD-ROMs first. The ICT committee is discussing this with the staff and will make a recommendation soon.

⁷ See the Glossary for information on computer-related hardware and software such as those mentioned here.

School B: A secondary school in KwaZulu-Natal

Details: 1 000 learners, 25 computers in a computer centre; networked and with a CD-ROM and access to the Internet; 3 computers in the administration offices. At one time there were a few computers in the staff room, but when the computer centre was built, they were moved there to increase the number available to learners at one time.

Each class of learners had a computer literacy lesson in the computer centre once a fortnight. In these lessons, they were taught a little about how the computer worked, and were given some basic word-processing skills. Thus, for example, over the years, they learnt how to open, close and save a file, how to make folders and organise their files into them, how to type and format a document. As soon as learners had learnt the basics, they were encouraged to use their basic word-processing skills to prepare school projects and even to write to pen pals. In more senior classes they learnt how to use a spreadsheet, and how to prepare a PowerPoint presentation. The computers in the computer centre were networked, and learners could access a CD-ROM at each workstation, so learners also learnt how to find their way round the school's very small selection of CD-ROMs. Learners could also access the Internet during their computer literacy lessons, and so they learnt how to write, send and receive e-mail and how to browse the worldwide web. The school offered Information Technology and Computer Application Technology⁸ as options for the FETC, and small numbers of learners chose them as part of their subject mix. Maths learners in the senior grades had a weekly lesson in the computer centre so that they could use a programmed instruction package that had been installed.

The demands on the computer centre during the school day were high. There was seldom a moment when it was not in use for Computer Application Technology, Information Technology or Maths lessons. Learners were allowed to book a computer after school on certain afternoons – but since many of them travelled by bus, or had sport, it was not easy for them to get to use a computer on those afternoons. Teachers also found it difficult to access the computer centre, as they often had extramural activities or meetings after school, and the centre closed at 15h00. Some of the teachers who were already computer literate did occasionally manage to access the computers, but were sorry when all the computers were moved to the centre, where they were tied up in timetabled lessons. They used the computers to do some of their administrative work and some subject-based research, and they also prepared work for their learners – but most found they could not do this often enough and felt frustrated. They suggested that their learners should try to look up information when they were able to access the computer centre after hours, and that they should type up some of their project work, but felt frustrated that they could not do more of this sort of work with their learners as part of their teaching day. The teachers who were not computer literate mainly carried on as if there were no computers at the school – computers belonged to a world of Information Technology and Maths and had no part in their lives.

⁸ For explanations of the terms used in this section see Glossary.

The principal's comments

We agreed at a planning meeting that the priority for our kids is to become computer literate. We do not have enough resources to do more than that for them – but at least they will leave here with some idea of what a computer is, and what it can do. Once a fortnight is not enough, but it is better than nothing and they can come here in the afternoons to practise – and the really keen ones do. We have also given priority to Information Technology and Computer Applications Technology as we want as many as possible to leave school with skills that can give them a job – and those two subjects will be more use to many of them than Geography or History might be. We also think that Maths is a priority, and as many learners struggle, we put in a programmed instruction package that they can use in certain classes. The teachers feel it has really helped them, and the Maths marks have improved! Those subjects have to have computers – and so we have no choice but to timetable their lessons in the centre. Some of my other subject teachers are unhappy, but we can't do everything for everyone!

School C: A primary school in an informal settlement attached to a large urban centre in the Western Cape

Details: : 803 learners, 35 computers at the school, with 2 in administrative offices, 2 in the staff room, 25 in the computer centre and 6 in the media centre. All the computers can access CD-ROMs and the Internet.

At this school, all learners had a computer literacy lesson once a week. This was timetabled as a double period, so that learners had time to do some work in between starting up and closing down their workstations. These lessons were given by a person specially employed by the school governing body to develop computer literacy at the school. However, each class's teacher had to accompany the class to the centre, and could give the lesson in conjunction with, or instead of, the support person. In addition, the timetable was open enough to allow for some teachers to take their classes to the computer centre at other times, by arrangement.

Teachers could use the computer centre whenever it was free during the school day, and after school whenever they wished. Both teachers and learners could also use the computers in the media centre. This centre had a range of other resources as well, such as a scanner and a data projector. Teachers sometimes arranged for a small group to go there during a lesson to do some research or a particular activity that could best be done on the computer, and gave different groups a chance to do this during the term. Teachers could also project a CD-ROM or DVD for the whole class if this was appropriate (they also used this for fund-raising). Teachers did not have many free periods, but when they did, they were also able to access the computers in the media centre, which were less heavily used than those in the computer centre. After school some of them worked together there on their preparation, sharing ideas and learning informally from each other. They also used the computers quite extensively to do much of their administrative work, and to send and receive e-mails. And, of course, they could also use the two computers in the staff room, which were never used by learners.

The Khanya project of the Western Cape Education Department had supplied the school with a range of software. The software covered all the school subjects, and also provided material in isiXhosa. It had tools which helped teachers design worksheets, make up crossword puzzles and create their own interactive activities, including some which could be used for assessment. Khanya also provided training to all the staff in the use of this software. In addition, the school had a range of CD-ROMs, such as ENCARTA and other reference materials, and had a budget, although small, for accessing the Internet. Teachers were shown how to download material from the net for use offline.

In addition to the training from Khanya, some of the teachers had enrolled with the SchoolNet training programme, and had worked through some of the modules.

The principal's comments

We are very committed to introducing computers into our curriculum, and have been fortunate to have the support of Khanya – and also the support of the SGB (School Governing Body), which raised funds for the post of a dedicated support person in the computer centre. When we first had the centre, most teachers did very little in it. But gradually some of them became interested, especially when they saw how their learners responded. I think insisting that teachers go to the centre with their learners was an excellent idea!

The Khanya training helped them see how they could integrate their subject work with the development of computer literacy, and many now work with the centre co-ordinator to plan what learners will do in the centre. This helps integrate computer literacy skills into subject work, giving greater relevance to the computer literacy work, and supporting subject learning at the same time! They also bring their learners from time to time – but this is not always easy to manage as the centre is fairly heavily used for the scheduled classes. Many of the teachers have also really developed their own computer skills with the help of the SchoolNet SA programme, and many of the modules have also helped them see how they can enrich their own teaching using it.

The centre co-ordinator has helped them put many of their ideas into practice, and is always suggesting new things for them to try. She is always available after school, and organises specific sessions to deal with particular issues of interest to the teachers from time to time. There is a lot of enthusiasm for surfing the Internet – but I have had to limit that as we just could not afford the huge bills we ran up in the first few months before I realised quite what we had let ourselves in for. We are trying to build up our collection of CD-ROMs, but there are so many calls on our limited funds that we have not managed a big collection yet. One really good decision we took was to put some of the computers in the media centre and the staff room. We could do with more in the computer centre, as learners have to share or take turns in their lessons there, but the benefits of having computers in more than one place have been enormous. Overall, I have been pleased to see the renewed interest in their work among so many of my staff, and how infectious their enthusiasm has been – but of course, not all of them are on board yet. We are working on that!

School D: An independent boys' school in KwaZulu-Natal

Details: 600 boys from Grades 8 to 12; 4 computer centres, each with 25 networked computers; 6 computers in the media centre, and 2 in each of the boys' hostels; 4 in the staffroom. In addition, there is a set of laptops for use as needed, and all members of the teaching staff have their own laptop or desktop computer in their classroom. All members of the administrative staff also have their own computer. The school has 24-hour Internet access for a fixed fee each month, and a large range of subject-related CD-ROMs, special software packages and data-gathering tools for use in different subjects. There is a dedicated technician who maintains the equipment, and a well-qualified senior member of staff champions the use of computers and related resources and supports the staff in integrating their use across the curriculum.

This school is clearly exceptionally well resourced. All learners have a computer literacy period each week, offered by the computer centre manager who has a master's degree in ICTs in education. He is very keen that learners should realise that computers are a tool for use in other work, and that computer skills are not an end in themselves. For this reason, he has drawn up a comprehensive programme of skills for the learners to develop over their time in the school and has work-shopped with the teachers how these skills can be developed and applied in their subjects. These teachers thus set tasks, which the learners work on in the computer centre, supported by the computer centre manager who teaches a skill directly, and then helps learners use it in doing their subject-based task. They focus on different subjects in turn, depending on where the skill can be best applied. In addition, teachers can book a centre for their learners fairly easily as there is no shortage of resources. The Maths teacher makes use of some specialised software to support learners, and several teachers frequently use the centre in subject time to facilitate their learners in research work in their subject. Many also use the set of laptops and specialised sensors and other tools on field trips and in practical work periods. Many of the boys have become extremely enthusiastic computer users and have developed high levels of skills. There is an active computer club, which manages the school website, and many clubs and societies have their own webpages. All the school's administration is done on computer.

Teachers are regularly sent to conferences and workshops, both to present papers and to learn from others, and there is a fortnightly staff workshop for each department with the computer centre manager to plan for the best integration of ICT skills into their work, and to support the development of their own competence.

The principal's comments

Some years ago, we realised that computers are the key to the future. We want our boys to leave school as comfortable with a computer as they are with pen and paper. They need to see that computers are tools in all aspects of their lives. With this in mind, we set about recruiting staff who could support this initiative and were fortunate to find our computer centre manager, as he has both the vision and the ability to offer leadership in its implementation.

We have also been fortunate in being able to build up the resources we need. Many strategic decisions have been made with a view to implementing our ideals. For example, right from the start, when we had fewer computers, we did not place them all in one centre as we wanted to ensure that some were available at all times for informal/ad hoc class use. We have also always placed some in the staff room, and over time have made laptops and other computers available to the staff. We want to extend our network so that all classrooms are eventually networked, but this is expensive. More realistic will be the placing of a small set of computers in each classroom so that teachers can make use of these for small group work and individual work, where appropriate, without having to move to a computer centre. We are raising funds for this at present. We have also invested in 24-hour Internet access, and this has really opened up possibilities for international exchange of ideas and for wide-ranging research.

We have had to do quite a lot of staff development to ensure that they can use these resources effectively, and have also spent time teaching the boys some rules for responsible use of the Internet. In addition, of course, we have put some mechanisms in place to block certain websites from being accessed! We have also built up a wonderful collection of CD and other software resources for use in all subjects, and some that are specially useful for remedial support, and the boys are encouraged to use these both in class time and after formal school hours.

Time has been a major concern. Our school has a lot of extramural activities. We have therefore built the fortnightly ICT workshop for each department into this programme, and have also encouraged the extension of our computer facilities to the surrounding schools and community so that it is integrated into the extramural duties of teachers and of boys. Despite all our best efforts, however, there is no doubt that some staff have just not seen the value of the work, and do the minimum, reluctantly. We keep using a combination of carrot-and-stick approaches to get them on board, and increasingly are considering applicants' attitudes to the use of computers in their work when making choices about new staff members.

What can we learn from these case studies?

These case studies give a clear picture of some of the options with regard to what can be done with computers in a school. Computer usage at these schools ranged from use by teachers only for very simple preparation (school A), to very specialised uses integrated into the curriculum in sophisticated ways (school D). At some schools, only teachers could access computers (school A); at others, teachers had very restricted access (school B), and at school D there was virtually unrestricted access by both learners and teachers. At some schools, computers were used by teachers as a resource for their lesson preparation and presentation in conjunction with other ICT resources, such as scanners, the Internet and data projectors (schools C and D), while at others (such as school B) teachers' use of the computer as a tool for their preparation and lesson presentation was almost non-existent, except in those subjects which relied directly on access to a computer (such as Information Technology and Computer Application Technology).

To some extent, these differences reflect differences in each school's approach to the integration of computers into the curriculum, their views of the potential benefits of the use of computers at their schools, and their approach to the teaching of computer literacy. However, they also reflect the influence of a range of constraints on their practice, and their attempts to make the best use of what they had available. If a school has only seven computers, as was the case at School A, then there is no point in hoping to integrate their use into the curriculum. Far better to make good use of these computers as a tool for supporting teachers in their work, both administration and preparation, and to devote resources to developing their capacity in this regard.

Where a school has more computers, as was the case with schools B and C, then a range of alternatives becomes possible, and the management of resources becomes a more complex matter. At school B the choice was made to focus on the development of computer-related skills, and although they were largely not integrated into the curriculum as a whole, every effort was made to conceptualise the mastery of computer skills. At school C, greater emphasis was placed on the integration of computer literacy into subject learning, and the development of teachers' capacity to use the computer for teaching across a range of subjects. Partly in response to this, greater effort had been made at school C than at school B to make sure that computers were available to teachers and learners outside the timetabled use in the computer centre by placing some of the computers in the media centre and in the staff room. At school B, the fact that the computers were tied up in the centre meant that even those teachers who wanted to, found it very difficult to use the computer for their own subject-based work. Perhaps if there had been a different vision for the best way to use computers, greater effort would have been made to give access for other uses (such as extending the hours of opening of the centre, timetabling some of the computer literacy lessons in the afternoon, or only offering them to certain grades). But while these choices were largely based on the school's view of what was best educationally, they were also a response to the resources available. School C had the benefit of more computers than school B compared to the number of learners, making it possible to have some computers housed outside the centre and still leave a workable number for learners to use there. It also had resources in the form of software appropriate to the curriculum from Khanya, and the benefit of teacher development support, also from this quarter.

At school D, where there was a relative abundance of resources, the more complete integration of computers into the teaching and learning process (as appropriate) was possible. However, the same key points can be made about this school, too. The same resources could have been used in very different ways if the vision for their use had been different. Many aspects of the vision could only be implemented because of the way resources had been selected and deployed. Key choices made here included employing a full-time technical support person so that the system was as fully operational as possible at all times. Other choices were the emphasis on staff development, focusing on teaching competence as well as technical skill on the computer and investing in subject-specific software in a range of subjects.

In all of the case study schools, the vision for the use of computers had shaped the kinds of resources that had been put in place – but its implementation had been both supported and constrained by the resources that were available and the ways in which they were managed.

Clearly, then, while the potential benefits of computers in schools is enormous, there are key factors that impact on their use in schools. Some are directly a matter of funding, other less directly so. They include at least the following:

- A vision of what should be and can be done with computers to enhance teaching and learning at the school.
- ICT resources themselves – what hardware and software are available and affordable? How much can be spent on Internet access? Where are available computers located? Are they networked? Who has access to them? Are they reliable, or are they often ‘down’?
- Staff competence – teachers do not always have the skills to use the computers themselves, or to see ways of using them for teaching and learning. They may lack technical skills and educational insights that make the computer resource add value to their work and to learners’ learning. Appropriate professional development opportunities need to be in place.
- Staff capacity – this may be insufficient to ensure adequate management and maintenance of the computers; partly a matter of funding but also of decisions about how to use resources.
- Staff buy-in – staff may be reluctant to embrace change. Advocacy strategies need to be in place.
- Leadership and championing of the use of ICT resources.

The above impact on such things as:

- The number of learners who can have direct access to ICT resources, the amount of time they can spend on a computer, what they will do in the time that they have access, and the benefits they might derive from the work they do on computer; and
- The number of teachers who will access computer-based resources, what they can and will actually do with computer-based resources when they can access them, and the benefits they and their learners will derive from their use of the resources.

Different uses of ICT for different purposes require different resources. Different uses are made possible and benefits made achievable both by what is available and by the way that what is available is managed. As schools acquire an increased number and range of resources, so the possibilities for their use increase. Table 5, on the following page, suggests types of uses of computer-based resources in schools, and shows the link between these and the resources needed to sustain them. It is important to note that resources include the professional development of staff with regard to technical computer skills, but even more importantly, with regard to their ongoing development as teachers – focusing on *how teachers use ICT to enhance the curriculum* (and decisions related to that) rather than just ICT.

We hope that schools will find Table 5 a useful tool to help them review their current resource provision and that it will assist them in framing their thinking about how best to use what they already have. Secondly, we hope that the table will provide some milestones which might help them to plan the journey, step by step, towards their new or revised vision for ICT integration.

Making the best of available resources without making do

Table 5 is intended to provide a systematic approach to thinking about the uses of ICT resources while at the same time thinking about the gradual increase in provisioning and use of ICTs – pushing the limits. It is, however, important to note that this table should not be viewed hierarchically, but rather as a framework of different possible types of ICT use in the light of available resources, levels of technical capacity, professional development opportunities and support for teachers.

Equally, it is not suggested that one type of use must precede another. Although the table suggests that, with very limited ICT provisioning, it might, for example, be a good idea to use the available computers for administrative purposes rather than for teaching and learning, this idea is not cast in concrete. While this option might be useful in one context, it may very well not be suitable in another. The types of uses are therefore not meant to be seen as strictly chronological or as prescriptive, but rather as a guide. Emphasis on one type of use rather than another will depend on the context. We hope that the uses illustrated in a range of scenarios will help schools to manage their planning processes.

Five aspects of ICT management and intergration in schooling

Table 5 presents a summary of the different types of ICT provisioning, and use with associated professional development and support needed. The information provided is organised around the following five aspects of ICT management and integration in schooling:

1. Types of ICT provisioning (including number of computers, where computers are located, who has access to them and the type of software needed).
2. Types of ICT training required for both administrative and teaching staff in the use of hardware and software.
3. Types of professional development needed for teachers to successfully integrate the use of ICTs into various aspects of teaching and learning.
4. The need for a specialist IT teacher(s).
5. The need for dedicated technical ICT support.

Eight types of ICT use

These five aspects are organised to form a framework of eight suggested types of ICT use. These are:

- Use 1:** The school administration uses the school computers
- Use 2:** Teachers use computers to do their administration work
- Use 3:** Teachers use computers to prepare worksheets and tests for learners
- Use 4:** Teachers access online resources to support teaching and learning in their subject
- Use 5:** Learners are taught to use computers to develop IT skills and knowledge. No formal attempts are made to integrate this work with subject-based learning; focus is on computer skills taught in relevant context – some use is made informally by learners (such as using a CD in their own time, or having access to the Internet.)
- Use 6:** Learners apply basic IT skills to work across the curriculum in their IT lessons, and informally outside official teaching time.
- Use 7:** Learners use computers to work on non-IT subjects from time to time, in loose arrangements made by their teachers as needs demand and resources are available.
- Use 8:** Learners use computers to do subject related in non-IT subject lessons in a sustained and well-integrated way.

The eight types of use described above are directly linked to types of ICT provisioning in Table 5. They illustrate a range of possible uses in a school and the type of software, professional development and support necessary for successful implementation. The full framework containing a detailed breakdown of ICT provisioning, uses and technical and professional training and support is provided in Appendix 2 (p. 100).



Table 5: Summary of types of ICT provisioning and use with associated professional development and support.
Refer also to Appendix 2 (p. 100) for detailed description.

Types of ICT provisioning and range of possible uses – number of computers, where computers are located, who has access to them and the type of software that is needed

- **Provisioning**

The range of ICT provisioning in schools varies from schools with one computer and printer (use 1) through schools with, say, four to six computers, a printer and a scanner (uses 2 and 3), or a computer centre with, say, 25 networked computers, printer/s, a scanner and a data projector (use 5) to highly resourced schools with one or more computer centres, a media centre and a computer in each classroom – sufficient computers and other ICTs – including digital camera, DVD player and the like for all teachers, learners and administration staff to access (uses 7 and 8).

- **Use**

The range of possible uses depends on the type of ICT provisioning. If, for example, a school has one or two computers, these could well be used to support the administration of the school rather than trying to find ways of providing access to teachers and learners (use 1). However, this use is not cast in concrete: how a school's management makes the best use of its ICT resources is, of course, dependent on the context. In some schools it might well be more appropriate for teachers to use these few computers for their administration and lesson preparation. In schools where four to six computers are available, these may be used for school administration and for teachers to do their administration and basic teaching preparation, like making worksheets, preparing tests and accessing teaching and learning resources online (uses 2 and 3). In schools that have a computer centre, learners may be taught to develop IT skills and knowledge (use 5). Computer skills are taught in a relevant context – some use is made informally by learners (such as using a CD in their own time, or having access to the Internet) but no formal attempt is made to integrate the use of ICTs across the curriculum. In schools that have a high degree of ICT provisioning, with computer centres and computers in each classroom, learners can use computers to do subject-related work in non-IT subject lessons in a sustained and well-integrated way – teachers integrate use of ICTs across the curriculum.

