
A STRATEGY FOR PROMOTING THE USE OF
COMPUTERS ACROSS THE CURRICULUM AT
PRIMARY SCHOOL LEVEL: A CASE STUDY.

THESIS

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DELENE HEUKELMAN

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ABSTRACT:

A growing number of primary schools are acquiring computers, mainly through parent funding. The study concerns the promotion of computer use across the curriculum in primary schools. Teachers need to be trained in the use of computers as a teaching aid in different subjects. A study comparing two periods of training was undertaken. Two model C primary schools, administered by the Department of Education and Culture, with similar profiles of educational computer use, were selected for the purpose. A training course consisting of five sections, where the use of the word processor, spreadsheet and database, both as personal tools and as teaching aids were introduced, was offered. Care was taken to select topics from current syllabi and to demonstrate how these topics could be presented and enhanced by using the computer.

The training was presented at school A over a period of 8 months and at school B over a period of 5 weeks. The supporting material and contents of the course were the same for both groups. A comparison between the effectiveness of the two training regimes was made.

The researcher's initial perceptions of the teachers' initial low level of computer literacy were confirmed by a questionnaire, responded to by each participant. It would seem that the shorter training period was more effective in raising the level of computer literacy and that if the training period was longer, the contact time should be increased to maintain support.

Neither training period resulted in a significant increase in computer use, either as a personal tool or as a teaching aid. The failure to do so may be ascribed to a number of influences, one of which is the teaching style of individual teachers. Changing the teaching style of an experienced teacher takes time and more effort than was available for either training period.

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CHAPTER 1

Introduction

Computers are becoming part of our everyday living. Every person who has a credit card, or uses an automatic teller machine, or receives a telephone account, is an end user of a computer. Most libraries operate with the help of computers. Is it then educationally sound to exclude this very real part of our existence from the school curriculum and specifically from the classroom? Shouldn't the education of our children reflect the reality of the society they live in?

Education is a social activity and tries to prepare children for adult life within a particular community. The omission of computer education would diminish the quality of the education provided, if computers are used extensively in that particular community.

This need is recognised by an increasing number of primary schools and their management committees. That parents perceive this need is evident in that a growing number of primary schools acquire computers through parent funding. Parents are prepared to spend the money to educate their children in this respect. They want their children to be computer literate.

1.1 What is computer literacy?

If we try to define the term "computer literacy" we realise that it is not so easy to pin the concept down. We all have a fairly good idea of what we mean when we say that somebody is "computer literate", however we need to formulate what the minimum requirements for an individual to be regarded as computer literate would be. Is somebody who uses the computer purely for playing games, and knows how to copy these games onto hard disk, create batch files to run these games and make running copies for all his friends, computer literate? Is somebody who uses the

computer extensively for computer-aided learning, but doesn't know how to install a program on hard disk, computer literate?

For the purpose of this study, it is necessary to give some sort of definition of what we mean when we say that somebody is "computer literate".

The basic application packages that are usually regarded as components of a computer literacy course, include a word processor, spreadsheet and a database. A working knowledge of these packages is a minimum requirement for computer literacy. However, being able to use these three packages is not sufficient, if the user does not know how to format a disk. An elementary knowledge of either a microcomputer operating system itself or a shell program that helps the user to perform the basic tasks related to the use of a computer, is also essential. Thus, according to this study, the minimum requirements for a person to be regarded as "computer literate" are therefore a working knowledge of a word processor, spreadsheet, database and a microcomputer operating system/shell.

Why are these packages regarded as essential for computer literacy? To be literate one must be able to read and write. Writing and being able to read one's own writing implies the use of these skills as a personal tool. Anybody therefore who produces any form of written document should be able to use the computer as a personal tool and should be able to make good use of the facilities that a word processor offers. Calculations form part of the three r's that are regarded as essential basic skills to teach pupils. The spreadsheet forms the basis for calculations that we have to make, even if it is a step further than adding two and two! Why a database? If the information around one may only be accessed by using a database, such as those found in libraries, ignorance of the principles on which a database works, cuts one off from a vast amount of information, and could seriously inhibit academic growth.

1.2 Background of the research

The implementation date for computer literacy training to be part of the initial teacher training of white teachers in the Department of Education and Culture in South Africa, was 1 January 1993 (Department of Education and Culture). Thus teaching students completing their training at the end of 1993 are required to be computer literate, if they are to be considered for posts in schools administered by the Department of Education and Culture. A large number of serving teachers, in all the Departments of Education, are presently either not computer literate or lack confidence in the use of computers. This tendency has also been reported in research in Britain (Bleach as in Govier 1988:20). Making the use of Information Technology a requirement of the statutory orders for all subjects of the National Curriculum at all levels in Britain, has not significantly increased the use of computers in the classroom (Govier 1991). The use of computers across the curriculum is inhibited by the low level of computer literacy among teachers. Furthermore there is a shortage of lesson material that incorporates basic computer literacy skills. This tendency has also been found in studies in other developed countries. In America

"for most classes in most subjects, computers are not yet the major medium through which students accomplish any of their tasks" (Becker 1991:7).

It also appears that

"the use of CAL was not sufficiently well established in German schools for it to be an integral part of any subject curriculum" by 1990 (Cox and Bosler 1991:74).

This is also the case in Britain, where studies have shown that even with training, student teachers do not use computers spontaneously. The most common reasons cited for not using

computers as a teaching aid, are the lack of confidence and/or expertise of the student teachers (Dunn and Ridgeway 1991:10). Cox and Rhodes (1990) in a study on teachers, report similar findings.

It is obvious that the first step towards increasing the use of computers as a teaching aid, must be computer literacy training of teachers and student teachers. The nature of computer literacy training is problematic. In Britain there is growing criticism of the level of computer literacy reached by trainee teachers.

"Some trainee teachers are so badly taught when it comes to information technology that their pupils have to show them how to use computers" (Pyke 1992:12).

Making computer literacy training courses a prerequisite for accreditation of teachers does not ensure confident use of computers by new teachers.

Indications are that in-service training for short periods ("two hours a week for five weeks") does not provide sufficient experience for teachers to use computers confidently as teaching aids (Cox, Rhodes and Hall 1989:173). The effective period for training and continued support has not yet been established.

1.3 The nature of computer literacy training

Very few people have the time and the ability to teach themselves to become computer literate.

"It takes time for children to accept the computer as a part of their environment, time for teachers to learn to integrate computers into their classroom, and time for teachers and children to become familiar with good software" (Wright 1990:36).

In most cases people have to be trained, or have support in some form, to become fully computer literate. Support

"demands considerable time and energy, and can only be effective over a period of time" (Wright 1990:36)

as was found by Paul Wright in his efforts to integrate computers in a primary school.

If training and support are to be provided in order to train practising teachers to become computer literate, the determination of the nature of this training and support is important.

The first requirement for adequate training, would be access to a computer on a regular basis. Using the computer as a personal tool would advance the level of computer literacy. Since the teaching load of teachers is increasing due to the efforts of the government of South Africa to reduce the number of teachers in the Department of Education and Culture, there is very little time during school hours for teachers to familiarise themselves with software. Lack of discretionary time therefore restricts access to computers during school hours. Teachers who have personal computers at home have better access to computers, but less immediate support if a problem should arise while at home, especially during initial stages of computer literacy training. This factor is mentioned by Paul Wright in his recordings of the integration of computers in one primary school:

"teachers are busy people, many have been frustrated to the point of exasperation by awkward programs" (Wright 1990:36).

Teachers need the time and access to computers to familiarise themselves with programs and support must also be available.

Teachers exposed to lesson material using generic software,

could be motivated to master such software. The necessary impetus to use computers, may be the provision of lesson materials that use the word processor, spreadsheet and database, for teaching thinking skills to children (Hunter 1985:20, Parker and Widmer 1989:27, Schatz 1989:27). Once teachers have mastered these three packages, considered to be essential for computer literacy, they could be encouraged to use them as personal tools. The use of these packages as personal tools would further influence the levels of both computer literacy attained by teachers and computer use in the classroom.

Teachers can be encouraged to use generic software to develop teaching resources, which could then be used across the curriculum. Public domain programs for word processing and spreadsheets, which could provide a considerable financial saving for schools who choose to use them, are available. Student versions of database programs are also available from bookshops that stock computer books. The price for these programs is considerably lower than for the complete program. These may be utilised to good effect, should a school choose to do so.

1.4 Goals of the research:

The goals of the study were to determine

- 1.4.1. whether raising the computer literacy level of teachers would result in an increased use of computers across the curriculum and
- 1.4.2. whether the period over which the computer literacy level of teachers was raised, influenced computer use in the classroom.

Since the training provided as part of the study was concentrated into a limited number of hours, it must be stressed that the training alone could not make the teachers participating in the study fully computer literate. However, it was hoped that the training would, at the very least, raise the level of the

teachers' computer literacy, and would stimulate teachers to pursue further training via formal courses or self study. The training was designed to provide a strong enough basis for future studies by the participating teachers.

The optimum training period for teachers to reach a level of computer literacy that would allow them to integrate computers into their classrooms with confidence, has not been established and research in this area could benefit the future training of teachers. This research was an effort to determine a basis for future experimentation.

In the following chapter a literature survey concerning the use of computers in primary schools and the training of teachers is described. The advantages of using computers as well as the problems surrounding the use of computers are discussed. Furthermore, the subject of using computers as a teaching aid in a multi-cultural teaching environment is touched on.

A discussion of the research methodology and methods used in the study then follows in Chapter 3. The research perspective, approach and method are discussed as well as the data gathering method. The limitations of the case study as a research method are pointed out.

Chapter 4 deals with a description of the research, i.e., the two schools involved, a broad description of the training provided and a discussion of the questionnaire used to gather data, which may be found in Appendix A.

Because the training formed the crucial part of the study, a detailed description of each training session is also provided. The notes that were provided for each training session are supplied in Appendices B, C and D. As much information on the training session as possible is given, so that the training could be replicated to a reasonable extent.

Chapter 5 contains the results of the questionnaires from the two schools, a comparison of the results from the two training periods and a discussion of possible conclusions that may be drawn.

Chapter 6 deals with the limitations of the study, tentative recommendations and recommendations for further research.

Chapter 2

Literature survey

In this chapter the advantages of using computers in primary schools are discussed. This study was undertaken with the object of making a contribution towards promoting greater use of computers in primary schools. The changing educational situation in South Africa is forcing teachers to re-evaluate their teaching styles, methods and strategies. An increasing number of pupils with a wider range of capabilities and backgrounds than is presently the case may in future be found in the same class. The number of pupils in the class will in some cases increase dramatically, as the teacher/pupil ratio is applied uniformly across all education departments as a result of new legislation aimed at providing for a single education department.

There has been a greater move towards multi-cultural education, since Department of Education and Culture schools have opened their doors to all race groups in South Africa. New teaching strategies have to be found to make teaching more effective and to accommodate the differences in capabilities and backgrounds. Computers could be used to alleviate some of the problems encountered in teaching pupils with a wide range of aptitudes.

This chapter also discusses the factors that influence the use of computers in primary schools, since these factors have to be taken into account if computer use in primary schools is to be promoted.

Lastly the computer literacy training of in-service and trainee teachers is discussed. Problems are identified and possible solutions are offered.

2.1. The advantages of using computers in primary schools

"In a society where most work is becoming computer-based, 'school-work' cannot forever resist the change" (Collins 1991:28).

Education is a social activity. It should reflect aspects of the society in which we live. If computers are an integral part of the society in which we live, then our education should reflect the use of computers and prepare the pupils for adulthood and therefore for a world in which computers are used extensively. The social rationale described by David Hawkrige (Hawkrige 1990:2), supports the use of computers in schools because of their use in society, since education prepares pupils to function in society. There is merit in this argument, particularly in primary school education.

Before discussing the advantages of using computers in the classroom, the distinction between using computers as a teaching aid and using computers to make administrative tasks easier must be emphasised.

Using computers as a teaching aid refers to the use of computers to facilitate learning. A computer program that teaches aspects of mathematics, could facilitate learning. A word processor could also be used to teach creative writing, the spreadsheet for accounting and the database for classification of birds in biology.

Using computers to make administrative tasks easier, would include using the word processor to set tests, examination papers and to write notes. It would also include using the computer for reports, marks, etc. Although these tasks are not directly related to the use of computers as a teaching aid, they do play a role in that the teacher gains more experience and finds that the computer saves time. They could promote a positive attitude towards computers. Using the computer for these tasks could help

to promote confidence and could play an important role in encouraging teachers to progress to using the computer as a teaching aid.

The study concentrates on the use of computers as a teaching aid. It specifically concentrates on using the word processor, spreadsheet and database as teaching aids, however other application programs could achieve the same results.

Results of a survey by Becker, as early as 1985 (Becker 1985:100), showed that only 18 percent of teachers participating in the survey thought that students using computers in class, worked without direct supervision "much more", and that only 7 percent observed "much more" academic learning by "below average" students. The argument that the computer frees the teacher to spend more time with individual students is not strongly supported by these findings. However, an increase in academic learning as low as 7 percent for the "below average" group, could be significant if the number of pupils concerned is large enough and the dominant group. Therefore even these early findings may be viewed fairly positively. In the same survey 30 percent of teachers observed "much more" general enthusiasm for school by students using computers and 24 percent reported a significant increase in academic learning by "above average" students.

What then are the advantages of using computers as a teaching aid? If the main purpose of learning, is the memorising of facts, then the computer has no place in the classroom. The computer has a much better memory than we do. It can free the pupil from having to memorise facts and teach the pupil to ask the right questions, draw conclusions and make new discoveries. The computer can thus be used to help the pupil discover new concepts.

"The full development of the pupil's cognitive powers demands a more sophisticated form of active engagement" than merely responding in the manner that is expected. The microcomputer "can encourage and demand the right kind of constructive questioning and active interchange" (Kelly 1984:10).

This active cognitive engagement leads to the development of the intellect and stimulates an enquiring mind - a commodity lacking in some of our present teaching environments. If the number of pupils per teacher increases the present situation could deteriorate even further.

What is done with computers determines how effective the use of computers as a teaching aid will be.

"the presence and availability of computers will not assure (nor even make substantially more likely) that changes in education will occur" (Becker 1991:8).

Findings by Chatterton (1988) support the fact that where the teacher chooses a Computer Aided Learning (CAL) program providing a close match in content and style to his/her own teaching style, a teaching style that enables the teacher to remain in control of the knowledge base, there is little change in classroom strategies.

Computer Aided Learning programs certainly constitute one aspect of using the computer as a tool. Many of these programs are expensive and tend to teach concepts or help the user to memorise information. Once the pupil has mastered that particular concept or has memorised the information, that specific program is of no further use to that pupil. Very often a teacher prefers to teach a certain concept in a different way. This means that although the school has bought the program, the teacher is dissatisfied with the way in which the program teaches that concept.

If one pages through journals such as "Micromath" and "The Computing Teacher", the articles on using spreadsheets, databases and word processors for young children emphasise a move towards content-free software. These tools may be used by teachers in different ways, depending on the need.

Other teaching aids, like the blackboard, overhead projectors, slide projectors, etc., are all passive (Mullan 1984:27). The pupil can sit and absorb information, without reacting to it. The teacher plays the role of prompting the pupil to react. The teaching style is therefore one where the teacher is the holder of all knowledge who disseminates information at his or her discretion. A good teacher elicits more reaction from the pupil: the pupil would have to respond in some manner. Getting every pupil to participate is not easy and it takes an experienced teacher to ensure this. It becomes increasingly more difficult the larger the group and the wider the range of aptitudes and capabilities become. The computer on the other hand can be totally interactive: each pupil working with a computer is forced to respond in order to progress. The pupil has more control over the speed of the learning process. The computer becomes the knowledge base. The information that is necessary for the pupil to make decisions and choices is provided by the computer. Information may be accessed when needed and as the pupil progresses. Because no information is withheld, the pupil is able to hypothesise and draw conclusions. The pupil becomes more independent while learning. The learning strategies employed by the teacher change:

"In most classroom situations, it is the teacher who controls the pupil's access to the knowledge-base and the feedback they receive regarding it. In ceding control, the teacher changes the power structure within the classrooms and opens the way to active pupil-participation in the lesson" (Chatterton 1988:185).

Perhaps this could be one of the factors that contribute to 30%

of teachers reporting

"much more general enthusiasm for school by students using computers" (Becker 1985:100).

Using the computer as a teaching aid, therefore could change the teacher's teaching style and approach. Regarding the use of the computer from the pupil's point of view, non-computer learning aids address the class as a whole and do not cater for the individual or special needs of each pupil. The computer, if used correctly, could address the needs of each pupil.

