THE DESIGN AND USE OF A DATA BASE FOR THE TEACHING OF HISTORY AT PRIMARY SCHOOL LEVEL

by

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Abstract

The changes brought about by society's move from an industrial to an information society has brought with it changes in the way that society operates - from the way we do business to the way we entertain ourselves and, increasingly, in the way we educate our children. That the society of tomorrow requires new skills to survive and operate had been, and continues to be, debated in a growing number of books and in the popular media. More and more educationists are calling for schools to 'restructure' so as to be able to provide the skills that this new society requires, especially those related to the management of information. The nature of these skills are discussed, together with the potential provided by information technology, particularly computers, to provide them.

The current use of computers in schools is addressed, together with the apparent inability of schools to generate effective change from within using in-service training. The researcher suggests that this makes it imperative that teacher training institutions provide the next generation of teacher-trainees with a thorough understanding of the requirements of an information society and the tools that it uses.

The research undertaken attempted to provide final year primary education teacher-trainees with one example of the way in which the electronic database can be used to change the teaching of history. By researching in the field and entering data into a data base, the teacher-trainees were able to look at information in new ways. By selecting and sorting data by different fields, they were able to act as 'true' historians - each interacting with the data in his or her own way to extract knowledge that is arguably unique for each participant. The data base was then used with a class of standard four pupils, with the researcher acting as participant observer. The reactions and responses of the pupils to the data was noted and these are discussed in the results. A non-participant observer, also a primary school history teacher, provided input with respect to the validity of the learning experience and to act as a control.

The research is described, together with the observations of the researcher, teacher-trainees and pupils involved. The observations of the non-participant observer are also discussed. Shortfalls and difficulties encountered are pointed out, and areas for further research suggested.

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Chapter One.

1. Social change and educational restructuring.

1.1 Social change and the Information Age.

Alvin Toffler's prediction of the advent of a new society "beyond" the industrial era and of changes that would be "bigger, deeper and more important than the Industrial Revolution... a second great divide in human history" (Toffler, 1970:21) is well under way and has been documented by other authors (Bell, 1973; Handy, 1985, 1989; Heller, 1990; Ornstein and Ehrlich, 1991; Peters 1987). The transformations involved as we move into the information age are affecting transitions across the entire social spectrum, including changes in traditional gender roles, the nature of work, recreation and education. Giddens (1989:632) points out that the lifestyles and social institutions of the modern world are "radically different" from those of even the relatively recent past - furthermore, "over the past half century or so, the pace of change has accelerated rather than slackened." Ornstein and Ehrlich (1991:2) support this in asserting that the world has changed to a greater extent since World War II than it changed between the birth of Christ and 1939. Nor, says Handy (1985:8), is the era of change over, predicting that we face major changes in the workplace, with jobs being fewer and farther between as we work shorter weeks, years and lives. We could face a greater range of work experiences too, say Stemmer et al. (1992:32) who have suggested that today's students may need to change careers as many as seven times during their lifetime. Evidence of such change grows on an almost daily basis. A growing number of professionals are now working at home, on trains, on busses, cars and in aircraft, using telecommunications to communicate with their business bases or associates around the world as more and more organisations replace office bureaucracies with leaner and more efficient work groups linked by computers (Ernsberger, 1993:36; Thornburg, 1989:11,12).

One of the major characteristics of today's society is a rapidly expanding store of knowledge. In the "post-industrial society", says Bell, the production and control of "codified knowledge" or systematic, co-ordinated information has become the main strategic resource on which society depends (Giddens, 1989:648). Naisbitt and Aburdene (1990:18) speak of an "information economy" in which information is the main economic commodity and where "the quality of innovativeness of human resources" will spell the difference between success and failure for both companies and countries (Naisbitt, 1990:30).

Toffler has spoken of a 'powershift', where knowledge has replaced money and muscle as symbols of power.

> "Knowledge itself is the source of the highest quality power... It is... the ultimate amplifier. This is the key to the powershift that lies ahead, and it explains why the battle for control of knowledge and the means of communication is heating up all over the world" (Toffler, 1990:18).

In a report to the U.S. Federal Communications Commission in the early 1980's, Robert Hillard gave his audience an idea of how information is expanding. By the time a child born then graduated from college, he said, the amount of knowledge in the world would be four times as great. By the time the same child was 50 years old, it would be fifty times as great and 97% of everything known in the world would have been learned since that child was born (Daines, 1984:3). Brown (1990:12) has calculated that 6000-7000 scientific articles were being written daily in 1983. In 1990, the volume of information in the world was between 4 and 7 times that available in 1986 - a short four years before. The consequence of this is that "for every page we had to learn at school, the pupils of class 2000 will have to learn the book."

However, while it is true that the Information Age presents us with much more information, Norton (1988:10) warns that:

> "There is a risk... that we may drown in this information while remaining starved of knowledge... In the midst of all this information, students must be prepared to bring order to the chaos of information and give value to data that would otherwise be useless" (Norton, 1988:10).

1.2 Education and change.

These developments have significant consequences for education. One might expect schools, as the first formal providers of social, educational and vocational competencies, to keep pace with changes occurring elsewhere in society so as to be able to respond to the community's adjusting needs. This, however, does not seem to be happening. Education world-wide seems to have been caught unawares by the arrival of the information age and is now suffering a scholastic 'fiscal drag' as it attempts to understand and come to terms with the needs of the future and so provide its clients with the competencies they require. Already, says O'Neil (1992:6), more than half of the young people leaving school in the United States are doing so without the skills or foundation required to find and hold a good job. Moreover, only a third of employers think that recent high school graduates show the ability to read and understand written and verbal instructions and only a quarter feel that they are capable of doing arithmetic functions.

Hartshorne (1992:332), has written that:

> "throughout the world there is a disenchantment with the traditional school and curriculum... with relevance, appropriateness and effectiveness of what the formal school has to offer being questioned by... governments, ... and by business interests, both here and abroad."

Jane David has stated that schools are out of step with the times. While the world has changed remarkably, with families, jobs, social organisations, and entertainment looking nothing like they did at the beginning of the century, schools look very much the way they did a hundred years ago: buildings, the shape

and size of classrooms, the age criteria by which classes are established and the ways of delivering instruction have changed very little, so that

> "From inside the school... one would hardly know that visual images, rapid motion, technology, and change are pervasive in the world outside. The nation's public school system faces the challenge of revamping and reorganising itself to prepare students to function productively in today's society" (David, 1991:37).

Other researchers echo these sentiments. David Moursund (1991:4) suggests that the educational system in the United States was designed for the Industrial Age about a hundred years ago, an era in which the human mind, the book, paper and ink were the major aids to the storage and processing of information. While this is no longer the case, the system's basic design and nature remains little changed.

1.3 Restructuring education.

The growing concern that schools will not be able to provide pupils with the information-handling skills they need in an information society has led to a movement calling for schools to 'restructure'.[1] Restructuring has two targets. It aims

1. at redefining structures so as to make them more flexible; and
2. more importantly, at changing the perspectives of people who work in these structures.

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[1] The term 'restructuring' is popular in the United States. Similar movements are occurring elsewhere in the world, albeit using different terminologies. Restructuring and reform should not be regarded as synonymous. While reform attempts to fine tune an already dependable system, restructuring attempts to redefine the system totally.

1.3.1 Redefining structures.

As in the commercial world, where the tendency is for large organisations to split into more proficient, economical and competitive units, educational restructuring attempts to rationalise the bureaucratic nature of school administrations from "a rule bound, compliance driven system..." to a "flexible, decentralised system that can adapt and respond to continual change" (David, 1991:39). Restructuring emphasises the need for solutions devised by those who are ultimately responsible for carrying them out,

> "... driving decision-making power down to its lowest possible level in the belief that the closer a decision is made to a student, the better it will serve the student... 'empowering' site staff to realise their vision of schooling" (Polin, 1991:6).

1.3.2 Redefining teaching practice.

McCullough (1992:8) has stated that real change only comes "through a major restructuring of the classroom and the way information is delivered." Thus, above all, restructuring asks individuals at all levels of the education system "to change the way they think about their jobs" (David, 1991:39), to consider new and better ways of teaching, to move away from rote learning and the teaching of isolated facts, and to move towards providing children with the new skills for tomorrow's world. Teachers are urged to adopt teaching practices that enable students:

> "... to apply skills, to understand concepts and solve problems... how to work collaboratively... to take responsibility for learning. In other words, we want teachers to give students the skills they need to function in the work force and in society" (David, 1991:40).

Restructuring thus emphasises "site level decision-making" (Polin, 1991:6) with "professional development a centrepiece of the restructuring effort" (Polin, 1991:7).

1.4 The 'Learner Centred' culture.

Dix-Pincott (1990:20) has suggested that a prerequisite for effective change in education is the development of a learner centred culture. This culture or ethos must pervade everything done in the school, including the way people learn, the way they treat one another, their responsibilities and the way the school is organised. Key characteristics of this culture include:

- "courses that respond to the individual student's needs, flexible personal learning programmes and targets;
- students working at their own pace with negotiated deadlines; and
- more flexible use of time, student self-assessment to accompany teacher assessment, reduced dependence on the teacher for learning with teachers 'letting go', greater variety of 'learning locations', more support for mechanisms and resource rich. 'From teaching to learning' is the shorthand way of saying we flip from the traditional culture to this new one" (Dix-Pincott, 1991:20).

Information technology is seen as having a part to play in supporting flexible learning, by providing the functions of storing and processing information, combining different forms of information (multi-media), analysis, synthesis and modification of information, communication, learning programmes and support systems.

> "Primarily, it is its interactive nature with the individual which gives it so much power as a tool for learning. The learner has control of and responsibility for what is happening and is not dependent on others when it comes to making progress. It is perhaps this putting learners in the driving seat which provides the greatest motivation to the learner" (Dix-Pincott, 1991:20).

1.5 Skills for today's students and tomorrow's survivors.

The skills required of the citizens of an information society have been variously described. Naisbitt, quoted by Norton (1988:10) suggests that the basics should lead to thinking, learning and creating.

1. Thinking.

   "Thinking is the ability to synthesise and make generalisations, to divide into categories, to draw inferences, to distinguish between fact and opinion, to put facts in order to analyze a problem, to arrange and rearrange information to make decisions, solve problems, create opportunities, and raise human potential."

2. Learning.

   "Learning how to learn is essential in a world that is constantly changing. There is no one subject that will serve one for the foreseeable future, let alone the rest of life. If an individual knows how to learn, he or she can adapt and change no matter what technological, social, or economic permutations occur."

3. Creativity.

   "Our schools... are models of rationality, but as decision loads become complex and the problems we face unique, creativity - seeing new solutions - becomes a prized ability."

Longworth (1981, in Underwood and Underwood, 1990:60) considers that what today's children learn at school has, at best, a useful life of half a generation, while at worst it is obsolete as it is taught!

Breivik (1991:87) has made the point that literacy in today's world needs a broader definition than before. He suggests that today's definition of literacy include the ability of individuals to find, read, and evaluate the information needed to function as productive members of society. Educators need to modify their programs in the light of our changing, information abundant environment so as to promote this broader notion of literacy.

This means placing less emphasis on lectures and textbooks and directing students towards multiple information systems such as on-line databases, videotapes, documents and journals - resources which encompass the school media centre, the community and the world, allowing students to "push back the walls of the classroom" and permitting variances in preferred learning styles among students who may learn more comfortably with visual materials or computer-assisted mediums (Breivik, 1991:87). This is supported by Kaplan (1993:36), who quotes American Education Secretary Richard Riley as saying that the "vast majority of Americans do not know that they do not have the skills to earn a living in our increasingly technological society and international marketplace." Reporting on the recent report on a comprehensive study of literacy released in by the U.S. Department of Education in September 1993, he stresses that while many people can read in the technical sense, they lacked the "strategies needed to use the information" (Kaplan, 1993:37). Kaplan suggests that a better measure of literacy would be whether one can locate a city office using a street map, write a letter explaining a billing error or figure out Newsweek's Conventional Wisdom Watch. The director of the survey, Irwin Kirsch, is quoted as stressing the need for workers to develop more interpretive abilities for the coming information age rather than "the rote skills prized on the assembly line."

The reaction of leading industrialists in Britain to the question of the skills required by tomorrow's survivors is that they will need to be:

- creative thinkers;
- flexible and adaptable;
- able to communicate;
- able to co-operate;
- investigative thinkers;
- able to handle information effectively;
- comfortable with research and study and able to enjoy learning; and
- comfortable with technology. (Aston, 1992).[2]

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[2]Stemmer, Brown and Smith provide a comprehensive list of employability skills. See appendix 1.

It is these skills that restructuring schools are trying to provide, by encouraging learning experiences that:

1. "accommodate different rates, modes, styles, and strategies of learning;
2. involve an expanded cast of players from the school, family and other sources;
3. include access to information, personal expertise, and settings outside the traditional school;
4. are student centred, placing increased responsibility for learning on the learner;
5. address educational needs throughout the learner's lifetime;
6. assist learners in developing learning networks; and
7. rely increasingly on a blended system of new and emerging technologies to support restructuring of the curriculum and restructuring of learning experiences" Thomas and Knezek (1991:49).

Barth (1991:124) challenges teachers

> "to think otherwise"; to move from being "dependant variables acting in response to what someone else tells them to do" to becoming independent variables, people who "initiate as well as respond";
>
> to understand that, "because the world outside and the students inside are changing so fast and in such unpredictable ways... the most important change is a culture of continuous adaptability, experimentation and invention";
>
> to "spend less time trying to help others accept the unacceptable and more time trying to change the unacceptable";
>
> Most importantly, "restructuring is not an end in itself; it is a means to help us work better together for our own and for our students' benefit... so that schools become more hospitable places for student and adult learning."