- **Location of computers**

Where to place computers and other ICTs depends on the type of provisioning and use. Use 1 for school administration implies that computers should be placed in administrative offices. With uses 2, 3 and 4, teachers use computers for their school administration work, to prepare worksheets and tests and to access online resources to support teaching and learning. Computers should thus be located to provide easy access to teachers, for example in the staff room. Use 5 clearly suggests that computers will be located in the computer centre, while in highly resourced schools where computer usage is integrated into the curriculum, computers will be located across the school in areas ranging from computer centres and specialist media centres to classrooms and the staffroom (uses 7 and 8).

● Software

The type of software needed depends on the range of ICT uses. For uses 1 and 2 (administration purposes) basic spreadsheet and word-processing packages are essential. Other more specific packages, such as for timetabling and financial management, are helpful. Tailor-made software is also useful, but this is not essential. Use 4, where teachers access resources to support teaching and learning in their subject, requires, in addition to the resources for use 2, e-mail/Internet, a webbrowser and a range of appropriate CDs. A well-annotated catalogue of educationally useful CD resources should be compiled to assist teachers in finding and selecting these, as well as a catalogue of useful websites. The Department of Education Thutong education portal is of value here. Use 5 (learners use computers to develop IT skills and knowledge) requires the use of software packages for learners to develop the skills appropriate for their age, grade and needs. Uses 6, 7, and 8 require packages that are relevant for subject teaching.

Types of IT training required for both administrative and teaching staff in the use of hard and software

● Uses 1 and 2 (administrative purposes) for both administrative and teaching staff. Training is needed in the use of:

- hardware to ensure a common understanding of the computer system;
- basic software packages; and
- e-mail and the Internet.

● Uses 3, 4 and 5 – teachers use computers to prepare worksheets and tests for learners and to access online resources, and learners use computers to develop IT skills.

Training is needed:

- in the use of drawing tools and clip art;
- for some subject teachers, specialist training in the use of the computer software for specific subjects, such as for typing Maths symbols and scientific notation, or specialised art packages;
- in how to navigate a CD, use hyperlinks, browse the web and save and use online material for use off line; and
- in how to prepare a PowerPoint presentation.

● Uses 6, 7, and 8 – learners apply basic IT skills across the curriculum and use computers to do subject work in an integrated way.

In addition to the ICT training required for use 5, teachers need training to:

- organise subject information and resources so that learners can easily access them;
- learn how to prepare work for learners to do on a computer using the local area network;
- learn how to mark and return work to them in this way; and
- learn how to use specific packages that learners will be using as part of their learning programme.

Types of professional development needed for teachers to successfully integrate the use of ICTs into various aspects of teaching and learning

The type of professional development needed for teachers is directly linked to the type and range of ICT use in a school. For example:

- **Use 2 – teachers use computers to do their administrative work:** This requires some work on assessment practices in the context of the revised National Curriculum Statements and in designing, recording and reporting tools, such as rubrics.
- **Use 3 – teachers use computers to prepare worksheets and tests:** This requires training in materials development, including the design of learning and assessment tasks and structured activities in the context of OBE. Embedded in this would be associated work on learning theory, and the scaffolding and mediation of knowledge, 'activity-based' learning, small group teaching and learning, questioning skills and how to make good use of the textbook, or a range of such books, in developing additional learning materials.
- **Uses 4 and 5 – teachers access online resources to support teaching and learning:** Training is required on how to evaluate material found on a website, how to best use resources for learning accessed on the Internet, how to adapt material, how to design differentiated activities, how to modify material and much of the sort of work suggested for use 3.
- **Uses 7 and 8 – learners apply basic IT skills across the curriculum and use computers to do subject work in an integrated way:** If computers are available in classrooms, teachers need, in addition to the ICT training required for use 5, professional support and development in facilitating whole class discussions, designing learning programmes in such a way that they incorporate online resources in an integral way, using subject-specific software and how to support learners in the use of specific software packages for their learning.
- **School management:** Might also need support in curriculum planning and in timetabling so that computer resources are available to non-IT subject classes. This might include deciding to limit access to computer-related subjects for certain grades of learners, and supporting those who do have access to computers to benefit from opportunities to consolidate IT skills in lessons across the curriculum.

The need for a specialist IT teacher

- **Uses 1 to 4:** The appointment of an IT teacher is not necessary for uses 1 to 3. Equally, it is not necessary to employ a full-time IT teacher for use 4, although it is crucial to designate one or more teachers to take responsibility for the management and the use of ICTs. Ideally these teachers should have some basic training in trouble shooting so that they can offer support to other teachers.
- **Use 5 – learners use computers to develop IT skills:** An IT teacher with the necessary training to teach IT skills to learners must be employed. The IT teacher's job description should also include managing the computer centre, supporting teachers and learners in their use of IT resources, basic trouble shooting, keeping an eye on the maintenance of ICTs and being responsible for the storage and management of all equipment.
- **Uses 7 and 8 – learners apply basic IT skills across the curriculum and use computers to do subject work in an integrated way:** The requirements are as for use 5, with additional support for the IT teacher in the use of subject specific packages.

The need for dedicated technical ICT support

This position may be held by a full-time or part-time staff member who is technically trained to do troubleshooting; offer technical support to all staff; maintain hardware, computer networks and the server; and manage, set up and operate all hardware – data projectors, scanners, etc. Other duties may also be included, depending on the needs of the particular school. While this type of support may not be necessary for uses 1 to 4, it is essential for uses 5, 6, 7 and 8.

Given the variations that are possible, it is important for schools to have a clear vision of what they would like to achieve with computers and related technology, and a sense of what they can achieve with what they have. They also need a plan to both manage what they have to the best advantage, and to move towards their ideal. In other words, strategic planning is essential. In the next chapters we give attention to these aspects.

CHAPTER FIVE

How can a school build a shared vision for ICT use?

As the government policy on e-Education becomes a reality, more and more schools will have computers, computer centres, an Internet connection or, in some cases, wide-ranging ICT facilities. All of this needs planning and management, which means, in part, finding answers to the following questions:

- How will ICT resources and facilities be used to support the administration of the school?
- How will they be integrated into teaching and learning?
- How will they be maintained?
- What technical support will be required to keep them in working order?
- What plans will there be for upgrading and further development of the facilities?
- What plans will there be for capacity building and professional development for staff in the use of computers and other ICTs?

In the same way as you might begin any long-distance trip with the help of a good map and guidebook, when planning to undertake the 'journey' required to implement an ICT initiative, you need the assistance of similar tools. Your first and best guide is an ICT plan. This will serve both as a compass to point you in the right direction and as a map to show you how to get there.

The first component of such a plan is the vision statement. To get the ICT planning process started you need a clear vision of what it is that you want to achieve and where you want your organisation to be in the future.

The need for a shared vision

The word vision comes from the Latin *video*, 'to see'. This link to seeing is significant: the more richly detailed and visual the image is, the more powerful it will be. In English we say, *do you see?* and in IsiZulu, *Uyabona?* when we are asking whether someone has understood something, and this illustrates the idea that if we can 'see' or 'visualise' something, we have understood it.

Having a clear vision means understanding what you want to achieve. But in a school environment, unless there is a *shared vision* or understanding, the chances of success are limited. To the extent that people understand and are committed to that vision, individuals are in a position to take responsibility, contribute their creativity and work together as a team. A shared vision guides and develops the strategic plan, giving all members of the school a common direction and enabling people to work together. Moreover, as we have already stated, it is, in fact, an important part of the planning process itself.



Steps in developing a vision

The process of developing a shared vision in the school and, later, the more detailed process of developing plans for ICT implementation and integration in the school, involve asking and answering a number of questions – not necessarily one after the other and often returning to the same question in a different way.

A vision statement shows:

1. *Where* you want to go or be in the future;
2. *How* you expect to get there;
3. *Why* you are on this journey;
4. *What goals* or milestones you expect to reach before long; and
5. *What values* and ways of working you commit to in order to achieve the vision.

Thus the vision statement is more than just a dream or a set of hopes. It also needs to reflect the actions that are needed in realising the vision. A vision is an image of your desired future. It is not a vague statement but an operational strategy, reflecting choices of what to do and what not to do, with definite goals.

Start with the big picture: *Why* are you on the journey?

A useful way of starting the process of building a vision is to first show those with whom you work the 'big picture' – the bigger context in which our schools operate and why it is important for schools to engage with ICTs.

To get some ideas of how to do this, go back to Chapter 1 and remind yourself of how South Africa fits into the global information society and of the implications of this for our economy, our education system as a whole and our schools in particular. You might want to have a short workshop for your School Governing Body (SGB) members and teachers in which you discuss the White Paper on e-Education (2004) and the White Paper 1 on Education and Training (1995). Both state that technological education for learners is very important and that mastering technology enhances the potential of individuals and leads to economic productivity. If possible, also compile some extracts from other readings on the role and value of ICTs to stimulate the discussion.

Understand the context: *Where are you now?*

Understanding the bigger picture does not help if you do not understand where you are in relation to the big picture. A vision needs to be expanded in the *context* of what is possible in a particular school.

This means starting with the school itself and doing a thorough audit of the current situation. It is important to be clear about where you *are*, before thinking about where you *want to be*.

An audit may include a careful examination of the number of computers in the school and taking a good, hard look at how the computers are used by

- the school principal and heads of department
- administrative staff
- teachers and
- learners.

Answering the question, 'Where are you now?' also involves thinking about possible resources in the community that could help you get where you want to go. These might include

- parents with particular business or other connections; and
- staff/parents with ICT experience/expertise to share.

Clarify the purpose: *Where do you want to be in the future?*

The tables in Appendix 2 will help you formulate your purpose because they describe various types of use of computers in schools. Your purpose should include both where you are now and where you want to be in the future. Finding answers to the following questions will help you establish those two positions.

- Is your purpose for having computers only to increase administrative efficiency for administrative staff and teachers? (See Uses 1 and 2 in Appendix 2)
- Does it include using computers to type up lesson and assessment material? (See Use 3)
- Or for researching lesson material? (See Use 4)
- Will learners be using the computers, or only staff? How will learners use them? Simply to develop IT skills? (See Use 5)
- Or for learning across the curriculum? (See Use 6, 7 and 8)

It is sometimes a good idea to write up your purpose for ICT use by sketching a word picture of how the school will be working with computers in five or ten years' time. For example:

Administrative staff and teachers use computers daily for administrative purposes such as attendance registers and entering of marks, as well as for communicating with businesses and/or parents using e-mail. Teachers prepare material for lessons using computers in the staff room, and a culture is developing in the staff room and in departmental meetings in which teachers share information about good teaching and learning resources to be found on the Web ...

Identify the values: *how will you work?*

Values are crucial in developing how to work to achieve a vision. When thinking about the *values* or principles that underpin your school's vision for integrating ICTs, you need to ensure that they are consistent with the values contained in your school's mission statement. Everything is driven by the values and mission of the school.

For example, a set of overall values expressed in the school's mission statement might include the school's commitment to *quality* education. This may be expressed in the ICT vision statement in various forms. For example, the vision statement may reflect a commitment to building staff capacity around ICT use so that teachers can *enhance the quality* of education provided.

Or, if your school's mission emphasises *participation* (consultative, inclusive decision-making), then the vision statement for the integration of ICTs should also clearly reflect a commitment to fostering participation. This may be reflected in your vision statement by stating the school's intention to work *co-operatively* with the community and/or to make the school's ICT resources *accessible* to the community. Or it might even include the idea of setting up a collaborative working arrangement with another school in the community.



Set goals: how will you get there and by when?

Once you have clarified your *values* and *purpose*, the next step is to set some *goals* or milestones that you expect to reach before too long.

The goals need to be influenced by the current reality. For example, if your school has two computers at the moment, you might want to continue using the computers for administrative work and keep them in the administration offices. Your goals for the next two years, may, however, be as follows:

- Maintain and upgrade the computers in the administration offices;
- Purchase, install and maintain two computers for use by teachers in the staff room for administrative purposes;
- Provide an e-mail connection to support the school's administrative functions.

In practical terms, this means setting up a contract for the provision of an e-mail service with an Internet Service Provider (ISP) and purchasing and installing two computers for use by teachers for administrative purposes. However, the issue of sustainability is very important. For example, the contract with the Internet Service Provider requires that sufficient funds are available to sustain the contract from year to year. Ongoing expenses such as printer cartridges and the purchase of paper also need to be taken into account. (See Chapter 6 for prioritising and planning and Chapter 7 for key considerations around budgeting for sustainability).

This implies expanding the use of computers from Use 1 to Use 2 as described in detail in Appendix 2 – from the use of computers by administrative staff only to the use of computers by teachers as well for administrative purposes.

In summary the *vision*, or image of the desired future, is a statement of intent and commitment to a set of values, purposes and goals that have been agreed upon by all concerned. However, it is important to keep the vision flexible, so do not have the vision statement printed in full colour brochures or carved in stone. Visions are always evolving. As you work towards your vision you learn more about yourselves and your context and other possibilities become clearer.

You may find Table 6, on the following page, useful as a guide for developing a vision.

Table 6: Guide to developing a vision statement

Develop a vision statement for integrating computers into your school using the table below to stimulate discussion. (Start by answering the three questions in the left-hand column.)	
What is our destination? ----- ----- ----- -----	Shared vision – this involves defining what you really want to do.
Where do we want to go to from here? ----- ----- ----- -----	Purpose – this defines why you want to do it – anticipated outcomes that guide your planned actions.
How do we want to act on the way? ----- ----- ----- -----	Core values – this involves defining the values that you think are the foundation for what your school does.
Vision statement:	
Once you have developed a common vision, specific realisable goals need to be set. These represent the actions people commit themselves to doing so that the vision can be realised.	

Developing a shared vision

Approaches to developing a vision vary, as Table 7 indicates. They range from management *telling* staff about the vision to involving all stakeholders in *co-creating* the vision together. Clearly, how much participation you would like to achieve will determine the process you choose. However, if your aim is to achieve a *shared* vision, it does mean *shared development* of the vision, not just a shared belief in it. Ideally this means involving all stakeholders in the process.

Looking at Table 7 from left to right you will see that the approaches become increasingly more participatory. It is likely that in most vision building processes, some time will be spent on each of the five approaches described in this model. However, depending on the culture of your school (a culture is an informal understanding of the 'way we do things around here') the emphasis may differ. In one school more emphasis may be placed on the *telling* while at another school more emphasis may be placed on *consulting* or *co-creating*.

Table 7: Developing a shared vision

Transmission		⇒			Participation ⇒
Telling	Selling	Testing	Consulting	Co-creating	
We've got to do this. It is our vision. Be excited about it!	Getting the buy-in before proceeding.	What excites you about this vision and what doesn't?	What vision do members recommend we adopt?	Let's create the vision we individually and collectively want.	
- Contextualise the proposed change or innovation in terms of: - the relationship between education and the 'real' world - education policy requirements. - Inform people of the new proposals – be direct, clear and consistent. - Be honest about the current situation. - Be clear about what is negotiable and what is not. - Start adding the details, but not too many.	- Give a picture of the <i>desired future</i> by sharing the vision with all stakeholders. - Stimulate enthusiasm for participation in the project – bring the vision to life with scenarios and examples that show computers in action and what it takes to get there. - Make the communication process interactive: listen to responses and modify the vision as appropriate. - Get the backing of key people who have influence among your key constituencies.	- Give as much information as possible so that responses are well informed. - Protect everyone's right to their own opinion. - Set up various mechanisms for talking and listening – elicit opinions.	- Set up small task teams to gather information. - Discuss the results with the whole group. - Don't try to tell and consult simultaneously.	- Start with each person's vision. - Each person's input is given equal weight. - Seek alliance, not agreement. - Focus on the process, not just on the vision statement. - Expect and nurture respect for each other.	

Based on: University of the Witwatersrand 1999

Each of the approaches in the above table may have advantages and disadvantages. In practice, however, it is unlikely that any *one* of these approaches is sufficient to achieve a *shared* vision. Instead of viewing these as five *separate approaches*, it may be more useful to think of them as five *parts of a process*. So, for example, *telling* or sowing the seeds of the vision may occur in many ways – as a directive from the education department, a donation from a charitable organisation, the drive from an individual or a group within the school, or inspiration and leadership from the principal. Whatever form it takes, there needs to be a starting point at which information is given to motivate everyone. Then once the seeds are sown, expanding the vision in the context of the school – *selling* – might be the next step, and so on.

Although a collaborative approach to developing a vision has advantages, someone has to manage the process. Even if the initial drive comes from another staff member or as a result of the general educational policy environment, it is still the responsibility of the principal or management team to drive the process. Key responsibilities of the leadership include:

- Getting the visioning process started (*telling*);
- Ensuring that clear communication channels are established between all levels and sectors of the school community (*selling*);
- Diagnosing the present condition of the school and identifying gaps (*testing*);
- Building commitment to the vision (*consulting*);
- Organising people so that they are aligned with the vision;
- Staying with the process (*co-creating*).

In summary, the school leadership is responsible for creating a sense of purpose that binds people together and motivates them to act. This does not happen by accident. Building a shared vision requires time, care and strategy. But when members of staff and other stakeholders have had an opportunity to consider the vision and when its purpose has real meaning for them, change begins to happen. Once they have gone through the frustration and ultimate satisfaction of creating a vision, they will develop action plans for implementation.



Analysis of examples of vision statements for integrating computers into schools

Each of the following examples reflects a different approach to developing a vision statement. The vision statements also reflect a range of different types of computer use that illustrate a range of possible practical applications within the school environment.

The examples focus on the place of computers in schools – dealing with a number of issues that are central to the integration of computers into the effective functioning of schools in general and into teaching and learning activities. We hope that reading through these will help you to think about your own context and to get started on drafting a vision statement for your own school.

In linking the examples of vision statements to the types of use described in Appendix 2, it is important to remember that the range of uses and benefits of computers in schools clearly relates to the level of resources available.

The emphasis is on a phased approach – matching what is ideal with what is possible. It is, however, important to simultaneously build the idea of long-term planning into the vision itself – in other words, starting with the here and now, but anticipating and planning for the future at the same time. In this way, progression and growth in ICT provisioning are embedded in the vision statement itself. It is equally important to recognise that technology changes very rapidly. Every two years or so ICT technology, both hard and software, changes. Planning and budgeting for change is therefore essential.

It is important that, as you develop a greater range of ways to use ICT (as described in Appendix 2), you put the necessary training and professional development in place. Equally important, as you buy new resources, is that you need to build systematically on the resources and capacity that already exist.



Example 1***Vision Statement – Lake Primary School***

By using computers as a tool, administrators and teachers will become more efficient and effective in facilitating and managing the learning environment at Lake Primary School. Administrative and communication processes as well as data storage and retrieval will be streamlined, promoting effectiveness of institutional and educational management.

Teachers will be developed professionally to recognise the role of information and communication technology in their teaching and to gain skills and confidence in using computers to support teaching.

The first paragraph in Example 1 expresses a vision for Uses 1 and 2 in Appendix 2 (p. 100) – appropriate for schools with a small number of computers:

- *The school administration uses the school computers, and*
- *Teachers use computers to do their administrative work.*

If you only have a few computers, it will be extremely difficult to integrate their use into teaching and learning processes or even to teach computer literacy to the learners. By limiting their use to general school administration, communication and teachers' administrative work, the computers will be optimally used to manage the learning environment and support quality education.

However, the second paragraph in Example 1 signals the next possible step in the process of integrating computers into the school. It anticipates the need to develop teachers professionally so that when more computers are purchased, teachers will be in a position to start integrating the ICT into their classroom practice. This paragraph indicates the intention to develop the range of uses of computers in the school – but doing this will mean that more computers, associated resources and training will have to be put in place. As we have mentioned, vision statements cannot only deal with what is currently possible – they need to look to future development and change.