Spreadsheets could be used to encourage critical thinking (Parker and Widmer 1989:27). The pupils released from mundane mechanical tasks, are free to ask higher-order questions and therefore think on a higher level. With databases pupils could be taught what questions to ask, a very important skill, because if the right questions are not asked, it could be very difficult to draw the right conclusions. When word processors are used in writing, the process is emphasised rather than the end product (Broderick and Trushell as cited in Govier 1988:21).

"An author can sit down and let his/her imagination loose. Bits and pieces of a work can be typed in with the full realisation that they can be edited, moved around, deleted, or added to at any time" (Bright 1987:135).

The learning possibilities of an ordinary essay increase, because by using the word processor, the changes are easily made without the pupil having to rewrite the entire essay each time. Creative thinking and writing mean that the learning experience takes place on a much higher level. Creative writing is stimulated by using word processors (Broderick and Trushell as cited in Govier 1988:21, Adams 1988:4). This concept of refinement may even be transferred to other areas. These are just a few examples of how computers could be used to improve the quality of teaching in primary schools.

A further valuable tool in primary education is the use of LOGO. A number of studies could be quoted as to how beneficial LOGO is in teaching thinking skills (Hughes MacLeod and Potts 1985, Howe 1981, Finlayson 1984 as cited in Govier 1988:25,29,30). Some studies, however, report no gain (Clements as cited in Govier 1988:21). The contradictions in research reports is the dilemma facing the teacher, especially when motivating the capital outlay of buying computers. Usually even the teachers involved in studies where the statistics eventually showed no gain, feel that the experience of using the computer to teach problem-solving was valuable in itself. It must be emphasised here that to quantify improvements in skills such as problem-solving ability, critical thinking, reasoning, confidence, etc., is very difficult. These abilities are very difficult to measure and because the tests do not show improvement in terms of statistics, it cannot be deduced that there were no improvements. The opinion of experienced teachers, who are able to evaluate these skills in terms of years of experience of working with pupils, may be far more accurate.

"It is known both that teaching and learning problem solving are difficult goals to achieve and that the advent of computers opens truly new ways for working toward these goals. The task now is to use the new tool effectively" (Bright 1987:112).

The computer also offers advantages in supporting a thematic approach in teaching in primary schools, both as a resource for storing and sorting information and for providing the central starting point or focus of a topic (Crompton 1989). Simulations could be used in science, or social studies, to experiment with the consequences of choices that the student makes. Different processes affect situations differently.

"One of the consequences of the potential increased focus on these processes may be the development of more interdisciplinary activities across content areas" (Bright 1987:111).

From doing case studies involving group work, it seems that the computer is very effective in generating genuine involvement and commitment, and can enhance those language and social skills which most teachers seek to develop in their pupils (Crompton 1989). Where pupils work in groups, they have to verbalise the problem they are trying to solve. This develops their problem solving and language skills.

The computer cannot cure all problems. Sometimes teachers who embrace this new aid, are also over optimistic.

"No one method or aid is going to be the universal panacea to educational ills" (Mullan 1981:34).

The teacher still has to choose the right tool for the situation and this tool must be used to its full potential. Sometimes the right tool can be the blackboard and chalk, but sometimes the computer is more productive.

An area not yet touched upon is the computer as a medium for distance education. The liberating social effects of free access to learning that is not prescriptive as to place or time, could be important in a changing society in South Africa. Since the arrival of communication satellites, the distance factor has become less significant.

"The modern designer of educational systems is no longer constrained by technology. The technology is there to deliver teaching quickly and accurately over vast distances" (Hooper 1983:107).

Users should however be aware that teaching thus provided is not necessarily of the nature required by the particular society involved, since foreign influences could be subtle and not compatible with the views of a particular society.

It is important to stress that computers ought to be used to

teach in ways that were not possible before, or to teach an aspect of content better than was possible before.

"This concept is especially relevant in those elective and exploratory areas of the curriculum where students may now experience sophisticated applications of computer technology within the school setting" (Langhorne et al. 1989:164).

Desktop publishing programs, used by a group of children publishing the school newspaper, could be used to teach skills that cannot be adequately measured: learning to work together, communicating, verbalising ideas, subdividing of work, problem solving, and so on - the list could continue.

2.2 The use of computers in a multi-cultural setting

In a multi-cultural society, computer-using teachers need to be aware of some considerations pertaining specifically to the use of computers in schools.

Care should be taken to guard against a situation where, in an educational setting, computers become "a new source of inequity" (Kirby 1990:537). Because of the political history in South Africa, factors such as financing of hardware, availability and quality of software and adequate staff development should be considered very carefully. Schools where pupils come from a socio-economic disadvantaged background should not be inhibited by lack of funds to offer free pupils access to computers.

2.2.1 Exposure to technology

Teachers using computers as a teaching aid should be aware of the different cultures' exposure to new technology. Rural communities may not have the same exposure to technology and might find it threatening. If the teacher acknowledges the situation and is equipped to provide the necessary support, the

situation could be remedied. The use of computers and importance attached to technology by different cultures, should not be ignored by educators.

Educational software that is used in a multi-cultural setting should accommodate different cultures so that pupils from different cultures and backgrounds feel comfortable while using the software. Subtle discriminations may not be detected by the teacher, but the user may be aware of these discriminations and develop negative attitudes towards computers.

2.2.2 Different needs for different cultures

Finding software that caters for the needs of all cultures in South Africa is a problem not unique to South Africa. An example may be found in Latin American schools where one of the major problems was found to be a lack of good quality software. It appears that the need was great enough for countries such as Brazil, Argentina, Mexico and Venezuela to have centred their effort on the production of learning materials. Some countries are even developing their own authoring systems.

"The major trend has been the translation of foreign software with negative results in many cases... The cultural heritage and perceptions, idiosyncratic interests and needs and world views of the Latin American people cannot be bypassed when producing good quality educational software" (Sanchez 1991:57).

American Computer Aided Learning programs can often be seen as culturally very different from those in South Africa.

2.2.3 Different language groups

The diversity of the South African population, with its abundance of languages and dialects, complicates the selection of suitable software. The educational advantage of teaching young children

in their mother tongue, is very difficult to achieve with the use of computers, since software is mainly available in English. Here again, content-free software like word processors, spreadsheets or data bases have a significant role to play. It must however be stressed that although the word processors, spreadsheets and databases are content-free, the packages themselves remain in English, with English commands for saving and retrieving files, etc. The operating language, be it limited, remains a foreign language to be mastered, before the package can be used to its full potential. Careful consideration could reduce the size of the problem, because the commands are learnt on a need-to-know basis, but where young children are concerned, care is needed.

"Some cultures such as the Anglo-American, may take to it more easily than others because their cultural and linguistic structures are more adaptable than others...information technology is essentially the product of American capitalist post-industrial society. But witness the Herculean efforts of Japan to overcome problems posed by their character sets" (Hawkridge as quoted in Scanlon and O'Shea 1987:241).

Although generic software may be regarded as content-free, using it with a different character set presents problems. This applies equally to other educational programs, because

"there were until recently few examples of good educational software offering a user interface written in Arabic or other non-Roman scripts. This tended to mean that students were either obliged to be, or to become, competent in a language such as English before they were able to engage in any sort of computer mediated learning activity. The potential cultural drawbacks of such a situation are obvious and have done little to promote the application of computers in schools in many countries" (Smith 1989:173).

Even explaining some concepts in certain languages is very difficult. Some computer related concepts are so foreign to some cultures, that there are no words to describe them. In some African languages even the words for storing and retrieving data do not exist. Often the computer terminology is not English, but American slang! Translating it into an African language and then explaining the concept could prove to be a futile exercise. If there are no words in a language to describe a computer-related concept, the use of computers must be very foreign and therefore due consideration must be given to this. This does not mean that the use of computers must be ignored, if these pupils have to function within a society where computers are used increasingly.

Again the question of education for a particular society arises. The dilemma of educating children to function only in one society, or educating children to be adaptable when they move from one environment to another, could prove very taxing if the two environments differ substantially with regard to the use of technology. This is especially true of a society that has a large third world component as well as a large first world component, of which South Africa is an example.

2.2.4 Different emphasis

Apart from the influences pertaining to the languages of different cultures, these cultures will emphasise different aspects of their education. Depending on the software developer's own culture, those aspects may be emphasised in the educational programs.

"to what extent should children choose for themselves in educational settings... what is the right balance in education, between children being taught to compete or to collaborate? In Japan or France or the United Kingdom the

answers to these questions will differ from those suggested by the American experts" (Hawkrige as quoted in Scanlon and O'Shea 1987:242).

End users need to be aware of this and decide whether the culture portrayed by the software is compatible with what they need.

2.3 Factors that influence the use of computers in primary schools

We have now considered the advantages of using computers in primary education, but the use of computers does not come without attendant problems. From British experiences it appears that common stumbling blocks in the use of computers are shortages of resources, i.e hardware, software, technical support and the lack of expertise of teachers (Govier 1991, Dunn and Ridgway 1991). Let us focus on this lack of expertise, which could also possibly be one of the causes for the shortages of resources and software.

2.3.1 Funding

Presently, computers in the primary school phase must be funded by parents. The decisions regarding the purchase of computers for a primary school are taken by management committees. Management, consisting of the principal, senior teachers and parents, may or may not be knowledgeable about computers and their applications at primary school level. Some members may be aware of the advantages of using computers for administration purposes, but few non-teachers will have knowledge of actual classroom advantages of using computers at primary school level. If management does not regard the use of computers as a teaching aid as important, the priority given to buying computers will be low. Funds will be channelled elsewhere, especially since financial constraints are becoming increasingly stricter. This would result in a shortage of resources, both of hardware and, at a later stage, also of software. The lack of not only computer expertise, but also expertise on how to incorporate the

use of the computer in the classroom, could also directly influence the acquisition of resources negatively. To address this problem, advocates of computer use in the classroom need to create positive attitudes towards the use of computers. Even if the individual members of the management committee are not knowledgeable about computers in education, a positive attitude towards the use of computers could influence decisions on allocation of funds for computers.

A specific problem not unique to South Africa relating to the acquisition of software, is the copyright law. The copyright law fails to recognise the special needs of education as is the case in the United States.

"Undoubtedly, much copying goes on that is strictly illegal. Perhaps worse, much valuable educational material is under-used in schools and colleges because of the legal constraints" (Hawkridge as quoted in Scanlon and O'Shea 1987:240).

Few producers of software are prepared to reduce the price of the software even though they know that the school has to buy multiple copies to run the software legitimately. This is forcing schools to consider moving towards networking, which requires a greater degree of expertise to maintain.

2.3.2 Attitudes of management

The attitudes of management do not only influence the actual acquisition of resources, but

"the attitudes of head teachers are critical in encouraging a positive attitude among staff and organising computer use to optimal effect" (Cox et al. 1987 as cited in Govier 1988:22).

If management does not give high priority to the use of computers

in the classroom, motivation for using computers must come from the teacher's own perception of the worth of the use of computers. In a situation where time constraints are significant and becoming increasingly so, and considering that it is time consuming to create lesson material for use with computers, it will take a strong minded teacher indeed to even consider the use of computers in the classroom. The effectiveness of enhancing teaching by using a computer, will have to be immediately visible and may even have to be spectacular to convince the teacher that it is worth the effort. An encouraging attitude by management towards computer training and computer use could therefore play a vital role in the success of any training program and influence the results of this study.

Because the acquisition of software has to be approved by management, the attitude of the management committee directly influences the availability of suitable software in each primary school. A negative attitude could therefore result in a lack of software, which would again directly influence the use of computers in the school and therefore the results of this study.

A further issue concerning management is the leadership involved in using computers effectively. Teachers who are members of the management team are there because they have leadership qualities. The capital outlay involved in providing this facility requires that it be utilised to maximum capacity. The leadership qualities of management could be applied to organising the most effective use of this resource. Without the organising ability of management the use of computers may be seriously inhibited, which would strongly de-motivate further funding by parents.

2.3.3 Computer literacy training for teachers

Studies have shown that in America

"for most classes in most subjects, computers are not yet the major medium through which students accomplish any of

their tasks" (Becker 1991:7).

It also appears that

"the use of CAL was not sufficiently well established in German schools for it to be an integral part of any subject curriculum" by 1990 (Cox and Bosler 1990:74).

How can we promote the use of computers in primary schools? Studies by Sheingold and Hadley (Sheingold and Hadley as cited in Polin 1991) of a more selective group of successful computer using teachers have found the following common point:

"the more 'enlightened' users of technology in teaching reported five to six years of experience".

This indicates that not only the level of computer literacy of the teacher, but also the experience of the teacher as a computer user, plays a definite role in the integration of the computer across the curriculum in the primary school. The question now is: can one speed up the process by raising the computer literacy level of teachers and exposing them to applications using generic software? What form of training is needed to make teachers successful computer using teachers in the shortest period?

For teachers to be able to use computers confidently as a teaching aid, they have to feel comfortable with the technology. Their computer literacy level must be sufficient to enable them to solve small problems that are encountered, like a printer that doesn't print because of a bad connection, or the program that will not load because the wrong disk was inserted in the disk drive, or the wrong instruction has accidentally been typed.

Computer literacy was not part of the basic training of most primary school teachers currently teaching in South Africa. The implementation date for compulsory computer literacy courses was January 1993 (Department of Education and Culture). Trainee

teachers must therefore receive some form of computer training. However, determining what form of training is problematic, since studies show that short courses, for example two hours a week for five weeks, are not adequate (Cox and Rhodes 1990). Studies of the profiles of competent computer-using teachers indicate that there is a marked difference between teachers who have been using computers for five or more years, and those with one or two years of experience (Sheingold and Hadley as cited in Polin 1991). Furthermore there is criticism that trainee teachers in Britain are presently not receiving adequate training to make them confident enough to use computers (Dunn and Ridgeway 1991a, Dunn and Ridgeway 1991b, Pyke 1992). That computer training is needed is obvious but problematic. Bearing in mind the results of the study by Sheingold and Hadley, as commented on by Polin, (Sheingold and Hadley as cited in Polin 1991) and that the training of teachers presently stretches over a four-year period, exposure to the computer and using it as a personal tool during this training period could possibly go a long way to equipping new teachers to be effective computer using teachers.

Training teachers to use the technology is one aspect. Another aspect is training them to use the technology as a teaching aid. For trainee teachers this is less problematic since they are still developing a teaching style, but for experienced teachers this could lead to anxiety:

"Changing one's teaching style involves de-skilling, risk, information overload and mental strain, as more and more get treated as problematic and less and less is taken for granted" (Eraut 1982 as cited in Wild and Hodgkinson 1992:80).

Technology can be a threat to many teachers. This in turn could lead to negative attitudes towards computers. To create a more positive attitude towards computers, support in the form of information, interaction between teachers struggling with the same or different problems, and the exchange of lesson material,

is of great importance to these teachers (Jacobs 1989).

2.4 Suggestions towards solving the problem of computer training for teachers

2.4.1 Computer literacy training for trainee teachers

The prerequisite of a computer literacy course for accreditation of new teachers, demanded by the Department of Education and Culture, is an attempt to formalise efforts to train some teachers in South Africa. In Britain formal steps by government that states that it is a requirement of the statutory orders for all subjects of the National Curriculum, at all levels, to use Information Technology (IT), have not produced the results envisaged, as a study by Dunn and Ridgeway shows

"A significant proportion of student teachers in this survey are likely to leave college with no classroom experiences using IT. Few will leave with even modest experience of using each of word processors, databases or other applications software with children" (Dunn and Ridgeway 1991:239).

The same may be said of primary schools:

"Primary schools, then, have considerable potential for the exciting and effective use of IT throughout the National Curriculum. But this potential is being thwarted in a major way by lack of resources" (Govier 1991).

The three resources identified by Govier are equipment, technical support and teacher education. Locally, not all institutions for the training of teachers are equally committed to the task of making each and every trainee teacher computer literate, which will result in various levels of competency.

Possibly a central teacher body should at least approve syllabi

in an effort to standardise training. No specific guidelines of what syllabi should contain have been provided and each institution can interpret the general guidelines differently. In the case of correspondence courses the effective computer literacy training of trainee teachers presents real problems. The numbers of teachers being trained by correspondence courses are significant. At the Natal College of Education, where teachers with only three years training may upgrade their training by correspondence to four years, there are presently in the region of 700 students per year and this figure is expected to increase (Koen pers. comm. 1992).

Furthermore the standard of computer literacy to be attained has not been made clear. Different institutions interpret the guidelines differently because there are no specific references to the contents of computer literacy courses. If computer literacy courses only teach theoretical knowledge about data manipulation concepts and social implications of computer use, it will not result in confident teacher computer usage. Training teachers to use a specific school administration program will also not result in the confident use of computers as teaching aids by teachers, which is the desired result.