The multiplicity of changes at both organisational and instructional level provide the potential for schools not simply to improve, but to change their practice fundamentally. Empowered by changes to both structure and in the way educators think, schools can transform the current educational system into one capable of providing students with the kinds of skills they need

in today's world and the world of tomorrow, moving away from a narrow focus on procedures and outcomes, to concentrate on teaching and assessing the kinds of thinking and problem solving skills that reflect the valued learning goals that are the desired outcomes for students. Says David (1991:39):

> "Restructured schools are driven by challenging goals for student learning. In restructured schools, students will understand what they read, rather than simply recite rules and regulations. They will be able to locate, retrieve, and interpret information, not merely memorise a set of facts. They will be able to identify and solve problems, not just fill out worksheets. They will be able to work collaboratively, as well as alone."

At its simplest, the restructuring movement suggests the need for educators to understand that current teaching practices are unable to provide children with the skills that are essential in an information society. It challenges educators to change the way in which they teach, to move from emphasising rote learning towards the position where they act as facilitators who encourage and empower children to take responsibility for their own learning, providing them with skills that enable them to research, to work collaboratively, to question and to develop critical problem-solving and thinking skills. Brown (1990:14) has said:

> "Education has been stated as the fourth wave, (Agricultural, Industrial, Information/Computing being the other three)... The process which education initiates, Data - Information - Knowledge - Understanding - Wisdom - Action, must move us beyond the knowledge boundary."

It is this challenge that the researcher has attempted to respond to. In the research, he has attempted to develop a computer-based intervention, using an electronic data base, in a way which enables users to work collaboratively and interactively with primary historical data, locating, retrieving, interrogating, manipulating and interpreting information so as to provide an opportunity for the development of thinking skills for the

solution of problems. All these competencies are called for by the restructuring movement. The design of the program, the problems faced in its development, together with the testing and evaluation thereof, will be discussed in later chapters.

The following chapter reviews the literature on the use of computers in educational institutions. It looks at:

1. the potential that computers provide for learning and for restructuring education by providing powerful learning tools;
2. the current use of computers in schools and the rationales provided for using computers in schools;
3. the limitations of current usage and the problems of implementing effective computer use across the curriculum;
4. current thinking on the ways that computers should be used in schools to change learning for the better and to restructure education; and
5. the use of the electronic data base as a learning medium, providing a background for the design of the research.

Chapter three looks at research methodology in general and at the research method used by the researcher. Chapters four and five look at the two phases of research in detail, and chapter six at the results of and the conclusions drawn from the research. Chapter seven discusses recommendations for further research.

Chapter Two.

2. Information Technology: Tools for facilitating change.

2.1 Computers - their potential for changing learning.

Technology provides powerful tools for facilitating change and it has long been argued that schools should use computers and related technology to develop problem solving skills in the classroom. The move towards achieving this has already begun. In Britain,

> "the use of IT[3] is no longer an option for pupils or for teachers. It is a requirement of the statutory orders for all subjects of the National Curriculum at all levels... and it is incumbent on teachers to:
>
> 1. master the use of hardware;
> 2. become familiar with a range of appropriate software;
> 3. appreciate the educational value of IT within their subject area;
> 4. organise pupils so as to make effective use of IT;
> 5. monitor and evaluate IT use; and
> 6. keep up to date with the developments in a rapidly growing field" (Govier, 1991:162).

Brown (1991:111) has said that IT offers:

- an enrichment to the learning process;
- an opportunity to enhance the ability for students to take responsibility for their own learning; and
- a learning environment which can extend the frontiers of the classroom.

---

[3] IT stands for Information Technology. This includes all technology that can be used to access and manipulate information, including computers.

Stonier has pointed out that:

> "the electronic revolution ... has extended the human nervous system... of greatest interest to educators, is the development of television and the computer. Television acts as an extension of our eyes and ears, transporting them across time and space. The computer is an extension of our brain" (Stonier, 1979:287).

This is amplified by Moursund, who has said:

> "In an increasing number of information processing tasks, a person and a computer system working together can far outstrip a human working without such an aid. No amount of tinkering with our current educational system will change this fact" (Moursund, 1991:4).

Lockard, Abrams and Many (1990:vii) have stated that "The question is no longer whether to use computers in the schools, but how best to use them."

The computer is in a position to play a major role in school restructuring, mainly because it provides the most efficient way of collecting, storing and manipulating information known to man. Because "the manipulation of information and the creation of knowledge are rapidly becoming the dominant form of economic activity", (Stonier, 1979:288) computers hold the key for revolutionizing education and for playing a major part in restructuring schools. As for facilitating change,

> "the computer and the electronic network are likely to have significant effects on education, and it behooves us to consider what those effects might be as we think of the issues of restructuring schools" (Collins, 1991:29).

Over the past few years pressures have increased from many sources for schools, including those in the third world, to participate actively in the computerization of society. The source of these pressures include parents who want their children to be able to cope with modern technology, businesses who hire staff into work environments that are becoming rapidly computerised, colleges and universities who expect basic

technological skills of high school graduates, and, probably most important, the students themselves who have grown up with computers.

2.2 Rationales for computerisation.

Various broad reasons have been advanced as to why computers should be used in education. Hawkridge has divided these into four main categories or rationales. These are described as:

1. the Social rationale;
2. the Vocational rationale;
3. the Pedagogic rationale; and
4. the Catalytic rationale (Hawkridge, 1990:1,2).

They may be described briefly as follows.

2.2.1 The Social rationale.

Here, the belief is that all children should be aware and unafraid of how computers work. Because computers play an increasingly important part of modern life and because schools are supposed to prepare children for adult life, it follows that schools should provide some measure of computer awareness.

2.2.2 The Vocational rationale.

Children should learn to operate computers. Learning how to program computers gives children confidence in their ability to control computers. Learning how to use applications programs provides skills which will be needed later in life. Computer literacy courses and computer science should therefore be offered at school.

2.2.3 The Pedagogic rationale.

Computers are able to teach. Computer aided learning or computer aided instruction offer certain advantages over traditional methods.

2.2.4 The Catalytic rationale.

Computers are able to change education for the better. Managerial, administrative and teaching efficiency can be improved. Use of computers enables teachers to place more emphasis on important problem solving approaches rather than tedious rote learning and calculation. Computers give both children and teachers more independence. Collaborative learning, as opposed to competitive learning, can be stressed.

While one could question these rationales, the idea of improving teaching and learning has gripped the imagination of educators world-wide. The ideal of enriching the curriculum, improving delivery, extending traditional methods of presenting information and offering new opportunities through the techniques that computers make possible, is very exciting. The catalytic rationale clearly has the most potential and supporters of this rationale see computers providing children with the opportunity to move away from rigid curricula, rote-learning and teacher-centred lessons, by giving more control to children to do their own learning. They also suggest that teachers will adopt 'more relevant' curricula by using computers, and thus bring educational opportunities to a larger number of students. The call of catalytic rationalists echoes the Papertian call for the child to control the computer, rather than the computer control the child.

2.3 Current computer use in schools.

There are four main ways in which computer technology is currently used in schools. The first is as an administrative

tool, whereby organisational, financial, pupil and other records are administered by computer. As such, "it must be considered an indispensable management tool for teachers and principals, making site level decisions" (Polin, 1991:7). The remaining three ways are associated with teaching and learning and are variously described. They are probably most easily understood in terms of tutor, tool and 'tutee'. (Taylor, R.P. (Ed.), 1980; Adams, T. 1988:1).

2.3.1 The computer as tutor.

Tutoring systems present subject material to which the subject responds. This type of material is programmed by specialists and includes drill and practice exercises and tutorials. The kind of program varies widely, from the simply repetitive (sometimes called 'drill the skill', or 'drill and kill'), to sophisticated tutorials which keep a check of progress and suggest areas for remediation. It also includes sophisticated simulations. In this mode, the computer is relatively inflexible. It controls or programs the child and fits into Hawkridge's pedagogic rationale.

2.3.2 The computer as tool.

Tools include such software as word processors, spreadsheets, data bases, programming languages and electronic communication systems. These applications are what one might call curriculum or content free, in that they can be applied to a wide variety of educational and other activities.

2.3.3 The computer as tutee.

Tutee systems are regarded by some as the most powerful, in that they allow the pupil to control or program the computer. The use

of LOGO is perhaps the best example of this mode of use.[4] The tool and tutee models fit into Hawkridge's catalytic rationale.

These three divisions should not be regarded as mutually exclusive, as a certain amount of overlapping is possible. A high level programming language like Pascal or Basic could fit into either the tool or tutee division, depending on how it is used. Other researchers have divided these categories further. Collins and Hopkins, for instance, speak of 'integrated learning systems' and Bull and Cochran speak of 'learner centred software' (Collins 1991:29; Hopkins 1991:28; Bull and Cochran, 1991:50). In reality, however, 'integrated learning systems' and 'learner centred software' fits into the computer as tutor domain because they present the user with information and questions and require the correct feedback. As such, they use the computer to entrench existing didactic practices rather than to exploit new potentials. Most educational software tends to be of the 'tutor' type. Very little of the 'tutee' type exists.

2.4 Problems of implementation.

Given the many opportunities offered by the use of computers in education, one might expect that more schools would be looking to the future and appropriating computers and allied technologies as rapidly as possible. This is clearly not the case. While it may be true that schools have embraced microcomputers at an unprecedented rate by educational standards,[5] it remains clear that:

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[4] For more detail on these models, refer to Adams, 1988, pp 1-5.

[5] Shao et al. (1989:86) have estimated that schools in the United States spent $2 billion on technology between 1978-1988. Thornburg (1989:16) has stated that there are over 2 million computers in American schools.

> "after a decade of enthusiasm, there is still no consensus about the role, value, or effectiveness of computers in schools. Well-thought-out goals are still lacking... initial fervour has given way to benign neglect" (Shao et al., 1989:86).

The same kinds of problem seems to apply to the majority of British schools.

> "When computers first reached primary schools in the early eighties, they were enthusiastically received by a few teachers... but... the majority of classroom teachers are lost in an ever changing minefield of the national curriculum with no reliable compass. There are a few glittering examples of schools with effective approaches to the field of information technology, a number that is unlikely to grow without a radical change of approach" (Wright, 1990:36).

2.4.1 Inappropriate use of computers in schools.

(Lockard, et al., 1990:361 and 356) have reported on two recent findings in the United States. The Federal Office of Technology Assessment found that fewer than 15% of teachers use computers in their teaching, and the National Assessment of Education Progress, released in early 1989 noted that:

> "most students' school experiences are dominated by memorisation of content presented by the teacher or textbook, and by the practising of skills in workbook or ditto exercises... Students are given limited opportunities to apply knowledge or procedures for new purposes" (Lockard et al., 1990:356).

The report urges teachers to find ways "to make students more active learners and to move away from traditional authoritarian roles" (Lockard et al., 1990:356). The use of computers is included among the approaches recommended. Reasons why using computers efficiently in schools remains difficult include the expense involved with respect to the acquisition of hardware and software, and the time needed and expense involved in training teachers to use the computer effectively across the curriculum. Furthermore, providing adequate training could well be more difficult than it first appears.

Recent research has shown a surprising lack of vision for the future of educational computing even amongst skilled users. Becker's findings from his administration of the 1989 international 'CompEd' survey of the International Association for the Evaluation of Educational Achievement, were that even the schools' computer coordinators did not see themselves being involved in major qualitative changes with respect to their usage of computers. There appeared to be a higher priority for merely acquiring computers than specifically acquiring computers that were either more powerful or networked. Their guesses about what kinds of computer use would increase most in the future matched almost exactly their current use thereof.

> "Relatively few respondents saw major increases coming in such areas as information retrieval and data analysis for social studies and science classes, creative work in art and music, or practice in foreign languages... Overall, the perspective of these teachers is one of incremental improvements in current practices that computers use rather than major changes in how they are used" (Becker, 1991:6).

This supports Dede's contention that there is a 'misconception of power'[6] amongst computer users. It is perhaps not surprising, therefore to find that even though the variety of software available has increased, the pattern of use remains traditional, with most software:

> "focused on recall of facts and algorithms rather than providing a learning environment for motivating higher-order thinking, problem solving, and deep understanding... Moreover, most occasions on which students use 'tool-oriented' applications... occur in computer education classes - not as part of instruction in mathematics, science, social studies or English... only a small proportion of instructional activities of students in most classes of computer using teachers actually involve using computers" (Becker, 1991:7).

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[6] Dede's 'misconception of power' is the misconception that students need computers with only limited power; in fact to benefit from the next generation of software, they need systems more powerful than many adult users now have. Refer to Lockard et al., 1990:vii).

David Cohen and Larry Cuban have argued that computer technology is likely to have little effect on schools, and that "to the degree that technology is flexible, it will be bent to fit existing practice and that, to the degree that it cannot be bent to fit existing practice, it will not be used" (Collins, 1991:28). This concern is echoed by Callister and Dunne (1992:326), whose findings suggested that "standard use of educational technology encourage a passive relationship with course materials that is the antithesis of empowerment." Says Perelman:

> "Merely injecting electronic tools into classrooms while leaving the basic design of educational systems unaltered offers little hope for the major improvements in educational productivity that a nation 'at risk' requires... Technological change and social change are interdependent and inseparable" (Perelman 1987, quoted in Ray 1991a:10).