Example 2

Vision Statement – Makhaya High School

Makhaya High School recognises the increasing need in the 21st century to know how to access information, to understand information and how to communicate. By integrating the use of computers as a component of a well-balanced FET programme, Makhaya High School will provide learners with the opportunity to develop lifelong learning skills through the use of computers. By using computers teachers will have access to online resources to support teaching and learning and to manage their administration. Through efficient use of computers as an administration tool, administrators will streamline school management, making it more effective.

Learners and teachers will have access to current information and communication technology resources, including external information sources such as the Internet.

Paragraph one in Example 2 expresses a vision for Use 5 in Appendix 2 (p. 100):

- *Learners use computers to develop information technology skills and knowledge. No formal attempts are made to integrate this work with subject-based learning – but learners do use the computers informally for this purpose (such as using a CD in their own time, or having access to the Internet).*

The vision statement reflects the kind of arrangement you would expect to find in a school that has the following ICT resources:

- A well-secured computer centre, with the appropriate number of computers so that there do not have to be more than two learners to a computer – ideally with enough computers so that each learner can work at their own workstation;
- A small number of workstations located elsewhere for staff and learners to use in free periods, and for staff to use after hours if the computer centre is heavily used by learners;
- A computer centre manager who has this work as her or his main responsibility, although she or he may also do some teaching and may support teachers and learners in their use of the ICT resources informally, outside of normal teaching hours;
- Appropriate software packages for learners to develop the skills appropriate for their age, grade and needs.

This kind of provision also implies that whoever teaches information technology will have had the necessary training to teach IT-related skills to learners. However, if you have the resources to provide for a special staff member and a computer centre for learners' use, you will already have equipped the administration office and

the staff room with computers for use by administrative and teaching staff. A vision for Use 5 in Appendix 2 will usually include Uses 2, 3, and 4 as well (see the last two sentences of paragraph one of the vision statement in Example 2).

Paragraph two of this example focuses the vision statement on new possibilities, paving the way for future improvements in computer provision and access by both learners and teachers – see Uses 6 and 7 in Appendix 2.

Example 3

Vision Statement – Western Christian College

Learners will be able to access education at any time from wherever they are. College staff, college leaders, governors, parents and local education authority staff will be able to access the information they require at any time from wherever they are.

Administration Staff

Administration staff will reduce the burden of administration through effective use of ICT, including general administrative communications and data transfer between the school, the district office and the provincial department of education. The use of ICT will also promote the effectiveness of management in information gathering, analysis and decision-making.

School Staff and School Leadership

There will be continuing professional development of school staff and school leaders to enable them to reach high standards of competence in ICT. School staff will apply these competencies to improve the quality of teaching and learning. School leaders will apply these competencies to improve the quality of leadership and management.

Learners

Learners of all abilities will be able to take greater control of their learning through the application of ICT in and out of school. This will be supported by the use of ICT in a balanced way throughout the curriculum. Learners will develop the skills to know when and when not to use ICT, and have the ability to use it effectively when needed. They will have access to high quality digital learning resources whenever and wherever they are needed and have links to their classmates and teachers while studying out of the college.

Wider Community

To promote inclusion of all, the wider community will have the opportunity to use the college ICT facilities outside normal curriculum time.

Infrastructure, Connectivity and Technical Support

The school will have a standard hardware, software and communications base in the college, effective access to the Internet, and high quality digital resources. Appropriate and efficient technical support will be in place to ensure the daily availability of the ICT resources.

Although the format of this vision statement is rather different from the first two examples, Example 3 consists of the same three key components as the other two examples:

1. A concise, clear statement of overall vision for using computers;
2. An indication of who will use the computers, as well as where and how they will be used (purpose); and
3. A statement related to the benefits, direct and indirect, that learners, teachers and administrators will gain from the use of computers.

Example 3 describes who will use the computers and what the benefits will be had in more detail than the previous two examples. It also focuses on each component of the school community in some detail.

Example 3 expresses a vision for Use 8 in Appendix 2.

- *Learners use computers to do subject related work in non-IT subject lessons in a sustained and well-integrated way.*

In its most sophisticated form, it will require sufficient resources for all learners to have ready access to a computer in any lesson across the curriculum, as such access is required. This can be achieved by having several computer centres which have adequate resources for a class of learners at a time, and enough centres so that at least one is always free of a class on an IT-related subject; and classrooms with several computers in each (and possibly each learner having their own laptop).

At a less intensive level, computers might be made available on a regular basis to integrate ICT into a certain subject or subjects where the school feels that the use of ICT would be particularly helpful. This might be the case, for example, for intensive Maths development, or for certain parts of a graphic design learning programme in the FET band, or for use in Accounting. The appropriate software would have to be provided, and sufficient computers would have to be available for learners to have access to them for this component of their work. Unless resources are plentiful, creative timetabling will be needed.

Western Christian College is clearly a highly resourced school, where the emphasis is not so much on setting up ICT provision in the school, but on stating the ways in which ICTs will benefit the whole school community: administrative staff, teachers, school leadership, learners and the larger community.

Conclusion

In developing a shared vision for the use of computers in schools, it is important to match what is ideal with what is possible. It is equally important to recognise that technological innovation is an ongoing process of change and that ICTs, both hardware and software, will change within a relatively short period. This means that it is necessary to revisit vision statements often, so that the vision can be adjusted to match changing conditions in the school and the community at large.

However, the key to implementing the vision is effective strategic planning by the school. The plan must include improvements in educational standards, professional development for school staff and school leaders, and ideally it should also involve an enhanced relationship with the wider community, and the acquisition, maintenance and replacement of ICT infrastructure. A holistic approach is required to link all the aims within the vision. Chapter 6 will explore what is needed to implement the vision.

CHAPTER SIX

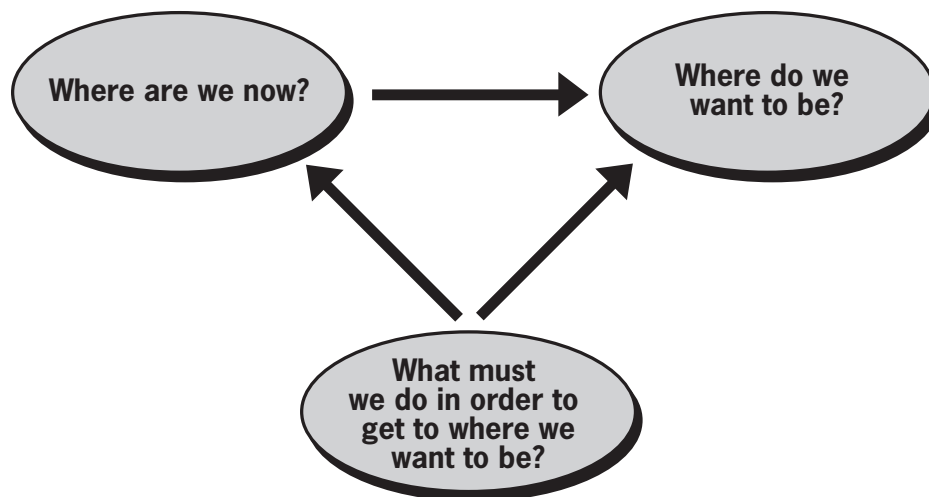
Strategic planning and management: How do we go about implementing the vision?

This chapter considers key aspects of planning and managing the process of introducing ICT into schools. There are many possibilities and many costs involved when a school moves into the use of ICT. Planning is therefore essential and needs to be strategic as well as methodical. It also means that a range of practicalities must be considered – finances, security and safety of ICT equipment, developing an ICT policy and staff development. These are considered in Chapter 7.

Strategic planning is a process which aims at producing essential decisions and actions that shape and guide what you do and why you do it (your vision). A strategic plan sets out in detail what needs to happen to achieve the vision within the intended time frame. In other words, it is a matter of mapping the route between the present situation (where you are now) and the desired future situation (where you want to be).

Although there are many ways of approaching strategic planning, the key planning questions remain constant.

Key planning questions



Where are we now? Situational analysis

After the participative process of developing a vision, the next step is to identify and prioritise critical issues and problem areas where changes need to be made in order to move towards the vision. The process of identifying and prioritising critical issues and problem areas is sometimes called a *situational analysis*.

A situational analysis is a comprehensive description and analysis of the current situation in which the school finds itself, both internally and within the greater community or environment. A situational analysis describes and analyses all the major aspects of the school or organisation. In order to draw up a situational analysis, you need to gather information from a variety of sources including people and documents such as policies and school records.

Conducting a SWOT analysis

A popular tool used to gather information is a SWOT analysis. SWOT stands for:

S = Strengths

W = Weaknesses

O = Opportunities

T = Threats

The SWOT analysis helps to answer the first key planning question, *Where are we now?* It also helps you to identify the areas that need to be changed in order to implement your school's ICT vision in a sustainable way.

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The SWOT analysis can be facilitated by anyone: by you as the principal, by the management team or by a group of teachers to whom you could delegate the task. However, it is most important that the process is done collaboratively, with all key stakeholders participating. A SWOT analysis is not something that you can do by yourself or on behalf of your school. Also, it needs to be done in a spirit of mutual trust and open-mindedness.

Many organisations, including corporations, universities and businesses, use this approach to planning and development.

Strengths and Weaknesses refer to things *inside* your organisation or school.

Examples of Strengths

- The teachers are very committed to integrating computers into their learning and teaching practice.
- Most teachers already do administrative tasks on the computers available.
- The principal and management team are organised and efficient in leading the process of integrating computers into the school.
- The school buildings allow for good security arrangements, which minimises the risk that computers and other ICT equipment at the school will be stolen.

Examples of Weaknesses

- Staff have limited computer skills.
- There is no clear planning at the school around using computers for administration and management and/or teaching and learning purposes.

At your school, you should seek to *build on your strengths* and *address your weaknesses*. Planning will help you to achieve this. Planning is the basis of organisational improvement.

Opportunities and threats refer to things *outside* your school or organisation, in its context or environment. While you do not have direct control over these things, your plans need to take them into account.

Example of an Opportunity

The Department of Education is willing to increase the budget for staff development at schools so that teachers' ICT skills can be improved. A large corporation has donated five well-functioning computers to the school, after the school had approached them for assistance.

Example of a Threat

In the community in which the school is situated, there are high levels of violence and crime due to poor socio-economic circumstances and a general lack of employment in the area. This makes the school vulnerable to the possibility that ICTs may be stolen or that the buildings in which they are housed may be vandalised.



How do you do a SWOT analysis?

Table 8 gives an example of a SWOT analysis for you to study.

Table 8: Example of SWOT analysis completed by Lake Primary School

Strengths	Weaknesses
- There is a positive attitude in the school towards change. - The principal is a good leader. He welcomes the introduction of ICTs at the school. - Three computers have been donated to the school, along with some start-up cash. - Some staff members have ICT skills. - Records are slowly being computerised. Class lists have been done by educators.	- The school's vision does not make any reference to ICTs or how the school wants to use ICTs for the benefit of both learners and educators. - Most staff members are not skilled in using ICTs. - Some staff members are scared of using ICTs and are reluctant to learn new skills. - There is not a time-table slot dedicated to staff or development meetings. - There is little formal staff development. - Learners do not access the ICTs at the school. - The school has inadequate security: roof sheets are lifting, keys are lost and there is no security door for the room where the ICTs are kept. - ICTs are not used for curriculum purposes or to introduce new methods of teaching. - Learner assessments are not recorded or generated with ICTs. - Parents cannot afford an additional levy for ICTs at the school.
Opportunities	Threats
- There is business support for the school from community members. - The request to use ICT equipment at the school could generate some additional income for the school.	- There are high levels of poverty and crime in the area of the school. - The Department is slow to respond to needs, e.g. the request for funding for a security door.

Adapted from: SchoolNet SA - SCOPE 2002

To run your own SWOT analysis, you will need to set up a meeting of all stakeholders (teachers, school management, SGB members, and so on). In the meeting, you need to explain the purpose of the SWOT analysis as well as the process. You should then find a way of opening up a discussion and analysis of the strengths, weaknesses, opportunities and threats that will assist or hinder integrating ICTs into your school. For example:

- Draw a large grid divided into four on a chalkboard or a flip chart and label them strengths, weaknesses, opportunities and threats.
- Divide participants into small groups and give each group one of the four elements (strengths, weaknesses, opportunities and threats) to discuss.
- Ask groups to report back and write up the ideas on the grid. Spend some time grouping ideas that are similar.

Once you have identified the internal strengths and weaknesses and the external opportunities and threats, examine how you can consolidate your school's strengths and opportunities. You can also look at how you can turn your school's weaknesses into strengths and change threats into opportunities.

Choosing priority areas

Based on the SWOT analysis, you will be able to identify key areas for change. It is not wise to undertake change in too many areas at once as it may be difficult to find all the resources needed to accomplish the change, such as time and money (remember, apart from physical resources such as money, you also need to budget for the time spent on managing the change process). It is therefore necessary to prioritise a few key issues to work on.

The key issues you prioritise must:

- be in line with your ICT vision;
- build on your strengths and opportunities; and
- address the main weaknesses and deal with the threats.

Some questions to bear in mind when choosing priority areas

Choosing priorities may be more difficult than you think. You will need to answer difficult questions, such as the following:

- What resources are available?
- Where should the emphasis be in the allocation of resources?
- What should be done now? What should be done later? And what should not be done at all?
- What can be done now?

The choices are about what is *most* important to deal with first, even if there are other valid and important concerns. The problem usually comes down to the fact that there is simply not enough money or time to do everything. Effective prioritisation helps you to focus on how to overcome these constraints and to work out the very best way of working within them.

The following guidelines on choosing ICT-related school priorities may help.

Guidelines for choosing ICT-related school priorities

- Choose ICT-related priority areas where you can hope to make rapid and visible progress. What can the school do to deliver quality ICT training for the benefit of administrators, educators and/or learners? (For example, is the school planning for staff development around ICTs, and/or improving security at the school?)
- Select priorities which, when they have been achieved, are likely to help you address other priorities later.
- Select priority areas that are in line with the Department of Education's statements on the introduction and use of ICTs at schools, so that when you report back, progress is quickly recognised.
- Address weak areas at the school by harnessing existing ICT-related strengths to overcome gaps. (If, for example, staff generally have few ICT skills while you are quite enthusiastic and confident about using ICTs, you could use your strength to help staff learn new ICT skills.)
- Select other weaknesses which are important at the school. For example, poor infrastructure and/or security at the school could be obvious areas to prioritise.
- Differentiate between concerns that are important, but which can wait, and those that are pressing and critical.
- Check the financial sustainability of the priorities identified before going ahead with implementation.

Source: SchoolNet SA - SCOPE 2002

Identifying priority areas: An example

When we examine the example of the Lake Primary School SWOT analysis (see Table 8: p. 70) in more detail, we notice that three of the weaknesses identified were:

- Most staff members are not skilled in using ICTs.
- Some staff members are scared of using ICTs and are reluctant to learn new skills.
- There is little formal staff development.

If we group these three issues together, it becomes clear that the area of *staff development* needs to be prioritised.

Effective prioritisation enables effective planning, which results in effective implementation. Once you have defined the areas and priorities that need to be developed, you can start setting goals for the concrete implementation plan.

Where do we want to be? Setting goals

The following is based on the section dealing with goal setting in the MSTP Course: Planning and Managing Change.

The terms 'aim', 'goal' and 'objective' are all part of the language of planning.

However, different planning systems use these terms to mean different things. For this reason it is important to define our terms. These definitions are set out in Table 9 on the following page.



Table 9: Definition of planning terms

AIMS
An aim is a statement of intent or purpose. It describes the anticipated benefits to be gained from making the intended changes. For example, a school may identify as a priority area the fact that basic school administration functions are inefficient because the two school computers are not used effectively. Their aim in effecting change in this area may be: ● 'To improve the school administration systems by ensuring that administrative staff and teachers are better trained so that they can use the software packages more effectively.'
GOALS
A goal is a description of the end result or achievement of the change process. It describes, in precise and specific terms, the future situation or condition that will exist as a result of the process of change. So, a goal for the aim stated above might be: ● 'Identify and book a suitable <i>word-processing</i> and <i>spreadsheet</i> training programme which will be offered to administrative staff and teachers in the second term of 2005 to provide them with the necessary skills to perform school administration tasks efficiently.'
OBJECTIVES
It may be necessary to accomplish a number of things as a means of achieving your goal. To achieve your goal, you may have a number of objectives. For example, to achieve the goal stated above it will be necessary to put a number of separate elements in place: find money to fund the training programme; identify the appropriate programme; and allocate dedicated time for staff to attend training. Examples of objectives would be: ● 'Research and identify appropriate training programme.' ● 'Raise R10 000.00 for 20 staff members to participate in the training programme.' ● 'Structure the school day to allow for staff to attend block training on four days.' (Some planning systems use the term 'output' instead of 'objective'.)

Adapted from MSTP (undated)

Effective goals are written in specific, measurable terms: Goals must be specific and measurable. A goal needs to be measurable so that you can monitor and evaluate progress. This will enable your school to know when you have achieved the goal.

Effective goals can be visualised: If your goal is specific, you will be able to picture the result. By seeing your goal in your mind, you will be able to keep your focus even when things are going slowly.

Effective goals are achievable: Goals need to be a challenge without being discouraging. You need to start small. But as ability, success and confidence grow among the school community you may decide to stretch for bigger goals.

Effective goals have realistic deadlines: Goals need time frames. You are likely to take action when you set a realistic time frame for accomplishing the goal. Schedule enough time to reach the goal, but not so much time that you lose interest in it.

Effective goals are manageable: Sometimes a goal can seem overwhelming because of its size. However, if you divide it into objectives, it becomes easier to manage and possible to achieve.

Because goals are something you want to make happen in the future, it is wise to have some more immediate checkpoints along the route. These checkpoints are objectives: they describe the short-term steps which you must reach along the way to achieve your goals. To illustrate how objectives are set, we will revisit the example used in Chapter 5 (see p 61) of the school that currently has two computers. The initial goals they might set could be something like:

- To provide an e-mail connection to support school administration functions;
- To extend ICT provision to facilitate teachers' use of computers for administrative work.

In concrete terms this means setting the following objectives:

- Setting up a contract for an e-mail service;
- Buying and installing two computers for use by teachers for administrative purposes.



Table 10 summarises these goals and the objectives that flow from them.

Table 10: Setting goals and objectives

GOAL 1: Provide an e-mail connection to support school administration function
Objective: Enter into contract with Internet service provider and install e-mail for use by administration staff
GOAL 2: Extend ICT provision to facilitate teachers' use of computers for administrative work
Objective: Purchase and install two computers for use by teachers for administrative purposes.

Objectives also provide intervals at which you can experience a sense of accomplishment, and this will be a motivator for continuing effort. Over time, computer provision may be gradually increased and additional levels of computer use and benefit may become achievable throughout the school.

Effective goals are monitored and evaluated: A regular review of your goals and the progress you are making will help ensure that they continue to be realistic, timely and relevant. Monitoring progress will also reveal problems which can have a negative affect on the achievement of your goals and which need to be acted upon.

What must we do in order to get to where we want to be? Developing an action plan

The following is based on the section dealing with goal setting in the MSTP Course: Planning and Managing Change.

Once you have conducted an analysis of your current situation, identified priority areas and set goals and objectives, much of the *initial planning* phase for integrating ICT into your school will be complete.

The next stage is to draw up a *detailed action plan* to implement the process towards achieving the goals you have identified. Action plans help you to identify the necessary steps or a series of specific activities needed to reach your goals and objectives. In an action plan you must be able to answer the following questions: Who is supposed to do what? By when and for what reason?

Although there are a variety of ways in which one could write up an action plan, there are certain elements which any action plan should include if it is to be effective.

These elements are:

- ⇒ The objectives, results or outputs that must be achieved on the way to achieving a goal.
- ⇒ The activities that must be undertaken to achieve those objectives, results or outputs.
- ⇒ How you will know that the objective or activity has been completed (there must be an indicator that will verify your achievements, e.g. if you call a meeting, the minutes of the meeting verify that it happened).
- ⇒ The time frames for the achievement of the objectives, results or activities (be realistic and give yourself real deadlines).
- ⇒ The person or persons (e.g. team or committee) who will be responsible for each task and/or activity.