Studies by Wild and Hodgkinson between 1989 and 1990 resulting from a survey of students on a 36-week Post Graduate Certificate of Education course in Britain, "showed a low level of starting competency in using computers" (Wild and Hodgkinson 1992:81). Only 7 percent of these students indicated regular personal use of Information Technology and only 22 percent indicated regular professional use (Wild and Hodgkinson 1992:82). This means that the training that these teachers received, did not result in the majority of them using computers, either for personal use or educational purposes. Specification of achievable objectives for the students' Information Technology development, could help to address the situation. Wild and Hodgkinson suggest the following:

"At the end of the initial teacher training course all students should, as a minimum:

- * be able to use the word processor for personal and professional use with confidence, maintain files and back-up copies of discs and produce printed output;
- * have used packages for the production of teaching resources, presentation of assignments or in classroom-based work. For example, in the production of OHP transparencies and work sheets;
- * have evaluated a range of software and computer applications of specific relevance to their main and subsidiary subjects on the basis of educational aims and objectives, integration into work schemes, consequences for classroom management and the implications of the use of IT in changing teaching and learning;
- * be aware of the IT requirements of the National Curriculum within and across subjects, concentrating on relevant Key Stages;
- * have used IT at some stage of their teaching practise in a planned way."

(Wild and Hodgkinson 1992:82-83)

The same objectives could be used as a starting point here in South Africa to achieve more uniform training results. The accent is on achievable objectives and not on vague theoretical goals.

Another vague area is the time allocation for these computer literacy courses. The allocation of periods for the training of students varies from one institution to another. The ideal would be that computer literacy is not only taught as a separate subject with a number of periods per week allocated to this course. If the use of computers across the curriculum is intended, the computer must also be used as a tool in every subject. This is not yet found in practice.

The period of training for teachers in the Department of Education and Culture at teachers' training colleges is presently at least three years, but in most cases four years. At universities the professional training usually consists of one year while the academic training could vary, depending on the course that is chosen. At technikons the academic and professional training of teachers is integrated and stretches over a four year period. If a minimum of three years academic and professional training is considered desirable, the trainee teacher could be effectively trained to use the computer during this period. The five to six years experience needed to become a successful computer using teacher (Sheingold and Hadley as cited in Polin 1991), is then attainable within a year or two of becoming a teacher. Effective and successful use of the overall training period of teachers could result in successful computer using teachers.

If formal steps are to be taken to ensure that trainee teachers are well-trained, then a great deal more than is presently prescribed must be done.

2.4.2 In-service training for teachers

Where in-service teachers in South Africa are concerned, the problem is more complex. Constraining factors are lack of time, motivation, accessibility to computers and support for teachers dealing with a new field. The first two factors could possibly be addressed by encouraging teachers, as in the case of trainee teachers, to use the computer as a personal tool. Once teachers have mastered the use of the computer and find it a time saving tool, the motivation to also use the computer as a teaching aid should not present a problem. If motivation is high enough, accessibility to computers could be addressed, perhaps by enthusiastic innovative teachers themselves.

A very important factor that cannot be neglected is that of support.

"Fear and anxiety are major features of all personal change and a major cause of resistance to professional change. The risk to survival increases as change reaches the 'swampy areas' on the boundaries of professional expertise" (Plant 1987 as cited in Wild and Hodgkinson 1992).

Professional contact with other teachers concerned with the same process, could help combat feelings of incompetence, uncertainty and anxiety. The formation of teacher-author groups, where teachers write their own programs, either by using an authoring system or a high-level programming language, with some technical and secretarial backing is an effective way for innovative ideas to be nurtured (Lewis 1983). Here, already competent computer-using teachers, who are members of the various teachers' associations could provide valuable support.

Once teachers and trainee teachers use the computer as a personal tool, the next step to using the computer as a teaching tool should not be a major one. Using the computer as a personal tool could make them more aware of the advantages of using a computer and help them gain more confidence in using the technology. The next phase, using the computer as a teaching aid to teach skills like problem solving and critical thinking, calls for a higher level of computer expertise: teaching strategies now have to effectively employ the computer as a tool. If the first phase is not mastered, it would be very difficult to progress to the next phase effectively.

It must also be stated that the progression from using the computer as a personal tool, to using the computer as a teaching aid, does not happen automatically. Teachers must be exposed to literature and other teachers who use the computer as a teaching aid successfully. It is not the presence of computers that will lead to change, it is what we do with them that matters.

The main problem however remains: who is going to train present teachers and when is this training going to take place?

Certainly some of the training could be achieved by in-service courses. The type of training for the use of computers as a teaching aid needs to be researched, which is what this study attempts to do.

It is therefore clear that although the presence of computers in the primary school is increasing, their use is not devoid of problems. To make use of all the advantages that using computers as a teaching aid has to offer, a great effort will have to be made by all training institutions. New teachers should not be a further burden where computer knowledge is concerned and those experienced, innovative teachers who are presently teaching, but are not aware of the advantages that computers have to offer, should be offered the chance to explore the possibilities of this teaching aid.

Since the introduction of computers to schools is an ongoing process, new problems are sure to arise and new applications for computers will be found. The fact is that computers in education can no longer be ignored. It is therefore better to approach the problem systematically and to have clear objectives for the use of computers when implementing their use in the curriculum. The success of this implementation must then also be evaluated at certain stages so that adjustments can be made. Once these objectives have been attained, new objectives can possibly be set. The process is dynamic and should not be allowed to stagnate.

Chapter 3

Research Methodology

In this chapter a general discussion of the research methods that were used is given. The reasons for deciding on a case study and its limitations are given. The data-gathering methods and observation methods are also discussed. In the next chapter a more specific description of the research is given.

3.1 Research perspective and approach

Because of the educational setting of the research, the perspective is educational and a case study approach was followed. The research was, on a small scale, an effort to "add to the functional knowledge" (Cohen and Manion 1989:218) that we have about the use of computers in the primary school classroom. The problem is twofold:

- a) the level of computer literacy of many teachers is perceived to be very low and
- b) their use of computers as a teaching aid is very limited.

The research concentrated on intervening in order to raise the level of computer literacy of two groups of teachers, over different periods, then comparing the results of the computer literacy levels attained and the use by the participants of computers as a teaching aid. The result when comparing the two training periods could directly influence further training of practising teachers.

The aim of the research was to determine the best way to equip teachers with the skills needed to use the computer effectively as a teaching aid, which in turn could lead to "additional or innovatory approaches to teaching and learning" (Cohen and Manion 1989:220).

3.2 A case study

The research method that was decided on was a case study to determine possible strategies to train teachers to become computer literate and to encourage teachers to use the computer as a teaching aid. Studies suggested that the time period during which a teacher is exposed to the use of computers could influence the level of integration of the computer in the classroom achieved by the teacher (Sheingold and Hadley as cited in Polin 1991). As the study by Sheingold and Hadley indicates, possibly five to six years would be needed to train teachers to become computer literate and to use the computer as an effective teaching aid. Investigating the influence of the period of training is therefore relevant to the computer literacy training of teachers. The pertinent aspect of this case study, is therefore the influence of time on the level of computer literacy attained and on the use of the computer as a teaching aid (Good 1963:388).

As suggested by Evans, a case study method is used to test a theory (Evans 1968:21). A case study was therefore chosen to test the theory that time influences the effectiveness of the training provided. A danger of using a case study, is that the case selected for study is not typical or representative of the spectrum being studied (Evans 1968:21). The schools that were chosen were perceived to be typical of schools where the acquisition of computers was funded by parents. Teachers were not particularly computer literate and computer expertise was not high. An attempt was thus made to select schools that were representative of schools that buy computers and attempt to integrate them into classroom practice. A school that has no problems funding the use of computers in the classroom and where all the teachers have a high level of computer expertise would not be regarded as representative of most schools in South Africa.

All the teachers, willing to participate, of two primary schools

were trained in order to investigate the difference, if any, of training teachers over a period of five weeks as opposed to training teachers over a period of eight months. The staff members of the two particular schools formed the unit of study, which had to be chosen and identified (Good 1963:88). The influence of the training on these teachers was observed and it was attempted to derive strategies from these results to indicate the directions of possible future in-service training efforts by the Education Departments concerned.

It should be ensured, as far as possible, that participants in a case study do not act unnaturally, either because they are encouraged to do so by the researcher, or because they feel they are being compared to another group (Evans 1968:21). Care was thus taken to minimise the Hawthorne effect (Mouton and Marais 1988:86), where participants in a study respond unnaturally because they are being studied. Teachers were informed that a similar study was to be conducted at another school, but the name of the school was withheld and it was stressed that the two training methods were to be compared and not the individual achievements of teachers. Rivalry between the two schools was not apparent during the study and care was taken not to evoke possible comparisons. As far as could be ascertained the study groups did not act unnaturally.

The setting was a natural setting (Cohen and Manion 1989:126), since the training was provided at the respective schools on their own computers. The training was thus provided on the same computers and under the same conditions as when the teachers would use the computers as a teaching aid. Providing the training in the same environment as would be used by the teachers was also regarded as essential to the success of the training, since the aim was to minimise misgivings about the computer and unfamiliar surroundings.

3.3 Reasons for selecting the case study method

The main reason for doing the case study was to gain knowledge about computer literacy training of teachers and the influence of this training on the integration of computers in the classroom. The search was for factors that influence the effectiveness of computer literacy training.

The case study method was selected because of the complexity of the groups being studied. The teachers' attitudes, competency and fears regarding computers, to mention but a few of the multitude of factors that contribute to the successful use of computers as a teaching aid, could best be researched by doing a case study. If there were other hitherto unknown factors that might influence the use of computers, a small study where the researcher is in direct contact with the group participating in the research, would provide better avenues to explore these factors.

Personal contact between the researcher and the participants in the research - needed to combat fears of a potentially threatening medium - was regarded as very important for the success of the training. People who are not computer literate often feel threatened and intimidated by computers (Kennewell 1992:195-200). Personal contact and guidance often help to overcome these initial fears. The scale of the training had to be small enough for the researcher to cope with the demands made on personal contact and provision of reassurance. These constraints could be accommodated within a case study .

The flexibility offered by using a case study suited the aim of the research which was to compare training over two different time periods. The research had to fit in with existing school programs and thus not all events, such as pressing administrative tasks that would necessitate the presence of participants, could be anticipated. Using the case study method made it possible to use the perspectives gathered in the collection of data, even

though some participants only participated in certain sections of the training.

It was not possible to train a large number of teachers from many different schools, since these are in-service teachers and the research had to cause as little disruption as possible. Larger numbers could limit personal attention. In an effort to limit the time absorbed by the training, staff members from only two schools were chosen and training was offered at those two particular schools. It was important that teachers did not feel that too much of their time was required to participate in the study as lack of commitment to the training program could seriously jeopardise the study and influence the results.

Communication between the researcher and the participants during the training and subsequent data collection process was essential to ensure that as many influencing factors as possible would be identified. The case study method provided the best avenue to for this communication.

3.4 Limitations of the case study

The literature supported a theory that time was one of the factors that influences teachers' ability to use the computer effectively as a teaching aid (Sheingold and Hadley as cited in Polin 1991). The research was initiated to explore this possibility further. It must be stressed however that the scale of the research was too small to generalise results arising from it.

The role that the researcher played in providing the training and training material also inhibits generalisation. Much of the success of training depends on the personality and competence of the trainer. The ability to make people enthusiastic about a project depends on the trainer. The results of the research could not be generalised to all trainers, because different trainers could achieve different results, even when using the

same training material.

Because of the natural setting of the research, the fact that participation was voluntary and that the research had to fit in with the existing school program, the control that could be exercised over external influences was limited. These influences could be of minimal or major importance. Examples of such influences would be the degree of support provided by the school's computer co-ordinator, how well the computer centre was organised and how much access to the computer centre is allowed. Frustration as a result of any of these aspects could deter the use of the computer considerably and influence the results of the research. Since the researcher was not a member of the staff of either of the two schools participating in the research these influences could not be monitored.

Another limiting factor resulting from the natural setting of the research, that was not part of the study but which could influence the integration of computers in classroom practice, was the variety of available and applicable software in the school. During the study, programs that did not have copyright such as As Easy As and PCWrite were supplied. Other public-domain/shareware programs, such as a desk top publishing program called "Print Partner" and a word processor for young children called "Word Processing for Kids" were supplied, as well as two small maths programs created by the researcher. The availability of applicable software and the commitment of management to acquiring new programs, could influence the use of computers in the classroom.

The availability of computer programs, or lack thereof, was one of the obstacles to be overcome by teachers wishing to use computers in the school. These constraints are unlikely to change in the near future. The natural setting was therefore an important part of the study, because if teachers could not be trained to make use of computers in spite of restricted resources, the value of the training would diminish.

3.5 Data-gathering methods

Data was mainly gathered by analysing the responses to a questionnaire completed by all participants after a period of six weeks subsequent to the completion of the training. The questionnaire is attached for reference as Appendix A. A covering letter to respondents explained the background to the questionnaire and stressed the confidential nature of the answers.

A choice had to be made between open-ended questions and closed questions. Because it is very difficult to determine the level of computer literacy attained by a person, other than by a practical test, it was considered that the best alternative was to allow respondents as much freedom as possible to express opinions and ideas. It was reasoned that freedom to respond would allow participants to describe events and experiences better if they lacked knowledge of the correct terminology. Since a case study method was chosen and no statistical analysis was intended, it was judged that open-ended questions offered more advantages than closed questions.

Because of the exploratory nature of the research, it was important to capture all relevant aspects such as motivation, priority given to the role of computers and teachers' ability to cope with minor problems with computers. The questionnaire was therefore designed to be as unrestrictive as possible, while nonetheless focusing attention on the relevant issues. The participating groups were small enough and flexible enough to allow this and valuable insights could be gained by allowing participants more freedom in their responses.

3.6 Participant observation

The training was provided by the researcher. During each training session however, because of the complex nature of teaching, the researcher had to observe reactions to the training

and provide support, motivation or information where it was needed. Although the observation was informal, information gathered in this manner determined the tempo and whether the training was successful and received positively or not.

The method of observation was therefore participant observation (Cohen and Manion 1989:125). The training was provided, after which the researcher withdrew. After a time interval of six weeks the participants were asked to respond, in writing, to a questionnaire, which they could choose to do anonymously or not.

The researcher provided most of the training. Only one session - the introduction to spreadsheets - was provided by a guest lecturer to both groups. Because of the close contact between the researcher and the participants in the training, participants could feel very committed to the researcher, which might increase the influences of the Hawthorne effect (Mouton and Marais 1988:86). Thus by allowing participants to express their opinions freely, without feeling that they were criticising or offending the person who offered the training, the questionnaire could possibly yield less biased results than results gained by interviewing participants. The anonymity offered by the questionnaire was perceived as less threatening than interviewing.

Chapter 4

Description of the research involved

A detailed description of the research involved in the study is given in this chapter. The two schools involved in the study are described, a general description of the training followed by a detailed description of what was done during each training session is given and the information gathering method is discussed in detail.

4.1 The description of the two schools involved in the research

Both schools were administered by the Department of Education and Culture and the pupils were predominantly white middle class pupils. Both groups of teachers were white and were sufficiently well trained, i.e. post matric qualifications, for the posts that they filled.

4.1.1 Description of the hardware of each school

The schools chosen for the case study were two primary schools that have both bought computers through parent funding. At both schools computers were bought towards the end of 1991. The computers were IBM-compatible. School A had 8 computers, 7 of which had a configuration of one 3 1/2" disk drive each and no hard disk drives, plus one computer with a 3 1/2" disk drive, a 5 1/4" disk drive and a hard disk. School B has 20 computers, all with hard drives and a 5 1/4" disk drive. All monitors were monochrome. Both schools had only one printer each. At the time of the research, both schools made use of a computer centre as opposed to placing a computer in each classroom. The computers described here are for pupil and academic staff use and do not include computers used for administration by secretaries, etc.

4.1.2 Description of the computer background of the computer co-ordinators and other participants

The co-ordinators of computer use in both schools had similar computer experience and training. Both co-ordinators had been in the same class, studying for a Further Diploma in Education (F.D.E.) in Computer Studies at the same institution during 1991 and 1992. The training for the F.D.E. consisted of a two year course. Topics such as word processing, spreadsheets, databases, MSDOS and programming in both LOGO and Pascal were covered extensively. As far as computer experience of other staff members was concerned, it was ascertained through informal talks with staff members before and during the training sessions that other teachers had varied experience with computers.

4.1.3 Description of participating staff members

School A had 16 staff members when the training commenced, but towards the end of the training more teachers were appointed while some teachers left. School B had 25 teachers participating in the research project. School A had approximately 500 pupils and school B had approximately 725 pupils.

4.1.4 Instruction medium

The instruction medium at both schools was Afrikaans. This is important, as the availability of software specific to the Afrikaans medium might be significant to further use of computers as a teaching aid. A shortage of suitable software in Afrikaans could discourage the use of computers. The fact that the language used by the software was English, which is a second language to all the participants, must also be recorded.