2.4.2 Shortcomings in teacher training.

There are many reasons why computers have failed to live up to the early expectations. Mostert (1992:1) has suggested that the drive to incorporate computers into the educational arena has come primarily from public demand based on the belief that exposure to computers is essential for modern education, rather than from educationists. The result of this is that computers have been included in schools "before educators have been convinced of their place in education or have been prepared to handle the subject adequately and in a coordinated fashion." This has led to teachers "being deluged in a rapidly changing technology with limited knowledge of how to make effective use of it" (Mostert, 1991:1).

Lockard et al. (1990:361) have suggested that the major problem area is the fact that "we have put all out faith in the technology and gave lip service to teacher training." They quote Preskill (1988), McCarthy (1988) and Knupfer (1988) as all citing "lack of training as a major concern of teachers." The Federal Office of Technology Assessment found that only a third of K-12

teachers had "even ten hours of in-service training." Knupfer reported "a median of three hours of in-service for 6th grade teachers in Wisconsin, with the large majority having none at all!"

Research into in-service training in Britain revealed that

> "short courses did not have the time to show the most important part of using computers in education, which is how to integrate computers into classroom practice" (Cox and Rhodes, 1990:B14).

2.4.3 Resistance to change.

Friedman (1985, in Lockard et al., 1990:361) claimed resistance to computers was much greater than most believed. Balajthy (1988, in Lockard, et al., 1990:361) concluded that a great deal of effort would be required to effectively increase the motivation of teachers to start using computers in the classroom. Other problems identified were hardware, shortages and the physical placing of computers in the school, which discouraged rather than invited use. Many found that the computer was too difficult to incorporate into teaching, which "may reflect the in-service problem or a growing realisation that it takes more time to teach with computers than without" (Collis, 1988, quoted in Lockard, et al., 1990:361).

Mathinos and Woodward carried out a study at a school "considered to be exemplary in its use of computers" (Lockard, et al., 1990:361), in 1987. Their findings over a thirteen week period was that although there were plenty of computers and software in both labs and rooms, a building computer coordinator and an aide, extensive in-service, and a five year plan for encouraging the use of computers in the school in its final year,

> "60% of students never used the computer at all, and half of those who did had only one experience in that quarter... Computer use was rarely integrated, rather a reward for finishing work early, with students free to select software to use. Teachers complained that

> the equipment was scarce, but the researchers found at least five computers unused at all hours of the day" (Lockard, et al., 1990:361).

This echoes the conclusions of Plomp, Steerneman and Pelgrum (1990) from their study of computer using schools in the Netherlands.

Stieglitz and Costa (1988, in Lockard et al., 1990:361)

> "surveyed teachers to assess the impact of Rhode Island's three year Technology in Education Initiative, which made six 12 hour workshops available to teachers. The overwhelming majority of teachers opted not to go beyond the introductory workshop and less than half reported any actual classroom use of computers, despite positive attitudes."

The Ontario Ministry of Education concluded that most supporters of the use of new technology in education:

> "vastly underestimate how difficult it will be for teachers to implement the changes new educational technologies will require in practices, materials, beliefs and skills" (Fullan, Miles and Anderson, 1987:141 in Lockard, et al., 1990:362).

Both Collins (1991:31) and Collis (1988:7) support this. Collins has stated that "computers make the teacher's job more difficult", as did new technologies (television, filmstrips) before, requiring teachers to spend more time on gathering material and organising classes to manage the new technologies efficiently, while Collis has suggested that:

> "Rather than reducing the teacher's workload, it still generally takes time and effort to find ways to integrate and manage computer use in the classroom. Not having adequate time to prepare for, reflect on, set up, or manage computer use is a major problem for teachers."

Collis (1988:6) suggests further that:

- There are no easy answers or simple conclusions about computers in education, and;
- classroom implementation of computers is proving to be more difficult than we expected.

Furthermore,

- Efforts to evoke change must realise that strategies for using computers in education "go counter to established teaching styles." Teachers lack role models for implementing and using computers effectively in the classroom. They therefore find it difficult to implement computers in their classrooms.
- The way teachers tried to use computers was inappropriate because they were not tightly linked to the curriculum. (Collis, 1988, quoted in Lockard, et al., 1990:362).

While there are many suggestions as to how in service training can be improved to empower and encourage serving teachers to use technology appropriately, there seems to be little evidence of increased and improved use of computers in schools world wide. Teachers seem still locked into the industrial paradigm, ruled by old curricula, outdated instructional styles, individual tests, examination statistics, timetables and bells, from which it is difficult to escape. It is this researcher's belief that we can expect little from the current generation of teachers when it comes to change and that success in the future depends on how well we train the teachers of tomorrow. Collis has mentioned the common perception that teachers generally teach as they themselves were taught, rather than as they were taught to teach. (Lockard, et al., 1990:362). This suggests that it is important that training institutions steep trainee teachers in a culture of technology and provide them with the opportunity to experience fully the power that information technology provides if we are to produce effective computer-based interventions in schools. The first part of the research carried out by the researcher, using final year teacher-trainees in developing an electronic data base, will be seen to attempt this. How this was done will be

discussed in the subsequent chapters. (Refer to pages 34, 43 and to chapter four.)

2.5 Accepting change. Using computers appropriately across the curriculum.

Early expectations of computers in education were that they would become ever patient tutoring machines (see page 16) and many teachers have expressed frustration at the lack of course ware to match and take over the presentation of their particular curricula areas. There seems to be little reason however, why computer use in schools should be markedly different from that in the rest of society. Nevertheless, even computer using teachers have been slow to use computers in the classroom in the way that they use them themselves. The reasons for this are varied, and range from the presence of machines in the classroom where they are available for use by children, to the management problems that teachers fact in sharing scarce resources and organising group work. However, an awareness of the potential that generic software offers with respect to learning appears to be growing. This includes the use of word processing, spreadsheet, data base and communications packages, software which Underwood calls "the tools of the 'informavoures' - the consumers of information" (Underwood and Underwood, 1990:59).

Imaginative use of this kind of software enables teachers to move away from a prescriptive model of instruction by facilitating the development of information handling skills which allow pupils to escape the situation where they are "tyrannised by curricula which fossilise information into facts to be known, rather than material to be manipulated and thought about" (Underwood and Underwood, 1990:61). As has been pointed out in chapter one, the problem which now faces us is no longer one of too little information, but rather of deciding which data to access and which system to use to do so most effectively - hence the emphasis on a process-oriented curriculum and the need to provide information handling skills.

Collins has identified eight major trends from the observations of researchers scrutinizing the use of computers in schools which are attempting to use computers to restructure. These are:

1. a shift from whole-class to small-group instruction;
2. a shift from lecture and recitation to coaching;
3. a shift from working with better students to working with weaker students;
4. a shift towards more engaged students;
5. a shift from assessment based on test performance to assessment based on products, progress and effort;
6. a shift from a competitive to a cooperative social structure;
7. a shift from all students learning the same things to different students learning different things;
8. a shift from the primacy of verbal thinking to the integration of visual and verbal thinking. (Collins, 1991:28-36).

Collins has considered that these trends are subversive to some of society's most deeply held educational assumptions and beliefs, particularly the view that underpins the didactic approach to learning.[7] Computers provide a way for teachers to change the way they think about pupils and the way they teach, in providing an easy entrée to what we today call the 'social constructivist' view of education which has developed from the work of educationists like Piaget, Dewey, Vygotsky and Montessori. This philosophy suggests that teachers should be:

> "facilitators who help students to construct their own understandings and capabilities in carrying out challenging tasks... putting the emphasis on the activity of the student rather than on the teacher" (Collins 1991:29).

Hopkins (1991) has described generic software as paving the way for the process of education to gain eminence over the product.

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[7] The didactic approach to learning emphasises the role of the teacher, by assuming that the teacher is the master of his particular domain of knowledge. The job of the teacher is to transmit this knowledge and expertise to the student. The student memorises and practises what has been passed on until he/she masters it, following which he/she demonstrates such mastery by way of an appropriate test. (Collins 1991:29,30). This is the way in which most education is carried out today.

> "By emphasising intellectual skills as opposed to verbalised knowledge, process involves children actively in the learning dynamic rather than treating them as passive recipients of facts to be learned and regurgitated. Software designed to help organise data provides an environment for cognitive development by supplying a learning tool which goes beyond the acquisition of comprehension and knowledge" (Hopkins, 1991:30).

Underwood and Underwood also support the use of computers with content-free software, and have suggested that they can be used to place high cognitive demands on children, allowing them to amplify their thinking by:

> "encouraging them to apply skills and knowledge, to evaluate and make judgements and finally to draw together disparate information into a whole, in order to solve problems" (Underwood and Underwood, 1990:62).

2.6 The Electronic Data base.

While the use of word processing, "which enables pupils to write creatively and cooperatively before they have mastered the skills required to control a pencil" (Govier, 1991:163), and spreadsheet programs all fit into the category of content free software, data bases have been seen as providing particularly effective ways of working with data. Working with data bases involves:

1. Data capture - obtaining the data;
2. Data input - entering into the system;
3. Organisation - sorting data efficiently;
4. Storage - retaining the data;
5. Search - finding desired items;
6. Manipulation - adding totals, comparing, etc;
7. Retrieval - bringing the data out;
8. Presentation - making it meaningful; and
9. Evaluation - applying standards. (Daines, 1984:10-11).

Underwood and Underwood (1990:67) suggest that these processes provide an ideal environment for children to work actively with data, encouraging them to become autonomous and self-motivated thinkers who construct their own knowledge, by "organising their

data, discovering regularity and relatedness." Chandler, (in Underwood and Underwood, 1990:63) has said:

> Computerised information storage and retrieval is capable of offering liberation from 'cluttered brains' and thus giving freedom to concentrate on the development of thinking skills."

Degl'Innocenti and Ferraris support this view, stating that:

> "the creation of manageable realistic datafiles allows and encourages the student to set up a process of observation, classification, making and testing of hypotheses, and formulations of new hypotheses, during which he or she emulates the creative work of the researcher. This process is important not only from a methodological point of view, but also because it allows the student to study and extend complex domains with a fresh approach" (Degl'Innocenti and Ferraris, 1988:158-159).

Beverly Hunter (1985:20-27) has identified the following learning processes as taking place when data bases are used. Children:

1. discover commonalities or differences among groups of events and things;
2. analyze relationships;
3. look for trends;
4. test and refine hypotheses;
5. organise and share information;
6. keep lists up to date; and
7. arrange information in more useful ways.

These processes, say Underwood and Underwood (1990:68), provide the most attractive way of using computers in school because the software:

1. "exploits the full potential of the machine itself - as in the adult world, information processing by computer allows rapid and increasingly complex manipulations of data";

2. "offers the opportunity for children to collate and interrogate their own material from the environment and to form their own mental reconstructions of the world as they understand it"; and

3. gives students not only "ownership of data because they have collected it" but also the ability to use large and effective bodies of data "because of the emancipation provided by the processing power of the computer."

Straker (1989:32) has elaborated on this final point. Because the amount of 'inauthentic' labour involved in dealing with large amounts of data is high,[8] teachers have tended to avoid the exploratory problem solving approach. The computer, however, provides the facility to manage large amounts of information without the user being overwhelmed by it. By emancipating the user from non-essential work, the computer frees him to concentrate on the process of learning. The computer thus helps children to explore the information in a way that would have been virtually impossible before schools had computers. Finally, "knowing how to find, select, interpret and reorganise material is the skill of the future and it is this skill that working with data bases provides" (Straker, 1989:32,33).

Norton has pointed out the need to develop competencies for managing a rapidly increasing amount of data (See page 3). Data base software provides a management tool that enables this, furnishing the user with the facility to sort, select and view data from a range of perspectives. The way in which the researcher made use of a data base to develop data handling competencies will be discussed in the following chapter.

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[8] "Inauthentic labour... means work which is not intrinsically valued as part of the learning experience..." For example, the number crunching which is necessary before the data becomes clear, and "involves children spending far more time on tasks such as completing simple computations or conducting frequency counts, than on thinking about the relationship between the data, the real task. This places severe limits on the amount of data that can be manipulated, and downgrades the activity from being an example of real-world research problem-solving to yet another classroom exercise" (Goodyear, 1985 in Underwood and Underwood, 1990:68).

Chapter Three.

3. Research Methodology.

This chapter describes the nature of scientific research, and contrasts the methods of research used in the so-called 'pure' and 'social' sciences. It covers the nature of the research carried out, together with the aims of and the reason for the choice of the research topic. The method for evaluating the research is also discussed.

3.1 Research Methods

Gay (1976:4) has said that the goal of scientific enterprise is to "explain, predict, and/or control phenomena" and that it is based on the assumption that "all behaviours and events are orderly and that they are effects which have discoverable causes." Scientists have developed strict criteria for testing and measuring scientific outcomes and these go by the general name of research methods. They are based on several assumptions, described by Van Dalen (1973:19) as:

1. The assumption of the reality of nature, based on the belief of an "objective reality which lies behind everything explorable and that the real world is presumably knowable on the pragmatic grounds that this assumption is more fruitful for inquiry than any alternative explanation of reality."

2. The assumption of the uniformity of nature, which accepts that "nature is so constituted that whatever is true with one case is probably true in all cases of similar description, that what has been found to be true in many instances in the past will probably continue to hold true in the future."

3. The assumption concerning the psychological process whereby the researcher accepts that "he can gain knowledge of the world through the processes of perceiving, remembering and reasoning."