These elements are covered by five basic questions:

1. *What* must to be done?
2. *How* will it be done?
3. *How* will we know that it has been done?
4. By *when* will it be done?
5. *Who* is responsible for doing it?



Table 11 serves as an example of how the five elements work together to form an action plan.

Table 11: Sample action plan

GOAL 2: Extend ICT provision to facilitate teachers' use of computers for administrative work				
Objectives	Activities	Indicators	Time frames	Person/persons responsible
What must be done?	How will it be done?	How will we know that it is done?	By when will it be done?	Who is responsible?
Purchase and install two computers for use by teachers for administrative purposes.	Establish the cost of two new computers. Raise funds in the community or identify and approach companies/ institutions for a donation of good quality used computers (e.g. two local banks). Procure two computers.	Two computers installed in staffroom for use by teachers	Within two months (state date).	A small task team comprising the deputy principal and two teachers will be set up (state people's names.)
GOAL 3:				

Conclusion

Plans in themselves have no particular value unless they lead to some form of action. In fact, when plans have been produced by considerable effort but have not been implemented, this can be demoralising to staff.

However, as you start implementing your action plan for integrating ICT, it is important to remember that this is a process and not a once-off event. Introducing something new means new routines and new ways of doing things. It is also often necessary to go through a period of trial and error until new practices become integrated with existing aspects of thinking and practice – all of which takes time.

Moreover, attempts to introduce new ICTs and the necessary training and technical support can easily be frustrated if the necessary resources are not available. It is therefore important that the principal and/or management team give careful thought to the implementation process and to creating the necessary climate at the school for supporting it.

The role of management in this regard includes:

- Sustaining commitment during implementation;
- Checking the progress of implementation;
- Helping to overcome problems if any are encountered;
- Checking the success of implementation;
- Taking stock; and
- Reporting on progress.

The following chapter deals with a number of practicalities involved in introducing, developing and sustaining the use of ICT in schools.



CHAPTER SEVEN

What are some of the practicalities that need to be considered?

Although plans for the integration of ICTs will vary from school to school, every school will have to think about the following:

- Financing ICTs – budgeting, fund-raising, purchasing, maintaining and upgrading;
- Deciding where to put the computers once they are bought (from a single computer in a single office to many computers in offices, staff rooms and/or a computer centre);
- Making sure that the computers and other ICTs are secure;
- Developing policy for the use of the computers and related equipment; and
- Developing and supporting staff.

Financing ICTs: Budgeting realistically

What can be done realistically in terms of ICT implementation depends on the available budget. It is therefore crucial to keep the overall financial picture of the school in mind as you do your planning. The more accurately you do your ICT budgeting, the more realistic your planning and implementation will be. The purpose of this section is to make you aware of the issues that need to be taken into account when preparing your ICT budget.

It is a mistake to think that once computers have been bought and installed in the school there are no further costs to cover. In the same way as when you buy a car, you need to think about the total cost of ownership, which includes not only the price of the car but also the running costs, such as the insurance, maintenance, repair and petrol. In the case of a computer, the initial purchase price of a computer is hardly ever more than half of the total cost of ownership – in other words, fifty percent or more of the cost is taken up by ‘running costs’. If your school has a small budget, it is vital to plan how you will cover the total cost.

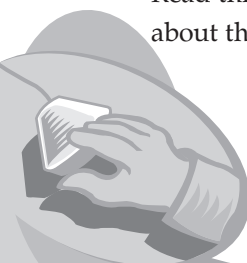
Specific costs for hardware, software and the like may vary from time to time and from place to place, and we cannot, therefore, go into the detail of these costs. The following list is, however, intended to help you think about budgeting for ICT beyond the obvious components. It will also give you some idea of the percentage breakdown of the total cost associated with ICT in schools.

Information provided by SchoolNet SA – SCOPE (2002) suggests the following breakdown of total costs:

- 45% Hardware
- 20% Software
- 15% Investment in teacher training
- 5% Repairs and maintenance
- 10% Replacement fund
- 5% Internet access, insurance and other incidentals.

As you will notice, this list does not include the cost of setting up a room to be used as a computer centre or the cost of installing the necessary security measures.

Read through the following article on budgeting realistically. It will help you to think more holistically about the issue of budgeting for ICT in schools.



Although plans for the integration of ICTs will vary from school to school, every school will have to think about the following:

Budgeting realistically

Essential to managing ICTs in your school is the realistic management of the cost. We work in a context where there are many needs and priorities. You are likely to encounter parents, educators and community members who say:

“Are ICTs really a priority, when our children do not have sufficient school books?” The better you manage the cost of ICTs, the more able you are to show the cost benefits. It is desirable to be able to show stakeholders that ICTs are worth the investment.

How can we budget effectively for ICTs in our school?

Too often we view technology as a single budget item and forget that there are different kinds of costs that we need to budget for when planning and implementing ICTs.

First, we need to budget for the maintenance of the technology that already exists at the school. This includes budgeting for the replacement and repair of equipment, service agreements, and the training of staff members. It does schools more harm than good to implement new technologies, at the expense of letting present programs and equipment go unused, because the staff is not trained or the equipment is not repaired.

Second, we need to budget to have funds available to implement new technologies and programs. This includes the buying of equipment, getting technical support, and conducting training, so that staff members are able to utilise new technologies and programs.

In order to make steady progress at our school, when introducing and utilising ICTs for the benefit of learners and educators at the school, we can not assume, unrealistically, that one day funding will become available. We need to ensure that we acquire funds purposefully and transparently. Even with acquired funds, we should not expect to be able to actualise all of our plans for ICT use at the school, all at once. The introduction and integration of ICTs into our schools is a process. Our ICT budget will reflect and allow for this.

Source: SchoolNet SA - SCOPE 2002

Guidelines for drawing up an ICT school budget

Although plans for the integration of ICTs will vary from school to school, every school will have to think about the following:

Before you start

1. It is a good idea to plan a process to make budgeting a shared activity:
 - Set up an ICT budgeting team or sub-committee.
 - Plan to consult widely about anticipated activities or events.
 - Develop a process for having the draft budget approved by the parent body and the SGB.
2. Think about income, not only about expenditure. What portion of the school income can you spend on ICTs? If you need more than this amount, how can you raise the additional funds?
3. Build monitoring into the budgeting process. It is not sufficient to imagine that because you have prepared a budget everything will just go according to plan. Monitoring the budget is a key aspect of proper financial management and sustainability.

Step 1: Prepare a draft expenditure budget

- Identify the areas or activities on which money needs to be spent (i.e. identify categories of expenditure such as hardware, software, technical support, staff development).
- Identify the line items for each area or activity (i.e. identify all the costs associated with one area – if the area is staff development, you need to consider not only the possible cost of the course but also additional items like the cost of transport to get the teachers to the venue where the course is being offered).
- Work out how much each line item is likely to cost for the year. Do not guess. Phone suppliers or go and look in the shops, so that you reflect the costs accurately.
- Keep your notes (explaining how you arrived at a budget amount) in a file for future reference.
- Type up your budget, check the figures and make sure you have left nothing out.

Step 2: Prepare a draft income budget

- Work out how much money you can realistically expect to raise from school fees and in particular what proportion can be allocated to ICT at the school.
- List other ways in which the school already raises additional money, and how much you can realistically expect to raise from this for ICT at the school.
- Work out your shortfall.
- Present this to the appropriate school committees, together with the Expenditure Budget.
- Develop a fund-raising and income-generation plan for the school.

Step 3: Present the budgets for comment

- Present drafts of both the expenditure and income budgets to the appropriate committee (Finance Sub-Committee, SGB etc).
- Amend the budgets as agreed by school stakeholders and the appropriate school committees.

Step 4: Monitor the budget

- Break down annual amounts into chunks which reflect the school's anticipated monthly expenditure – taking into consideration variations because of holidays and exams.
- Look at the amount spent on each item every month and compare it with the budgeted amount.
- If you spend more on some items than the allocated amount, see if you can balance the cost from under-spending on other items.
- Be prepared to explain why you are spending more or less than the allocated amounts.
- Use the information on under- or over-spending to do your budgeting more accurately in the future.

Budgeting tips

- Check your figures, as it is easy to make simple calculation mistakes or leave important items unaccounted for.
- When you budget for the future, remember that your budget should take inflation increases into account. For example, if a computer mouse or other ICT accessory costs R100 this year, it may cost R110 next year.
- Also, remember that you should not inflate the costs for budget items automatically – the Department of Education demands that school budgets are related to real needs and actual costs.
- Be just as concerned about how you are going to bring money into the school as you are about how you are going to spend it.
- Make a plan about how you are going to encourage parents to pay school fees, so that a portion of these fees can be directed towards payments for ICT-related costs at the school.
- Encourage clubs, sports teams and cultural committees to contribute to the school's income. For example, you could encourage them to raise funds to pay for their own activities and functions.
- Above all, do not guess line item costs in your budget. Instead, take the time to verify the costs of these items with suppliers.



Being realistic about funding

The money raised by a school through school fees will not, in all probability, cover all the requirements for ICT usage. This is because ICTs are costly. In some schools, fund-raising has assisted schools to reach their ICT goals, despite having started with a small income from school fees.

However, fund-raising for a large project like setting up a computer centre needs careful consideration. Setting up and running such a centre may require funding from a number of sources. Income from fund-raising cannot, however, be relied on until it has been collected. No matter how effective your planning, events can be poorly attended or the money raised can be less than expected. Sometimes, the expense of having a fund-raising event can be higher than anticipated. You therefore cannot afford to commit the school to any purchases or contracts until the money is in the bank!

Using your computer facilities to generate funds

Ideally, with focused leadership and management at the school, the ICT centre can become an income-generating tool for the school. In this way, the ICT centre will fund some or all of its own costs and the school may no longer have to rely on donations from funders or other forms of fund-raising.

Summary

For proper planning and management of ICTs in your school, it is important to anticipate the expenditure that will be incurred. Accurately and carefully identifying the items that need to be included in an ICT budget for the school is key. In this section we have also highlighted that the initial purchase and installation of computers usually accounts for less than fifty percent of the total expenditure and that the running costs, in fact, make up more than half of the expenditure. These therefore need to be budgeted for accordingly. Finally, it is not sufficient to just prepare a budget and leave it at that – fund-raising needs to be thought about carefully, and monitoring and control of ICT expenditure is crucial.

Paying attention to sustainability is one of the central ideas on this guide. Without careful planning and consideration of what can realistically be sustained financially and in terms of infrastructure and human resource capacity, there is no chance of successfully integrating the use of ICTs into schooling.

Deciding where to put the computers

Whether a school has one computer or one hundred, the question of where to put it or them is equally important. Computers need to be installed in places where they are accessible to the people who can benefit from using them. For example, if the only computer in the school is in the principal's office, where no one else can use it when she or he is away at meetings or is interviewing parents, this will be a problem. At the same time it is important to ensure that computers are secure. It is no use putting a computer in the passage outside the principal's office for anyone to use if the passage cannot be locked – that is asking for it to be abused or stolen.

This section raises some questions for you to consider in your planning so that you can make the best use of however many computers you have.

A single computer

A number of provincial departments of education have committed themselves to providing at least one computer per school for administrative purposes. Even though its purpose is clear, it is still necessary to give some thought to placing it in order to get the maximum benefit. Even a single computer can be used effectively for various purposes, from administrative tasks through developing and storing financial data to sending e-mails, downloading departmental documents and writing reports. Perhaps the principal needs to use it to download departmental document and write reports. Perhaps she manages her e-mails herself, or perhaps her secretary does it. Who does the preparation of timetables and budgets, and when could they have access to the computer? Several different people could use this computer and develop the skills necessary to use it effectively, but it has to be put in a place where they have access to it at the best time to do the work. You also need to think about times for doing work on the computer, and times for learning how to use the computer more effectively. Perhaps the training could take place after hours, and the work could be done according to a roster system for different users during working hours.

Computers in class rooms, resource centre or staff room

The location of computers should be based on the learning and teaching needs of staff as well as on your assessment of staff capacity and how responsive staff members will probably be to training. Which subject areas have the greatest need for a computer? What range of teaching methods do teachers use in those subjects? What additional teaching methods could they be encouraged to use if they had frequent access to a computer? Regardless of the needs of the subject, which teachers would respond best to the opportunity to use computers in their subjects? If you have two computers for use by teaching staff, perhaps you will decide to put them both in the staff room. But perhaps one of the computers should, for example, be for Maths teachers and should be put in the classroom of the Maths Head of Department.

You may also need to consider how learners can access computers. If you want learners to use computers to practise their IT skills or to do project work, you will need to ensure that computers are available in places and at times that are convenient for learners to use them. Putting a couple of computers in the resource centre for learners to use for projects, and then opening the resource centre only during the five hours of compulsory school time, will not help much.

Some schools will be privileged enough to have a substantial number of computers and other ICTs. Such schools may accommodate their computers in classrooms, in computer centres, in the staff room, in their administrative offices, in the resource centre or any other secure places for informal use by learners during break. Other schools will have too few computers to think about a variety of places to put them in. But all schools, whether well resourced or not, need to think about how they can make the best of the ICT resources they have for teaching and learning.

Computer centre

Because security is a problem in our country, many schools that have a number of computers tend to place them in a computer centre rather than have them scattered in different classrooms around the school premises. It is obviously easier to try to secure one room than to install security measures in a number of rooms.

If your school decides to set up a computer centre, there are a number of factors other than security that you should consider.

For maximum effectiveness of teaching and learning, consider:

- **Layout** – carefully consider the position of work tables or workstations. Can the teacher move around easily? Will all learners be able to see the teacher and the white board? (Try to avoid using a chalk board because chalk dust can harm computers.)
- **Furniture** – tables or desks need to be the appropriate height and chairs need to offer good back support.
- **Lighting** – this should be slightly lower than in a standard classroom to minimise glare. Consider putting blinds on the windows to further reduce glare.

For preservation of the equipment, consider:

- **Temperature** – ideally the temperature in the room should be kept at between 18 and 24 degrees Celsius.
- **A dust-free environment** – computer centres need to be dust free. For this reason, and to control the temperature and humidity, installing air conditioning is ideal.
- **Power points and installation** – consult a qualified electrician who knows about computers so that circuits are not overloaded. Power surges must be avoided as they may cause modems and motherboards to blow out.
- **Storage** – you need storage space for software, manuals, ink cartridges, etc.



Buying computers and other ICTs

The information in this section is based on SchoolNet SA - SCOPE 2002.

The old saying 'cheap is dear' applies here. Do not always buy the cheapest but rather look for:

- Reliability
- Standardisation
- Good basic service at a reasonable price.

Computers: Most modern computers are generally very reliable (both brand names and generics). It is, however, more important to find a good long-term supplier who will supply good quality equipment and service than to save a few Rand in the short term.

Refurbished computers: Some companies take outdated or discarded computers and refurbish or restore and repair them so that they are still usable – at a very low price. Recent research conducted by SchoolNet SA reflects the debate regarding the value of purchasing refurbished computers (details of the report are given in the Reference Section at the end of this guide). While in general it is felt that refurbished computers are often more trouble than they are worth, there are also success stories. Again, proper research into the company supplying the refurbished computers is necessary (see Resource Section for further information on refurbished computers.)

Printers: The choice of printer depends on your needs. The two basic options are the colour or black and white inkjet printer on the one hand, and the laser printer on the other. While it might be nice to print some promotional school materials in colour occasionally, colour printers are very expensive to run due to the cost of the ink.

In general, inkjet printers are cheaper, but if your school plans to print large volumes of black and white materials, you could consider a laser printer. Although the initial cost of a laser printer is higher than that of the inkjet printer, the price per page for bulk printing is cheaper and the quality is better.

Not all computers need their own printers – if computers are networked, a number of computers can share one printer.

CD-ROM drives: As most software is distributed on CD-ROMs (or the Internet), it is important that computers come equipped with a CD-ROM drive that can read CDs. CDs are also useful for back-up purposes.

Scanners: Scanners are devices used to take up and change images or texts into a digital format that can be read by a computer. You can, for example, scan a picture or a text into a computer's memory. This means that the picture or text becomes digital (or computerised). Once you have a digital version of a picture or a piece of text, you can modify and change it on the computer to suit your needs. It can then be incorporated into any document.

Data projectors: The data projector is connected to the computer. It is used to project onto the wall any image or text generated by the computer. It can be used to demonstrate computer skills to a whole class, and learners can then follow the teacher's actions projected onto the wall. It is also necessary to have a data projector for PowerPoint presentations.

Local Area Networks: This is a communications network that facilitates easy interconnection of computer terminals, printers and scanners to each other and to a server (a centrally situated computer that drives the local area network or LAN). It allows for linkage between all computers within a computer centre or within the whole school. It is necessary to call in a specialist to design a local area network. The design needs to take into account both the current needs of the school and the long-term ICT expansion plans.

The server computer makes resources available for all the computers that are connected to the LAN. The server can, for example, store (or host) files, applications (software) and shared printers. The advantages are:

- Security
- Centralised back-up of all files
- Reliability.

The disadvantages are:

- Needs an expert to administer
- Is expensive.

E-mail and Internet access: Although some schools might be cautious about allowing staff or learners access to the Internet for fear of high costs and possible access by learners to inappropriate information or websites, the Internet remains an invaluable resource for up-to-date information and is an essential tool for preparing learners for life in a technological world.

Any decision to enter into a contract with an Internet service provider, whether it is for a single computer or for a computer network, must be based on the strategic plan drawn up in consultation with the school community. Issues of affordability need to be addressed and various options, their pros and their cons, need to be carefully considered. Get quotes from a number of Internet service providers before you take a final decision.

Options include:

- **Dial-up analogue/digital telephone:** This option is generally used where a limited number (say, one or two) computers are linked to the Internet and usage is fairly limited. You need a modem. You pay a monthly fee to the Internet service provider and calls are charged as normal telephone calls. Monthly calling costs can become high if the line is used a lot during peak hours.
- **ISDN (Integrated Services Digital Network) access:** The modem, the monthly fees and the rate of the telephone cost are higher for this option than for the analogue option. The connection speed is faster and the ISDN line can serve a large number of networked computers simultaneously. This option is not available in more remote areas.
- **Leased lines:** These are lines that can be used 24 hours a day. The charges depend on the distance to the Internet service provider and on the bandwidth. The set-up cost and the monthly costs are considerably higher than for the previous two options. This option is not available everywhere.
- **ADSL (Asymmetric Digital Subscriber Line):** This service has a fixed monthly cost for Internet connectivity. The speed is much higher than with any of the previous options. This service is however, not yet available everywhere in the country. One pays a fixed monthly rate to use the ADS line, which makes budgeting simpler as it means that costs for this service do not fluctuate from month to month.
- **Wireless access and satellite connection:** While these options do exist in a limited number of areas, the set-up costs are extremely high and the options are therefore unsuited to school purposes.

In conclusion, while it is impossible to provide a complete guide to buying computers and other ICTs as the information needs continual updating, please refer to the Selected Resources section of this guide for website addresses where you can get such information.

Securing computers and ICTs

ICT security can be viewed from two perspectives: the physical security of the IT equipment; and systems security such as protection against viruses, hackers and the like. There is also the need within a school for certain learner and/or staff information to be secure – such as forthcoming exam papers or personal staff information.

Physical security

Theft of equipment in schools is an ongoing reality. You must ensure that there is adequate security before you buy any equipment. Although burglar proofing and alarm systems are not entirely adequate solutions to the problem of theft, they are deterrents.



The following is a list of questions to help you think about your school's current ICT infrastructure and security systems.

A checklist of questions to help you think about the physical security of your ICTs

1. What is the level of crime in your area?
2. Has your school ever been vandalised/burgled?
3. Is your school isolated or is it within a community or township?
4. Does your school have a fence? And/or a locked gate?
5. Do you have any type of surveillance system at your school?
For example:
 - Video camera
 - Electronic doors
 - Alarm system.
6. How are the computers stored?
 - In the office
 - In a special safe
 - In rooms with burglar bars and an iron gate on the door
 - In the computer lab with a strong security system
 - No specified area.
7. Who authorises how the computers are used?
8. Is the room where the ICTs are stored well secured?
9. Who keeps the keys to the room where ICTs are stored?