4.1.5 Support by headmasters

Both headmasters were positive towards the participation of their staff in the research project. No information on either

headmaster's motivation of his staff for supporting the research project was available. The headmaster's support and motivation concerning general use of computers could influence the attitude of staff towards the training that was provided. The researcher stressed that teachers were under no obligation to participate in the research. Teachers were not expected to explain absence from training sessions in any way. Some staff members did not attend all the lectures, since the training had to fit in with the existing school program. The normal activities of the school, like meetings that had to be attended and other appointments, continued.

4.2 Description of training provided

4.2.1 Training periods

The training for school A - five lectures spread over 8 months - commenced in July 1992 and ended in March 1993. School A had had an introductory course in MSDOS before the commencement of the research. This introductory course did not form part of the research.

The training for school B - five lectures spread over 5 weeks - commenced on 15 February 1993 and ended on 15 March 1993. Because the teachers from school A had attended an introductory course in MSDOS, it was judged that, in order to compare the two schools, school B should also have an introductory course in MSDOS. This was provided by the researcher on 8 February 1993. The MSDOS training was not regarded as part of the research and will therefore not be described here.

As far as possible, all factors, except the period over which the training was provided, were kept constant. Both groups received exactly the same notes, both groups were taught by the same lecturers and the duration of each training session was the same for both schools.

The training provided as part of the research consisted of 3 hours' training spread over two afternoons in the use of spreadsheets, 1 hour of training in the use of a word processor, and 2 hours' training, spread over two afternoons, in the use of a database. A total of 6 hours training was thus provided. A detailed description of each training session may be found in chapter 4, under the heading **4.4 Detailed description of the training sessions.**

The training was provided after school and took place on the computers at the two respective schools. The five week period during which school B's participants received their training was during the first term, which was in summer, while it was very hot and humid. This is mentioned, because it required a great deal of dedication on the part of the teachers to participate in the study under these conditions.

4.2.2 Supporting material provided

In both cases reading matter to support the use of spreadsheets, word processors and databases in primary schools, was provided. This consisted of articles from educational journals such as "Micromath" and "The Computing Teacher" which were chosen because of their practical value.

For each section a set of notes was prepared. The notes may be found in Appendix B (spreadsheet notes), Appendix C (word processing) and Appendix D (database notes). Each teacher received a copy of the set of notes, which, combined with the lectures, provided step-by-step information on how to master the application program under discussion. The idea was for the teachers to work through these notes with the researcher to familiarise themselves with these notes and to write down personal reminders about certain aspects in these notes. It was hoped that teachers could then afterwards refer to the notes when problems occurred. The notes formed an important part of the support offered to help teachers cope in the absence of the

researcher.

4.2.3 Emphasis on teaching aids

Throughout the training, the use of spreadsheets, word processors and databases as teaching aids was emphasised, although the use of these programs as personal tools for the teachers was also demonstrated. It was judged that the use of generic software as personal tools would inspire greater confidence and could then possibly lead to use as teaching aids. The distinction between using the computer as a personal tool and that of using the computer as a teaching aid was discussed and stressed.

Both schools were provided with two small mathematics programs developed by the researcher. Furthermore a desktop program called "Print Partner" (Public domain) and a word processing program suitable for use by young children, called "Word Processing for Kids" (also public domain) were provided.

4.3 The gathering of information

From informal talks with the staff members and headmasters, it was ascertained that there was a pressing need for training, since the level of computer literacy of the teachers was perceived to be very low. The computers had been bought but were not being used by the teachers.

An initial questionnaire, designed to determine the teachers' level of computer literacy, was sent out to the teachers of school A, but did not yield much information. Questions such as "Do you use a spreadsheet?" were left unanswered and subsequent informal talks revealed that staff members did not know what a spreadsheet was prior to the training.

It was therefore decided to complete the training envisaged and then ask the staff members to write comments about certain issues raised in a questionnaire (Appendix A).

Since the number of teachers involved, (41 in all) was manageable, teachers were asked to respond in their own words to open-ended questions. This was done to provide maximum opportunity to express feelings and individual ideas.

The questionnaire was divided into four sections. Section A concerned the spreadsheet, section B the word processor and section C the database. Section D was a general section concerning the training in general. The aim of the questions asked in each section, was to determine whether the training provided not only gave sufficient knowledge but also generated confidence to use the various tools, both as personal tools and as teaching aids. The possibility that personal confidence plays a role in determining whether a teacher will use the computer as a teaching aid or not had to be investigated.

As some teachers did not attend all the lectures but could possibly provide valuable information and ideas on the sections that they did attend, the first question of each section was: "Have you attended both/the lecture(s) on" (Appendix A questions 1, 4 and 7).

The second question of each section (questions 2, 5 and 8, Appendix A) tried to determine the background knowledge and use of that particular tool for each participant. It determined knowledge of the tool (Questions 2.1, 5.1 and 8.1, Appendix A), use as a personal tool (Questions 2.2, 5.2 and 8.2, Appendix A) and use as a teaching aid (Questions 2.3, 5.3 and 8.3, Appendix A).

The third question in each section (Questions 3, 6 and 9, Appendix A) concerned the training provided. It tried to determine whether the training provided was sufficient to give an overview of the tool (Questions 3.1, 6.1 and 9.1 Appendix A). It also tried to determine whether the training provided was sufficient to allow participants to use the tool as a personal tool as well as a teaching aid. It was important to determine

whether the concept of using the computer as a teaching aid was acceptable to the participants. This section also tried to determine whether actual use of the computer had taken place since the training (questions 3.4, 3.5, 6.4, 6.5, 9.4 and 9.5, Appendix A). Participants were asked to list deficiencies and strengths of the training (questions 3.6, 3.7, 6.6, 6.7, 9.6 and 9.7, Appendix A). It was hoped that comments from participants on these questions could possibly highlight points to consider for future training sessions.

In section D, which was a general section concerning the training as a whole, in order to assess their attitude towards the training, participants were asked to indicate whether they had gained anything from the training (question 10, Appendix A). If they answered that they had not gained anything from the training, but did not list any possible deficiencies in the training when asked to do so, it could indicate that their attitude towards the training was negative.

Teachers were also asked to indicate whether they had used the computer as a teaching aid with any other programs, since this would indicate that although they did not have the confidence to use the computer as a teaching aid with the tools provided in the training, they may have gained enough confidence to use the computer with other less demanding applications.

The last question (question 12, Appendix A) assessed whether the participant's attitude towards computers was negative or positive. It also determined whether teachers saw possibilities for using generic software as a teaching aid.

The questionnaires were distributed at School A, 45 days after the last lecture on databases and at School B, 47 days after the last lecture on databases, a period therefore of approximately six weeks after the last lecture. During this period there was a school holiday of 14 days. This particular period was chosen to give teachers who wanted to spend some time during the

holidays to familiarise themselves with the material provided, the opportunity to do so.

Both schools received their questionnaires on the same day. School A returned 8 out of 16 questionnaires. School B returned 22 of the 25 questionnaires. The low return rate encountered at school A could possibly be largely ascribed to two factors:

- i) the period during which the last two sessions took place was a very busy period for teachers of the school
- ii) a number of staff members had left and were replaced by others, which could have influenced commitment to the project over a long period.

Participants were allowed to complete the questionnaires independently and in their own time.

4.4 Detailed description of each training session

Since the actual training sessions were regarded as the crucial part of the study, a detailed description of each session is given. The notes that were given in support of each training session may be found in Appendices B, C and D.

The order in which the three application packages were presented, may have an influence on the success of the training. Personal preference, how difficult the application program is perceived to be and the amount of typing involved if the participant's keyboard skills are lacking could determine the participant's attitude towards the training. It must also be remembered that a course in MSDOS was offered prior to the training that constituted part of the research. The first session was therefore not the participants' first introduction to keyboard functions. The training on the use of a spreadsheet was offered first because the amount of typing could be limited. It was hoped that participants would not regard good typing skills as essential for the training. The word processor was offered next, since most teachers could benefit directly from personal use of

this tool in setting notes, tests and exam papers. The database training was offered last.

4.4.1 Session 1: Introduction to a spreadsheet:

The spreadsheet that was used was As Easy As Version 4.0, since it did not incur any cost to the school, other than site registration if they chose to use it permanently, and teachers with computers at home could also register copies at a minimal cost, without infringing any copyright laws.

In this session existing files on disk were supplied to teachers. The following topics were demonstrated using the given files: labels, numbers, formulas, sorting, graphs and copying.

4.4.1.1 Labels

Teachers were asked to load a file that explains the layout of labels (See Appendix B, page 81). They were taught how to load and save a file and why it is necessary to save frequently while working.

The concept of what the computer takes to be a label, what the computer regards as a number and which symbols specifically denote a label were introduced. Then they were taught how to justify labels, to the left, right and centre.

4.4.1.2 Numbers and formulas

A second file, which was an example of a short score sheet (Appendix B, page 81), was used to explain what the function of a formula is, how a formula may be created and the advantages of using a formula, should some of the numbers change. The column widths were changed to illustrate this additional feature.

4.4.1.3 Sorting

The next feature to be taught was sorting. For this purpose an existing file with names and amounts payable (See Appendix B, page 82), was loaded. The steps to sort the names alphabetically form part of the file and appear on screen as the file is loaded. Teachers were asked to follow the given steps to sort the names in ascending alphabetical order and to repeat the process with the amounts payable, but in descending order. The process was repeated a number of times for different columns in ascending and descending order.

4.4.1.4 Graphs

A file that contains the month, rainfall and temperatures was loaded into memory (appendix B page 83). Part of this file was a previously drawn line graph, which was used to show teachers how to display graphs that were drawn and saved as part of the file and how graphs might be drawn. Teachers could change values and examine the influences of the changes on the existing graph. They were introduced to the different types of graphs offered by AS EASY AS. They now had to draw a pie chart showing the rainfall per month. It was emphasised that the choice of x-values was important.

4.4.1.5 Copying

Two cells, one containing a number and one containing a formula, were used to illustrate how to define the range of cells to be copied and how to indicate the target. Teachers were taught how to copy a single cell as well as a range of cells (Appendix B, page 83).

4.4.2 Session 2: Continue spreadsheets

The concepts demonstrated in session 1 were now repeated, but teachers had to create their own files. Since most teachers have

to work with marks at some stage of their teaching practice, it was judged that a simple score sheet would offer the best medium for practising all they had learnt in the first session. This application of a spreadsheet would demonstrate that it could be very useful as a personal tool.

Teachers were asked to create a score sheet for a class of five pupils. They had to type in names and two sets of marks for each pupil. A formula had to be used to find the average of the class. The names were then sorted alphabetically and another sort was performed to find a list of pupils in order of achievement. A bar graph of the names of the pupils on the X-axis, and the corresponding mark on the Y-axis, was then created. Marks were altered and the changes in the graph noted. The names were copied to another column to illustrate the copying feature.

In this session teachers were introduced to the help function and formatting. The possibility of working with decimals or currency was illustrated. Further information about graphs and statistical functions was examined using the screens provided by the help function (Appendix B, pages 84-87).

To balance the use of the spreadsheet as a personal tool with that of using the spreadsheet as a teaching aid, lesson material for the use of spreadsheets in mathematics was created by the researcher and demonstrated. The spreadsheets for these were supplied on disk and teachers were asked to load these in as each spreadsheet and its use was demonstrated. Topics from the new mathematics syllabus were chosen and it was demonstrated how the spreadsheet could be used to enhance the teaching of these topics. The corresponding number of the topic in the syllabus was given as a reference in each case.

A spreadsheet was created to enhance pattern recognition. A formula was used to calculate each multiple. The pupil could then change the number - 3 in the example on the next page, fig. 4.1 - to anything. The corresponding multiples would

appear. This allowed the pupil to find multiples of any numbers and would enhance pattern recognition considerably. This topic is covered in the junior primary phase as well as the senior primary phase.

Mathematics Std 2 Syllabus: 5.4.1 Numbers Theme: Multiples			
Let's find patterns!			
Multiples of:	3		
3	33	63	93
6	36	66	96
9	39	69	99
12	42	72	102
15	45	75	105
18	48	78	108
21	51	81	111
24	54	84	114
27	57	87	117
30	60	90	120

Figure 4.1 Pattern Recognition

The problem of finding the biggest area to be fenced with a fixed length of fencing was demonstrated using the spreadsheet to show how the different lengths and breadths chosen influence the area fenced. Formulas for the calculation of the circumference and the area were used. The pupil could then type lengths and widths, which would result in the circumference and area being calculated. By entering different values pupils could be led to discover that a square offered the best option.

Mathematics Std 4 Syllabus: 7.3.3 Area Theme: Circumference and Area			
A farmer would like to fence a square/rectangular area. One side of the area to be fenced already has a 20 m wall. The farmer only has 300 m fencing material. What must the lengths of the sides be, so that the biggest area is fenced?			
Length	Width	Circumference	Area
		(Formula)	(Formula)
120	40	320	4800
100	60	320	6000
80	80	320	6400

Figure 4.2 Biggest Area

The use of bar graphs with the spreadsheet was demonstrated to indicate how a child's concept of relationships between the values and how they affect the graph, could be enhanced. Since bar graphs form part of the mathematics syllabus, the use of the spreadsheet in teaching this topic is very satisfying and practical. The following figure illustrates this section:

Mathematics Std 2 Syllabus: 5.8.2 Representation of Data Theme: Bar graphs	
How do you travel to school?	Number of pupils
1. Walk	3
2. Bicycle	5
3. Car	8
PRESS F10 TO SEE THE GRAPH	

Figure 4.3 Bar Graphs

The bar graph representing the mode of travel on the X-axis and the number of pupils on the Y-axis was displayed by pressing the F10 key. The pupils could then change the number of pupils who travel in a specific way, which would then change the graph accordingly.

The solution of a number of other problems cited in the syllabus was also demonstrated with the aid of the spreadsheet and was well received by teachers. Teachers could then experiment freely with the lesson material.

Copies of further supporting material from journals such as "Micromath" and "The Computing Teacher" were left for teachers to browse through on their own.

4.4.3 Session 3: The word processor

The word processor that was used was PCWRITE, again for the reason that no costs were incurred by the school and teachers who owned computers could take a copy home. The use of word processors for the creation of any written material in any subject was stressed. The basic features of word processing, storing, retrieving, editing, layout and printing, were discussed, emphasising that the particular word processor is irrelevant as those features could be found in any word processor. These topics were then taught in greater detail.

4.4.3.1 Creating, storing and retrieving a file

A file called FIRST, containing a number of typing errors (See Appendix C, page 88), was created and stored by the teachers. The same file was retrieved.

4.4.3.2 Editing text

Typing errors in the text retrieved from the file created by the teachers were corrected using the methods for single characters: backspacing, inserting characters and overwriting characters. Teachers got to know the difference between the backspace key and ordinary arrow keys. They learnt that the delete key deletes the character to the right of the cursor and the backspace key deletes the character to the left of the cursor.

The appearance of the document was discussed and enhanced by centering and underlining text. Block operations were then taught: copying, moving and deleting blocks of text (See appendix C, page 90). The search and replace functions of the word processor were also mastered.

4.4.3.3 Page layout

Not all participants got as far as changing the page layout, but the notes provided information about this topic. Some participants got there accidentally! The notes provided information on changing margins and page lengths. The different lengths of the different types of paper were discussed.

4.4.3.4 Printing:

Because the configuration of the printer is an integral part of installing the program, this was done by the researcher, but since both schools had only one printer connected to a computer, it was left to the computer co-ordinator of each school to demonstrate or help with when the need arose. At one of the schools a teacher actually brought a document that she needed, which she completed and printed during the lecture. She was very excited and enthusiastic, since this was the first time that she had ever used the word processor.

The merits of using the word processor for any written material

created in class by pupils were discussed. Examples of applications of the word processor in a number of subjects were given.

4.4.4 Session 4: Database

The database that was used was the student version of dBASE III. This database allows a maximum of 30 records in the database. The essentials of what a database does, as well as the advantages of using a database, were explained (See appendix D, page 93).

The principles of a database were then demonstrated by retrieving an existing database on birds, created by the researcher. The database consists of records containing three fields (the name of the bird, the food that the particular bird eats and the shape of its beak). Beak shape was denoted by a number 1-10 (compare page 101 of Appendix D), corresponding to the 10 different classes of birds' beaks.

Teachers had to identify the three fields as well as the data types of the contents of each field. Teachers then had to add records to the existing file and using the **browse** option ensure that the new records had in fact been added (appendix D, page 94). Some of the records were then edited.