Such absolute assumptions would seem questionable. However, says Van Dalen, (1973:19) "assuming that nature is absolutely uniform in all respects is not necessary... science is only possible to the extent that nature is reasonably uniform." Furthermore, man can overcome some of the weaknesses of these assumptions. For example, the researcher "routinely records the information he has experienced through his senses... develops systematic methods for recording information; periodically reviews these data... takes photographs... recordings ... to improve the range, accuracy, and completeness of his memory" (Van Dalen, 1973:24,25).

3.2 Scientific research.

Early research in the domain of social science accepted these assumptions, notwithstanding the fact that they were developed from and for the natural sciences. This positivist approach is still used, and is referred to as the 'normative' model of human research.

3.2.1 The normative model.

Cohen and Manion (1989:124) have described this approach (also called the 'positivist normative', 'traditional scientific' or 'agricultural-botanical' method) as resting "upon the creation of theoretical frameworks that can be tested by experimentation, replication and refinement." In short, human behaviour is governed by rules and can, and should, be measured by examining its performance against specified criteria using natural scientific methods. They add that the normative researcher attempts to devise general theories of human behaviour and to validate them through the use of increasingly complex research methodologies in an attempt to institute "a comprehensive 'rational edifice' or universal theory to account for human and social behaviour" (Cohen and Manion, 1989:39).

The normative model would seem, therefore, to proceed from a theory or hypothesis, and attempt to measure the human behaviour

being observed against it. The hypothesis would either be rejected, or not rejected, according to statistical tradition. The normative model has been used in areas such as psychology for a long time, and has great value when assessment can be reduced to measuring and counting differences between control and experimental groups and establishing levels of significance using statistical designs. It is particularly well suited to large scale research.

However, a significant amount of experimentation in education is small scale and personal - being set in the classroom, or even within a specific group of children in a classroom - yielding interactions and behaviours that are impossible to reduce to a set of numbers. Such experimentation does not really require a strong theoretical background. This had led educational researchers to look for approaches that allow for a vigorous interaction between researcher and subject, while enabling an evaluation of the diversity of opinions and outcomes noted within the milieu of such research but which have seemed to be outside of the bounds of 'scientific' evaluation.

The normative model has other limitations with respect to human research. Best (1970:6) has noted that "it is more difficult to develop sound theories of human behaviour than it is to develop theories and predict occurrences in the purely physical world." Gay (1976:5) has pointed out that while the goals of educational research may be the same as for other research, there is a major difference between it and other scientific research because of the "nature of the phenomena being studied." He adds that explaining, predicting and controlling situations involving people is difficult because of the complex nature of humans, making the number of variables (some of which we are totally unconscious of) at work in any given educational situation so great that:

> "it is extremely difficult to generalise or replicate findings. The kinds of rigid controls which can be established and maintained in a biochemistry

laboratory are virtually impossible in an educational setting" (Gay, 1976:5).

Best had highlighted some of the major differences that make human research different from research in pure science.

1. "No two persons are alike in feelings, drives, or emotions. What may be a reasonable prediction for one may be useless for another.

2. No one person is completely consistent from one moment to another. Human behaviour is influenced by the interaction of the individual with every changing element in his environment, often in a way that is difficult to predict.

3. Human beings are influenced by the research process itself. They are influenced by the attention that is focused on them when under investigation and influenced by the knowledge that their own behaviour is being observed.

4. The behavioral sciences have been limited by a lack of adequate definitions. Accurate operational definitions are essential to the development of a sophisticated science. Such traits as intelligence, learning, hostility, anxiety, or motivation are not directly observable. As constructs they can only be postulated, and since they cannot be seen, heard or felt, they can only be inferred by test scores, or by observed hostile or aggressive acts, skin responses, pulse rates, or persistence at a task" (Best, 1970:6,7).

These realisations have led to the development of additional methods of analysis, more suited to the observation of humans and the wide variety of environments in which they operate. These methods of analysis are anti-positivist and fall under the general title of 'interpretive' research.

3.2.2 The interpretive model.

(Cohen and Manion, 1989:124) have described this model as being "subjective" and as "complementing rather than competing with the experimental stance." It is characterised by "concern for the individual", aspiring to understand "the subjective world of

human experience"... by attempting to "get inside the person and understand from within" (Cohen and Manion, 1989:38). It emphasises the viewpoint of the player rather than the spectator. The interpretive researcher thus:

> "begins with the individual and sets out to understand his interpretations of the world around him. Theory is emergent and must arise from particular situations; it should be 'grounded' on data generated by the research act" (Cohen and Manion, 1989:38).

As such, theory in the interpretive model follows rather than proceeds the research with the researcher working "directly with experience and understanding and building his theory on them" (Cohen and Manion, 1989:39) so that the data is "glossed with the meanings and purposes of those people who are their source" (Cohen and Manion, 1989:39). For the interpretive researcher, the aim of scientific research "is to understand how this glossing of reality goes on at one time and place to compare it with what goes on in different times and places... (so that) theory becomes sets of meanings which yield insights and understanding of behaviour" (Cohen and Manion, 1989:39). These, they say:

> "are likely to be as diverse as the sets of human understandings which they are to explain. From an interpretive perspective the hope of a universal theory which characterises the normative outlook gives way to multifaceted images of human behaviour as varied as the situations and contexts supporting them" (Cohen and Manion, 1989:39).

Cohen and Manion highlight two further differences between the normative and interpretive models. The first relates to the concepts of "behaviour and action", and the second to "different conceptions of theory" (Cohen and Manion, 1989:38).

In the normative model, behaviour refers to responses to both external and internal stimuli, but in either case, "the cause of the behaviour lies in the past" (Cohen and Manion, 1989:38). In contrast, interpretive approaches "focus on action" (Cohen and Manion, 1989:38). To the interpretive researcher, behaviour is

deliberate and "future oriented" (Cohen and Manion, 1989:38) and actions are meaningful only "in so far as one is able to ascertain the intentions of the actor and share his experience" (Cohen and Manion, 1989:38).

3.3 Background to the research.

The researcher's two main interests form the basis for the research. These are the belief that:

1. computers are not, but can, be used effectively in the classroom.

2. there is a need to provide teachers and teacher-trainees with effective, easy-to-use computer based resources so as to empower them to make effective, cross-curricular use of computers. (See pages 23, 43.)

The current use of computers in schools and the fact that computers have failed to impinge effectively in the educational milieu has been discussed at length in chapter two. The research carried out attempted to provide a computer intervention that would provide a point of takeoff for teacher-trainees and in-service teachers by providing a resource that can be used effectively in the classroom. The researcher was well aware of the magnitude of the problem faced by those attempting to use computers effectively in the classroom and was conscious of the fact that it is unlikely to be solved easily or immediately. These realisations influenced the choice of research method. It seemed clear that what would be needed was something that went beyond "casual reflection at the end of a lesson" to something that would allow for "a deliberate and systematic cycle of action, reflection and self-evaluation of aspects of classroom practice" (Walker, 1990:59). In short, the research carried out would in all likelihood serve as the beginning to a period of ongoing development. The use of the interpretive model seemed best able to provide this. The researcher's approach has been to work cooperatively and interactively with both the teacher-trainees and pupils involved in the two stages of the research, to observe their collaborative endeavours and to report on their

actions and responses (both verbal and written) and so categorize their actions in an attempt to gain an understanding of the learning dynamic taking place, attempting to "get inside the person and understand from within" (Cohen and Manion, 1989:38). The actions of these groups have been described in detail in an attempt to provide empirical evidence for the conclusions drawn.

Several options are open to the researcher who decides upon the qualitative, interpretive model. Two options that stood out were the case study method and the action research method. The research had characteristics of both these approaches.

3.4 The case study.

Cohen and Manion (1989:124-5) have stated that:

> "the case study researcher typically observes the characteristics of an individual unit - a child, a clique, a class, a school or a community. The purpose of such observation is to probe deeply and to analyze intensively the multifarious phenomena that constitute the life cycle of the unit with a view to establishing generalisations about the wider population to which it belongs."

Ary, Jacobs and Razavieh (1972:286) concur, emphasising the in-depth study of the individual or small unit, in which the investigator attempts to discover and understand:

> "all the variables that are important in the history or development of the subject... with the emphasis on understanding why the individual does what he does and how his behaviour changes as he responds to his environment."

Such an study obviously requires detailed observation over a long period, with the investigator gathering data about the subject's past and present state and experiences, his surroundings and the way that these interrelate. Gay's (1976:137) description of the case study is essentially the same. He describes it as an:

> "in-depth investigation of an individual, group, or institution. In education, case studies are typically conducted to determine the background, environment, and characteristics of children with problems... the primary purpose being .. to determine the factors and relationships among the factors, which have resulted in the current behaviour or status of the subject of the study... the purpose being to discover why, not just what."

Best (1970:127) has stated that the emphasis "is not upon the individual representing a type, but upon the individual as a unique personality, with his own constellation of problems and needs."

3.5 Action research.

This method of research had been described by various authors. Gay (1976:8) has said that the purpose of action research is "to solve classroom problems through the application of scientific method" by concerning oneself with local problems in a local setting rather than "with whether the results are generalisable to any other setting." He suggests further that action research is "not characterised by the same kind of control evident in other categories of research." Best (1970:12) supports this, pointed out that action research is focused on the immediate application, not on the development of theory or general application, and that its purpose is to:

> "improve school practices and, at the same time, to improve those who try to improve the practices... in such qualities as objectivity, skill in research processes, habits of thinking, ability to work harmoniously with others, and professional spirit."

Kemmis (in Walker, 1990:57) has suggested that action research has developed out of the need for a form of research which is:

> "sensitively attuned to the world of practice and the concerns of practitioners, and capable of building systematic understandings about practice through the critical reflections of practitioners."

Hustler, Cassidy and Cuff (in Walker, 1990:58) have suggested that in carrying out action research, teachers:

> "subject themselves and their practice to critical scrutiny; they attempt to relate ideas to empirical observations; they attempt to make this process explicit to themselves and others through the written word. Their prime concern is to improve their own practice in a particular situation from the standpoint of their own concern or worry... They use and/or design aspects of their action to find out more about effective teaching."

Walker (1990:57,58) describes Brown as suggesting that action research is able to "empower practitioners to transform their practice" and to be "emancipated" through the process of "collaborative effort, rigorous critique and self-reflection."

Cohen and Manion (1989:217) quote Halsey's description of action research as being a "small scale intervention in the functioning of the real world and a close examination of the effects of such intervention." They go on to describe it as:

- situational, "being concerned with diagnosing a problem in a specific context and attempting to solve it in that context";
- collaborative, with "teams of researchers and practitioners working together on a project";
- participatory, with team members taking "part directly or indirectly in implementing the research"; and
- self-evaluative, with modifications being made and evaluated continuously "within the ongoing situation with the objective of improving practice in some way or the other" (Cohen and Manion, 1989:217).

While the scope of action research can range "from a teacher trying out a novel way of teaching social studies with his class" to "a sophisticated study of organisational change in industry using a large research team and backed by government sponsors", its "evaluative frame of reference remains the same, namely, to add to the practitioner's functional knowledge of the phenomena he deals with" (Cohen and Manion, 1989:218). Action research

applies scientific method "by focusing on a specific problem in a specific setting" and emphasises "precise knowledge for a particular situation and purpose" (Cohen and Manion, 1989:218).

Cohen and Manion (1989:218,219) have suggested eight contexts in which action research may be used. These are not mutually exclusive. They are of the kind:

1. "which acts as a spur to action" in an attempt "to get something done more expeditiously than would be the case with alternative means;

2. which addresses itself to personal functioning, human relations and morale and is thus concerned with people's job efficiency, their motivations, relationships and general well-being;

3. which focuses on job analysis and aims at improving professional functioning and efficiency;

4. which is concerned with organisational change in so far as it results in improved functioning in business or industry;

5. which is concerned with planning and policy making, generally in the field of social administration;

6. which is concerned with innovation and change and in the ways in which these may be implemented in ongoing systems;

7. which concentrates on problem-solving virtually in any context in which a specific problem needs solving; and

8. which provides the opportunity to develop theoretical knowledge, the emphasis here being more on the research element of the method" (Cohen and Manion, 1989:219).

Action research is well suited to education and can easily be carried out by a single teacher operating on his own or with his class or by a group of teachers working together in a school or even by groups of teachers and researchers working together in a sustained relationship. The purpose of action research in a school or classroom falls, according to Cohen and Manion (1989:220), into five main categories. These are as a means:

1. "of remedying problems diagnosed in specific situations, or of improving in some way a given set of circumstances";

2. "of in-service training, thereby equipping the teacher with new skills and methods, sharpening his analytical powers and heightening his self-awareness";

3. "of injecting additional or innovatory approaches to teaching and learning into an ongoing system which normally inhibits innovation to change";

4. "of improving the normally poor communications between the practising teacher and the academic researcher, and of remedying the failure of traditional research to give clear prescriptions; and

5. although lacking the rigour of true scientific research, of providing a preferable alternative to the more subjective, impressionistic approach to problem-solving in the classroom."

Action research is also well suited to the cooperative mode of investigation. Its prime feature is essentially an on the spot procedure designed to deal with a concrete problem located in an immediate situation (Cohen and Manion, 1989:223) and relies chiefly on observation and behavioral data (Cohen and Manion, 1989:225).

Action research has been criticised by some as failing "to qualify as genuine research" and being nothing other that "the application of common sense or good management" where "the action aspect has overshadowed the research element" (Best, 1970:13). Gay (1975:8) has stated that "the value of action research to true scientific progress is limited because its findings lack generalisability." Nevertheless, action research "provides immediate answers to problems which cannot wait for theoretical solutions" (Gay, 1975:8), and "it does apply scientific thinking and methods to real-life problems and represents a great improvement over teacher's subjective judgements and decisions based upon folklore and their limited personal experiences" (Best, 1970:14). Furthermore, "Action research enables teachers to develop their classroom skills, to see incremental changes in

their work and to take some control over their working lives in ways not previously imagined" (Walker, 1990:62).