To protect your assets it is necessary to budget and plan for appropriate security. Many schools may choose a combination of physical security, such as bars on windows, and possibly a caretaker who sleeps on the school premises at night. Electronic security such as an alarm system is another option.

Insurance: Taking out insurance for equipment is also an important precaution, although this is often very expensive. When taking out an insurance policy be sure to check what is included and what is excluded. Damage caused to equipment by lightening strikes and power surges is often excluded. If you require such coverage, it needs to be specified, but it usually makes the premiums very high. Insurance for laptop computers is also quite expensive, but usually very necessary given the obvious risks involved in moving around with a laptop.

There are, of course, also a number of common-sense precautions that you can take, like disconnecting modems and unplugging computers during an electric storm and disconnecting all IT equipment at night.

Systems security

Appropriate systems for blocking viruses that could corrupt your computer systems and for securing the server (where this applies) and systems for data recovery are also important for the efficient and effective use of ICT in schools. Again, budgeting and planning are key.

Schools that have access to the Internet must enforce certain rules and the educationally accountable use of the Internet. Abuse of the facility at the school's expense (e.g. visiting pornographic sites) must be avoided.

The use of passwords or, if necessary, strong measures must be enforced to protect confidential data such as examination papers.

The issue of having rules for the use of the Internet brings us to the whole idea of having an IT policy.

Developing an ICT policy

One of the keys to successful ICT implementation is the development, and implementation, of a thoughtful ICT policy.

There are several levels of policy – from a document that states the vision, the beliefs that underpin it, and the plan for implementation of ICTs to a document that sets out the rules and procedures for using computers and other ICTs in the school. With complex and expensive equipment like ICTs at your school, it is important to think carefully about their use and care. You will find that with careful thought and planning, you save time and money and prevent divisive disputes from taking place.

The focus in this policy section is on guidelines for use within the institution.

Why should you have an ICT policy?

Read the following school ICT scenarios, which cover a narrow range of policy concerns but serve to introduce policy in practical terms. After reading each scenario, think about possible policy solutions to these situations. While having a clear ICT policy may not prevent all the mishaps mentioned in the scenarios, such a policy provides guidelines for behaviour and states the steps to be taken if the guidelines are not followed.

School ICT scenarios: How would a clear policy on ICT usage have helped to prevent these situations?

1. An educator brings a stiffy disc from home and uses it on the school system without checking for a virus infection. The infected disc causes the whole system to crash, which leads to delays in preparing examination papers and class worksheets and in the updating of records.

Possible response: A clear policy could have prevented the educator from bringing an infected disc to school. He would then have known that if he did this he would be responsible for repairing the damage done.

2. Learners are given access to the computers on which educators work. A learner by-passes the security passwords and 'discovers' a series of examination papers and offers them to other learners before an examination date.

Possible response: The policy could have prevented the learners from getting access to other information.

3. A stressed-out educator who not only chain smokes but also drinks coffee all day long spills a cup of coffee over a new computer, causing it to malfunction and lose data.

Possible response: Having a clear policy of what to bring into the computer room could help prevent this scenario.

4. An educator puts an unlicensed programme on the system. Microsoft does a random check and threatens to sue the school for unauthorised usage.

Possible response: A policy that explains the consequences of such behaviour would make it clear to the educator that he is responsible for such action.

5. A learner accesses pornographic sites and sends e-mails to other learners containing pictures and links. A parent discovers material that his child has been exposed to in this way and angrily confronts the school management team (SMT), threatening to sue the school.

Possible response: A policy that restricts which kinds of sites can be visited would have prevented such behaviour. Learners and/or educators caught doing this would have to receive discipline, as agreed upon and stated in the school ICT policy.

Source: SchoolNet SA - SCOPE 2002

We hope that in reading through these scenarios you got a sense of some of the things that can go wrong when there is no clear ICT policy at a school. However, school ICT policies are about much more than control – they require vision and leadership in planning and implementation.

Key areas to be covered in an ICT policy

Introducing computer facilities into a school requires a great deal of preparatory work. If you prepare well, your equipment will be well used and safe, and the future of learning areas such as Computer Application Technology (Computer Studies) that depend on it will be secure.

The school's ICT policy needs to address logistical aspects such as management of IT equipment (storage, safety and security), as well as use of hardware and software by staff and learners. Some of the aspects it should deal with are as follows:

- Physical security – burglar bars, alarms and responsibility for seeing that the security is working;
- How to use the equipment – guidelines for handling sensitive equipment;
- Guidelines for access – who may use the equipment and when;
- Rules for use of the Internet – including such issues as time spent and/or material downloaded (for example, pornography).

In addition, the consequences of breaking the policy rules need to be spelt out.

Who should participate in developing the ICT policy?

As with all the decision-making and planning processes that are part of an initiative such as introducing ICT into a school, all stakeholders should ideally be involved. This makes it more likely that consensus and buy-in will be achieved.

Making the policy public

It is important that the whole school community should have access to and be clear about the contents and implications of the ICT policy. To this end some schools send copies of such policies to parents and require both parents and learners to sign that they have familiarised themselves with the policy content and understand it.



Developing and supporting staff



Implications for planning and implementation

Staff development and support are as important to successful implementation of ICT in schools as is proper financial planning. Integrating the use of ICT into your school has direct implications for staff. The staff need to be trained, the equipment needs to be maintained and repaired, new timetables need to be created to include the use of computer facilities, and curriculum issues need to be considered.

These issues have financial, time and training implications. In planning training and professional development, there are two mistakes that are often made:

- That teachers only need basic computer skills;
- That once-off training is enough.

Going beyond the basics

It is often assumed that that once the teachers know how to use computers, they will be able to use them in their teaching. However, knowing computers and basic computer programmes is only the first step. Making the link with teaching is where the training really needs to start.

If teachers are not comfortable with computers and cannot see them as helpful aids in the teaching and learning process, they will not use them. But to reach the point where teachers feel comfortable enough to integrate the use of computers into the curriculum requires in-depth understanding. To teach effectively with software is very different from just being able to use it.

In addition, integration of ICT into the curriculum often requires professional development on teaching methods as well as basic computer training. If a teacher cannot use a particular teaching method in the first place, it will not help to show her how the computer can support her in using that method.

For training in computers and software, there are many courses available, from basic computer literacy to courses in specific application software. Your school may have the funds to send teachers to attend these courses or you may have to look for more affordable options.

You could also investigate a range of options, such as:

- Whether your provincial department of education provides training for teachers in ICT;
- Whether there are any community centres in your area that provide ICT training;
- Whether any of your current members of staff can provide basic computer skills training to other staff members; and
- Whether there are volunteers in your community who could share their ICT skills with your staff.

It is wise to explore all the options available to you.

For professional development in using computers for teaching and learning, there are also a number of options. Ideally, however, teachers should enrol for university courses in which educational and ICT issues are dealt with simultaneously.

Computer training is not a once-off activity

A second error that people often make is to regard computer training as a once-off activity.

Although teachers need to be oriented to the use of computers through basic courses, it is equally important to follow up the training with ongoing professional development support and technical support. Support may be needed at different times, not just initially when computers are first introduced to a school.

Plans to develop staff at schools often tend to place the most emphasis on implementation and basic technical skills training, while ongoing support and technical support training which allow educators to troubleshoot get less consideration.

What do teachers need to be able to know and do?

In South Africa the White Paper on e-Education (Department of Education 2004: 19) defines the skills and knowledge that teachers nationally are expected to achieve:

Every teacher, manager and administrator in General and Further Education and Training must have the knowledge, skills and support they need to integrate ICTs in teaching and learning.

The White Paper further defines five different levels of professional competency in utilising ICT in education, which are set out in Table 12.

Table 12: Five levels of professional competency in utilising ICT

Level	Standard for competency in ICT
Entry	Computer literate. Able to use computers and teach learners to use computers.
Adoption	Able to use various techniques, including the computer to support traditional management, administration, teaching and learning.
Adaptation	Able to use technology to enrich the curriculum and use integrated systems for management and administration.
Appropriation	Able to integrate technology into teaching and learning activities, and use integrated systems for management and administration within a community context.
Innovation	Prepared to develop entirely new learning environments that use technology as a flexible tool, so that learning becomes collaborative and interactive. Technology is integrated as a flexible tool for whole-school development.

How will teachers achieve this standard?

To progress towards the achievement of the Standard for Competency in ICT, teachers need to work through the four steps set out below:

- First, teachers must understand the concepts and the basics of how to use hardware and key software. Initial training addresses this first step.
- Second, teachers must practice until they become fluent in the use of computers. Here, they need to focus on fluency with core software, such as word-processing and Internet engines. This is not easy, and they will need ongoing technical support.
- Third, once the teacher has developed the necessary understanding, feel and vision to begin the classroom implementation process, much of the work involves developing a broader understanding of educational software in more detail (What is out there? How does it work and what can it do?). Subject specialist professional development is needed for this.
- Fourth, teachers need to learn how to use relevant educational software and general computer skills in their teaching and learning. To do this effectively teachers need to understand learning and how to mediate it.

This implies both technical training around the use of ICTs and software as well as professional development around ways of integrating and mediating the use of ICTs and the relevant software programs in learning and teaching contexts.

It is important to remember that however good the ICT infrastructure in a school may be and however wide the range of software the school has, these are only as good as the teacher using them.

In summary, planning for ICT staff development involves:

- Identifying current weaknesses in staff skills, attitudes, and knowledge at this school;
- Working out professional ICT development and support priorities;
- Identifying sources of support and professional ICT development;
- Drawing up a plan with activities, service providers/personnel, timelines and budgets for initial training, ongoing support and professional development.

But all of this takes time. Both teachers and those who support them need to allocate enough time to the development of new knowledge and skills. Staff development and support should not be regarded as a once-off event, but as a continuous process. As provision of ICT and new software increases, the need for appropriate staff development will increase. Staff development thus needs to be integrated into the vision statement and budgeted for appropriately, both in financial terms and in terms of planning and human resource management. Capacity building is central to the idea of sustainability.

Conclusion

One of the central messages running throughout this guide has been the idea that what you can do with ICT depends on the resources available and the vision you are working towards. This message holds equally true when it comes to using ICT as a tool for learning and teaching. The degree of ICT integration into the curriculum depends on the level of ICT provision as well as the capacity of your teachers.

By highlighting the current trend, we have tried to give you a glimpse of what is possible so as to inspire you to slowly develop your own vision and your planning towards this ideal.

Appendix 1

ICT and curriculum

A note to guide professional development of teachers for ICT integration

This sub-section is adapted from SchoolNet SA - SCOPE 2002.

Since the introduction of an outcomes-based approach to education in South Africa, there have been significant shifts in our pedagogic approach. These include the following:

- A shift from authoritarian approaches which encourage rote learning, to teaching in which learners are encouraged to question and use their own prior experience and knowledge - to think critically, to reason, to reflect and to take action;
- A shift from transmission or teacher centred mode to approaches in which the teacher mediates learning and helps learners learn for themselves - learners shift from passive to active learners;
- A shift from a single authoritative textbook to the use of a range of resources;
- A shift from summative, examination-focused assessment to a continuous, formative approach to assessment;
- A shift from individualistic to collaborative learning approaches.

If ICTs are going to be helpful with these approaches, teachers have to know how to use them to support the new approaches.

In most cases, this means that teachers need to re-assess the nature of the learning process in their classes. Significantly more emphasis is now placed on open-ended questions and information skills. In addition, the new paradigm places information technology in a central role in the already transforming learning process.

An integrated approach to the use of ICT in the curriculum is characterised by the following:

- Setting learner-centred, curriculum-related tasks. The learners must use the computer room to do primarily educational tasks, such as history or biology assignments or tasks.
- Setting tasks that are open ended in order to support problem solving and critical thinking. Closed-ended tasks support non-challenging reproduction of information and should be avoided.

Example 1:

How would you set an assignment on The Growth and Development of the Urban Centre, which does more than ask for a repetition of the story? The task could be re-phrased to read: *How would your city look today if motorcars never existed?*

Example 2:

How would you set an assignment on the Titanic that does not prompt learners to cut and paste the vast amount of literature and pictures on the topic? Instead of instructing, 'Do a project on the Titanic', the following task could be set: *How could the outcome of the Titanic disaster have been different, or even avoided?*

The learners now have to examine the question and identify issues that they would need to study. They need to find information, evaluate it and process it. In this process they would make use of a range of resources, including non-ICT resources. ICT would be the tool for gathering information, as well as the tool for producing their work.

- Developing contextualised activities. In searching for context educators should integrate the activities of the computer room into the broad school curriculum including subjects and learning areas, but also sport, culture and extra mural activities.
- Setting tasks that develop collaborative group skills. Learners will benefit from co-operative interaction as they enquire about and discuss the issues raised by the topic. These are valuable social skills.
- Using ICT to enhance and stimulate thinking around the issues presented in lessons.
- Exploiting ICT to provide opportunities for knowledge application in real life contexts.
- Making use of a range of tools in an open-ended task that provides opportunities for creative expression. This is an important part of the curriculum that can be well served by the exciting opportunities that ICT presents.

Research by John Bransford⁹ shows that learning skills without a context results in limited or no transfer of skills, and that, in fact, one needs to learn skills in the context of authentic use. Eisenberg and Johnson (1996) write:

It has become increasingly popular for educational technologists to advocate integrating computers into the content areas. However, when learners learn isolated skills and tools without a basic understanding or rationale for their use in problem-solving endeavors, these skills are of little value. Therefore, it is critical that we teach learners how to use computers in a way that allows them to be creative, flexible, and purposive in their pursuits. While there are specific skills that learners should learn, the transfer and application of skills from situation to situation should be recognised as the most beneficial part of any curriculum. As most technology scholars note, learners develop true 'computer literacy' when they have genuinely applied various computer skills as part of the learning process.

The other area of research into integration has been in the field of information literacy. With the advent of the Internet, and the exposure given to life skills development in the curriculum, there has been considerable convergence between computer literacy and information literacy. This can be attributed to the role of ICT as the tool that enables most information management in this digital age.

In the new paradigm, computers are used as a tool for finding information and for communication in the educational context. The acquisition of IT skills is integrated into this context (as opposed to being used for 'computer literacy' classes in the old paradigm).

Approaches to using educational software have also shifted. Previously software offered opportunities for 'drill-and-practise' type training, some interactive tutoring and edutainment, and provided content-based information. Currently, more and more software functions in the form of an interactive tool, virtual laboratories and simulations, and provides information as a resource.

The integrated approach requires a carefully planned strategy and ongoing support of the learning process. To implement ICT, teachers need professional development, not only in ICT but also in the new approaches and in how to use ICTs. In fact, they need to move to the position in which the use of ICT is so integrated into their teaching and learning that it no longer becomes a question of whether they will use ICT for a particular task, but how they can use it more and more effectively.

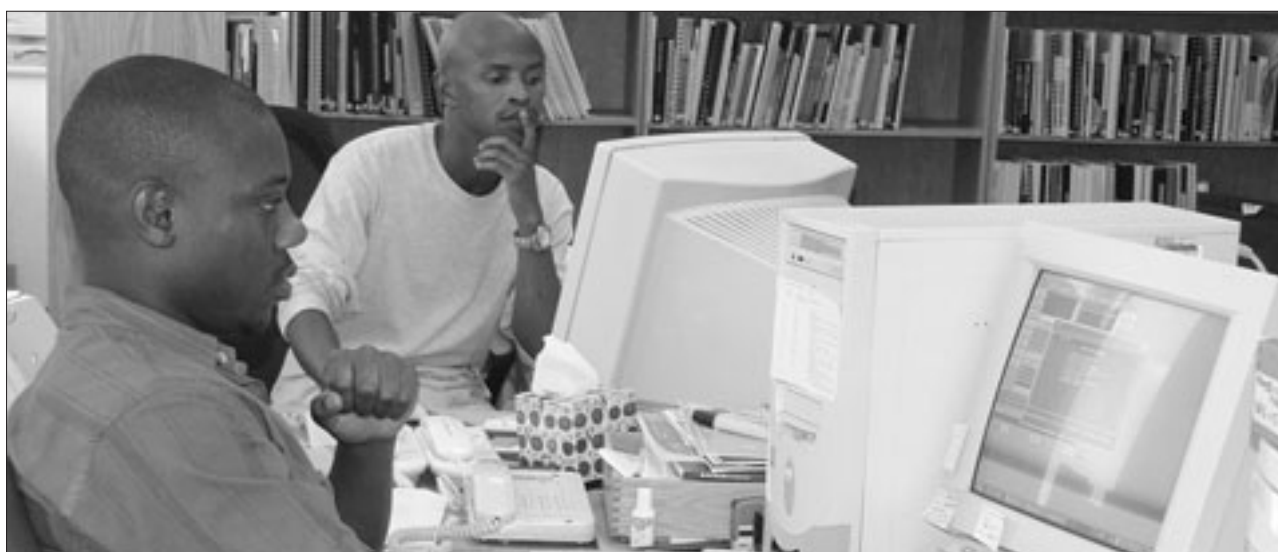
⁹ A professor of Education and Psychology and an internationally known scholar in cognition and technology.

APPENDIX 2

Types of ICT provisioning and use with associated professional development and support

NOTE:

- The eight scenarios illustrating types of ICT use in this table are intended to serve as a guide for planning and management of ICTs in schools.
- It is assumed that provisioning and the associated professional development and support reflected in each type of use are built up incrementally and in a sustainable way. For example, provisioning and use in use 2 builds on the foundations laid in use 1 and so on.



USE 1 The school administration uses the school computers**ICT RESOURCES**

- **Number of computers:** A small number of computers (e.g. one or two computers).
- **Networked:** Ideally networked so that information can be shared, but not essential.
- **E-mail/Internet:**¹⁰
- Access to e-mail helpful for communicating with the education department and for accessing documents sent from that source.
- Access to the Internet also helpful – used to access government policy and related matters – but probably not essential initially.
- **Additional hardware:** Printer - essential.

LOCATION OF COMPUTERS

- a. **Administration office:** In the school clerk's office, possibly one in the principal's office.
- b. **Computer centre/laboratory:** N/A
- c. **Staff room:** N/A
- d. **Media centre/library:** N/A
- e. **Specific classrooms – e.g. Science laboratory:** N/A
- f. **All classrooms:** N/A
- g. **Other:** N/A

SOFTWARE PACKAGES**For administrative purposes:**

- For use by administrative staff.
- Basic spreadsheet and word-processing package essential; other more specific packages (such as timetabling, financial) – helpful; tailor-made software the top of the range – not essential.

For teaching and learning:

- N/A

ICT TRAINING*Administrative staff:***Hardware**

- Some training to ensure common understanding of the computer system.

Software

- Some training for relevant administrative staff in basic packages probably needed.
- Some training in use of e-mail and Internet likely to be needed.

Teachers:

- **Hardware** – N/A
- **Software** – N/A

PROFESSIONAL DEVELOPMENT FOR TEACHERS

N/A if computers are only used by administrative staff.

IT TEACHER N/A

TECHNICAL ICT SUPPORT STAFF N/A

¹⁰ **NOTE:** E-mail/Internet access requires an e-mail account to be set up and maintained with an Internet service provider. This is an ongoing cost. Schools will also need to decide how many e-mail accounts are needed (for administration/teachers/learners), which also has financial implications.

USE 2 Teachers use computers to do their administration work

ICT RESOURCES

- a. **Number of computers:** A small number of computers (possibly two to four); accessible to administrative staff, principal and teachers; co-ordination needed regarding the maintenance of records and the filing of information.
- b. **Networked:** Ideally networked so that information can be shared, but not essential.
- c. **E-mail/Internet:**
 - Some e-mail access allowed for teachers needing to interact with other schools – preferable but not essential.
 - Access to the Internet also helpful – used to access government policy and related matters – but probably not essential initially.
- d. **Additional hardware:** Printer – essential.