The concept of searching the database was explained. They then had to list all the seed-eating birds and note the class (1-10) of beak that these birds had. The shape of the beak could be seen on page 101 of Appendix D. All the seed-eating birds had the same shape of beak, number 6. They then had to list all the birds with a class 6 beak, and note what food these birds ate. They all ate seeds. The exercise was repeated for birds with differently shaped beaks and different food preferences. They were thus led to discover that there is a relationship between the shape of a bird's beak and the food that it eats.

The exercise was valuable for two reasons: this topic forms part of the school syllabus for Standard 4 General Science, so teachers found it an interesting approach, but it was also valuable because the searches that were performed formed a natural extension of the skills they had to learn in respect of a database.

Photographs of birds (pages 98-100 of Appendix D) were supplied and teachers had to classify the shape of the beak and indicate what food the bird would be expected to eat. It was stressed that a higher-order thinking skill was being employed instead of mere recall.

4.4.5 Session 5: Database continued

In this session teachers were led to create a database for information about school children (appendix D, page 96). Teachers could, after discussion, choose the fields and data types that they wanted. In the notes, certain fields were suggested (appendix D, page 96) but teachers did not rigidly adhere to these fields.

The data description was chosen for each of the fields, as well as the field width. The database was created accordingly. Fictitious data was entered. Teachers then had to list all the records with a certain field that was equal to a given value. Repeated searches were carried out. The basic skills that were taught during session 4 were repeated using the database that teachers themselves had created.

During all the training sessions teachers were reminded that not only were the packages taught excellent personal tools to master, but that they could also be used very effectively as teaching aids. This emphasis was considered important, as it could not be assumed that teachers would automatically progress to using these tools as teaching aids. By using actual topics from existing school syllabi it was hoped that enough interest could

be raised to encourage teachers to experiment with these tools as teaching aids.

Chapter 5

Research findings

The questionnaires were distributed to the two participating schools. Teachers could complete the questionnaires independently and anonymously and return them within a reasonable time. The responses to the questionnaires are discussed under the headings of School A and School B. School A was the school that received the training over the 8-month period and school B was the school that received the training over a five-week period.

5.1 Analysis of the responses to the questionnaire

5.1.1 School A

Conducting a study over an 8 month period at a school proved to have some problems, of which the biggest one appears to be the movement of staff. There was a constant turnover of staff which resulted in very few participants being part of all three components of the study.

Sixteen questionnaires were distributed and eight questionnaires were returned. As mentioned before, several staff members participating in the training offered for each section left and were replaced by others. Thus, although there were 16 members attending each training session, the same people were not involved at each section. This could possibly have influenced commitment towards the research project and resulted in the low return rate of the questionnaires. It was therefore very difficult to draw clear conclusions from the results gathered under these circumstances. The results of each of the sections of the questionnaire concerning the training that had been done on each of the tools are summarised separately. The number of participants who responded to each particular section of the questionnaire is given at the top of each table. It must be emphasised that this number is only the number of participants

that responded in the questionnaire to the training that had been given for that particular tool. Each training session was attended by 16 teachers from school A.

5.1.1.1 Background knowledge: school A

For the first question in each section concerning knowledge of that particular tool (Questions 2.1, 5.1 and 8.1, Appendix A), only a single YES was indicated. Only one person knew what a word processor was and had used it as a teaching aid (Table 5.1). This means that, for school A, the perceptions of a low starting level of computer literacy were indeed accurate.

SPREADSHEET: (QUESTIONS 2.1-2.3) (NUMBER OF RESPONSES: 4)	NO	YES	NO ANSWER
DID YOU KNOW WHAT A SPREADSHEET WAS?	4	0	0
DID YOU USE A SPREADSHEET AS A PERSONAL TOOL?	4	0	0
DID YOU USE A SPREADSHEET AS A TEACHING AID?	4	0	0
WORD PROCESSOR: (QUESTIONS 5.1-5.3) (NUMBER OF RESPONSES: 6)	NO	YES	NO ANSWER
DID YOU KNOW WHAT A WORD PROCESSOR WAS?	5	1	0
DID YOU USE A WORD PROCESSOR AS A PERSONAL TOOL?	6	0	0
DID YOU USE A WORD PROCESSOR AS A TEACHING AID?	5	1	0
DATABASE: (QUESTIONS 8.1-8.3) (NUMBER OF RESPONSES: 7)	NO	YES	NO ANSWER
DID YOU KNOW WHAT A DATABASE WAS?	7	0	0
DID YOU USE A DATABASE AS A PERSONAL TOOL?	7	0	0
DID YOU USE A DATABASE AS A TEACHING AID?	7	0	0

TABLE 5.1 Responses questions on background knowledge: school A

5.1.1.2 Responses to spreadsheet training: school A

SPREADSHEET: SECTION A : NUMBER OF RESPONSES: 4	NO	YES	NO ANSWER
QUESTION 3: (3.1, 3.2, 3.3, 3.4, 3.5 Appendix A)			
WAS THE TRAINING OFFERED SUFFICIENT?	1	3	0
ARE YOU ABLE TO USE THE SPREADSHEET AS PERSONAL TOOL?	3	1	0
ARE YOU ABLE TO USE THE SPREADSHEET AS TEACHING AID?	3	1	0
HAVE YOU USED THE SPREADSHEET AS PERSONAL TOOL SINCE THE TRAINING?	3	1	0
HAVE YOU USED THE SPREADSHEET AS TEACHING AID SINCE THE TRAINING?	4	0	0

TABLE 5.2: Responses to spreadsheet questions: school A

Comments on the quality of the training may be summarised by the following: (Questions 3.6 and 3.7, Appendix A)

- a) While the training was being offered, it was considered sufficient, but through lack of access to a computer at home, very little of what had been done could be remembered.
- b) The notes were very good and proved to be a great help.

5.1.1.3 Responses to word processing training: school A

The following table summarises the responses to questions pertaining to the word processing training:

WORD PROCESSING SECTION B: NUMBER OF RESPONSES: 6	NO	YES	NO ANSWER
QUESTION 6: (6.1, 6.2, 6.3, 6.4, 6.5 Appendix A)			
WAS THE TRAINING OFFERED SUFFICIENT?	1	5	0
ARE YOU ABLE TO USE A WORD PROCESSOR AS PERSONAL TOOL?	2	4	0
ARE YOU ABLE TO USE A WORD PROCESSOR AS TEACHING AID?	2	4	0
HAVE YOU USED A WORD PROCESSOR AS PERSONAL TOOL SINCE THE TRAINING?	4	2	0
HAVE YOU USED A WORD PROCESSOR AS TEACHING AID SINCE THE TRAINING?	5	1	0

TABLE 5.3: Responses to word processor questions: school A

There was only one comment about the quality of the word processor training, namely that it was enjoyable and that it

illustrated the value of a word processor.

5.1.1.4 Responses to database training: School A

DATABASE: SECTION C: NUMBER OF RESPONSES: 7	NO	YES	NO ANSWER
QUESTION 9: (9.1, 9.2, 9.3, 9.4, 9.5 Appendix A)			
WAS THE TRAINING OFFERED SUFFICIENT?	2	5	0
ARE YOU ABLE TO USE A DATABASE AS PERSONAL TOOL?	4	3	0
ARE YOU ABLE TO USE A DATABASE AS TEACHING AID?	4	3	0
HAVE YOU USED A DATABASE AS PERSONAL TOOL SINCE THE TRAINING?	7	0	0
HAVE YOU USED A DATABASE AS TEACHING AID SINCE THE TRAINING?	7	0	0

TABLE 5.4: Responses to database questions: school A

Comments about the quality of the training on the database may be summarised as follows (questions 9.6 and 9.7 Appendix A):

- a) Time was a limiting factor and although the notes were very good, the participant still did not feel comfortable with the tool itself. The reason cited being, no further contact with the computer after the training.
- b) The course was enjoyable and highlighted the efficient use of a database.

5.1.1.5 Section D: General

QUESTIONS 10 AND 11: (Appendix A): NUMBER OF RESPONSES: 7	NO	YES	NO ANSWER
DO YOU FEEL YOU HAVE GAINED ANYTHING BY ATTENDING THE TRAINING?	2	5	0
DO YOU USE THE COMPUTER AS A TEACHING AID WITH ANY OTHER PROGRAMS THAN THE ONES USED IN THE TRAINING?	7	0	0

TABLE 5.5: Responses to questions on training in general: school A

A general comment was that not having a computer at home diminished the effectiveness of the training.

5.1.2 School B

Twenty-five questionnaires were distributed and twenty-two were returned. Two of those returned had not been filled in, therefore only twenty of the twenty-five questionnaires could be used. Because of the high return, it was possible to gain more insight into the situation.

5.1.2.1 Background knowledge: school B

The questions in the questionnaire concerning the background knowledge of the participants (questions 2, 5 and 8, Appendix A) indicated that initial perceptions about a low starting level of computer literacy were also justified in this case. The following table summarises responses:

SPREADSHEET: (QUESTIONS 2.1-2.3)	NO	YES	NO ANSWER
DID YOU KNOW WHAT A SPREADSHEET WAS?	16	4	0
DID YOU USE A SPREADSHEET AS A PERSONAL TOOL?	17	3	0
DID YOU USE A SPREADSHEET AS A TEACHING AID?	19	1	0
WORD PROCESSOR: (QUESTIONS 5.1-5.3)	NO	YES	NO ANSWER
DID YOU KNOW WHAT A WORD PROCESSOR WAS?	12	6	2
DID YOU USE A WORD PROCESSOR AS A PERSONAL TOOL?	12	6	2
DID YOU USE A WORD PROCESSOR AS A TEACHING AID?	14	4	2
DATABASE: (QUESTIONS 8.1-8.3)	NO	YES	NO ANSWER
DID YOU KNOW WHAT A DATABASE WAS?	15	4	1
DID YOU USE A DATABASE AS A PERSONAL TOOL?	17	2	1
DID YOU USE A DATABASE AS A TEACHING AID?	17	1	2

TABLE 5.6 Responses questions on background knowledge: school B

As may be seen from these results, before the training, a high percentage of the participants did not know what a spreadsheet, word processor or database were. The lack of knowledge was more marked where the spreadsheet and database was concerned than in the case of the word processor. Further scrutiny revealed that of the 4 who indicated that they had prior knowledge of a spreadsheet, 3 had also used the spreadsheet as a personal tool,

yet only 1 had used it as a teaching aid.

5.1.2.2 Responses to questions on spreadsheet training: School B

Responses to the questions pertaining to the spreadsheet training (Question 3, Appendix A) may be summarised as follows:

SPREADSHEET: (QUESTIONS 3.1-3.5)	NO	YES	NO ANSWER /UNCERTAIN
WAS THE TRAINING OFFERED SUFFICIENT?	3	16	1
ARE YOU ABLE TO USE THE SPREADSHEET AS PERSONAL TOOL?	6	13	1
ARE YOU ABLE TO USE THE SPREADSHEET AS TEACHING AID?	8	11	1
HAVE YOU USED THE SPREADSHEET AS PERSONAL TOOL SINCE THE TRAINING?	17	2	1
HAVE YOU USED THE SPREADSHEET AS TEACHING AID SINCE THE TRAINING?	19	0	1

TABLE 5.7 Responses to spreadsheet questions: school B
Responses to the questions concerning the training offered seemed very positive, as 16 of a possible 20 considered the training to have been sufficient, 13 judged that the training enabled them to use the spreadsheet as a personal tool, yet only 2 had in actual fact used the spreadsheet as a personal tool since the training. The same 2 people had also used the spreadsheet as personal tool before the training! The training did not inspire a single new person to use the spreadsheet as a personal tool, nor had it inspired a single person to use the spreadsheet as a teaching aid.

The following would summarise the deficiencies indicated in the training: (Question 3.6, Appendix A)

- a) tempo too fast / not enough time
- b) not enough practice
- c) no access to a computer
- d) too many participants for one teacher
- e) contents too much for the available time.

The strengths that were cited may be summarised as follows: (Question 3.7, Appendix A)

- a) Good examples were used.

- b) It was interesting.
- c) Initial fear decreased.
- d) The training highlighted the applications.
- e) The training offered the same impact to beginners as to experienced users.
- f) The notes were good.
- g) Individual attention was given.

It is noteworthy that one person judged that there were too many participants for one lecturer to handle, yet other participants considered the individual attention given sufficient. Perhaps participants who were coping, considered the attention that had been given to be sufficient, whereas participants who had had difficulty coping, had experienced frustration and therefore had needed more attention than what had been given.

5.1.2.3 Responses to questions on word processing training: school B

Responses to the questions on the word processing training that were offered may be summarised as follows:

WORD PROCESSING: (QUESTIONS 6.1-6.5)	NO	YES	NO ANSWER /UNCERTAIN
WAS THE TRAINING OFFERED SUFFICIENT?	4	13	3
ARE YOU ABLE TO USE THE WORD PROCESSOR AS PERSONAL TOOL?	3	13	4
ARE YOU ABLE TO USE THE WORD PROCESSOR AS TEACHING AID?	5	11	4
HAVE YOU USED THE WORD PROCESSOR AS PERSONAL TOOL SINCE THE TRAINING?	11	6	3
HAVE YOU USED THE WORD PROCESSOR AS TEACHING AID SINCE THE TRAINING?	16	1	3

TABLE 5.8: Responses to word processing questions: school B

Of the 6 participants who have used the word processor as personal tool since the training, 3 had also used the word processor as personal tool before the training was offered, therefore 3 had not previously used the word processor as personal tool. Only 1 person had been inspired to use the word

processor as a teaching aid, in spite of a high number of participants indicating that they had had knowledge about word processing before the training.

The deficiencies offered in the word processing training may be summarised as follows: (Question 6.6, Appendix A)

- a) tempo too fast / not enough time
- b) more practice needed
- c) too many participants per lecturer.

Possible strengths in the word processing training may be summarised by: (Question 6.7, Appendix A)

- a) It was very interesting.
- b) The training stimulated interest in the subject.
- c) The notes were very good, logical and a great help.
- d) Individual attention was given.
- e) Directions given were good.

5.1.2.4 Responses to questions on database training: school B

DATABASE: (QUESTIONS 9.1-9.5)	NO	YES	NO ANSWER / UNCERTAIN
WAS THE TRAINING OFFERED SUFFICIENT?	5	13	2
ARE YOU ABLE TO USE THE DATABASE AS PERSONAL TOOL?	9	9	2
ARE YOU ABLE TO USE THE DATABASE AS TEACHING AID?	12	6	2
HAVE YOU USED THE DATABASE AS PERSONAL TOOL SINCE THE TRAINING?	14	3	3
HAVE YOU USED THE DATABASE AS TEACHING AID SINCE THE TRAINING?	18	0	2

TABLE 5.9 Responses to database questions: school B

Although 9 people indicated that they would be able to use the database as a personal tool, only 3 had done so since the training and nobody had used the database as a teaching aid since the training. It must however be pointed out that the application possibilities of a database, both as a personal tool and as a teaching aid, are more limited than that of the word processor or the spreadsheet. Not many databases would be created during a six week period in a primary school, or for that

matter for personal use.

Deficiencies in the training may be summarised as follows:
(Question 9.6, Appendix A)

- a) not enough time
- b) not enough practice
- c) not general enough to include examples for junior primary phase
- d) too many participants for one lecturer.
- e) lack of immediate support in the absence of the lecturer was frustrating.

Strengths of the database training that were included may be summarised by the following: (Question 9.7, Appendix A)

- a) Good examples were used.
- b) The presentation was good.
- c) The notes were very good and well structured.
- d) Classroom use was excellently illustrated.
- e) The choice of birds as a database was excellent.

In all three questions concerning the deficiencies in the training (Questions 3.6, 6.6 and 9.6, Appendix A) the time factor was mentioned by a number of participants. It would seem that many participants had found the time that had been allocated insufficient. Many participants indicated that the volume of work covered, was too much for the available time.

In all three questions concerning the strengths of the training (Questions 3.7, 6.7 and 9.7; Appendix A) the support offered by the notes was found to be valuable. Another common strength was the illustrative value of the examples. The training was also described as interesting.

5.1.2.5 Responses to questions in General Section: School B

The general response to the training provided (Question 10, Appendix A) was as follows:

GENERAL (QUESTIONS 10 AND 11)	NO	YES	NO ANSWER
DO YOU FEEL YOU HAVE GAINED ANYTHING BY ATTENDING THE TRAINING?	2	16	2
DO YOU USE THE COMPUTER AS A TEACHING AID WITH ANY OTHER PROGRAMS THAN THE ONES USED IN THE TRAINING?	15	3	2

TABLE 5.10: Responses to questions on training in general:
school B

Responses to questions 12 a) and 12 b) followed the same trend as the questions in Sections A, B and C concerning personal use and use as a teaching aid. Participants were generally positive towards the training, yet not inspired enough or had not gained enough confidence to use the programs as personal tools and certainly not as teaching aids.