Best (1970:13) quotes Stephen Corey (1953, vii), a leader in the action research field as saying that:

> "I have lost much of the faith I once had in the consequences of asking only the professional investigator to study the schools and to recommend what they should do... most of the study of what should go and what should be added must be done in thousands of classrooms... and must be undertaken by those who may have to change the way they do things as a result of those studies. Our schools cannot keep up with the life they are supposed to sustain and improve unless teachers, pupils, supervisors, administrators and school patrons continuously examine what they are doing... Singly and in groups, they must use their imaginations creatively and constructively to identify the practices that must be changed to meet the needs of modern life, courageously try out those practices that give better promise, and methodically and systematically gather evidence to test their worth."

The research undertaken has characteristics of both the case study and the action research approaches, but falls mainly into the action research category. In providing an additional strategy to the traditional approach to the primary school history syllabus and the limitations imposed by the pencil, paper and textbook approach, many of the characteristics of action research will be seen to be present. Some of these, aiming at "improving school practice" (Best, 1970:12) being "situational", "small scale", "collaborative", "participative" and "self-evaluative" (Cohen and Manion, 1989:217), "injecting additional innovatory approaches to teaching and learning..." (Cohen and Manion, 1989:220) are clear. The one ingredient that requires it to have modifications "within the ongoing situation with the objective of improving practice in some way or another" (Cohen and Manion, 1989:217) would seem to be absent, the reason being that the researcher has been living in Cape Town, some 800 kilometres from the research site, during this year. This has prevented the "cyclical and ongoing" (Walker:1990:59) research desired for true action research. However, as has been stated

on page 34, the current research is seen as being the beginning of a larger investigation and the researcher intends to add to the data base in 1994 when he returns to the Eastern Cape, not only by enriching the existing data if and where possible, but by adding extra data to form an extensive data base of grave yard data from the 1820 Settler period. These grave sites are scattered throughout the settler region and have the potential to provide a powerful resource for the analysis of 1820 settler data. Some of the ways in which this data can be used is discussed as recommendations for further research in chapter seven (see page 92).

Certain characteristics of the case study are also present in the research. The research can be seen to observe "the characteristics of an individual unit - a child, a clique, a class, a school or a community" (Cohen and Manion, 1989:124,125). The approach used to describe in detail the actions of the teacher-trainees as they tested the Salem data base's initial useability, (see chapter four) has characteristics of the case study method. The same is true of the approach taken in describing the actions of the four groups of standard fours who used the Salem data base as a learning package. (See chapter five.) Nevertheless, the researcher feels that the overall research does not match the classical case study in that it did not really

> "probe deeply... to analyze intensively the multifarious phenomena that constitute the life cycle of the unit with a view to establishing generalisations about the wider population to which it belongs" (Cohen and Manion, 1989:125).

3.6 The aims of the research.

The aim of the research can be divided into two main areas, affecting, firstly, the teacher-trainees who built the data base and, secondly, the pupils who tested it.

The importance of providing effective computer skills to teacher-trainees has already been mentioned. (Refer to pages 23 and 34.) There were three main aims with respect to the teacher-trainees.

1. It attempted to provide the teacher-trainees concerned with a working knowledge of the use of data bases and data handling as a learning medium.

2. It attempted to provide them with the opportunity to carry out real as opposed to contrived research, using primary sources, as a model for future research using similar tools with their own classes.

3. It attempted to provide the researcher with a frame of reference with respect to the learning dynamic involved when data bases are explored by users with little previous experience with them.

Essentially, the questions the researcher was seeking to address was whether teacher-trainees with a limited knowledge of data base design and query skills, could attain a useful working knowledge thereof by working with their own data and if so, how easily it can be attained. Further, whether such teacher-trainees would regard such an approach as worthwhile, both for themselves and the children that they would be teaching. Finally, to see whether those, if any, who saw value in such an approach would actually use it in their own teaching when in schools.

In the final analysis, where the database was tested with school going children, the researcher was attempting to see whether the use of the database would provided a useful extension to traditional methods of teaching this particular part of the primary school history syllabus. The reactions of the children involved, together with those of the non-participant observer, provided this data.

3.7 The design of the research.

The research was designed to fit the restructured school model[9] as described by researchers like Collins (1991), David (1991), Moursund (1991), Ray (1991) and Brown (1990, 1991) and attempted to make use the of the computer and generic software to develop a flexible and useful learning tool. Lockard et al. (1990:353) have suggested that in integrating the computer across the curriculum, its use must contribute either as a way to improve effectiveness, or to do what could not be done as well before. A determined effort was therefore made to construct a learning environment which would not be possible (or much more difficult), using traditional teaching methods. The electronic data base was decided upon as a learning medium, for use within the history curriculum. Finally, the research was designed to emphasise process rather than product, so as to enable teacher-trainees to:

> "construct their own understandings and capabilities in carrying out challenging tasks... putting emphasis on the activity of the student rather than on the teacher" (Collins 1991:29).

3.8 The setting of the research.

The research was set in the small Eastern Cape hamlet of Salem, one of the original fifty-four areas allocated to settler parties who emigrated from Britain to Albany in 1820. Salem has the distinction of being the only original settlement which is still in existence. It has a church and a cemetery going back to the time of the original settlement and it is this primary data which provided the focus for the research.

A group of sixteen final year Bachelor of Primary Education teacher-trainees from Rhodes University, Grahamstown, agreed to participate in the research, as part of the Information

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[9] whereby teaching emphasises children learning to apply skills, to understand concepts and solve problems... how to work collaboratively... to take responsibility for learning... Refer to chapter one, page 4.

Technology module of their final year curriculum. None of the subjects had previously worked with a data base and no formal attempt was made to 'teach' the skills of data base design and data base interrogation, other than a short description of what a data base is, and a hands-on session involving the sorting and interrogation (and discussion of the outcomes thereof) of a database designed by Goldberg (1992).[10]

The data collection was limited to the data found on the headstones and other memorial objects in the graveyard. The graveyard was divided into eight roughly-equal sections, each allocated to a pair of teacher-trainees, who noted down all the details marked on the headstones and memorials present.[11] The researcher also participated in the data collection. This data was discussed and entered into an electronic data base by the pairs of teacher-trainees. Once all the data had been entered into separate data files, the files were combined by the researcher into a single data base.[12] The data base formed the basis for manipulation by the teacher-trainees, and for fine tuning, where such modification was required.

The data base was also designed so as to be easily managed by upper primary school children, as this would be the age that the teacher-trainees involved in the research would be teaching. It would also be the group that the finalised database would be tested on by the researcher. The pupils who tested the data base in the second phase of the research used the data base exactly as constructed and modified by the teacher-trainees and researcher, under the supervision of the researcher as participant observer. A non-participant observer from the school

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[10] This short data base demonstrates how seemingly opaque data can become relevant and powerful when sorted by different fields. See Appendix 2.

[11] See Appendix 3.

[12] Rapidfile 1.2, a flat data base produced by Ashton Tate and now supported by Borland, was used. This package was well known to the researcher and is regarded as easy to learn and use.

also took part to act as a control, and reported back to the researcher.

3.9 Participant observation.

Essential to educational research is observation, and this falls into two main categories, being participative observation and non-participative observation. Cohen and Manion (1989:125) have stated that the participant observer "engages in the very activities he sets out to observe" very often to the extent that he becomes one of the group. By way of contrast, the non-participant observer stands aside from the group, often deliberately divorcing him or herself from it, in an attempt to observe the actions of the group objectively. The choice between these two methods would depend largely on the kind or observation being undertaken and the intentions of the researcher. If the researcher needs to observe from a distance, without interfering or influencing the subjects under observation, the non-participatory approach would be most appropriate. If, on the other hand, the research being undertaken was of such a nature that the observer and his subjects needed to work together to discover new outcomes (as often happens in the restructured classroom where the teacher has given up all pretensions to being the fount of all knowledge and works with his class in a multitude of areas where they learn together), the participatory approach is more appropriate. It is this method that the researcher used.

There were several reasons for this.

1. The pupils would need a high level of direction with respect to the material in the Salem data base - an area in which the researcher could be regarded as expert.

2. The pupils would need guidance with regard to their interpretations of the data base, with respect to both historical matter and those related to the data.

3. The researcher had no preconceptions as to the number or type of observations, or pattern of discoveries, that the children would make. In a very real sense, both researcher and the pupils would be making discoveries together as they went through the data.

The researcher also made use of a non-participant observer to act as a control and to provide feedback with respect to the validity and efficacy of the learning method. One of the criticisms of participant observation is that it is "subjective, biased, impressionistic, idiosyncratic and lacking in the precise quantifiable measures that are the hallmark of survey research and experimentation" (Cohen and Manion, 1989:129). Using a non-participant observer helped overcome these weaknesses of participant observation and provided a level of triangulation. The non-participant observer, in this case an experienced teacher who has an interest in the use of computers in education and who had also taught history, remained detached from the process and noted his observations on paper. These were discussed with the researcher, and are discussed in the findings in chapter six (see page 88).

The following chapters looks at the findings of the researcher. These consist of verbal comments noted during the development phase and the written comments of the teacher-trainees recorded on a questionnaire.[13] The findings of the trial run, carried out with standard four pupils, are also recorded, as are the observations of the non-participant observer and the researcher.

[13] See Appendix 4.

Chapter Four.

4. The design, development and testing of the Salem data base.

4.1 The design of the database.

The Salem graveyard was visited several times by the researcher before the research was carried out, to get a rough idea of the kind and amount of data available and to assess any limitations that it might impose. Once this had been done, the researcher selected data fields to be used, set up the Salem data base for data entry and drew up a data collection form for use by the teacher-trainees. This matched the data fields of the Salem data base.[14]

Although the researcher would have preferred the group to decide on the data to be included and the names of the fields to be used, it was not possible for all involved to visit the site beforehand. The researcher therefore took the liberty of selecting the kind of data to be included. Five fields were selected - surname, firstname, date of death, age and comments, the final field allowing for the collection of any data that the teacher-trainees felt should be included in the Salem data base once the raw data had been collected and analyzed. This field could also be used to capture general comments, which would not fit exactly into a field, but which might be useful, if only for general discussion. It should be noted that Rapidfile makes it easy to add and subtract fields and to change field formats. Had the group decided to add an extra field, or to do without a

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[14] Strictly speaking, the term 'data base' refers to inter-relational or three dimensional data bases, which are able to access and relate different data files using one or more common fields. DBase 4, from Ashton Tate, is a well known example. The term 'data file' refers to a 'flat' or two dimensional data base, which can work with only one file at a time. Rapidfile fits into the latter category. For the purpose of this discussion, the terms 'data base' and 'data file' should be seen as being synonymous.

field, the necessary changes would have been easy to make. As it happened, the teacher-trainees involved were happy with the selection, and the need for extra fields did not arise.

4.2 Limitations in designing the data base.

While the power of any database grows with the number and variation of fields, there is a point at which power is sacrificed to efficiency and ease of use. Because this was the teacher-trainee's first real encounter with a 'real' data base and because the data base would ultimately be used by primary school children, it was decided to keep it as simple as possible. Considerations that needed attention were of the sort that required all the fields to fit onto one screen.[15]

Samples of data taken from a specific locations in the graveyard indicated two things.

1. The range of data for inclusion was actually quite small and not much bigger than had been selected.[16]
2. There would be enough information for meaningful interrogation so long as such interrogation was carried out imaginatively and intelligently.

4.3 The collection of the data.

The group was taken into the field by bus. The teacher-trainees were divided into eight pairs, each of which was allocated a section of graveyard. All data written on the gravestones was noted, information not fitting into a specific field being listed

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[15] While it is possible to design a multiplicity of data formats by excluding certain fields and by changing the position and/or order in which they are presented to get all the data needed onto one screen, it was felt that this would cause confusion.

[16] All data written on the gravestones or other structures was captured. Information with respect to the material used for specific gravestones, or the physical condition thereof, was not used.

under 'comments and other details.' The data collection proceeded without incident, and the teacher-trainees were given time to enter their data into the data base on returning home. Once each group had carried out this task, the researcher used the merge facility to merge each of the data files into a single data base[17], for interrogation by the group.

4.4 Checking design integrity.

The teacher-trainees spent about twenty minutes checking the data for integrity and consistency with regard to spelling, and about two hours interrogating the data base. These sessions were formal and had to be attended by all the teacher-trainees. This testing was seen as being of utmost importance, as, to be of use, the data had to prove to be queryable, robust and relevant. Several problems arose, and were dealt with. The date format of the data base proved difficult to work with, being American with the month preceding the day. This made it difficult to list the dates in the correct order. The solution involved a major redesign of the data base which could only be carried out at a later date. The other problem which arose was that of consistency with respect to the age of death. Some individuals had died at the age of three months, and some within a few days of birth. All these ages had to be converted into years, a relatively simple step involving only a small part of the data. A final problem that was revealed was the fact that Rapidfile did not regard 'Amm' and ' Amm' as the same. This is true of most software. The data had to be checked for leading spaces, which affected Rapidfile's ability to sort accurately.

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[17] See appendix 6. The database is presented in alpha order by surname and year of death in this listing. The accompanying disc has the database in Rapidfile format (Salem.rpd) and in Dbase format (Salem.dbf).