LOCATION OF COMPUTERS

- a. **Administration office:** In the school clerk's office, possibly one computer in the principal's office.
- b. **Computer centre/laboratory:** N/A
- c. **Staff room:** Possibly one computer for staff in staff room; or
- d. **Media centre/library:** One in the library for staff.
- e. **Specific classrooms** – e.g. Science laboratory: N/A
- f. **All classrooms:** N/A
- g. **Other:** N/A

SOFTWARE PACKAGES

For administrative purposes:

- Basic spreadsheet and word-processing package essential; other more specific packages (such as timetabling, financial) – helpful; tailor-made software the top of the range – not essential.

For teaching and learning:

- Basic spreadsheet and word-processing package essential; other more specific packages (such as timetabling, financial) – helpful; tailor-made software the top of the range – not essential.

ICT TRAINING

Administrative staff:

Hardware

- Some training to ensure common understanding of the computer system.

Software

- Some training for relevant administrative staff in basic packages probably needed.
- Some training in use of e-mail and Internet likely to be needed.

Teachers:

Hardware

- Some training to ensure common understanding of the computer system.

Software

- Some training in basic software packages probably needed, e.g. spreadsheets.
- Some training in use of e-mail and Internet likely to be needed.
- Some subject teachers might need specialist training in the use of the computer for their work – such as for the typing of Maths symbols and scientific notation.

PROFESSIONAL DEVELOPMENT FOR TEACHERS

- Some work on assessment practices, especially in the context of the Revised National Curriculum Statements.
- Designing recording and reporting tools, such as rubrics.

IT TEACHER N/A

DEDICATED TECHNICAL ICT SUPPORT STAFF N/A

USE 3 Teachers use computers to prepare worksheets and tests for learners**ICT RESOURCES**

- a. **Number of computers:** At the minimum, a small number of computers at a central location, to which teachers have ready access.
- b. **Networked:** Ideally networked so that information can be shared, but not essential.
- c. **E-mail/Internet:**
 - Some e-mail access allowed for teachers needing to interact with other schools – preferable.
 - Access to the Internet also helpful – used to access government policy and related matters.

Additional hardware:

- A printer - essential (and should ideally be networked)
- Scanner- useful.

LOCATION OF COMPUTERS

- a. **Administration office:** A few computers for administrative purposes/one for the principal.
- b. **Computer centre/laboratory:** N/A
- c. **Staff room:** Computers may be in staff room; or
- d. **Media centre/library:** library; or
- e. **Specific classrooms:** Provision in individual classrooms or working spaces is a possibility – allows for readier access, but the benefits of informal support and learning from colleagues would be diminished. Ideally, combination of both classroom and centralised location.
- f. **All classrooms:** N/A
- g. **Other:** N/A

SOFTWARE PACKAGES**For administrative purposes**

- Basic spreadsheet and word-processing package essential; other more specific packages (such as timetabling, financial) – helpful; tailor-made software the top of the range – not essential.

For teaching and learning

- Basic spreadsheet and word-processing package essential; other more specific packages (such as timetabling, financial) – helpful; tailor-made software the top of the range – e.g. for report cards.

ICT TRAINING*Administrative staff***Hardware:**

- Some training to ensure common understanding of the computer system.

Software:

- Basic training in application of basic packages.
- Basic training in use of e-mail and Internet.

*Teachers***Hardware:**

- Some training to ensure common understanding of the computer system.
- Use of a scanner.

Software:

- Some training in use of e-mail and Internet likely to be needed.
- Training for teachers in the use of basic packages that would be helpful to them – spreadsheets, word processing and associated drawing tools and clip art.
- Some subject teachers might need specialist training in the use of the computer for their work – such as for the typing of Maths symbols and scientific notation or use of specialised art packages.

PROFESSIONAL DEVELOPMENT FOR TEACHERS

- Training in developing materials for use by learners, including the design of learning and assessment tasks and structured activities in the context of OBE. Further work on recording and reporting tools. Embedded in this would be associated work on learning theory; the scaffolding and mediation of knowledge; 'activity-based' learning; small group teaching and learning; and questioning skills. How to make good use of the textbook, or a range of such books, in developing additional learning materials would also be included.

IT TEACHER N/A**TECHNICAL ICT SUPPORT STAFF** N/A

USE 4 Teachers access online resources to support teaching and learning in their subject

ICT RESOURCES

- a. **Number of computers:** Sufficient number of computers for the administrative staff and the principal; and sufficient centrally located computers for teachers to do their administrative work, prepare worksheets and access online resources (possibly three to five computers).
- b. **Networked:** Computers should be networked.
- c. **E-mail/Internet:**
 - Teachers should have access to the e-mail
 - Access to the Internet to download material to use offline, e.g. teaching resources on Thutong, the DoE education portal (www.thutong.org.za) also helpful to access government policy and related matters.
- d. **Additional hardware:**
 - Printer/s – essential (printers should ideally be networked).
 - Scanner – essential (especially for illustrations and other images).
 - Data projector – useful.
 - CD writer – useful.

LOCATION OF COMPUTERS

- a. **Administrative office:** Sufficient for admin purposes (depending on size of administrative staff and size of the school).
- b. **Computer centre/laboratory:** N/A
- c. **Staff room:** Some centrally located computers for use by teachers in staff room; and/or
- d. **Media centre/library:** some computers in library; and/or
- e. **Specific classrooms:**
 - One or two in specialist classrooms, e.g. Maths, Science, Art.
 - In addition, a data projector and a computer in at least one venue which might be booked for use with learners would allow teachers to make material they had accessed online available to learners in class time. A laptop would make this option possible in a range of venues.
- f. **All classrooms:** N/A
- g. **Other:** N/A



SOFTWARE PACKAGES**For administrative purposes:**

- Basic spreadsheet and word-processing package and web browser essential; other more specific packages (such as timetabling, financial) – helpful; tailor-made software the top of the range – not essential.

For teaching and learning:

- At the minimum, in addition to the resources for use 3, teachers need a range of appropriate CDs; a well-annotated catalogue of educationally useful CD resources should be compiled to assist teachers in finding and selecting these. In addition, a catalogue of useful sites should be compiled. Thutong, the DoE education portal, will be of value here.

ICT TRAINING*Administrative staff***Hardware:**

- Some training to ensure common understanding of the computer system.

Software:

- Basic training in application of basic packages.
- Basic training in use of e-mail and Internet.
- Training in use of any tailor-made software.

*Teachers***Hardware:**

- Some training to ensure common understanding of the computer system/network.
- How to use a scanner.
- How to use a data projector.

Software:

- Basic training in use of e-mail and Internet.
- Training in use of any tailor-made software.
- Training for teachers in the use of basic packages that would be helpful to them – spreadsheets, word processing and associated drawing tools and clip art.
- Some subject teachers might need specialist training in the use of the computer for their work – such as for the typing of Maths symbols and scientific notation or use of specialised art packages.
- Teachers will need training in how to navigate a CD, use hyperlinks, browse the web and save and use online material for use off line.
- Training in how to prepare a PowerPoint presentation.

PROFESSIONAL DEVELOPMENT FOR TEACHERS

This may include professional development in such areas as:

- Subject-specific IT applications and developing materials using a word-processing programme.
- Evaluation of material found on a website; how to make educationally appropriate use of resources for learning accessed in this way, including how to develop visual literacy skills, adapt material and design differentiated activities using the same resources; how to modify material and much of the sort of work suggested for use 3.
- Facilitating whole-class discussion.

IT TEACHER

- While it is not necessary to employ a full-time IT teacher, it is crucial that one or more teachers be designated to be responsible for the management and use of ICTs.
- Ideally they should have some basic training around troubleshooting so as to be able to offer support to other teachers.

TECHNICAL ICT SUPPORT STAFF N/A

USE 5

Learners are taught to use computers to develop IT skills and knowledge. No formal attempts are made to integrate this work with subject-based learning; focus is on computer skills taught in relevant context - some use is made informally by learners (such as using a CD in their own time, or having access to the Internet.)

ICT RESOURCES

- a. **Number of computers:**
Sufficient number of computers for:
 - Administrative staff and principal
 - Teachers to do administration, prepare worksheets, etc. and search for teaching and learning resources.
 - 20 to 35 computers to equip one computer centre (some schools may have more than one computer centre).
- b. **Networked:**
 - All computers networked.
- c. **E-mail/Internet:**
 - All computers linked to e-mail/Internet.
- d. **Additional hardware:**
 - Printer/s networked – essential.
 - Scanner – essential.
 - Data projector – essential (used for teaching IT skills).
 - CD writer – useful.

LOCATION OF COMPUTERS

- a. **Administrative office:** Sufficient number for administrative purposes and for the principal's use.
- b. **Computer centre/laboratory:** A well-secured computer centre, with the appropriate number of computers so that there do not have to be more than two learners to a computer – ideally enough so that each learner can work at their own workstation.
- c. **Staff room:**
 - A small number of workstations located elsewhere for staff to use in free periods and after hours if the computer centre is heavily used by learners.
- d. **Media centre/library:** A small number of workstations located elsewhere for learners to use in free periods.
- e. **Specific classrooms:**
 - One or two in specialist classrooms, e.g. Maths, Science, Art.
 - In addition, a data projector and a computer in at least one venue which might be booked for use with learners would allow teachers to make material they had accessed online available to learners in class time. A laptop would make this option possible in a range of venues.
- f. **All classrooms:** N/A
- g. **Other:** N/A

SOFTWARE PACKAGES

For administrative purposes:

- Basic spreadsheet and word-processing package and web browser essential; other more specific packages (such as timetabling, financial) – helpful; tailor-made software the top of the range – not essential.

For teaching and learning:

- Teachers would need a range of appropriate CDs; a well-annotated catalogue of educationally useful CD resources should be compiled to assist teachers in finding and selecting these. In addition, a catalogue of useful sites should be compiled. Thutong, the DoE Education portal, will be of value here.
- Appropriate software packages for learners to develop the skills appropriate for their age/grade/needs.

ICT TRAINING*Administrative staff***Hardware:**

- Some training to ensure common understanding of computer network.

Software:

- Basic training in application of basic packages.
- Basic training in use of e-mail and Internet.
- Training in use of any tailor-made software.

*Teachers***Hardware:**

- Some training to ensure common understanding of the computer system.
- How to use a scanner.
- How to use a data projector.

Software:

- Basic training in use of e-mail and Internet.
- Training in use of any tailor-made software.
- Training for teachers in the use of basic packages that would be helpful to them – spreadsheets, word processing and associated drawing tools and clip art.
- Some subject teachers might need specialist training in the use of the computer for their work – such as for the typing of Maths symbols and scientific notation or use of specialised art packages.
- Teachers will need training in how to navigate a CD, how to use hyperlinks, browse the web and save and use online material for use off line.
- Training in how to prepare a PowerPoint presentation.

PROFESSIONAL DEVELOPMENT FOR TEACHERS

- As in use 4: Training in how to evaluate material found on a website; how to make educationally appropriate use of resources for learning accessed in this way, including how to develop visual literacy skills, adapt material and design differentiated activities using the same resources; how to modify material.
- Also work on facilitating whole-class discussion.
- IT person might need support in curriculum design, facilitating learning, assessment and classroom management.

IT TEACHER

- IT teacher with the necessary training to teach IT-related skills to learners; subject teachers will not be involved, so no additional training beyond that provided for use 4 will be needed.
- The IT teacher's job description should also include managing the computer centre and support of teachers/learners in their use of the IT resources informally, outside normal teaching hours.
- The IT teacher also needs to be able to do basic troubleshooting.
- Should keep an eye on maintenance of ICTs and be responsible for storage and management of all equipment.

TECHNICAL ICT SUPPORT STAFF

This may include a full-time or part-time staff member who is technically trained to do the following, among others:

- Troubleshoot.
- Offer technical support to administrative and teaching staff.
- Maintain hardware and computer networks, the server and so on.
- Manage, set up and operate all hard and software – data projectors, scanners, etc.

While it may not be possible to employ a full-time technical support staff member, it is important to designate one or more staff members to assist the IT teacher with some technical support/management of equipment, etc.

USE 6

Learners apply basic IT skills to work across the curriculum in their IT lessons, and informally outside official teaching time

ICT RESOURCES

- a. **Number of computers:** Sufficient number of computers for:
 - Administrative staff and principal.
 - Teachers to do administration, prepare worksheets, etc. and search for teaching and learning resources.
 - 20 to 35 computers per computer centre (the school may have more than one centre).
- b. **Networked:**
 - All computers networked.
- c. **E-mail/Internet:**
 - All computers linked to e-mail/Internet.
- d. **Additional hardware:**
 - Printer/s networked – essential.
 - Scanner – essential.
 - Data projector – essential.
 - CD writer – useful.
 - Television/video recorder – useful.

LOCATION OF COMPUTERS

- a. **Administration office:** Sufficient number for administrative purposes and for use by the principal.
- b. **Computer centre/laboratory:**
 - A well-secured computer centre, with the appropriate number of computers so that there do not have to be more than two learners to a computer – ideally enough so that each learner can work at their own workstation.
- c. **Staff room:**
 - A small number of workstations located elsewhere for staff to use in free periods and use after hours if the computer centre is heavily used by learners.
- d. **Media centre/library:** A small number of workstations located elsewhere for learners to use in free periods.
- e. **Specific classrooms:**
 - One or two in specialist classrooms, e.g. Maths, Science, Art.
 - In addition, a data projector and a computer in at least one venue which might be booked for use with learners would allow teachers to make material they had accessed on-line available to their learners in class time. A laptop would make this option possible in a range of venues.
- f. **All classrooms:** N/A

SOFTWARE

For administrative purposes

- Basic spreadsheet and word-processing package and web browser essential; other more specific packages (such as timetabling, financial) – helpful; tailor-made software the top of the range – not essential.

For teaching and learning

- Teachers would need a range of appropriate CDs; a well-annotated catalogue of educationally useful CD resources should be compiled to assist teachers in finding and selecting these. In addition, a catalogue of useful sites should be compiled. Thutong, the DoE education portal, will be of value here.
- Appropriate software packages for learners to develop the skills appropriate for their age/grade/needs.
- Some packages that are particularly relevant for subject teaching; in primary schools, it seems this level of work can be well delivered using the Khanya software.
- A selection of CDs that are useful in a range of subjects, and which learners can access in 'free' time during school hours and after school to do subject-related work.

ICT TRAINING*Administrative staff***Hardware:**

- Some training to ensure common understanding of how network functions.

Software:

- Basic training in application of basic packages.
- Basic training in use of e-mail and Internet.
- Training in use of any tailor-made software.

*Teachers***Hardware:**

- Some training to ensure common understanding of the computer system.
- How to use a scanner.
- How to use a data projector.

Software:

- Basic training in use of e-mail and Internet.
- Training in use of any tailor-made software.
- Training for teachers in the use of basic packages that would be helpful to them – spreadsheets, word processing and associated drawing tools and clip art.
- Some subject teachers might need specialist training in the use of the computer for their work – such as for the typing of Maths symbols and scientific notation or use of specialised art packages.
- Teachers will need training in how to navigate a CD, use hyperlinks, browse the web and how to save and use online material for use off line.
- Training in how to prepare a PowerPoint presentation.
- How to organise subject information and resources so that learners can easily access them; how to prepare work for learners to do online, and how to mark and return it to them in this way.

PROFESSIONAL DEVELOPMENT FOR TEACHERS

- As in use 5: Training in how to evaluate material found on a website; how to make educationally appropriate use of resources for learning accessed in this way, including how to develop visual literacy skills, adapt material and design differentiated activities using the same resources; and much of the sort of work suggested for use 3.
- Also work on facilitating whole-class discussion.
- Teachers will need support in curriculum design, and in thinking through how to integrate what has to be learnt in IT with what has to be learnt in subjects; subject teachers and the IT teacher will also need support in the use of subject-specific packages.
- Support in the design of tasks that can be built into a range of online resources available for learners to use – particularly in the context of the sort of material which Khanya provides (see section on useful resources), which teachers can customise, but also in the context of the standard packages more readily available; support in the evaluation of online activities available for learners, and in how to integrate them meaningfully into the subject curriculum.

DEDICATED IT TEACHER

- IT teacher with the necessary training to teach IT-related skills to learners; subject teachers will not be involved, so no additional training beyond that provided for use 4 will be needed.
- The IT teacher's job description should also include managing the computer centre and support of teachers/learners in their use of the IT resources informally, outside normal teaching hours.
- The IT teacher also needs to be able to do basic troubleshooting.
- Should keep an eye on maintenance of ICTs and be responsible for storage and management of all equipment.
- The IT teacher will also need support in the use of subject specific packages.

DEDICATED TECHNICAL IT SUPPORT STAFF

This may include a full-time or part-time staff member who is technically trained to do the following, among others:

- Troubleshoot.
- Offer technical support to administration and teaching staff.
- Maintain hardware and computer networks, the server and so on.
- Manage, set up and operate all hard and software – data projectors, scanners, etc.

While it may not be possible to employ a full-time technical support staff member, it is important to designate one or more staff members to assist the IT teacher with some technical support/management of equipment, etc.

USE 7 Learners use computers to do work on non-IT subjects from time to time, in a loose arrangement made by their teachers as needs demand and resources are available.

ICT RESOURCES

- a. **Number of computers: Sufficient number of computers for:**
 - Administrative staff and principal.
 - Teachers to do administration, prepare worksheets, etc. and search for teaching, learning resources and for learners to work on in classrooms or in library/media centre.
 - 20 to 35 computers per computer centre (the school may have more than one centre).
- b. **Networked:**
 - All computers networked.
- c. **E-mail/Internet:**
 - All computers linked to e-mail/Internet.
- d. **Additional hardware:**
 - Printer/s networked – essential.
 - Scanner – essential.
 - Data projector – essential.
 - CD writer – essential.
 - Digital camera – useful.
 - Television/video recorder – essential.
 - DVD player – useful.

LOCATION OF COMPUTERS

- a. **Administration office:** Sufficient number for administrative purposes and for use by the principal.
- b. **Computer centre:**
 - A well-secured computer centre, with the appropriate number of computers so that there do not have to more than two learners to a computer – ideally enough so that each learners can work at their own workstation.
- c. **Staff room:**
 - Sufficient number of workstations located elsewhere for staff to use in free periods and after hours if the computer centre is heavily used by learners.
- d. **Media centre/library:** Sufficient number of workstations located elsewhere for learners to use in free periods.
- e. **Specific classrooms:**
 - Sufficient number of computers in specialist classrooms, e.g. Maths, Science, Art.
 - In addition a data projector and a computer in at least one venue which might be booked for use with learners would allow teachers to make material they had accessed on-line available to their learners in class time.
 - A few laptops would make this option possible in a range of venues.
- f. **All classrooms:** Some and ideally all classrooms may have at least one computer.

SOFTWARE

For administrative purposes

- Basic spreadsheet and word-processing package and web browser essential; other more specific packages (such as timetabling, financial) – helpful; tailor-made software the top of the range – not essential.

For teaching and learning

- Teachers would need a range of appropriate CDs; a well-annotated catalogue of educationally useful CD resources should be compiled to assist teachers in finding and selecting these. In addition, a catalogue of useful sites should be compiled. Thutong, the DoE education portal, will be of value here.
- Appropriate software packages for learners to develop the skills appropriate for their age/grade/needs.
- Some packages that are particularly relevant for subject teaching; in primary schools, it seems this level of work can be well delivered using the Khanya software.
- A selection of CDs that are useful in a range of subjects, and which learners can access in 'free' time during school hours and after school to do subject-related work.

ICT TRAINING

Administrative staff

Hardware:

- Some training to ensure common understanding of how network functions.

Software:

- Basic training in application of basic packages.
- Basic training in use of e-mail and Internet.
- Training in use of any tailor-made software.

Teachers**Hardware:**

- Some training to ensure common understanding of the computer system.
- How to use a scanner.
- How to use a data projector.