5.2 Summary of Responses

From the responses it could clearly be seen that with both schools the level of computer literacy before the training was low. In both cases the majority of participants indicated that they had gained something by attending the training.

The training did however not lead, in either case, to a significant increase in the use of the computer as a personal tool or as a teaching aid. In the case of school A, 5 out of 7 (71,4%), and in the case of school B, 16 out of 20 (80%), of the participants indicated that they had gained something. At school A, however, not a single participant had used the computer as a teaching aid since the training, while at school B only 3 out of 20 (15%) had subsequently used the computer as a teaching aid with other programs.

The participants from school B indicated greater confidence in

the use of the computer as a personal tool and to a lesser extent as a teaching aid, as a result of the training in each program, as opposed to participants from school A. Participants from school A described the training as sufficient to give an overview of the uses of each tool, but were not confident about using the tool. Table 5.10 on the next page, compares the results of the responses from the two schools to questions measuring confidence:

QUESTIONS 3.2, 3.3, 6.2, 6.3, 9.2, 9.3 (APPENDIX A)	SCHOOL A:		SCHOOL B:	
	NO	YES	NO	YES
ARE YOU ABLE TO USE THE SPREADSHEET AS PERSONAL TOOL?	3 (75%)	1	6 (32%)	13
ARE YOU ABLE TO USE THE WORD PROCESSOR AS PERSONAL TOOL?	2 (33%)	4	3 (19%)	13
ARE YOU ABLE TO USE THE DATABASE AS PERSONAL TOOL?	4 (57%)	3	9 (50%)	9
ARE YOU ABLE TO USE THE SPREADSHEET AS TEACHING AID?	3 (75%)	1	8 (42%)	11
ARE YOU ABLE TO USE THE WORD PROCESSOR AS TEACHING AID?	2 (33%)	4	5 (31%)	11
ARE YOU ABLE TO USE THE DATABASE AS TEACHING AID?	4 (57%)	3	12 (67%)	6

Table 5.11 Comparison of responses

In each case the "NO" responses from school A were higher than the "NO" responses from school B, except the question about using the database as a teaching aid. The "NO" responses to the ability to use the tool as a teaching aid varied between 31% and 67% for school B and between 33% and 75% for school A. It may be concluded that the level of computer literacy at school B was raised to some extent, but not at school A. The training over the shorter period therefore seemed to give more confidence, but this was not followed up by actual classroom use. Although teachers were confident of their ability to use the program as teaching aids, they had not done so since the training.

From comments about the quality of the training, time seemed problematic. This forms part of the problem concerning access to a computer. Teachers who do not have computers at home found it particularly problematic and this was mentioned a number of times in the responses. The school computers do not offer free access because there is very little available time for teachers during school hours.

5.3 Discussion of the research findings

The value of the training was perhaps in introducing participants to some practical uses of the computer. Maybe the training was valuable in the sense that an overall introduction to the different applications of these programs was given. What is evident however, is that follow-up courses would be required, before positive results in personal use and use as a teaching aid could be accomplished.

From the analysis of the responses it would appear that the training over a shorter period had more to offer than the training over a longer period. The shorter training period seems to have raised the level of computer literacy marginally, while training over the longer period did not achieve this. It would seem that if the period of training is lengthened, the contact time must increase accordingly. Neither training session, however, produced significant increases in computer use as a teaching aid.

Comments written repeatedly in response to different questions of the questionnaire, seemed to indicate that lack of access to a computer at home prevented teachers from experimenting on their own and practising the skills taught in the training. Some teachers "wished they had a computer at home." This bears out experiences at the Durban College of Education, where any part-time student wanting to study any computer course is required to have personal access to a computer, preferably the student's own in his/her home. Having access to the school's computers is not considered sufficient. Experience in the past has been that, even over an extended period, in courses stretching over 2 years (2 hours every 2 weeks), the quality of the training of students who do not have their own computers does not match the quality of the training of students who do have their own computers.

Another point to consider is that a person motivated to buy a computer probably has already identified uses for the computer

and sets about using the computer for those purposes. Introducing this person to different applications to broaden his/her vision, may be more productive.

Chapter 6

Conclusion

A discussion on the limitations of this study follows, with tentative recommendations based on the results of this study. Further recommendations for future research are discussed.

6.1 Limitations of this study

Because only a total of 31 teachers were involved in the study, the results cannot be generalised. The results of the study can only be used to indicate possible directions for the future training of teachers.

It must also be emphasised that the two schools used in the study were model C primary schools administered by the Department of Education and Culture. The teachers involved were white and all had post-matric teaching qualifications.

The results of the study depended on keeping the training content and presentation constant while varying only the time over which training was presented. Although every effort was made to vary only the time-scale of the training certain factors could not be guaranteed to be constant.

These factors would include the following:

6.1.1 Motivation

The motivation of teachers over a longer period is different to the motivation of teachers over a short intensive period. If the training is done in a shorter period, there is greater pressure to absorb information and the training could be perceived as more intensive. This requires greater motivation. Attempts to keep teachers motivated and focused were made with both groups, but motivation outside the training sessions could not be controlled,

since the researcher was not an integral part of either of the schools.

The value attached to the program by management could also influence the motivation of the teachers. If one group perceives the research as an experiment while the other group regards the training as an essential part of becoming a better teacher, the priority attached to becoming computer literate could differ from one group to the other.

6.1.2 Previous experience

The two schools selected were chosen because they had bought computers at the same time. There could however be no guarantee all the teachers had not previously been exposed to the use of computers. In some cases some teachers had previous experience while others did not. In certain cases this also influences attitudes, because negative experiences could lead to negative attitudes. Indications from a study done in Britain on students entering a B.Ed or Post Graduate Certificate of Education course, seem to indicate that "negative feelings are likely to be experience-dependent" (Summers 1990:269).

6.1.3 Participation

The individual members participating could not be kept constant. The group participating in the training over a longer period, could not be kept constant, since some staff members resigned, got transferred or went on maternity leave. These staff members had to be replaced and the new members who were appointed, did not have the same level of computer literacy as those who had left.

The group participating in the shorter, more intensive training period could also not be kept constant either, since some staff members had prior engagements. Events such as sports meetings had to be attended and could not be cancelled or postponed. The

research had to fit in with the existing school program, a situation which made demands on teachers' time and energy.

6.1.4 Spacing of training sessions

The spacing of the training sessions of the group trained over a longer period had to be reconciled with the existing school program. The existing schedule had to be studied and time allocated accordingly. There could thus be longer periods between sessions or shorter periods, depending on the existing program. For optimum results, one would prefer the periods of time between sessions not to be too long, since participants tend not to work with the computer on their own. These long periods then result in participants having difficulty in picking up the threads again. The other alternative would be to have more contact between sessions.

6.1.5 Group size

The group trained over a longer period was smaller (16 teachers) than the group trained over a shorter period (25 teachers). This could possibly influence the training. With both groups the ratio of participants per computer was not more than two, but the time it took for the trainer to respond to questions or problems encountered by individuals, was affected by the overall size of the group.

6.1.6 The computer centre

6.1.6.1 Access

Frustrations arising from lack of access to the existing computer facilities, could possibly have influenced the results of the study. The teachers in general had very little time available for accessing the computers at the school.

6.1.6.2 Support

The teaching load and enthusiasm of the computer co-ordinators at schools could influence the amount of support being provided for teachers. A too heavy teaching workload could prevent the co-ordinator from being available when teachers encounter problems they were unable to solve. Factors that could play a crucial role in encouraging other teachers to attempt the use of computers as a teaching aid, would include the following: the personalities of the computer co-ordinators, continued exposure to new teaching trends, attitudes towards further training and ability to solve problems.

6.1.6.3 Organisation

The organisation of a computer centre takes time. Lack of time could result in a poorly organised computer centre. A computer centre where the software is well organised and the hardware is regularly serviced would promote computer use. A computer centre where software is not graded and indexed and where computers are often faulty, would discourage teachers from using computers as a teaching aid. Since two different people were involved with the research, the organisation of the computer centres could influence the results of the study.

6.2 Tentative recommendation

The goals of the study were to determine

- 6.2.1. whether raising the computer literacy level of teachers would result in an increased use of computers across the curriculum and
- 6.2.2. whether the period over which the computer literacy level was raised influenced computer use in the classroom.

From the results of the questionnaire, it would seem a shorter,

more intensive period of training has more to offer in terms of confidence gained by participants, than limited contact over a longer period. Although time constraints put a heavy load on participants during the shorter intensive training period, more positive results were achieved. Although participants in the shorter training period did not follow up their perceptions of their ability to use the programs discussed, they were confident they would be able to. Whether this confidence would last, is a matter for further research. The longer training period did not provide the majority of participants with the necessary confidence to use the tools discussed.

Neither training session was successful in increasing computer use, either as a personal tool, or as a teaching aid. Intensive training over a longer period could possibly achieve this. Raising the level of personal computer use seems to be a prerequisite for using the computer as a teaching aid. If the use of the computer as teaching aid is not compatible with the teaching style of the teacher, the training offered would have to promote effective ways of changing teaching styles.

It would therefore seem, that although the level of computer literacy of the group trained over a shorter period was raised, the training did not increase the teachers' use of computers across the curriculum.

The period over which the computer literacy level was raised did have an influence on the effectiveness of the training, but there were no significant changes in computer use across the curriculum.

6.3 Recommendations for further research

6.3.1 Management of the computer centre

The influence of the management of the computer centre on the integrated use of the computer as a teaching aid should be researched. Research into whether negative influences could be avoided if computers are not in a computer centre but distributed throughout the school should yield valuable information. If a computer could be placed in every classroom, it might solve the problem of accessibility, but other problems might be encountered. Teachers need to be taught how to use a single computer effectively in a class of 30 to 40 or more pupils. To some teachers this may seem such a hopeless task that it is abandoned before any attempt is made. Research into the provision of effective support for teachers where computers are distributed, i.e. a computer in every classroom, could influence decisions on whether to put computers in a computer centre or to distribute computers to each classroom.

6.3.2 Creation of lesson material

Another area to research, considering the severe time restrictions and workload of teachers, would be the creation of computer-based lesson material. How realistic is it to expect teachers in South Africa today to spend a lot of time creating lesson material incorporating the use of the computer? Is fellow teacher support in the sharing of lesson material a solution to the problem? Is it possible for a teacher to teach effectively with lesson material created by other teachers?

6.3.3 Influence of management on computer use

Teachers' attitudes play a definite role in their approach to the use of computers. The influence of the management of a school on the attitude of the teachers at a particular school and the resulting computer use across the curriculum could be researched.

Studies by Margaret Cox seemed to indicate that the attitudes of the head teachers in Britain did influence the motivation of teachers to use computers. Although attitudes towards computers in general could be changing, the present management in South African schools did not have computer literacy as a component of their training. It would be interesting to determine whether the lack of computer literacy training influences computer use by staff members.

6.3.4 Availability of suitable software

Minority language groups all have to work through the medium of English. Research into the effect of using English to operate the computer, while it is a second language for the pupil and the mixed use of languages that results, could provide answers to many language groups that are hesitant to introduce computers to their schools. There are not many programs available in Zulu, while the Zulu nation forms a significant component of society in South Africa. Generic software such as spreadsheets can to some extent be used in languages other than English, but to be able to use facilities such as sorting of data, copying or graphing, the pupil has to revert to English and, at the very least, know the terms used in the package.

6.3.5 Pupils' opinions

Since it is the pupils to whom all this relates, perhaps a study involving pupils' opinions about what is presently being taught regarding computers, could perhaps be enlightening! Pupils may find what is being taught either boring or intimidating. Since more and more households are acquiring computers, sometimes the best and most expensive equipment available, pupils' opinion about the quality of the equipment may determine whether poor quality or dated equipment is detrimental to effective teaching. These topics could be researched and may yield interesting results.

6.3.6 Qualifications of the computer co-ordinator

The role the computer co-ordinator plays in computer use in the school environment is very important. Research into the qualities and qualifications necessary for this person to be successful could offer some solutions to problems encountered by using computers in schools. It is equally important to study what is required of the computer co-ordinator in terms of a task description that is fair and attainable.

6.4 Conclusion

This study was a sincere attempt at promoting the use of computers in primary schools. However, because teaching is an activity related to people, the complexity of the situation is beyond a single study. Further research may reveal more factors that influence the use of computers in primary schools.

Since the use of computers in some privileged primary schools is a development that is well under way, time may be the only remedy for solving some of the problems concerning computer use. It would, however, be a tremendous advantage if the process could be speeded up, since computers have so much to offer. The inability of adults to employ the technology to enhance their teaching is handicapping the pupils' use of this technology.

APPENDIX A:

Questionnaire

INFORMATION CONCERNING TRAINING

The following questions are concerned with the computer training that was provided at your school and in which you participated. All information provided by you, will be treated as confidential, so please feel absolutely free to air your views. Space has been provided for your name, but if you wish to remain anonymous, you may leave the space blank.

Space for answering each question has been provided. The space provided is not an indication of how much you are required to write. If not enough space has been provided, please feel free to comment on loose pages, just remember to number your answers the same as the questions, otherwise answers and questions cannot be matched.

This is an honest attempt at gathering information and if you could add information of value, it would be appreciated.

School: _____

Name: _____

Section A: Spreadsheet: As Easy As

Question 1:

Did you attend both lectures on this section?

Question 2:

2.1 Did you know what a spreadsheet was before the training was done?

2.2 Did you use a spreadsheet as a personal tool before the training was done?

2.3 Did you use a spreadsheet as a teaching aid before the training was done?

Question 3:

3.1 Do you feel that the training that was provided, was sufficient to give an overview of the use of a spreadsheet?

3.2 Are you, after the training, able to use the spreadsheet as a personal tool for instance to help with processing of marks?

3.3 Are you, after the training, able to use the spreadsheet as a teaching aid?

3.4 Have you, since the training, used the spreadsheet as a personal tool?

3.5 Have you, since the training, used the spreadsheet as a

teaching aid?

3.6 Please describe possible deficiencies in the training in the use of spreadsheets, that was provided:

3.7 Please describe possible strengths in the training in the use of spreadsheets, that was provided:

Section B: Word Processing: PCWRITE

Question 4:

Did you attend the lecture in this section?

Question 5:

5.1 Did you know what a word processor was before the training was done?

5.2 Did you use a word processor as a personal tool, before the training?

5.3 Did you use a word processor as a teaching aid, before the training?

Question 6:

6.1 Do you feel that the training that was provided, was sufficient to give an overview of the use of a word processor?

6.2 Are you, after the training, able to use the word processor as a personal tool for instance to set notes?

6.3 Are you, after the training, able to use the word processor as a teaching aid?

6.4 Have you, since the training, used the word processor as a personal tool?

6.5 Have you, since the training, used the word processor as a teaching aid?

6.6 Please list possible deficiencies in the training that was provided for the use of the word processor:

6.7 Please list possible strengths in the training that was provided for the use of the word processor:

Section C: Database (Student Version of Dbase)

Question 7:

Did you attend both lectures in this section?

Question 8:

8.1 Did you know what a database was before the training was done?

8.2 Did you use a database as a personal tool, before the training?

8.3 Did you use a database as a teaching aid, before the training?

Question 9:

9.1 Do you feel that the training that was provided, was sufficient to give an overview of the use of a database?

9.2 Are you, after the training, able to use the database as a personal tool for instance to keep records?

9.3 Are you, after the training, able to use the database as a teaching aid?

9.4 Have you, since the training, used the database as a personal tool?

9.5 Have you, since the training, used the database as a teaching aid?

9.6 Please list possible deficiencies in the training that was provided for the use of the database:

9.7 Please list possible strengths in the training that was provided for the use of the database:

SECTION D: GENERAL

Question 10:

Do you feel you have gained anything by attending the training?

Question 11:

Do you use the computer as a teaching aid with any other programs than the ones used in the training?

Question 12:

How do you feel, after the training, about the use of the computer as

a) a personal aid

b) a teaching aid?

THANK YOU VERY MUCH FOR YOUR CO-OPERATION, IT IS APPRECIATED

APPENDIX B:

SPREADSHEETS: (AS EASY AS)
(Set by F.N.Heukelman)

PAGE 1

LAY OUT OF LABELS (THAT MEANS ALL TEXT, WORDS UNDERLINING....)

<u>Position</u>	<u>Method</u>
MARKS	TYPE 'MARKS TO LEFT JUSTIFY THE WORD
MARKS	TYPE "MARKS TO RIGHT JUSTIFY THE WORD
MARKS	TYPE ^MARKS TO CENTRE THE WORD

PLEASE NOTE: Don't use any of the following symbols when typing in numbers: ', ", ^. It results in the number losing its numerical value and being regarded as a string of characters that only looks like a number to US. Numbers are automatically right justified in the cell and CANNOT be centred or left justified.