4.5 Working with the Salem data base.

The teacher-trainees worked in pairs in a computer laboratory, and were encouraged to share their findings and any questions that arose. A deliberate attempt was made to develop a climate that supported collaborative learning and the sharing of ideas. Groups were therefore asked to discuss their findings amongst themselves and to note down all the queries they were able to develop, as well as any problems that they came across. At the end of the session, each group was asked to present their most important findings and problems to the class for discussion. At the end of the session, the teacher-trainees were asked to complete a questionnaire[18] consisting of thirteen questions, covering their work with the data base and their findings. It also asked them whether they felt that the work they had done would be relevant in the primary school situation in which they would eventually work. The object here was to evaluate the perceptions of the teacher-trainees with respect to the use of computers and electronic data bases in primary education. The researcher was fully involved in these sessions, working as facilitator by answering questions regarding the ways in which the data base worked and, to a lesser extent, by suggesting ways of querying the data. He also controlled the plenary session in which the groups discussed their findings and perceptions about data base work.

4.6 Interrogation of the Salem data base.

The main tools used in querying or interrogating a data base are data selection and the ordering of data and the teacher-trainees picked up these skills quickly. The researcher made a determined effort to maintain his role as facilitator, as one of the objects of the operation (refer to page 42) was to see to what extent the teacher-trainees were able to apply the basic skills themselves, using the data at hand. All the teacher-trainees seemed to cope

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[18] See appendix 4.

well, and a good selection of questions were asked. The teacher-trainees were encouraged to share their findings, and it was interesting to see the extent to which collaborative learning took place, both within and between pairs. When particularly interesting discoveries were made, the teacher-trainees involved were asked to share such discoveries. In one such session, an attempt was made to complete a family tree and in another, a group discussed their observation of how first names tend to run in families through several generations. The high rate of infant mortality and its possible causes were also discussed and general disappointment was expressed at lack of detail with respect to the cause of death. A shortage of time prevented a full discussion of the teacher-trainees findings, but one important point was raised. This was the general paucity of data available on the head stones. One student commented that quite a number of headstones omitted the data and age of death, which "left the data incomplete." The student concerned wondered whether the exercise could be regarded as valid in the light of such incomplete data. All the teacher-trainees expressed the feeling that the exercise would have been very much more powerful had there been more data available, so as to enable them to draw up accurate family trees, and to see where people had come from or exactly what they had died of. This led to further discussion on the nature of historical evidence and the difficulties that all historians face when dealing with primary sources. Ways of getting around the problem were discussed, such as interviewing surviving members of families and consulting further sources, such as the marriage and burial records available in the Cory Library.

The question of 'dirty' or incorrect data was also raised. It is known, for instance, that a number of settlers travelled under assumed names. Families with a large numbers of children would, under the terms of settlement, have to pay extra for those children who did not fit within the quota allowed. These families sometimes requested settlers with few or no children to take older children as their own, to avoid paying an extra

amount. Some of these children reverted to using their correct names after settlement, but some did not. This has let to a great deal of confusion for historians trying to trace the movement of settlers in the early years. One student asked how one could be sure that the information provided was correct. It had to be admitted that there was in all probability a fair amount of dirty data. People are sometimes hazy about relatives' dates of birth and ages and often guess when asked for a figure. No particular data presented itself in this instance, although some showed up in a questionnaire. This will be discussed later. It must be borne in mind that the primary education teacher-trainees who were involved with the research had no formal historical training. A handful had completed the first year history course, and some had not completed matric history. In the light of this, the researcher felt that the discussion had been most worthwhile, if only for making these teacher-trainees aware of the nature of historical research and the difficulties involved.

Towards the end of the session, the researcher demonstrated the way in which the data base could be asked to provide statistical data, such as the mean age of death. The teacher-trainees were asked to guess at what this might be. After some discussion, several figures were presented, and a hypothesis advanced that it would be low, because it was believed that people generally did not live long "in the past." The statistic of 58,2 years, derived from the 102 records that had an age of death, caused much discussion. Given the high rate of infant mortality, the teacher-trainees felt that this figure was high. They were also interested to see that a fair number of people had lived into their 70's and beyond. It had to be pointed out, however, that the graveyard was still used and that many of the people buried there had died fairly recently. The database was queried further, using a selection process that eliminated people buried after 1900. This cut the sample to 53 people and the average age of death to 42,5 years. This statistic seemed to support the original hypothesis.

An important misapprehension was revealed by this discussion, being that many of the teacher-trainees had the idea that the graveyard was an old one, this in spite of their having handled data that showed quite clearly that it was still used. It was felt that children would need to be made aware of this factor.

Another question that was asked was where all the original settlers were buried. Nash (1987:114-115) lists in excess of 200 families as having settled at Salem. Only ten records from the data could be identified as original settlers. The teacher-trainees felt that many more of the original settlers should have been buried there, and discussed reasons why so few should have been identified. This led to further discussion about the conditions that the settlers faced at the time of settlement, and how hard times caused many to move off the land.

Of particular interest to the researcher was the fact that the great majority of teacher-trainees had no problems in querying the data base. Only one student admitted that she did not feel comfortable when working with computers. The two main query tools used, that is ordering and selecting specific data, use quite simple key strokes which the teacher-trainees managed to master quickly. Even the keystrokes required to work out statistical data and which were only used towards the end of the session, were mastered quickly and used by all the groups. The same was found to be the case when the data base was used by standard four pupils. Although both teacher-trainees and pupils cannot be said to be fully conversant with the software, they were able to query and interrogate the data base with relative ease, having been given three simple series of key strokes. This point will be returned to later when discussing the responses to the questionnaire.

4.7 Analysis of the student questionnaire.

The final task was the completion of the questionnaire. The responses will be discussed briefly. The questions asked of the

teacher-trainees will be used as sub-headings. A summary of the questions is included in the appendices, as appendix 5.

1. What question or questions did you ask of the Salem file?

An analysis of the synthesis of data from the questionnaire reveals that a wide range of questioning techniques were used, ranging from the relatively mundane function of listing the families in alphabetical order, to the making of hypotheses about the average age of death of the community represented in the graveyard. One group tried to see whether there was a pattern of longevity within specific families by looking at the average age of death within these families. This particular result was not discussed with the groups and it is not stated whether any result was obtained. Nevertheless, the question is a valid one. Another group noted that one death, that of Jeremiah Long buried in 1809, was listed in the data base as having occurred before 1820. The group asked the class whether some 'settlers' had arrived before 1820? This raises the point again of dirty data. It is clear from other sources that the Longs were not original Salem settlers. A Jeremiah Long is the only Long mentioned in the original lists of settlers, registered as one of George Smith's party which settled at George Vale, to the east of the Kowie River. He was aged about 40 in 1820, was married to Ann and had two sons, James aged 13 and Jeremiah, aged 11. It was not possible to establish whether the Longs of Salem are the same family as the data available does not allow for a connection. The teacher-trainees concluded that the date of death of the younger Jeremiah is in all likelihood incorrect, most likely as a result of being copied incorrectly by the group involved. This is another instance of 'dirty data' not in this case inherent in the primary source, but acquired in the collection.

2. What were some of the difficulties you encountered in attempting to get an answer to your questions?

This referred to answers from the teacher-trainees' questions of the Salem data base. The main difficulties encountered by the teacher-trainees concerned the shortage of information on the grave stones and, consequently, in the data base and this proved to be a major source of frustration. The case of Jeremiah Long is a case in point. Few graves had more than the bare minimum of information such as name, date of death and age at death and a fair number was missing even this data. Several graves had no data at all. One student pointed out that this lack of information "might skew the result" obtained when working, for example, with the arithmetic mean of the age of death. Very few head stones provided linking information that enable more than the drawing up of rudimentary family trees.

One problem was inherent in the structure of the data base. This was a problem of listing dates of death in order because of the default format of the date, which was American. This was changed later, but not, unfortunately, in time for the teacher-trainees to use it.

3. Were you able to learn anything from manipulating the data file that you would not have learned using traditional methods? If so, what?

All the teacher-trainees who responded were positive in their replies. One stated that "I probably would not have been as interested as I was because I would not have collected the data myself." This supports Underwood and Underwood's comment on page 28 about the power that 'ownership' of data gives to learning. Other comments included the observation that the data file "made all information easily accessible. It would have taken a tremendous amount of time to sift through the information manually" and that "you learn to question information, to formulate your own questions." Another student said that it

enables one to "come to your own conclusions" and another that the data file "allowed you to see the same information from different angles." Finally,

> "The data file allows for a lot more manipulation of information and gives the ability to match and compare different fields of information which would have been very difficult and time consuming (using traditional methods)."

4. Do you think the process of data collection, data file creation and file interrogation is a worthwhile exercise for primary school children to carry out? If so, why?

The replies to this question proved interesting, especially when contrasted with the answers to question five. All the responses were positive. In providing reasons for their responses, several teacher-trainees emphasised the need for children to 'own' the data by doing the research themselves. Others felt that it provided a problem solving approach, and others that it was easy to use, that the learning method could be used across the curriculum, that it promoted discovery learning, went beyond the syllabus, was challenging and rewarding, was a "fun way of dealing with material which otherwise would have appeared dull and boring', and was better than 'thick irrelevant text books."

5. Discuss some of the difficulties you might encounter as a teacher attempting this sort of exercise with a class of children.

The answers here were distinctly less positive than those provided for question four. "I do not feel competent enough when using the computer to actually show children and encourage children to use the computer" said one. Another said that it would be difficult to keep track of everyone because they would all be asking different questions and following different paths of interest! This reply is disturbing from the point of view that the same student was very positive about her own work using the data base. This raises the problem of the ability of teachers to change their teaching approaches, even when they

recognise new methods to be better than old ones, and brings to mind Collis's point that teachers teach as they were taught, not as they were taught how to teach (Refer to page 23). This point will be further developed at the end of the chapter.

A third felt that "knowledge of the computer" would be needed before the process could take place. What was seen to be needed here was formal training in the use of computers and specific software packages, this in spite of the fact that the teacher-trainee herself was not provided with this level of training prior to using the package successfully. Another trainee felt that some children might lack confidence and, because of their unfamiliarity with computers, be afraid of making mistakes and therefore avoid using them. Two saw discipline problems arising, with dominating children taking over when the computer was being shared. One student felt that children "might not be able to think of the questions to put into the computer and might not be able to analyze it properly". Another felt that children "might not have a sense of discovery that is necessary for this type of exercise." The majority of teacher-trainees saw the obstacle of access to computers as the major one. The general consensus was that there would have to be sufficient computers for all the children to use, at one time, if the exercise was to be completed successfully. In other words, there would have to be at least half as many computers in the classroom as pupils. None of the teacher-trainees referred to the strategy of working in groups to overcome this problem.

6. Discuss the use of technology of this sort.
   a) Does it get in the way?
   b) Was the software (Rapidfile) difficult to use?
   c) Was it difficult to access, to input data, to query the file?
   d) In what way, if any, did the computer facilitate the exercise?

One student answered yes to question a), but did not elucidate and another said that it did so "sometimes, because it takes spaces as letters, so when ordering it is not quite in alphabetical order." This particular problem was dealt with in checking the integrity of the data. One student answered yes for question c), and another responded with "a little at first." The rest of the responses were positive in these sub-sections. All the teacher-trainees agreed that the computer facilitated the exercise of querying the data. One said that it made everything "a lot quicker and easier", another that it enabled one to "move about the information so that it is ordered and makes sense without fear of losing ir or forgetting it". Another wrote that "you could get answers to your questions quickly - little time is wasted. Input errors can be corrected easily" and another that "without the computer there would be no exercise. I don't know if I could do the data base without the computer now, it would seem so tedious."

7. Would it be necessary to first teach children about data bases in general and Rapidfile in particular, before engaging on an exercise of this sort?

The responses to this were mixed, ranging from a definite "Yes, the children would need a sound knowledge of operating the data base and how to query it" to "No, they learn by experience." The count of yes's was nine to seven no's. On checking the question, the researcher felt that it had been badly phrased. What was intended was to see whether the teacher-trainees thought that pupils would require a thorough, formal introduction to data bases, or whether they would cope with it by learning as they went along - which is the approach that the researcher took with the teacher-trainees. The question was poorly formulated and did not really ask this. The responses could not be used as a result.

8. Does one need to develop new learning skills when using this sort of application.
   a) If so, what are they?
   b) How can they be best developed?
   c) What difficulties are we likely to face?

The answers to section a) emphasised three aspects - the need to learn how to ask questions, the need to develop critical thinking skills, and the need to develop computer related skills - that is, to understand hardware and software. Only one respondent suggested that no new skills would be needed in responding that "No, basic ones can be transferred." The rest used phrases like "learning to ask questions", "learn to think critically", "teach children to work on their own and analyze data" and "learn to think for themselves." There was a clear consensus that using data bases as learning tools requires new ways of thinking and the development of new skills.

The responses to section b), which asked how such skills can be developed, emphasised the need for practice. Other suggestions were to "encourage children to ask questions", to allow the child to ask his own questions, by "motivating children to question the facts" and by "allowing the children to work in pairs and discuss - giving them opportunities to experiment, discover and think for themselves."

In section c), when asked about the difficulties that they might face in achieving this, most respondents felt that children would "struggle" or "feel insecure" and "find it difficult initially to ask their own questions" because they are "so used to the teacher asking the questions." In the words on one student, "children who are used to traditional methods might be reluctant to think of questions themselves (like me!)." The same respondent noted that the teacher would need to find data applicable to the syllabus or project. Another highlighted the need for the teacher to provide guidance while allowing the children the freedom to experiment and discover. Another

isolated the problem of access to computers and "making time for computers", but added that "careful planning could alleviate these problems."