Software:

- Basic training in use of e-mail and Internet.
- Training in use of any tailor-made software.
- Training for teachers in the use of basic packages that would be helpful to them – spreadsheets, word processing and associated drawing tools and clip art.
- Some subject teachers might need specialist training in the use of the computer for their work – such as for the typing of Maths symbols and scientific notation or use of specialised art packages.
- Teachers will need training in how to navigate a CD, use hyperlinks, browse the web and save and use online material for use off line.
- Training in how to prepare a PowerPoint presentation.
- How to organise subject information and resources so that learners can easily access them; how to prepare work for learners to do on-line, and how to mark and return it to them in this way.

PROFESSIONAL DEVELOPMENT FOR TEACHERS

- Training in how to evaluate material found on a website; how to make educationally appropriate use of resources for learning accessed in this way, including how to develop visual literacy skills, adapt material, design differentiated activities using the same resources and develop material.
- As at use 6: Training in how to evaluate material found on website; how to make educationally appropriate use of resources for learning accessed in this way, including how to develop visual literacy skills, adapt material and design differentiated activities using the same resources; how to modify material, and much of the sort of work suggested for use 3.
- Work on facilitating whole-class discussion
- Teachers will need support in curriculum design, and in thinking through how to integrate what has to be learnt in IT with what has to be learnt in subjects; subject teachers and the IT teacher will also need support in the use of subject-specific packages.
- Support in the design of tasks that can be built into a range of online resources available for learners to use – particularly in the context of the sort of material which Khanya provides (see section on useful resources section at end of the guide), which teachers can customise, but also in the context of the standard packages more readily available; support in the evaluation of online activities available for learners, and in how to integrate them meaningfully into the subject curriculum.
- School management might need support in curriculum planning and in timetabling so that computer resources are available to non-IT subject classes at least occasionally. This might include deciding to limit access to computer-related subjects for certain grades of learners, and supporting those who do have access to it to benefit from opportunities to consolidate IT skills in lessons across the curriculum.
- If computers are available in classrooms, teacher support in managing group work and conceptualising differentiated learning activities in an effective way would be needed.

DEDICATED IT TEACHER

- IT teacher with the necessary training to teach IT-related skills to learners; subject teachers will not be involved, so no additional training beyond that provided for use 4 will be needed.
- The IT teacher's job description should also include managing the computer centre and support of teachers/learners in their use of the IT resources informally, outside normal teaching hours.
- The IT teacher also needs to be able to do basic troubleshooting.
- Should keep an eye on maintenance of ICTs and be responsible for storage and management of all equipment.
- The IT teacher will also need support in the use of subject-specific packages.
- Teachers will need to feel confident in their ability to manage a class in the computer centre – but ideally should have the support of the computer centre manager/ IT teacher on such occasions.

DEDICATED TECHNICAL ICT SUPPORT STAFF

This may include a full-time or part-time staff member who is technically trained to do the following, among others:

- Troubleshoot.
- Offer technical support to administration and teaching staff.
- Maintain hardware and computer networks, the server and so on.
- Manage, set up and operate all hard and software – data projectors, scanners, etc.
- While it may not be possible to employ a full-time technician, some kind of system for regular technical support will need to be put into place.
- IT support available in the centre when subject teachers use it with their learners.

USE 8 Learners use computers to do subject related work in non-IT subject lessons in a sustained and well-integrated way

ICT RESOURCES

- a. **Number of computers:**
 - Sufficient computers for the administration and for use by the school principal.
 - In its most sophisticated form, this level requires sufficient resources for all learners to have ready access to a computer in any lesson across the curriculum, as such access is required. This can be achieved by having several computer centres which have adequate resources for a class of learners at a time, and enough of these so that at least one is always free of an IT-related subject class; classrooms with several computers in each; each learner having their own laptop.
 - At a less intensive level, computers might be made available on a regular basis for online work to be integrated into a certain subject or subjects where the school feels that the need for online work is particularly beneficial. This might be the case, for example, for intensive Maths development, or for certain parts of a graphic design learning programme in the FET band, or for use in Accounting.
 - The appropriate software will need to be provided, and sufficient computers available for learners to have access to them for this component of their work; creative timetabling will be needed unless resources are generous.
- b. **Networked:** All computers networked.
- c. **E-mail/Internet:** All computers have e-mail and Internet access.
- d. **Additional hardware:**
 - Printer/s networked – essential.
 - Scanner – essential.
 - Data projector/s – essential.
 - CD writer – essential.
 - Digital camera – essential.
 - Television/video recorder/DVD – essential.

LOCATION OF COMPUTERS

- a. **Administration office:**
 - Sufficient number for administrative purposes and for use by the principal.
- b. **Computer centre:**
 - One or more well-secured computer centres, with the appropriate number of computers so that there do not have to be more than two learners to a computer – ideally there should be enough so that each learners can work at their own workstation.
- c. **Staff room:**
 - Sufficient number of workstations located elsewhere for staff to use in free periods and after hours if the computer centre is heavily used by learners.
- d. **Media centre/library:**
 - Sufficient number of workstations located elsewhere for learners to use in free periods.
- e. **Specific classrooms:**
 - Sufficient number of computers in specialist classrooms, e.g. Maths, Science, Art.
 - In addition, a data projector and a computer in at least one venue which might be booked for use with learners would allow teachers to make material they had accessed online available to their learners in class time.
 - A few laptops would make this option possible in a range of venues.
- f. **All classrooms:**
 - A few computers in all classrooms.

SOFTWARE**For administrative purposes**

- Basic spreadsheet and word-processing package essential and web browser; other more specific packages (such as timetabling, financial) – helpful; tailor-made software the top of the range – not essential.

For teaching and learning

- The appropriate software will need to be provided, and sufficient computers available for learners to have access to them for this component of their work. Creative timetabling will be needed unless resources are generous.
- Teachers would need a range of appropriate CDs; a well-annotated catalogue of educationally useful CD resources should be compiled to assist teachers in finding and selecting these. In addition, a catalogue of useful sites should be compiled. Thutong, the DoE education portal, will be of value here.
- Appropriate software packages for learners to develop the skills appropriate for their age/grade/needs.
- Some packages that are particularly relevant for subject teaching; in primary schools, it seems this level of work can be well delivered using the Khanya software.
- A selection of CDs that are useful in a range of subjects, and which learners can access in 'free' time during school hours and after school to do subject-related work.

ICT TRAINING*Administrative staff***Hardware:**

- Some training to ensure common understanding of how network functions.

Software:

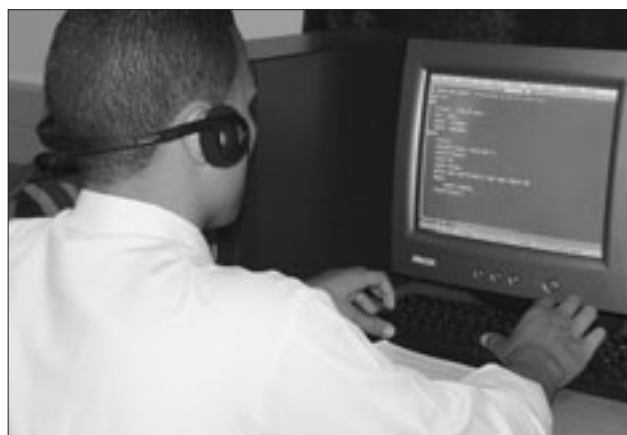
- Basic training in application of basic packages.
- Basic training in use of e-mail and Internet.
- Training in use of any tailor-made software.

*Teachers***Hardware:**

- Some training to ensure common understanding of the computer system.
- How to use a scanner.
- How to use a data projector.

Software:

- Basic training in use of e-mail and Internet.
 - Training in use of any tailor-made software.
 - Training for teachers in the use of basic packages that would be helpful to them – spreadsheets, word processing and associated drawing tools and clip art.
 - Some subject teachers might need specialist training in the use of the computer for their work – such as for the typing of Maths symbols and scientific notation or use of specialised art packages.
 - Teachers will need training in how to navigate a CD, use hyperlinks, browse the web and save and use on-line material for use off line.
 - Training in how to prepare a PowerPoint presentation.
 - How to organise subject information and resources so that learners can easily access them, how to prepare work for learners to do on-line, and how to mark and return it to them in this way.
- Teachers will need specific training in the package that learners will be using as part of their learning programme.



PROFESSIONAL DEVELOPMENT FOR TEACHERS

This may include professional development in such areas as the following:

- As in use 7: Training in how to evaluate material found on a website; how to make educationally appropriate use of resources for learning accessed in this way, including how to develop visual literacy skills, adapt material and design differentiated activities using the same resources; how to modify material, and much of the sort of work suggested for use 3.
- Work on facilitating whole-class discussion
- Teachers will need support in curriculum design, and in thinking through how to integrate what has to be learnt in IT with what has to be learnt in subjects; subject teachers and the IT teacher will also need support in the use of subject-specific packages;
- Support in the design of tasks that can be built into a range of online resources available for learners to use – particularly in the context of the sort of material which Khanya provides (see section on useful resources section at end of the guide), which teachers can customise, but also in the context of the standard packages more readily available; support in the evaluation of online activities available for learners, and in how to integrate them meaningfully into the subject curriculum.
- School management might need support in curriculum planning and in timetabling so that computer resources are available to non-IT subject classes at least occasionally. This might include deciding to limit access to computer-related subjects for certain grades of learners, and supporting those who do have access to it to benefit from opportunities to consolidate IT skills in lessons across the curriculum.
- If computers are available in classrooms, teacher support in managing group work and conceptualising differentiated learning activities in an effective way would be needed.
- Teachers will need support in designing their learning programmes in such a way that they incorporate online resources in an integral way.
- Where subject-specific software is selected as a fundamental component of the learning programme, teachers will need support in understanding the approach to the subject that is adopted, and how they should support learners in the use of the package for their learning.

IT TEACHER/S

- IT teacher with the necessary training to teach IT related skills to learners.
- The IT teacher's job description should also include managing the computer centre and support of teachers/learners in their use of the IT resources informally, outside normal teaching hours.
- The IT teacher also needs to be able to do basic troubleshooting.
- Should keep an eye on maintenance of ICTs and be responsible for storage and management of all equipment.
- The IT teacher will also need support in the use of subject-specific packages.
- As for use 7, subject teachers will need to feel confident in their ability to manage a class in the computer centre – but ideally should have the support of the computer centre manager/ IT teacher on such occasions.

TECHNICAL ICT SUPPORT STAFF

This may include a full-time or part-time staff member who is technically trained to do the following, among others:

- Troubleshoot.
- Offer technical support to administration and teaching staff.
- Maintain hardware and computer networks, the server and so on.
- Manage, set up and operate all hard and software – data projectors, scanners, etc.

It is necessary to have a full-time technician to manage and maintain all ICT equipment and software, troubleshoot and offer technical support to all staff and learners.



GLOSSARY OF TERMS

Attachment	A text or graphic file that is attached (linked) to and sent with an e-mail message.
ADSL (Asymmetric Digital Subscriber Line)	A system for providing a very fast Internet connection that allows you to use a telephone at the same time.
Application software	Programs utilised by the user such as word processing, spreadsheets, desktop publishing and databases.
ATM	Automatic teller machine.
Backup	To make a duplicate but separately stored copy of the contents of a computer-held data set, software application or individual files; back-ups should be done regularly.
Bandwidth	How much information you can send or receive through a telephone line connection when you are connected to the Internet; usually measured in bits per second (bps). A full page of English text is about 16 000 bits . This would take about 1 second to download .
Bit	Abbreviation for binary digit. The smallest unit of information a computer can store.
Boot	To start up a computer. The computer is regarded as 'bootstrapping' itself by loading the program which starts its operating system.
Byte	An eight-bit unit of information that represents one character.
Browser (web browser)	A program (software) that is used to look at various kinds of Internet resources.
Chat rooms	Internet relay chat (IRC) takes place in chat rooms which is a method of ensuring 'real-time' and multi-user communication. When Internet users are online simultaneously, they can communicate by sending text messages which are read almost as quickly as they are sent, i.e. on a par with normal face-to-face conversation.
CD-ROM (compact disk, read-only memory)	A CD-ROM is a round disk (CD) that is designed to store data in the form of text and graphics, as well as hi-fi stereo sound.
CD writer (compact disk writer)	Hardware device used to save information onto a CD.

CD ROM Drive	CD- ROM drive a device built into the computer (or external) used for reading CDs. As most software is distributed on CD-ROMs, it is important that computers come equipped with a CD-ROM drive.
Computer-aided instruction (CAI)	Software that is used in conjunction with normal teaching methods to provide opportunities for drill and additional practise in a given subject.
Computer Application Technology	FET subject, part of the new revised national curriculum (previously, computer studies - Standard Grade).
Computer-based instruction (CBI)	Use of computer software to teach or train learners (the software 'takes the place of the teacher').
Computer centre or (computer laboratory)	A classroom equipped with on average between 20 and 35 computers and possibly other ICTs , used to teach learners computer literacy and for cross-curricular integration of ICTs.
Computer conferencing	Development of electronic mail designed to support many-to-many communication. Each conference consists of a group of users who have a common interest in the conference subject matter. Computer conferencing software enables organisation, storage, structuring and retrieval of messages. In particular, messages may be organised under different topics, by author or by date of posting.
Computer literacy	The ability to operate a computer and to understand the language used in working with a specific system or systems – basic skill in use of computers, from the perspective of such skill being a necessary societal skill. It includes competency in the use of basic software packages such as Word, Paint, Powerpoint. (Computer literacy is currently incorporated as part of the Technology Learning Area in grades 8 and 9).
Computer-mediated communication (CMC)	Use of computers to communicate, as in computer conferencing and electronic mail .
Computyping	Using a computer to learn to type (currently offered as a matric subject).
CPU (Central Processing Unit)	The Central Processing Unit is the brain of the computer. The clock speed, usually quoted in megahertz (MHz), determines how fast each chunk of data is moved through the CPU. The faster the clock speed, the more powerful the computer.

Crash	Sudden failure of software or hardware, often resulting in no response to mouse or keyboard actions.
Cyberspace	Term originated by author William Gibson in his novel Neuromancer. The word 'cyberspace' is currently used to describe the whole range of information resources available through computer networks.
Database or databank	Any collection of data, or information, that is specially organised for rapid search and retrieval by a computer. Databases are structured to make the storage, retrieval, modification and deletion of data quick and easy.
Data capturer	A person whose task is to transfer data from one medium into a computerised database.
Data projector	Device used to project a colour image output from a computer onto a large screen.
Default settings	The settings which occur for every program, for example, in a word processing program the default settings would be single line spacing; 1 inch margins; tab stops every 5 spaces. Default settings vary from one program to another and can be changed by the user.
Desktop computer	Traditional office or personal computer. This has three or more parts linked together by cables: the system unit which houses the central processing unit and disk drives ; the monitor ; and a keyboard and probably a mouse.
Dial-up access	A type of connection to the Internet that allows you to call a computer directly on the Internet, staying online during the time you are connected.
Digital camera	A camera which captures and stores images as digital (electronic) information. Images can be stored either on a memory chip in the camera, on disks or in some cases on plug-in memory cards.
Digital divide	The gap between those who have computers and those who do not, as well as the gap between those who are computer literate and those who are not.
Document	The general term given to a file created using a word processor, for example, a memo; fax; an article.

DOS (Disk Operating System)	Standard operating system designed to manage files for personal computers, e.g. MS-DOS, developed by Microsoft for the IBM PC.
Download	To use one computer to obtain data from another computer or from the Internet, electronically. Downloaded information can be incorporated into other files , displayed, printed or saved.
DVD (Digital Versatile Disk)	Data storage medium, optical disk capable of storing high quality video as well as data such as programs, text, still images and sound, including entire movie films (also known as 'digital video disk').
DVD player	A machine on which DVDs are played. The machine is connected to a television set so that the DVD can be viewed (in the same way as one would connect a video recorder to a TV to be able to view a video).
e-Education	In the South African context, the concept of e-Education revolves around the use of ICTs to accelerate the achievement of national education goals. E-Education is about connecting learners and teachers to each other and to professional support services, and providing platforms for learning.
E-mail (electronic mail)	Messages, usually text, sent from one person to another via computer. E-mail can also be sent automatically to a large number of addresses using a mailing list .
ENCARTA	A multimedia educational information resource. It comprises a set of CDs which is essentially like an electronic encyclopaedia.
Extension/file extension	Part of the file that follows the name of the file, e.g. doc is the extension of a word file called letter.doc . File extensions are used to classify documents according to file types, e.g. all Word files have a doc. extension and all Excel files have a .x/s extension.
FAQ (Frequently Asked Questions)	FAQs are documents that list and answer the most common questions on a particular subject - often seen on websites.
Favourites	When you find websites or pages that you like, you can keep track of them so it is easy to open them in the future by adding them to your Favourites folder – it is like an address book of favourite sites. Any time you want to open that page, just click the Favourites button on the toolbar, and then click the shortcut in the Favourites list.

File	A named collection of data – a computer program, document or a graphic that exists on a storage medium such as a hard disc , floppy disc or CD-ROM .
Floppy disc	A removable magnetic storage medium, typically 3.5 inch size, with a capacity of storing 1.44 MB
Firewall	A means of protecting a networked computer system to prevent unauthorised access.
GIS (Geographic Information System)	A computer system for capturing, storing, checking, integrating, manipulating, analysing and displaying data related to positions on the earth's surface. Typically, a GIS is used for handling maps of one kind or another. These might be represented as several different layers where each layer holds data about a particular kind of feature (e.g. roads). Each feature is linked to a position on the graphical image of a map.
Hard disk or (Hard drive)	A hard disk is inside the computer and has a large storage capacity. A hard disk holds program files and can be used to store the user's documents.
Hardware	Physical components of a computer or a communications system, including both mechanical and electronic parts, such as the processor, hard drive, keyboard, monitor, cables, mouse and printer. Contrasted with software .
Home page	Introductory or opening webpage of a website belonging to an individual or organisation.
Hyper link	An element in an electronic document that links to another place in the same document or to an entirely different document. Typically you click on the hyperlink to follow the link. For example, if you open a webpage containing information about the city of Johannesburg, you might find a link related to gold mining. If you click on the link, it will open up the webpage dealing with gold mining.
Hypertext	A special type of database system in which objects (text, pictures, music, programs, and so on) can be creatively linked to each other. When you select an object, you can see all the other objects that are linked to it. You can move from one object to another even though they might have very different forms. For example, while reading a document about the South African musician, Spokes Mashiane, you might click on the word penny whistle, which could display a document on the nature of the instrument or a document on Kwela music or perhaps even invoke a recording of one of Spokes Mashiane's pieces. The user can choose to follow the link or to continue using the original file sequentially.

Image	A picture or graphic that appears on a webpage.
IT (Information Technology)	IT is short for Information Technology is the broad subject concerned with all aspects of managing and processing information, especially within a large organisation or company. Because computers are central to information management, computer departments within companies, universities and schools are often called IT departments.
Information Technology	FET subject in the new revised national curriculum (previously Computer Studies - Higher Grade).
Information and Communication Technologies (ICTs)	The technologies which together support people's ability to manage and communicate information electronically. They include not only computers, but also such technology as digital cameras , video recorders, television and radio.
Interactive	A computer system that will accept input from a human being and will respond according to that input. The fact that a computer places text on a screen when you type does not mean that it is truly interactive. True interactivity is when you make a change in the programme and it responds according to that change. For example, most good computer games are interactive.
Internet	The vast collection of interconnected networks that all use the TCP/IP protocols and that evolved in the late 60s and early 70s. The Internet connects roughly over 100 000 independent networks into a vast global Internet.
Internet connectivity	Actual number of computers connected to the Internet in any of the following means: dial-up connection, through a service provider, through satellite, etc., in any set-up, e.g., stand alone, networked, etc.
Intranet	A private network inside a company or organisation that uses the same kinds of software that you would find on the public Internet, but that is only for internal use. As the Internet has become more popular, many of the tools used on the Internet are being used in private networks. For example, many companies have web servers that are available only to employees. Usually connected by special high speed cables rather than phone lines.
ISDN (Integrated Services Digital Network)	Telecommunications standard for the transmission of digital information over ordinary telephone lines, and the name for the digital telephone network. Contains channels for digitised speech, data, image or video signals.