Example of a short score sheet:

<u>NAME</u>	<u>TEST 1</u> (40)	<u>TEST 2</u> (40)	<u>ASSIGNMENT 1</u> (10)	<u>ASSIGNMENT 2</u> (10)	<u>TOTAL</u> (100)
Joubert, K	40	40	8	10	98
Munnik, L	35	28	7	6	76
Brits, P	40	39	8	7	94
Ahlers, P	18	32	5	5	60
Roets, A	34	34	5	8	81
CLASS TOTAL	167	173	33	36	409
CLASS AVERG	33.4	34.6	6.6	7.2	81.8
CLASS AVERG%	83.5	86.5	66	72	81.8
LOWEST					60
HIGHEST					98

NOTE: The table above contains 42 numbers, but only 20 of these numbers are typed in as NUMBERS - all the other numbers are the result of formulas which are calculated. Therefore 22 numbers will change automatically if the numbers that appears in that formula changes.

SORTING OF NAMES OR NUMBERS

If a list of names or numbers must be sorted, the DATA option must be selected out of the MAIN menu. The following list of names (unsorted) must first be sorted alphabetically according to the surnames and then be sorted (in ascending order) according to the amounts.

NAME	AMOUNTS PAYABLE
----	-----
ROETS, PT	15.00
BOTHA, KA	45.56
LOUW, RS	45.78
EHLERS, P	12.01
BOTHA, K	34.12

Type the following instruction to sort the names alphabetically:

```

/      call up main menu
D      choose DATA option
S      choose SORT option
D      choose DATA RANGE option - all the cells that need to
      be sorted - use the full stop (.) and the arrow keys
      to specify the RANGE
P      choose the PRIMARY sort key - this is the single
      column used for sorting. Note that the column
      heading never forms part of the P or D option above as
      this would result in the heading being sorted along
      with the contents of the column! Now choose Sort
      Order: A for ascending or D for descending order.
G      G stands for GO, meaning execute the sort.

```

Repeat the above steps, but sort the amounts in descending order (the names will not stay in alphabetical order!)

1. GRAPHS

Although virtually any data can be used to draw a graph, it is necessary to be sure beforehand what you expect the graph to look like, otherwise wrong conclusions may be drawn from the graph. A pie-chart can for example only have one Y-range. If two Y-ranges are needed, another type of graph (bar graph) must be drawn. Also determine which of the columns in the spreadsheet must represent the X-axis values and which the Y-axis values, so that the correct information may be shown. Let us examine two graphs: (refer to graphs on disk)

MONTH	RAIN FALL	TEMPERATURE (MAXS)
Jan	34.20	29.00
Feb	0.00	31.00
Mar	12.50	30.00
Apr	0.00	28.00
May	0.00	27.00
Jun	1.00	27.00
Jul	2.00	26.00
Aug	15.00	24.00
Sep	49.00	23.00
Oct	69.00	27.00
Nov	67.00	26.00
Dec	100.00	29.00

The first graph gives both the rain fall and temperature on one graph, using a line graph. The second graph, a pie chart, shows the rain fall per month. You must draw this graph on your own.

2. COPY INSTRUCTION

When two or more of the same constants or formulas are to be used, you only need to type one then you may copy it to all the other cells where it is needed.

For this we use the COPYCELL instruction from the main menu as follows:

Place the cursor on the cell that needs to be copied.

Type / and C and specify the necessary ranges using the arrow keys and the full stop(.).

The following values are given:

17.00
56.00

The first value is a constant (17) and the second value is the result of a formula. In each case, copy the two items to cells C to H of the same row.

FORMATTING

The appearance of one or more cell in a range can be assigned a format with the following keystrokes: /rf

TYPE	FORMAT	STATUS
----	-----	-----
Fixed	123.12	[F2]
Science	1.245E+8	[S3]
Comma	1,500.0	[,1]
Currency	\$523.52	[C2]
Percent	34.12	[%2]
General		
Text	+A1+B2	[T]
+/-	++++	[+/-]
Date	20 May,87	[D1] six different forms
Hide		[H] Invisible cell
Reset		Return to global format

The value in the cell is actually retained with all decimals

Next Previous Topics Quit

G R A P H S (1)

You can plot up to 6 different curves on a single graph.
Types of graphs include:

- LINE - X values are treated as labels and plotted in the order they occur in the X-range
- X-Y - X values treated as numbers
- BAR - X values treated as labels
- PIE - Y values plotted as percent of sum of Y values. X contents are treated as labels and plotted next to percent Y values.
- STACK - Stacked Bar Graph. Each specified Y range is plotted as an incremental bar, on top of the previous one.

[....More Graphs....]

Next Previous Topics Quit

G R A P H S (3)

Steps in defining a graph:

- a) Define the X-range
- b) Define one or more Y-ranges (A through G)
- c) Specify the format of the X and Y axes (if desired)
- d) Specify the graph, X-axis and the Y-axis titles (if desired)
- e) Finally view or print the graph.

To generate an exploding pie chart (with one or more slices of the pie separated from the rest), in the column to the right of the Y-range enter the number of the pixels that you want that slice removed from the rest of the pie.

Remember that a pie chart can only have one Y-range. If more than one Y-ranges are defined, then the A-range is used in generating the pie chart.

[...More Graphs....]

Next Previous Topics Quit

S T A T I S T I C A L F U N C T I O N S (1)

Statistical functions operate on a range of values. A range specifies a rectangular block of data in the spreadsheet. Only ONE range may be used as an argument, i.e. Range = A1..B10 defines the block of data from:

a1...b1
a10...b10

When specifying the range only two dots can be used to separate cells, i.e. A1..B6

The range may be specified in two ways:

The first way is to type the name of the formula up to and including the first bracket. At this point use the cursor keys to move the pointer out of the cell, and move it to one corner of the desired range you wish to highlight.

[...More.....]

Next Previous Topics Quit

S T A T I S T I C A L F U N C T I O N S (2)

Press the '.' key. This anchors the pointer so that additional pointer movements highlights more than just a single cell.

Expand the pointer until the desired range is completely highlighted. If the range is bigger than the are displayed on the screen then press the '.' anchor key to examine each of the corners of the range. A little flashing cursor will indicate the current corner. It is also this side of the pointer which may be moved by the cursor keys.

When the range is completely highlighted press any other key to return to your original cell and continue to input your formula. Or if you are finished with the formula press the [enter] key. Your formula will be entered into the spreadsheet at the current cell position.

[.....More.....Stats...]

Next Previous Topics Quit

S T A T I S T I C A L F U N C T I O N S (3)

The second way to specify a range is simply to type the range name by specifying the corners of the range as individual cells separated by two periods i.e. A1..B2

Presented below are the statistical functions available within AS EASY AS. To illustrate the use of each function an example is included.

All examples will operate on the numbers contained in the potion of the spreadsheet duplicated below, A1..B2

A/B/C/
1	1.1	5.6	8.2
2	2.3	7.5	10
3	3.5	4.4	2

[.....More.....Stats.....]

Next Previous Topics Quit

S T A T I S T I C A L F U N C T I O N S (4)

@SUM(Range)	Sum of the range	@Sum(A1..C3) = 44.6
@AVE(Range)	Average value of the range	@Ave(A1..B2) = 4.955555
@COUNT(Range)	Count the number of elements in the range. Blank cell ignored.	@Count(A1..B2) = 9
@MIN(Range)	Minimum value in range	@Min(A1..B2) = 1.1
@MAX(Range)	Maximum value in range	@Max(A1..C2) = 10
@VAR(Range)	Returns the population variance of the range	@Var(A1..B2) = 8.438024
@STD(Range)	Standard deviation of the range	@Std(A1..B2) = 2.904827
[....More		

Next Previous Topics Quit

L O G I C A L F U N C T I O N

The function @IF(Test argument, arg1,arg2) returns:

value of arg1 if the test is true
value of arg2 if the test is false

Test may use logical operators >,<,<=>,>=<=#OR#,#AND#,#XOR#

Example @IF(10>2,3*2,4+5) = 6
@IF(10<2,3*2,4+5) = 9

As an example of using logic within a formula try the following:

+(a1>2)*3+(a1<=2)*4

This formula will yield a result of 3 if the value stored in cell A1 is greater than 2 and yield a 4 if the value is less than or equal to 2.

Next Previous Topics Quit

Appendix C:

NOTES ON WORD PROCESSING: PCWRITE

(Set by D.Heukelman)

General

Word Processors all have certain basic functions in common. When learning a new word processor, always start with these common functions and then progress to those functions that distinguish the word processor you are getting to know, from the others. These common functions comprise the following:

1. Create and save a file.
2. Retrieving a file that has been stored.
3. Editing text
 - 3.1 Underlining
 - 3.2 Centering text
 - 3.3 Copying, moving and deleting block of text (Copy, Move, Delete)
 - 3.4 Searching and replacing specific text (Search, Replace)
4. Page Lay out
 - 4.1 Setting of page lengths
 - 4.2 Setting margins
5. Printing.

When you choose to change to a different word processor, first find the equivalent instructions that will handle the above functions.

1. Create and Save a file:

1.1 **Create a file**

- * Place the program disk in A: drive and switch on the computer
- * When the cursor appears, type **ED A:FIRST**
- * Note the message that appears at the top of the screen:

File not found; ESC to retype, or F9 to create A:FIRST

- * As you would like to create the new file called **first** on the disk in the A: drive, press F9. The top line on the screen now reads as follows:

Esc:Menu Push Wrap+ Se- R:F 99% 1/1, Read "A:FIRST"

- * You are now ready to type in text. Please type the following text exactly as it is given (mistakes and all!):

Once upon a time there were a few veryyy brave teachers. They reallly wanted to learn to use a word processor. Nervously they sneaked into the computer certre, but within moments they mastered word processing ! All because they showeed courage.

1.2 **Saving a file**

- * Press the F1 key.
- * The System/Help Menu appears at the top of the screen:

Esc F1:Help F2:Exit F3:Save F4:Command F5:Name F6:File F7:Print F8:Dir

- * Press F3, the save option. The computer saves your

file and allows you to continue working on that file. (If you wish to leave the program, press the F2 key, which allows you to exit)

- * Please leave the program, by pressing F1 and then F2, so that we can learn the next function, which is how to retrieve a file. (Normally you would save a file a few times during the creation of the file, before leaving the program)

1.3 Retrieving a file

- * First type **ED A:FIRST**
PCWRITE first searches for the file on disk A: and if the program finds the file the following message is displayed:

Press Esc for no backup, F9 to write backup file "A:FIRST"

- * If you wish to make a backup copy you may do so now, otherwise press the F9 key. The contents of the file is displayed on screen.

2. Editing Text

The contents of the file FIRST is now displayed on the screen. Let's correct the errors. Remember the following:

- * The backspace key erases the character to the left of the cursor.
- * The delete key erases the character to the right of the cursor.
- * The arrow keys move the cursor without erasing characters
- * If a key is pressed down and kept down, it repeats itself, so lightly does it!

Delete text:

Place the cursor on the last of the y's of **veryyy**, press the backspace key. What happens? Now correct the word **reallly** and **whithin**. Also remove the space between the word **processing** and the exclamation, there should be no space between the word and the punctuation.

Insert text:

Ensure that the top line on the screen contains "push+". If not press either the "scroll lock" key or CTRL-V.

- * place the cursor on the u in **Oneceuponatime**. Press the space bar. Note that the text automatically moves to the right, creating the necessary space. Now continue to correct the text where necessary.

Overwrite text:

This mode is used to write new text over existing text, which means text to the right of the cursor **does not move to the right automatically**. Press the scroll lock key or Ctrl-V. Note the message at the top of the screen. Also note that the physical appearance of the cursor has changed.

- * Place the cursor on the N of **Nervously** and type the

word **Bravely**.

- * Now delete the extra characters.

2.1 Underlining

When text needs to be underlined, press the alt key down and keep it down, now press u and let both keys go. A control character appears at the beginning of the text that must be underlined. Type the required text and end the underlining by pressing alt-u again. Everything between the control characters will be underlined.

2.2 Centering text

To centre text between the existing margins, type the text and then press shift-F8.

2.3 Copying, moving and deleting blocks of text

Sometimes one needs to repeat, move or delete a section of the text in a document. The procedure is then as follows: mark the text, move the cursor to the new position (in the case of copying or moving) and press the Enter key.

Copying:

- * Place the cursor on the first character of the block of text to be copied.
- * Press the F3 key. Use the arrow keys and move to the last character to be copied. Text thus marked is highlighted.
- * Press the F3 key again to indicate that the end of the block has been identified. Now the block has been marked.
- * Move the cursor to the required place.
- * Press the F3 again.
- * Press F5 to unmark the text.

Moving:

- * Place the cursor on the first character of the block of text to be moved.
- * Press the F6 key. Use the arrow keys and move to the last character to be moved. Text thus marked is highlighted.
- * Press the F6 key again to indicate that the end of the block has been identified. Now the block has been marked.
- * Move the cursor to the required place.
- * Press the F6 again.
- * Press F5 to unmark the text.

Deleting a block of text:

- * Place the cursor on the first character of the block of text to be deleted.
- * Press the F4 key. Use the arrow keys and move to the last character to be deleted. Text thus marked is highlighted.
- * Press the F4 key again to indicate that the end of the block has been identified. The text disappears.

- * Press the CTRL-F4 key again and the text reappears. Text that has been mistakenly deleted can be recalled.
- * Press F5 to unmark the text.

2.4 Searching and replacing of text:

Sometimes one needs to replace a word or sentence throughout the document with a different word or sentence. This facility allows this.

- * Place the cursor at the beginning of the document.
 - * Press the F9 key. The top line now reads:
Esc F9: Find " ." F10 : Replace
 - * The cursor is on the full stop between quotation marks. Type the word or phrase to be searched for.
 - * Now press the F10 key. The cursor will automatically move to the full stop between the quotation marks at the "replace" option.
 - * Type the word or phrase which is to replace the old text and press the Enter key.
 - * The cursor will stop at each instance where the search phrase is found. If it should be replaced press the F10 key.
 - * Now press the grey + key on the right of the keyboard to find the next appearance of the search phrase.
- If you wish the replacement to happen automatically without stopping each time, press the alt-F10 key.

3. Page lay out

You may set the margins as well as the length of the page on which you are working. Paper comes in different lengths. The normal photocopying and typing paper is slightly longer (11.69 inches) than the computer paper with the perforations on the side (11 inches).

Page lengths:

- * place the cursor at the beginning of the document.
 - * type the following: .L:11i
- This means the length of the page is 11 inches.

Left and right margins:

- * Place the cursor at the beginning of the document.
- * Press F2. The ruler appears at the top of the document.
- * Find the "L" and the "R" on the ruler. This is the present margin setting.
- * Place the cursor on the ruler where the new margin must be. Type a capitol L for the left margin and a capitol R for the right margin. The old margin setting will appear as a lowercase "l" and "r".
- * Press f2 again. The ruler will disappear but the new margin setting is now active.

4. Printing

To be able to print a document, the necessary files must be on your program disk. When setting up the program, a work disk must be created (See Appendix 1 for these instructions).

- * Press F1 and F7 to select the print option. The

following message appears :

File to print

- * Press Enter. The following message appears:
Loading print program
- * Wait. The following message will then appear:
Esc:Exit F9:Print to disk F10:Printer is ready
- * Press F10. The following message appears:
Waiting. Print from "....." Ready to begin
and other options.
- * Press F10 again.

Appendix 1

Setting up the printer forms an integral part of installing your program. No printing can be done before this setup is done, therefore it is better to do this before actually using PCWRITE. The setup process is described for only a single floppy disk drive and pcwrite on the hard disk in the directory PCWRITE. To start with you must be in the PCWRITE directory.

- * Place a blank, formatted floppy disk in the A: drive.
- * Ensure that the prompt is C: in the correct directory.
- * Remember that only the Dos prompt is active.
- * Type workdisk A:
- * The program asks certain questions about the configuration of your computer. Answer these questions so that the program may function correctly.

You may now use this disk as your work disk.

Appendix D:

NOTES ON Database: Student Version of DBASE

(Set by D.Heukelman)

A Database consists of a set of records. Compare this to the records the school has on each pupil. The record has a certain format, eg. the pupil's name, adress, I.Q., and marks for each standard etc. In order to create a database, the planning done beforehand is crucial. You must be clear on exactly what information is to be stored in this database. Each data item in the record for each child is called a field of the record, for the school record example we will have a name field, adress field, I.Q field and possibly for each year one or more performance fields.

A database is used to order information. Once a database for the pupils in the school has been created, all the pupils whose surnames begin with "A" may be isolated. It would also be possible to isolate all the pupils with an I.Q. higher than 100. A database is used to manipulate and represent the data in such a way that the user may draw conclusions from this data and use the data accordingly.