9. Does this style of learning have a place in the new South Africa? If so, why?

The majority of respondents answered in the affirmative and only two suggested that it did not. The reasons given by these respondents were that most schools in South Africa would not be able to afford computers, that only elite schools have them and that there is a need to "get rid of elitism." The second respondent suggested that it was more important to get all children basic education with decent equipment and reading books and that this was not the time to waste sums of money on computers. The remainder of the respondents accepted that computers are here and that they are part of the future. Some felt that there was a need for children to become independent thinkers and to ask questions, and seemed to assume that the use of computers in schools would ensure that this happens. There also seemed to be an assumption that these skills could not be achieved without computers. Several mentioned the problem of funding, but agreed nevertheless that computers had a place in South African schools.

10. Does this kind of learning justify the use of more time?

Only one respondent was negative and stated that it should be incorporated into other subjects areas, such as mathematics and science. The researcher takes this reply to really mean yes, so long as the use of computers is applied across the curriculum. Other respondents were all in favour of spending more time with computer based learning. One student made the point that computers "should not be looked at as a separate subject." Another said that the learning techniques used could be transferred to other subjects, and another that computer learning was "active learning - the children are not just learning content

but a number of skills which are extremely useful and may be applied to other situations."

11. Do you think this kind of learning is cost effective? Why?

Answers here were varied, but generally it was felt that computers were not cost effective in the classroom. Two teacher-trainees thought that it would be, one qualifying this by saying that computers would need to be used all the time and for all subjects if they was not to become an expensive addition to the text book. The other suggested that computers should be used because computers are playing an increasingly important role in society, and that education needs to change with the times. Four responses suggested that the initial cost would be high, but that the long term benefits would make it worth while.

12. What is the greatest challenge to the teacher using this style of learning?

Answers provided here fell into three main areas.

1. those that involved finding relevant information for children to query;
2. those involving the mastery of the software; and
3. those involving the ability of teachers to embrace a new paradigm whereby the teacher could stand back and act as facilitator.

Five responses stressed the first aspect, that of finding information that was both relevant and suited to the learning method. Two respondents felt that the ability of the teacher to master the various pieces of software was the main challenge. Eight felt that the challenge involved new management skills, those which allowed the teacher to stand back and allow the child to learn for him or herself. As one respondent put it, teachers find it difficult to accept that" children are actually learning and doing something worthwhile without teaching them." Another

felt that the challenge lay in "letting go of her traditional control over children and her traditional teaching styles so as to allow the children to construct their own learning". Another said it was having to "take a back seat and allow the children to direct their own learning and not interfere too much."

13. What are the short term and long term benefits to the pupil using this approach to learning?

The answers to this question varied widely but were all positive. Phrases that were used most frequently were that it led to "problem solving" (five times) and to children becoming "independent thinkers" (six times). Others saw the benefits as including children who could work independently of the teacher, (three times) and children involved with problems that were more relevant. Others said that it would provide children with the skills needed for querying and analysing data, and that it would provide them with life skills for the future. Four mentioned the learning of computer skills, and two that learning would become more relevant. Others said that learning would become more interesting, quicker and easier and that it would allow for the development of critical thinking.

4.8 Conclusions drawn from the analysis of the student questionnaire.

When all the responses are considered, certain trends emerge. The answers to questions one and two show quite clearly that the teacher-trainees were able to master the techniques of data input and data query and the responses to questions three, four, six, eight, nine, ten and thirteen show that they were largely supportive of the kind of educational process that they encountered in working with the Salem data base. However, when contrasted with their responses to questions five and question seven, it becomes clear that while the teacher-trainees were excited about the work that they themselves did, they lacked confidence to repeat the exercise with their own classes. The

teacher-trainees also showed an understandable apprehension about doing anything new with their classes. This is to be expected of student teachers who are not quite sure of what kind of school they will be going into or quite what will be expected of them. The responses to question eleven indicate quite clearly the perception that computers are too costly to be considered. It is difficult to argue with this given the current state of education in South Africa as a whole, and South Africa's current economic situation. The responses to question twelve indicate a realisation that computers can be powerful learning tools, but are coupled with a rather hesitant willingness to embrace the technology because of the general perception that mastering the hardware and software is difficult. Thus, in spite of the fact that the teacher-trainees enjoyed the exercise and found it useful they remain largely hesitant to take the plunge and use similar interventions themselves.

4.9 Providing opportunities for teacher-trainees to become effective computer users.

The researcher would suggest that the main reason for this hesitance is the fact that the teacher-trainees involved had not had enough exposure to computers in general. The teacher-trainees used in the research were only available for participation in the research late in the year - in October - and the only previous experience they had of computers was word processing, and that to various degrees. Some had attended an introductory course in word processing, but did not use computers themselves. Others were competent word processors. For all the teacher-trainees, however, this was their first exposure to the use of computers as a learning medium and it came at the very end of their four years of teacher training. Cox and Rhodes (1990:B14) carried out research into the efficacy of in-service training in primary schools falling under the control of the Inner London Educational Authority (ILEA). Their findings were that short courses were unable to show the most important part of using computers in education, that is, the integration of

computers into classroom practice. They concluded that only a proper course in computer literacy, a certificated ILEA course of 150 hours spread over a year, trained teachers effectively with respect to integrate computers effectively into their teaching.

Thompson (1991:1) has also commented on the need for the effective training of teachers and has stated that:

> "Long and sad experience has shown that if the training of teachers (to use computers effectively) is neglected, the learning process with computers can be more costly and less effective than with traditional methods."

What seems clear to the researcher is the need to provide teacher-trainees with access to computers and computer based learning strategies at an earlier stage of their training, so that by the time they do venture into schools, this kind of exercise will be as thoroughly engrained as a teaching strategy as the normal pencil and paper exercises. As David (1991:40) has pointed out, even given authority and knowledge, successful change takes time. Teachers and administrators cannot change roles to create new learning environments, and to build ongoing learning into their jobs without being given sufficient time to do so. In spite of their positive feelings about the use of data bases as a learning strategy, two questions remain. The question that needs to be posed is whether the teacher-trainees involved in the research described will:

1. be prepared to use data bases if the schools they join have computers; or
2. be prepared to lobby for this kind of learning tool if they are appointed to schools which do not have them.

4.10 Using data bases to trigger questions.

A final observation which can be drawn from this particular exercise is that, while the data base proved disappointing to some of the teacher-trainees from the point of view of it being

unable to answer all of their questions, one needs to consider the exercise not from its ability to provide answers, but rather from its ability to trigger questions. A wide variety of questions were asked. The records were listed alphabetically. Family relationships were analyzed. Records were sorted by age of death. Simple family trees were drawn up. Some teacher-trainees were able to hypothesise and check the hypothesis by querying the data, as was the case with the mean age of death and the suggestion that given names persisted within family groups. Other questions could not be answered, such as the questions regarding the relationship of Jeremiah Long to the original settler who came out with Smith's party, and the question regarding the whereabouts of the other original settlers. These questions could, in all probability, be solved by further research. The point, however, is whether the questions would even have arisen with traditional methods of learning history. The researcher submits that this is very unlikely. Text book history, while providing a useful overview of events, cannot compare with real historical research, which provides a new and powerful dimension to the knowledge of those querying the data. The computer adds a new perspective to this task, by making the sorting and section of data, a tedious task in the past, quick, efficient and accurate. As such it brings the task of research within the realm of people who would not normally be expected to carry it out.

4.11 Assessing achievements.

In measuring the findings of the research against the aims, the researcher concludes that the three aims (refer to page 42, 65) were partly met. The students achieved a working knowledge of the use of data bases and data handling as a learning medium and had the opportunity to do real research using primary sources. It is doubtful, however, whether the teacher-trainees will use their experiences as a model for similar research with their own classes in the future, unless provided with a high level of support by the schools involved. Given that few primary schools

in South Africa are using computers at this level, such support is unlikely in the short term. The researcher therefore concludes that any hope that the teacher-trainees would be convinced of the efficacy of the method to the extent that they would make it a part of their arsenal of teaching methods, is unlikely to be fulfilled.

The researcher feels that it is relatively easy to demonstrate the usefulness of data handling software, and to convince trainee teachers of its usefulness in the classroom. Like Cox and Rhodes, he believes that it will take a great deal more than short term exposure for teachers and teacher trainees to fully internalise and embrace the process as a daily classroom tool.

In the second part of the research, the researcher presented the Salem data to a group of standard four children. The way that they were able to use it is described in the next chapter.

Chapter Five.

5. Using the Salem data base with school children.

The second phase of the research involved using the data base with primary school children. Twenty three of the twenty eight standard four pupils from the researcher's own model C school took part in the programme. The class, which consisted of both boys and girls, was unstreamed, and had a wide range of abilities. GSAT scores, administered in the same year, ranged from 84 (stanine 3) to 145+ (stanine 9).

The children had covered material on the 1820 Settlers as part of their standard three syllabus, using the traditional text book and notes approach. As many of them seemed hazy about the subject, the reasons for the arrival of the Settlers and the conditions existing on the frontier at the time, were explained before introducing the data base. While the researcher would have preferred to repeat the entire research exercise with the class - that is, the entire data capture exercise - this was not possible for geographical reasons. The children were in Cape Town, and the Salem graveyard some 800 kilometres distant. This meant using the resource as it had been developed by the Bachelor of Primary Education teacher-trainees and the researcher. It should be noted that a number of the design shortcomings noted by the teacher-trainees had been solved. All the ages had been converted to one unit and the date format changed to enable the records to be listed chronologically.

5.1 The use of computers in the school.

The children involved had had six months of exposure to computers at the school. They had worked mainly with word processing software (Microsoft Works), but had also been exposed to two data bases - a litter database, developed by the researcher, and a personal data base, developed jointly by the children and the

researcher. Rapidfile was used for both these data bases. The children were therefore familiar with the concepts of sorting and selecting. They had also worked with the Microsoft Works spreadsheet.

Three computers and a printer, linked by a printer sharer, were provided in the classroom for their use before, during and after school, from approximately 8h00 to 15h45, after which the classrooms were cleaned and locked. No other restrictions, other than those dictated by common sense, were placed on their use.[19] Literacy lessons had been provided during the second term, in the afternoon, to small groups. These covered word-processing, spreadsheeting and, in the third term, data base work. A fourth computer was added during the third term. The children were encouraged to hand in work produced by the computer, and this naturally led to considerable pressure on the use of the equipment. The computers were also used during class time, mostly for writing compositions, reports and for preparing projects. The spreadsheet had also been used to a certain extent for problem solving in mathematics. The data base work was completed during the third term - the last session just prior to the project being run.

5.2 The pupils' level of computer use.

In spite of quite a broad exposure to computers, the children's level of sophistication as computer users can not be regarded as high. It soon became apparent that a group of about six pupils began to dominate the computers during class time and after school. Another similar sized group, who had computers at home, seemed to prefer completing their computer related tasks at home. The rest, while happy to attend the afternoon learning sessions,

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[19] The computers were available exclusively for the class. The children were requested not to use software other than that provided by the school, and to keep the computer area, a shelf along the length of the classroom, tidy. They were also requested to ensure that the computers were switched off and covered by the last user.

continued to hand in their work in written form. Only three pupils were observed to be using a spreadsheet by themselves. The same three plus one other were observed to be using Rapidfile and the class data by themselves.

5.3 Initial exposure to the electronic data base.

The approach taken in exposing the children to data bases followed that recommended by Unia (1991:33) rather than Hunter (1985:20-27). Unia used fifth graders to actively develop and analyze a community census as their first exposure to data bases. The researcher used a similar method. The children were asked to involve themselves in a litter project as part of a community awareness campaign, and the researcher felt that this would provide an opportunity to use a data base as a 'real' as opposed to a contrived tool. The project was geared towards identifying litter by types in certain locations, to see whether its origins could be identified, and if so, whether the data could trigger suggestions that would preventing further littering. The exercise was not especially successful, as the data proved too similar for rigorous interrogation.

In the personal data base, the children were provided with a template into which they entered various pieces of personal data, such as their names, where they lived, their height, weight, shoe size and favourite meals. After the data was entered, the children asked to query it. This exercise proved more successful, and the children were able to begin developing hypotheses that they could follow up.

5.4 Work with the Salem data base.

The research was spread over a period of four days, using four different groups and working in pairs, because of the limited number of computers. The methodology used was based on that

recommended by Hunter.[20] Each session lasted about an hour and a quarter. The Salem data base was introduced, and the children invited to scroll through the data to identify the fields used, and the number of records. The origin of the data was explained and it was pointed out that Salem is the only original 1820 Settler site still occupied. The occupants consist of descendants of the original settlers, and people who have arrived subsequently. The children were then invited to use their data base interrogation skills to see what they could discover about the data, and to discuss it with their partner, the researcher (as participant observer), and the group, as an exercise in cooperative endeavour. The non-participant observer attempted to note all the activities down so as to be able to make his own observations about the effectiveness of the activity as a learning experience. At the end of each session, the children were given a ten question questionnaire to complete at home.[21] This attempted to elicit from the children the aspects of the work that they enjoyed, those they did not enjoy, and whether they felt the exercise had been worthwhile. A synthesis of the responses was drawn up for analysis.

5.5 Work with group one.

All the pairs began by ordering by surname, possibly because this was the first field in the data base. The immediate response was that "there are lots of Amm's." As they progressed, it became clear that there were many other names that occurred frequently. It became clear to the researcher that, although the children understood that the people sharing surnames were related in some way, the majority of them did not realise how they could make use of this information. The researcher then suggested that it might be possible to build family trees. This was done, with the various pairs looking for suitable families to work with.