ISP (Internet Service Provider)	Just as you have a telephone service provider, you have to subscribe to an ISP if you want Internet access. Major ISPs in South Africa include MWeb and IAfrica – there are many others.
Kilobyte (KB)	1024 bytes (in multiples of 8 bytes).
Laptop computer	Portable computer, small enough to carry around and use on your lap.
Leased line	A phone line that is rented exclusively from one location to another to receive a high-speed Internet connection.
Listserver/mailling list	Automated e-mail distribution system, one method of supporting discussion groups using e-mail. The list is of e-mail addresses of everyone who has joined the group (known as subscribers). A message posted to the group is sent to the listserver, which copies the message to every subscriber on its list. Each subscriber finds a copy of all the new messages from the group waiting in the mail. Also sometimes known as a 'mailing list'.
Local Area Network (LAN)	A computer network limited to the immediate area, usually the same building or floor of a building.
Login	The user name used to gain access to a computer system. This is not secret, in contrast to a password .
Megabyte (MB)	A unit of computer memory or data storage capacity equal to 1 048 576 (220) bytes (one million bytes).
Megahertz (MHz)	Millions of cycles per second. The unit of frequency used to measure the clock rate of modern digital logic, including microprocessors. MHz pertains to the speed at which the computer operates.
Memory	The computer circuitry that holds data which is waiting to be processed.
Menu	A list of commands or options. Usually a number or the first letter of an option is pressed or you can move your cursor onto the option required and press Enter. You can also use the mouse to select whichever option you require.

Modem MO dulator DE Modulator	A device which allows the computer to communicate with other computers along a telephone line.
Monitor	The computer screen.
Motherboard	Main printed circuit board (PCB) in the computer, which holds the principal components. The processor and clock chips will either be plugged into or soldered to the motherboard.
Multimedia	Resources that include different kinds of media, for example, plain text and audio; or audio, video and text.
Netiquette	The etiquette to be used on the Internet .
Network	Any time you connect two or more computers together so that they can share resources, you have a computer network.
Online	Connected to the Internet. To work online you must first create a connection to the Internet via a network or by dialling up to your Internet service provider .
Online resources	Resources that are available (very often free of charge) on a website.
Operating system	The most important program that runs on a computer. Every general purpose computer must have an operating system to run other programs . Operating systems perform basic tasks, such as recognising input from the keyboard, sending output to the monitor screen , keeping track of files and directories on the hard disc and, controlling peripheral devices such as disc drives and printers. Operating systems provide a software platform on top of which other programs, called application programs, can run.
Overhead projector	A device used to project text and images off a transparency onto a white screen or wall.
Password	A code used to gain access to a locked Internet system (e.g. you have to have a password to do Internet banking).
Pixel	Short for picture element, a pixel is the smallest unit in a graphic image. Computer display devices use a matrix of pixels to display text and graphics.

Platform	The underlying hardware or software for a system. For example the platform might be an Intel 80486 processor running DOS Version 6.0. The term is often used as a synonym of operating system .
Port	Slots in the back of a computer to plug in another piece of hardware , such as a printer, a mouse or a scanner.
Portal	Web portal – commonly referred to as simply a <i>portal</i> , is a website or service that offers an broad range of resources and services, such as discussion forums. <i>Thutong</i> , (www.thutong.org.za) the Department of Education's portal delivers information of a wide range of educational issues including curriculum and teaching and learning resource materials.
PowerPoint	A software package developed specifically for facilitating the development of presentations. (Such presentations can be viewed on the computer monitor or projected onto a screen with the use of a data projector .)
Power surge	Fluctuations in electrical current that can damage computer hardware or corrupt data.
Program	An organised list of instructions that, when executed, causes the computer to behave in a predetermined manner. Without programs, computers are useless. A program is like a recipe. It contains a list of ingredients (called variables) and a list of directions (called statements) that tell the computer what to do with the variables. Programs are also sometimes referred to as software or an application. They serve as a tool to perform a particular function, for example, Word, is a word processing program that allows one to type and layout documents.
RAM (Random Access Memory)	The most common computer memory which can be used by programs to perform necessary tasks while the computer is on. An integrated circuit memory chip allows information to be stored or accessed in any order and all storage locations are equally accessible. The size of the RAM (or memory) is described in Megabytes or Meg . For example, the text of a six hundred page paperback book would require about a megabyte of storage. A typical desktop computer has 256 Megs of RAM.

Real time	Synchronous communication, for example talking to someone on the phone is in real time, whereas listening to a message someone left on your answering machine is not – this is called asynchronous communication.
Refurbished computers	Used or second-hand computers that have had all data cleaned from their hard drives. (Usually sold more cheaply than new computers.)
Scanner	Device by which hard-copy pictures and text can be converted into digital form for use on a computer. Small hand-held devices work by rolling the scanner head across the paper. Larger flatbed scanners work rather like a portable photocopying machine. With a speech synthesiser, it is possible to scan text into the computer and hear it read aloud. Scanners can also be used to read bar codes and convert them into numeric data.
Search engine	A web-based tool that finds webpages based on terms and criteria specified.
Server	A computer, or a software package, that provides a specific kind of service to client software running on other computers. The term can refer to a particular piece of software, such as a WWW Server, or to the machine on which the software is running, e.g. 'Our mail server is down today, that's why e-mail isn't getting out.'
Simulations	In computing, pre-defined but dynamic model of a situation which allows the user to pretend to do things that might be impractical or dangerous in real life. This could be motor racing or heart surgery. There are also decision-making simulations such as moving house.
Software (packages)	Generic term for all computer programs. Software falls into two major types: applications such as spreadsheets or databases, and systems software such as MS-DOS or Windows. In addition, there are utilities or tools. Contrasted with hardware.
Spreadsheet package	A computer program that allows you to create and manipulate spreadsheets electronically. The spreadsheet application allows words and figures to be entered into individually identifiable cells on a grid format. Cells can be linked by formulae, so that altering numbers in individual cells will produce an alternative set of results. This enable you to study various <i>what-if</i> scenarios. Spreadsheets may be used to model situations whose rules are governed by mathematical relationships, they are therefore useful for the management of budgets.

Stiffy disk	Small portable data storage medium in which the disk is flexible (as opposed to a hard disk). Currently usually a 3.5 inch disk in a rigid plastic case. (Known as a floppy disk in other countries.)
Template	A template is like a pattern – an outline that is used over and over. A template for a document is a basic document with a design, but it has no content or information. You open the template document, insert the content or information into the document and then save the document under a new name.
URL (Uniform Resource Locator)	The standard way to give the address of any website or resource within a website on the Internet that is part of the worldwide web.
Upload	The act of transferring information (normally files) from your computer to the Internet.
Virus	Mischievous or destructive software transferred covertly to files and applications, often via the Internet or with other files on a disk. Some can disable a computer or network once activated and must, if possible, be removed using anti-virus software. There are, however, many hoax virus warnings and users should not pass on such warnings unless they are sure of their reliability.
Web browser	A software programme that allows you to view, search and download items from the web. Common browsers are Netscape and Internet Explorer.
Webmaster	A person who maintains a website.
Webpage	A file accessible by a web browser on the worldwide web webpages can contain text, sounds, pictures, movies and hypertext links to other webpages.
Website	A set of webpages designed and published on a web server for a person or organisation.
Word processing package	Software originally devoted to the creation, editing, formatting, storage, revision and printing of text, but currently often including the capacity to include graphs, spreadsheets and photographs, and to produce sophisticated page layouts.
Workstations	Desks or tables where learners can work in groups or individually.
Worldwide web (www)	Also known as the www, W3 or simply the web. A distributed information service on the Internet of linked hypertext documents accessed using a web browser such as Microsoft Internet Explorer or Netscape. On the web, any document can be linked to any other document.

SOME USEFUL RESOURCES

NOTE:

- The suppliers, service providers and websites mentioned below serve merely to illustrate the range of useful services and resources available. This list is, however, by no means complete. The authors of this guide further wish to state that the selection of the following suppliers and service providers is not an endorsement of the quality of these services or products. It is merely intended to give you a 'taste' of what is out there. We hope that you will be inspired to do your own research and seek out suppliers, service providers and useful websites that will help you to build your own database of information pertaining to the implementation of ICTs in your school.

Buying hardware

As stated earlier in this guide, when purchasing ICT hardware you need to take a number of things into account.

- The cheapest deal is not necessarily the best. You need to consider whether the company you are dealing with has a good reputation, what kind of back-up service it provides, possible service contracts and length of guarantee offered on purchases. Negotiate with suppliers who are willing to make long-term arrangements for schools at competitive prices.
- Schools should also think about organising themselves into local consortia with other schools to increase buying power. The ICT subject advisors in the provincial education departments could also play an important part in such a structure. In addition to price and quality benefits to individual schools, an organised approach would have other benefits such as standardisation of hardware and software platforms, enabling more effective sharing of educational resources across schools.
- Should you buy refurbished computers? This has its pros and cons. While there are instances of schools purchasing refurbished computers that have turned out to be more trouble than they are worth, there are also well-documented instances where the purchase of refurbished computers has been very successful. As with all things, if your school decides to go the route of buying refurbished computers, it is important that you do the necessary research first. The following considerations are important:
 - Is the company or organisation that is selling refurbished computers well known?
 - How old are the computers? At this point you should not be looking at anything older than a Pentium III. (Technological change is so rapid that within a very short space of time computers become so outdated that you might, for example, find that you cannot run the latest software on them.)
 - Does the company guarantee that all the old data have been properly removed?
 - What kind of guarantee is offered?
 - What kind of after-sale service, if any, is offered?
 - What is the cost of a refurbished computer compared to a new one?

You may want to check the Internet for companies selling refurbished computers, but before you commit yourself to a purchase, ask the company or organisation to provide you with contact details of satisfied customers so that you can check with them yourself.



Computer Aid International, the world's largest charitable provider of refurbished computers to schools and non-profit organisations has recently opened an office in Johannesburg, you may want to contact them for further information regarding refurbished computers.

Guide for computer buyers

Recommending websites or any other sources of information providing buyer guides is risky because information becomes outdated and if these sources are not updated the advice could be incorrect.

We would suggest looking at e-Books.com. These are cheaper electronic versions of the latest books (like, *Buying a Computer for Dummies*) and you can be sure that they are going to be kept up to date.
http://usa1.ebooks.com/ebooks/book_display.asp?IID=175923

Another useful website is *Help with PCs*
<http://www.helpwithpcs.com/buying/buying.htm>

Obtaining software

Purchase of software also requires careful thought. It is important that teachers become skilled in evaluating software so as to ensure that purchases meet the specific needs required. Be cautious about products that claim to be 'interactive' or that claim to take over the teaching role. Such claims may be exaggerated. Always examine the product carefully before committing yourself to purchasing it.

Free operating system from Microsoft

Microsoft has entered an agreement to provide free software to South African schools for the next five years. For more information, go to the Microsoft SA School Agreement web site:
<http://www.microsoft.com/emea/education/partnersInLearning/schoolAgreement.msp>

You can download the agreement from this site, complete it and post it off to Microsoft and they will send you all the software you require for free.

Contact Microsoft Call Centre:
Tel: +27 11 257 0000, 0860 22 5567
Fax: +27 11 257 0257

PO Box 5817
Rivonia 2128
South Africa.

Training programmes

Educators' Network Distance Modular Training

<http://www.school.za/edn/what.htm>

This is a collection of 17 training modules for educators on the integration of ICT into education. The modules are suitable for anyone who has entry-level computer skills. The contents deal with different aspects of ICT integration. An integral part of the Educators' Network approach is the distance training that SchoolNet SA administers. Educators can register for a course at the beginning of each term and choose the module they want to study. They are then assigned to a group and to a mentor with whom they communicate via e-mail – completing their assignments, commenting on each other's work and reporting back on their learning. There is a fee for the distance education course, but the materials are available free of charge on the Internet or on CD-ROM. These materials are now accredited by the University of KwaZulu-Natal as a distance course. See <http://ace.schoolnet.org.za> for more information.

Intel Teach to the Future

<http://teach.schoolnet.org.za/>

SchoolNet SA administers the Intel® Teach to the Future programme. It is a worldwide initiative that brings together resources from leading high-tech companies to improve ICT integration in the classroom. This professional development programme was designed to address the challenges educators face in effectively applying computers and the Internet to enhance learning. The facilitator-led training incorporates the use of the Internet, webpage design and multimedia software. The programme is free to teachers in schools but it is not for beginners. For more information on how it has been working so far in South Africa you may visit <http://www.intel.co.za/education/>

Partners in Learning Programme

<http://www.microsoft.com/Education/PartnersinLearning.aspx>

Microsoft, in cooperation with the Department of Education, is designing a comprehensive range of teacher development resources and training programmes covering the full spectrum, from basic ICT skills training to curriculum-integrated resources. SchoolNet SA is providing the training with ICT focus for educators. This face-to-face training takes place on site at selected schools. The materials are on CD and will be available on Thutong, the national education portal.

Khanya

www.khanya.co.za

Khanya is the Western Cape Education Department's Technology Education Project.

Contact Khanya for training and training material – basic computer literacy with examples of educational uses.

The International Computer Driver's Licence (ICDL)

<http://www.icdl.org.za>

This is an internationally recognised entry standard for general computer literacy. While not specifically for education, some South African higher education institutions use it as an entry requirement for studies. It comprises the following seven modules:

1. Basic concepts of IT
2. Using and managing files
3. Word processing
4. Spreadsheets
5. Databases
6. Presentation tool
7. Information and communication

You can find out more about this on the website.

ICT Integration Project Organisations

*I*EARN*

<http://www.iearn.org/>

Inter-classroom collaborative projects conducted with the use of ICT

Global Teenager Project

<http://www.globalteenager.org/>

Learning Circles for inter-classroom collaboration

Think.com

<http://www.think.com/>

A free global hosted web application, hosted by Oracle

Internet search engines

For the South African version of Google, the most popular and efficient search engine currently, go to <http://www.google.co.za> You will have the option of searching for South African resources only or searching the whole Web. Google is available in Afrikaans, Sesotho, isiZulu and isiXhosa

Aardvark (www.aardvark.co.za) and Ananzi ([+www.ananzi.co.za](http://www.ananzi.co.za)) have a wealth of information on South African and African topics.

Websites

Some useful South African websites for teaching and learning resources

- **Department of Education, Thutong South African Education Portal**

www.thutong.org.za

The national education portal – delivers information, curriculum and support materials to the South African schooling community, offering thousands of resources – all free. Register now!

- **Learn.co.za**

www.learn.co.za

Learn.co.za was set up as part of the Learning Channel Johnnic Communications group initiative to develop educational content for print and electronic media, as well as partner with broadcast and new-media to be an innovative multimedia educational platform.

This site offers information about OBE, matric revision and an archive of lessons in Maths, Science, English, Geography, History, Business Economics and more.

- **Mathematics Learning and Teaching Initiative (MALATI)**

www.wcape.school.za/malati

As a project of the Western Cape Department of Education, MALATI works independently, complementing the government curriculum development, seeking to develop, pilot and spread alternative approaches and tools for teaching and learning Mathematics that are aligned with the national curriculum requirements.

This website contains a substantial selection of Maths curriculum support materials.

- **SchoolNet SA**

www.school.za

SchoolNet SA was established in November 1997 as a non-profit educational organisation. The vision was to create learning communities of educators and learners who use ICTs to enhance education in South Africa. The organisation arose from the work of provincial schools networks – non-profit collaborative entities formed by networks of schools to assist each other in gaining access to and using the Internet and computers.

SchoolNet SA offers a large range of educational, technical and support services related to the implementation of ICTs in education. This website offers a range of teacher resources for educator development in ICT integration as well as links to a host of other sites offering free resources.

Some useful international websites for teaching and learning resources

- **Classroom Connect:**
<http://www.classroom.com/>
 Searchable directory of free online lesson plans and lesson plan resources.
- **Commonwealth of Learning:**
www.col.org
 The Commonwealth of Learning (COL) is an intergovernmental organisation created by Commonwealth Heads of Government to encourage the development and sharing of open learning/distance education knowledge, resources and technologies. COL is helping developing nations improve access to quality education and training.
- **CyberSchoolBus:**
<http://www.un.org/Pubs/CyberSchoolBus/index.asp>
 United Nations global teaching and learning resources.
- **DiscoverySchool:**
<http://school.discovery.com/>
 DiscoverySchool.com is dedicated to making teaching and learning an exciting, rewarding adventure for students, teachers, and parents. It includes Kathy Schrock's Guide for Educators at <http://school.discovery.com/schrockguide/>
- **GINIE (Global Information Networks in Education) project:** www.ginie.org GINIE is a web-based resource that is designed specifically for developing countries. This tool is geared towards educational professionals and provides information to train teachers and assists in the development of policies for using ICTs.

 Free educational materials are provided and teachers are encouraged to post their own productions to the site. This site also provides opportunities for teachers and other education professionals to network.
- **United Nations Education, Scientific and Cultural organisation (UNESCO):**
www.unesco.org
 UNESCO is involved across a range of sectors including education. This website provides links to information regarding many education-related projects, conferences and publications.

- The **UNESCO SchoolNet Toolkit** for Asia includes valuable guidelines about ICT in education that can be applied more globally.

<http://www.unescobkk.org/education/ict/v2/info.asp?id=16282>

Book 1: ICTs in Education and SchoolNets

<http://www.unescobkk.org/education/ict/resources/JFIT/schoolnet/toolkit/guidebook1.pdf>

Book 2: Planning SchoolNet Programmes

<http://www.unescobkk.org/education/ict/resources/JFIT/schoolnet/toolkit/guidebook2.pdf>

Book 3: Implementing SchoolNet Programmes

<http://www.unescobkk.org/education/ict/resources/JFIT/schoolnet/toolkit/guidebook3.pdf>

Book 4: Practitioner's Guide

<http://www.unescobkk.org/education/ict/resources/JFIT/schoolnet/toolkit/guidebook4.pdf>

- **UNESCO (ICT) Portal for Teachers**

<http://www.unescobkk.org/ips/ict/ict.htm>

This Information and Communication Technology (ICT) Portal for Teachers provides a gateway to Internet resources and websites to help teachers use ICT to enhance their teaching.

- **UNESCO International Bureau of Education (IBE):**

www.ibe.unesco.org

This site hosts a curriculum bank of HIV/AIDS educational materials.

- **Wikipedia:**

www.wikipedia.org

Online free content encyclopaedia.

- **Webopedia:**

www.webopedia.com

Free online dictionary for words, phrases and abbreviations that are related to computer and Internet technology. It provides easy-to-understand definitions, making it accessible to users with a wide range of computer knowledge.

Professional development – international research on e-learning

- **e-Learning Reviews:**

<http://www.elearning-reviews.org>

Provides those interested in research on e-learning with concise and thoughtful reviews of relevant publications. The goals of the collaborative project are to provide ongoing updates and a solid base of existing literature from the various disciplinary perspectives, and to further the development of e-learning as a scientific, research-oriented discipline.

Planning and management of ICT in schools

- National Association of Advisers for Computer in Education (NAACE) has released *Implementing ICT*. It focuses on four key themes relating to the effectiveness of ICT in schools:
 - leadership and coordination <http://www.naace.org/impict/leadership.html>
 - teaching and learning <http://www.naace.org/impict/teaching.html>
 - managing infrastructure <http://www.naace.org/impict/infrastructure.html>
 - measuring success <http://www.naace.org/impict/success.html>
- British Educational Communications and Technology Agency (BECTA) schools sector resources <http://www.becta.org.uk/schools/index.cfm>
- **ICT Planning** (National Centre for Technology in Education)
<http://www.ncte.ie/ICTPlanning/>
- **ICT Planning matrix**
<http://www.ncte.ie/ICTPlanning/ICTPlanningMatrix/>
Check out your school's level of development in each of these categories:
 - Management and planning
 - ICT and the curriculum
 - Staff professional development
 - School ICT culture
 - ICT resources and infrastructure.

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