1. Working with an existing database

The first step is to load the right database. The opening screen looks as follows:

Setup	Create	Update	Position	Retrieve	Organize	Modify	Tools
ASSIST	Opt:					Opt: 1/6	CAPE
Move selection bar-↑↓ Select ← Leave menu → Help F1 Exit ESC Select a database file							

The **Setup** menu is open and looks as follows

Database file
Format for screen Query
Catalog View
Quit Dbase III Plus

Select **Database File**, you are prompted for the drive and the name of the file. Please type in **birds**.

- * The contents of the file may be seen by selecting the **Update** menu, which offers the following options:

Append
Edit Display
Browse Replace
Delete Recall Pack

- * Select the **Browse** option. A list of the information is displayed on screen and the arrow keys allow the user to move up or down.

Assignment: Identify the fields of each record.

Leave the **Browse** option by pressing **CTRL-END**.

- * Select the **Append** option - this means adding to the existing file.

Assignment: Add the following birds:

<u>Name</u>	<u>Foodtype</u>	<u>Beak Shape</u>
Black Cheeched Waxbill	seed	6
Malachite Kingfisher	fish	4
Swan	?	9
Crimson Breasted Shrike	insect eater	3

Assignment: Use the **Browse** option to check whether the records have been added.

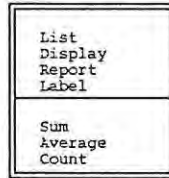
- * Select the **Edit** option to change existing records.

Assignment: Change the question mark in the Swan record to what ever you think swans eat!

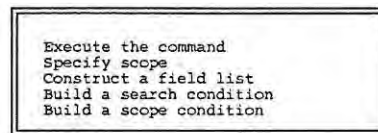
Searches:

The value of a database lies therein that records may be retrieved in a specific order which allows the user to make useful groupings of the data, which in turn leads to further insights being formed. Searches are handled as follows:

- * Select the **Retrieve** option.
The following options are offered:



- * Select **List** , the following options appear:



Before a search can be carried out, a search condition must be specified, all records to be listed must fulfill the search condition, the computer must "know" what to look for. Select the option **Build a search condition**

- * The fields of the record structure appear on the left of the screen while the characteristics of each field is displayed in the centre. Use the arrow keys to move up and down. Notice how the information in the centre changes according to the selection of the field. Select the field according to which you would like to search.

Assignment: Select the **Food Type** field

- * The logical operators =, <=, >= etc. are now displayed.

Assignment: Select = and type in **seed**
Select **no more conditions**, and then **execute command**

All the birds with the food type **seed** are listed.
Note the contents of the field on **beak shape**.

Assignment: Repeat the exercise with **fish**.

Repeat the exercise again, but choose the field denoting the **beak shape** and list all birds with **beak shape 6** . Note the contents of the field denoting **food type**.

What can be concluded from the shape of the beak of the bird and the food that they prefer?

2. Creating a database

* Decide on the record structure:

name, 30 characters
adress1, 30 characters
adress2, 30 characters
code, 4 characters
standard, 2 characters
IQ, 3-digit number

* Load Dbase, the following appears on screen:

Setup	Create	Update	Position	Retrieve	Organize	Modify	Tools
ASSIST	C:\>					Opt: 1/6	CAPS
Move selection bar-↓ Select ← Leave menu → Help F1 Exit ESC Select a database file							

The **Setup** menu is open and offers the following options:

Database file
Format for screen Query
Catalog View
Quit Dbase III Plus

* Note the communication bar at the bottom of the screen, this is the only way for the computer to communicate with the user. Press the arrow keys and note how the communication bar reacts.

* We would like to create a new database. Use the → key to move to the next menu, **Create**. The options now offered are as follows:

Database File
Format
View
Query
Report
Label

Because a new database file must be created we choose the first option, **Database File**. The following options are then offered:

A:
B:
C:
D:
E:

Indicate on which disk the file must be created. Use the arrow keys and Enter to select. You are now prompted for the name of the database file:

Enter the name of the file:

Type in the name and press Enter.

* Specifying the fields:

The following appears on screen:

Bytes Remaining: 4000

				Up a field: ↑ Down a field: ↓ Exit/Save: ^END Abort: ESC
--	--	--	--	--

Field Name	Type	Width	Dec	Field Name	Type	Width	Dec
------------	------	-------	-----	------------	------	-------	-----

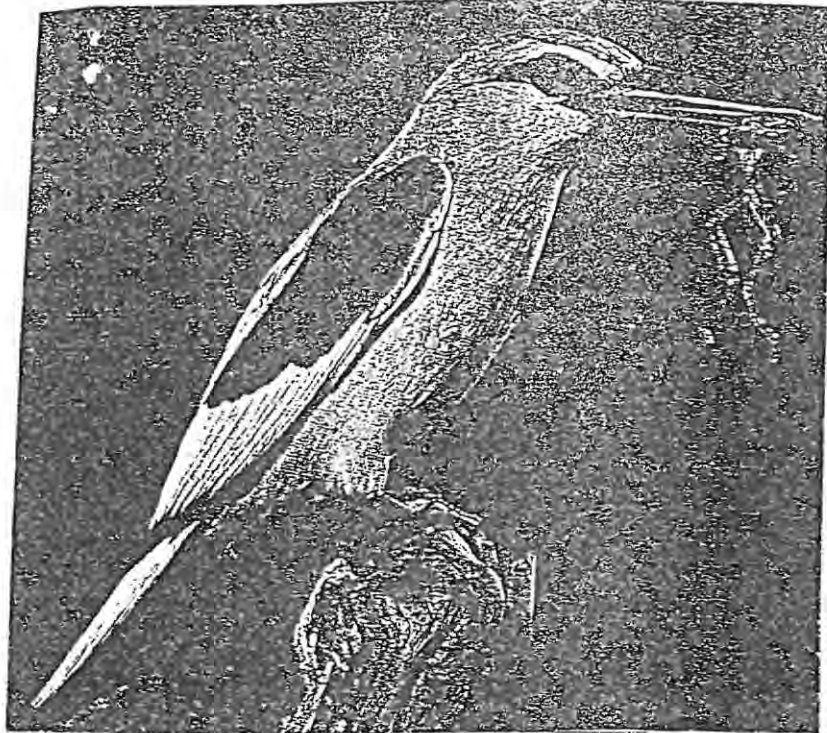
1.

- * Type in the name of the field, (in this case; NAME) , accept **characters** and type the length of the field, in this case 30
- * Once all the fields have been specified, end the activity by holding down the **CTRL** key and then pressing the **END** key
- * The computer offers the option to input data into these fields, accept this option by pressing **Y**.
You may now input data.
- * End this activity by pressing **CTRL-END**

You have now created a database file and may treat it as before. Select the **Update** option to see the contents of the file by selecting the **browse** option, you may add to the file by selecting **Append** and the contents of the fields may be changed by selecting the **Edit** option.

Assignment:

1. Add the information for three more pupils to your file
2. Assume that the first pupil changes his/her adress, show this in your file.
3. Now list all pupils with an I.Q. higher than 110.
4. List all pupils in a certain class



A woodlark kingfisher, *Halcyon senegalensis*, with its prey, a painted reed frog, *Hyperolius marmoratus*.



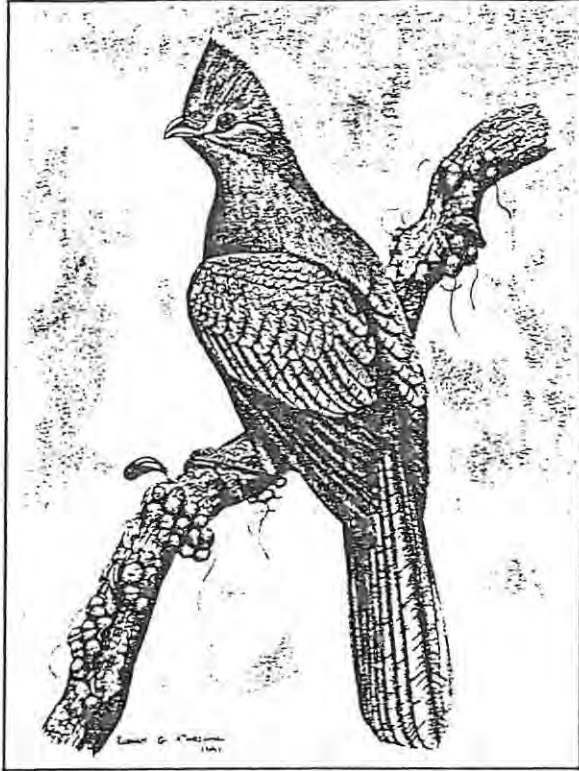
SWIFT *Schoutedenapus myoptilus*



Fish Eagle
Haliaeetus fuscipes



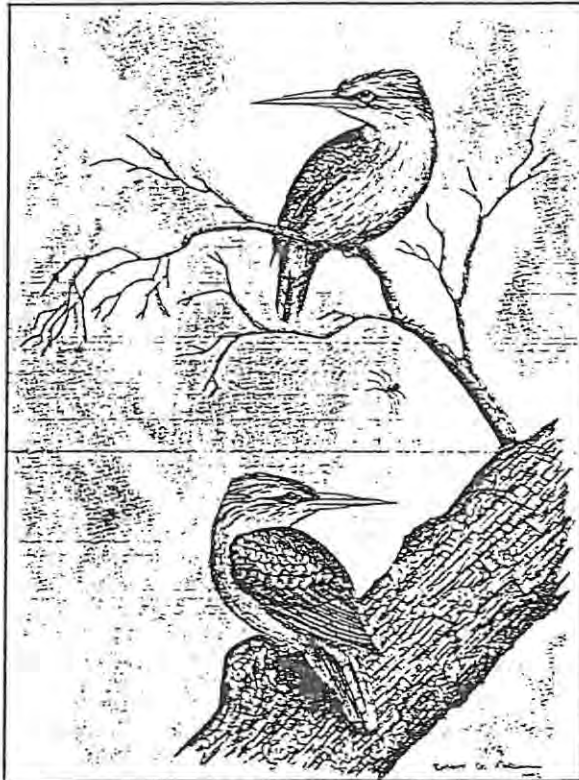
PINK-THROATED TWINSPOOT *Hypargos margaritatus*



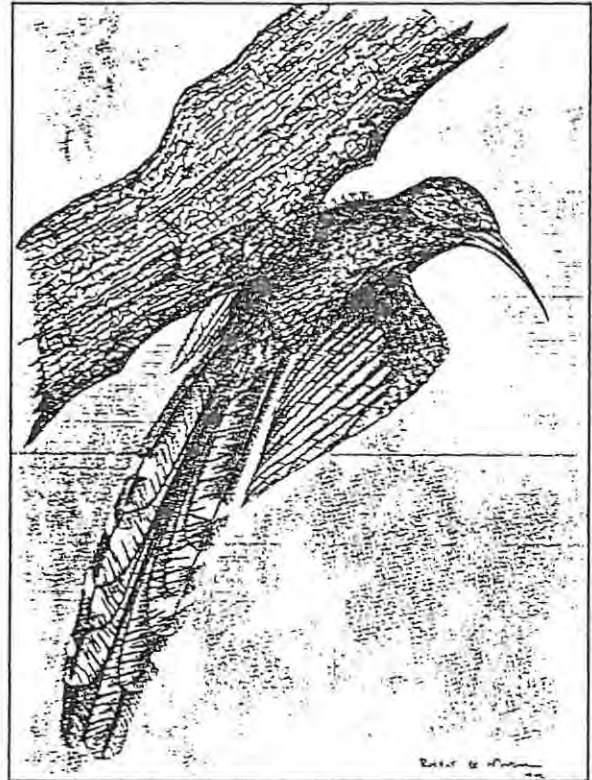
A: Knysna Loerie in the forest.



B: Paradise Flycatchers with chicks.



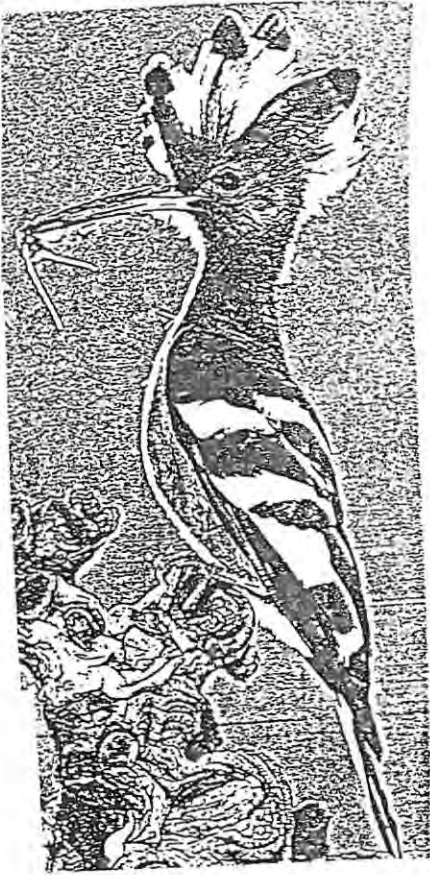
C: Brown-hooded Kingfishers at dusk.



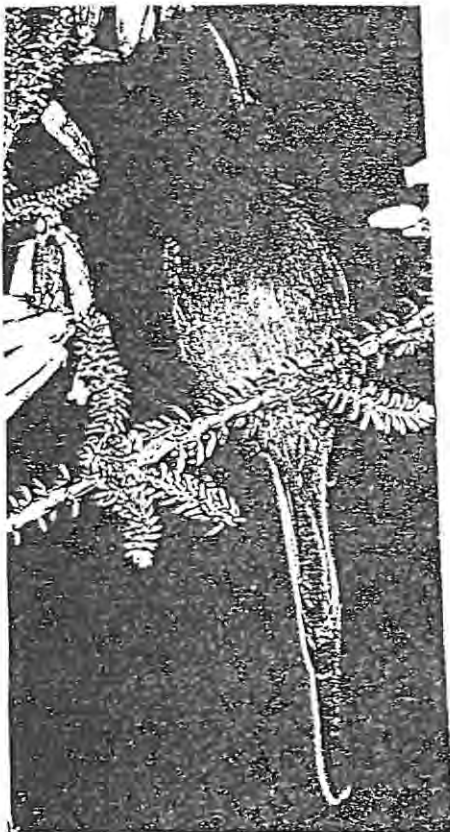
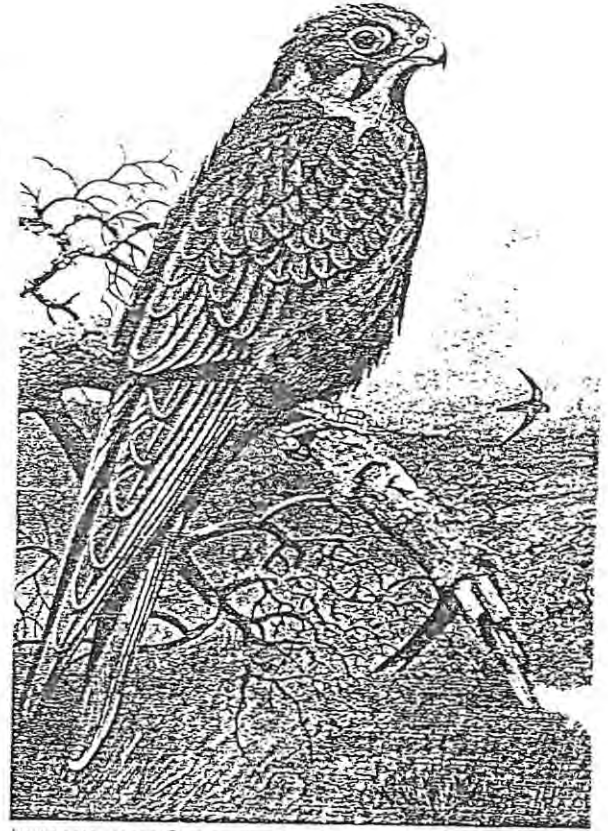
D: Red-billed Woodhoopoe, foraging.

"Hoopoe" by Hein von Hörsten, Somerset West,

Cape.



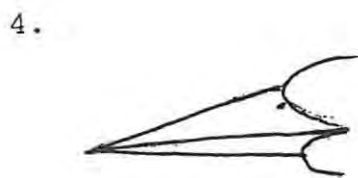
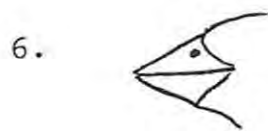
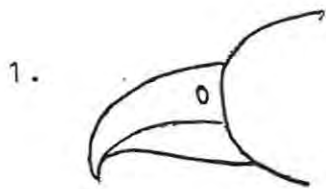
The ground hornbill



The orange-breasted sunbird, *Nectarinia violacea*, a bird who



The goliath heron,



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