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[20] See appendix 15.

[21] See appendix 5.

It soon became apparent to the children that family trees were not easy to build. One child responded that "It doesn't always tell us who is related" and another that "There is not enough information." This soon became a general complaint, and the researcher suggested that the children use the comments field to find the exact relationship between the records with the same surname. One group suggested selecting each family name as a subset in order to do this, and was encouraged to do so. Another group observed that, although this would work, it was not necessary, as ordering by surname more or less achieved this anyway. The Amm family was identified as being one that had enough information to carry out such an exercise, and about five minutes were spent in developing the tree[22], the researcher noting it down on the chalk board under the group's direction.

Although this exercise produced a worthwhile result, the group were far from satisfied because of the fact that there were still a number of Amm's who could not be linked to the tree. This was seen as a good point at which to discuss the nature of historical research, and about five minutes was spent in explaining the problems that historians face with respect to incomplete data. The children were asked to suggest ways of getting around this, and one proposed that one might find the information in a history of the 1820 Settlers. This was discussed further, and consensus was reached that this would not be any good, as such a book would only deal with original settlers, and not their consequent families. The researcher then reminded the group of the detailed family tree they had seen in a Dutch family bible at the museum, and suggested that certain 1820 Settler families might well have kept detailed histories of their families. One child suggested that the 1820 Settler Museum might be a good point to begin such a search, while another suggested that the group ask the librarian of the local public library.

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[22] See appendix 7.

A further exercise carried out by the first group came from the observation by one of the pairs that the ages of death could be ordered, and that one of the people had died at the age of 102. Two groups asked what an age expressed in the form '.835' meant, and it was explained that ages below 1 year (those listed on the graves in months and days) had to be expressed as a decimal. All the children noted that there were a considerable number of records which had no data in this field, and the reason for this, that the data did not exist, was mentioned. A strategy whereby this data could be eliminated by selecting only those records that had data in the field, was provided.

The pairs expressed surprise at the number of people who had died at a young age and several expressed their disappointment that there was no information as to why, or from what, these deaths has occurred. One child suggested that the group count of the number of people who had died under the age of a year. This was done by scrolling through the data, which had been ordered by age of death. Further suggestions were made - one being that the number of people over the age of 70 be counted. This figure proved to be very high. As little other than wonder seemed to be coming from the exercise, the researcher suggested that it might be possible to look at this kind of data in a more useful way, and asked what this might be. Eventually, one child responded that it might be put on a graph, and asked whether Rapidfile could do this. Another child suggested that it could be done using the spreadsheet function of Microsoft Works. The researcher then suggested that ages be grouped in lots of ten years, to make the data more manageable. The group drew up a frequency table, counting by scrolling through the data, which had been ordered by age of death. This information was transferred to the chalk board and was then entered into a Lotus spreadsheet on a hand held computer by the researcher (the task taking about a minute) and shown to the group.

The children were asked to comment on the graph, an activity that generated a great deal of discussion, especially at the number

of children (those ten years and younger) who were buried there. The general consensus of the children in the group was that the number of child deaths was high because medical science had not made much progress until recent years. Other reasons, such as availability of doctors during the days when roads and transport were rudimentary, was also discussed. The figures were noted down so that the group could create their own graphs during class the following day.[23]

One problem that soon became apparent was that the majority of, if not all, the children seemed to regard the records as if they were all 1820 settler records. It had to be pointed out that this was not so, and that the graveyard, in one respect, is a living' record of the people of Salem, in that people were still living in the community and being buried there. This apparent contradiction in terms was regarded with some amusement, but seemed to provide some clarity on the position. This had to be pointed out to all the groups.

5.6 Work with group two.

The initial approach used with all the groups was similar, although the later stages of the period were used to discuss the findings of previous groups and to look at such findings in greater detail, or to go into new areas. As has already been discussed, the idea of family trees was used with group one, to draw up the Amm family tree. This idea was used with the second group, and the Gush family tree drawn up. The graph developed with the first group was looked at by the second, and further developments made. One pair in the second group managed to list the data by date of death. The researcher suggested that it might be possible to use this to get a cleared picture of the number of burials at particular times in the history of the settlement, and asked the group to see whether they could get anything useful from the data by doing this. Counts by year

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[23] See appendix 8.

seemed to achieve nothing, so the children were asked to consider a better way of doing it. Eventually one child suggested that a similar strategy to that used by the first group, listing by decade, be used. This was done. The children had no difficulty with the ordering, and were able to calculate the frequency of death by decade by simply scrolling the data. A table of this data was drawn up on the chalk board and a rough graph drawn from it.

Disappointingly, very little discussion was generated by the graph, other than that more people seemed to be dying as the years went by. There was no response when the researcher asked why this might be. It was then pointed out that populations grow once people settle in an area, and generate families. Also, that the more people there are, the more people are likely to die. It was at this stage that a very interesting question was asked, in all probability without the questioner realising just how significant it was. The question was why, if that was the case, was there a drop in the number of burials between 1920 and 1940, and then a sharp increase. The data base was unable to provide the answer to this question and little further discussion was generated by the group. The researcher could only guess at the answer, and suggested that it might have something to do with the depression and a consequent movement off the land to urban settlements in search of work. The question did, however, provide a suitable point at which to explain that real historical research is often frustrated by questions of this sort, which can only be answered by further research. One child made the useful observation that the Grahamstown graveyard should show the opposite trend if the researcher's hypothesis is correct, and that there should be a marked increase in the number of burials during these decades. This would be interesting to follow up.

5.7 Work with group three.

A suggestion by the third group was that it might be useful to look at which family is best represented in the data. Ordering

the data by surname and counting the number of occurrences was done quite easily, and a table drawn up. Rapidfile was unable to present the names by frequency of occurrence, so the data had to be entered into a spreadsheet for sorting. One pair used the spreadsheet to enter the data, which the researcher then sorted.[24] The resulting information was regarded with interest, and it soon became clear that many of the families best represented had been living in the area for a long time and that, in all likelihood, still did so.

All the groups had noticed that some of the records indicated that the graves belonged to 1820 settlers, and each group was shown how to select these records, using the keystrokes for matching records, which were written on the chalk board. All the groups had also noticed that the ages of death of this particular subset were high, and had come to the conclusion that the original settlers must have been "tough." These records were looked at in detail by group three, and a graph drawn by one of the pairs, using a spreadsheet.[25] Several of the children, just like the teacher-trainees before them, remarked that the subset seemed particularly small, given the number of original settlers. The researcher used this as an opportunity to once again discuss the difficulties encountered by historians doing research using primary sources. The idea of using further sources to fill the gaps was discussed. The whereabouts of such sources was examined. It was at this point that one of the children remarked on paucity of information in the standard three text book that they had used, stating that "it doesn't tell us what happened to them." This led to a lively exchange on the nature and purpose of history textbooks, with the group deciding that they would rather do "real" history all the time. The limitations imposed by time and location were pointed out by the researcher.

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[24] See appendix 10 and appendix 11.

[25] See appendix 12.

5.8 Work with group four.

The last group were led into the discussion in much the same way as the previous groups, and explored similar data. A further theme were developed by this group - that of comparing longevity by century.

The idea of a shortage of good medical care, developed by group one, was further developed by group four. The findings of group one, and the graph that they had developed, was presented to the group for discussion. Before long, one child suggested changing the graph so as to look more carefully at the number of children who had died in the present century, and to compare this with the number who had died in the last century. Although this could be done by simply looking at the records ordered by age of death, a more powerful method was demonstrated. The researcher showed the group how to isolate the records of people who had died under the age of eleven. This produced a sub set of 18 records, which could then be listed by date of death. This made the counting easier. A table was drawn up, and a graph produced.[26] This graph generated a great deal of discussion and it was decided that it supported the original hypothesis that medical care was a great deal better today than it was in the last century. One child pointed out that this was "doubly so, because there should also be a lot more children today."

Several of the interactions with the data were developed during general class time, following on from the special group sessions in which the groups were introduced to the Salem data base. It was possible, for instance, to devote time to language exercises whereby the children embarked upon a creative writing exercise devoted to drawing out feelings of empathy for those who had lost children at an early age. In another, letters of condolence were written. The graphs which were generated were presented to the class as a whole as part of a Mathematics lesson. The

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[26]See appendix 13.

interpretation of graphs and the graphing of data had already been covered by the class both in the process of developing computer literacy when demonstrating the ability of the spreadsheet, and as a part of the Mathematics syllabus. These sessions were now exploited by the researcher to 'revise' graphs and to demonstrate the way that skills can be used across the curriculum.

A great deal of general discussion was generated during these general class periods, much of it devoted to longevity. All the groups had seemed to be particularly interested by the field that showed the age of death and, as has been seen, a significant part of the work done by the groups had hinged on this field. The class made much of the seemingly high rate of infant mortality during the last century, and expressed disappointment at not being able to see exactly what the children had died of. Another aspect that seemed to fascinate them were the records which could be identified as 1820 settlers, and their ages of death. Given the generally held impression that life was tenuous in days gone by, it was felt that these people were in some way special because they had lived so long. On looking at the graph demonstrating the distribution of graves by age of death (appendix 9), the class came to the consensus that one either "didn't make it" and died young, or "made it" and lived to a ripe old age.

This point raised once again the generally held misconception that the data represented people of a bygone are - that is, the 1820 Settlers and their immediate family. This misconception also seemed to prevail amongst the teacher-trainees who developed the data base originally. It had to be pointed out again that the Salem graveyard was not a 'dead' graveyard, but a 'living' one, and one that is still in use today. This point had to be made several times. The reason for this misconception is perhaps not difficult to understand. Given the general human tendency to look forward, it is easy to regard a graveyard as a symbol of the past.

The researcher felt it necessary to develop the graph to see whether the impression that one either died young or lived to a ripe old age was a) true, b) more true of the 19th century than the 20th, or c) more true of the 20th century that the 19th.

The resulting graph[27] indicates to the researcher that, except in the case of children below the age of 11, the distributions are similar. However, trying to get this concept over to the children proved difficult. The children's work with graphs up to this point had concentrated on comparing totals by looking at respective column heights. In this exercise, what needed to be compared was the shapes of the two lots of data - the 19th century data and 20th century data. The point was explained, but seemed to elude the majority of the children. It was consequently not pursued at great length.

[27] See appendix 14.

Chapter Six.

6. An analysis of learning processes experienced in working with the Salem data base.

6.1 Measuring learning outcomes.

It is useful to measure the activities of the children involved in the research against the observations of Beverly Hunter (1985:20-27), who has suggested that the following learning processes take place when children work with data bases. She says that children:

1. discover commonalities or differences among groups of events and things;
2. analyze relationships;
3. look for trends;
4. test and refine hypotheses;
5. organise and share information;
6. keep lists up to date;
7. arrange information in more useful ways.

All of these activities were experienced by the teacher-trainees who compiled the data base originally, and the pupils involved at school level. The pupils were quick to recognised the family ties between people with similar names and were able analyze these. Trends that they were immediately able see were those regarding infant mortality and the longevity of the records belonging to 1820 Settlers. The former trend also triggered the hypothesis that medical science is better and more accessible to people today than it was in the nineteenth century. They were able to test this hypothesis and conclude that it was true. The children were able to organise and share information, and to arrange the information in more useful ways simply by ordering data and discussing their findings. The only activity that they were not able to manage was updating the list.

6.2 Responses to the pupil questionnaire.

The feedback from the questionnaire was generally positive. The questions asked, together with an analysis of responses, follows.

1. Did you enjoy working with the Salem database? If so, say what you enjoyed about it.

All the pupils reported positively on this question. Five commented that it was better than working with a text book, five that it was interesting and two that it was fun. Several pupils commented that they enjoyed the interaction with the computer, and their ability to sort and select data. One stated that 'I enjoyed it because it was real historical data.'

2 Do you think you learned anything useful about the people of Salem from working with the database? If so, say what.

There was a wide variety of responses here, One pupils stated that he/she could see which family was the biggest, another that he/she was able to link relationships within the families. A third suggested that children under the age of 11 and adults between seventy and eighty "died the most." Six observed that some of the families have lived there for a long time and a further three that the original settlers were "healthy" and lived to an old age. One commented that children from the Gush family died at a very young age. Two stated that they had discovered that medical science had improved in recent years. Only one child responded negatively to the question.

Although the comments tally in general with the observations of the researcher as to the kind of learning experiences that took place, the comment about the Gush children dying young is incorrect. The youngest Gush child listed died aged seven years, the next youngest is listed as dying at the age of sixteen. Four King children, however, are listed as dying aged under one year.

The child in question might have confused the names, not having access to the data base when completing the questionnaire.

Some of the children's comments were vague. The comments that "you could see which family was biggest" and that "the people of Salem had quite big families" probably refers to the family best represented in the graveyard. There was not enough information in the data base to support that statement that all the families were big. Another comment, that "The relations of and the British Settlers lived to quite an old age" is only partly true. The identifiable settlers did live to a good age, but not all their children did.

3. If you did not enjoy working with the Salem database, say what you disliked about it.

Six children responded to this question. Five of the responses dealt with the shortage of information. One girl stated that "I enjoyed it, but the computer sometimes made me feel 'lost.'"

4. Do you think this is a useful way to learn about history? Is so, why? If not, why not?

All the responses were positive. Four children said that the data base enabled them to find out more, and listed their ability to develop family trees and graphs. Three commented that they were able to sort data, something that they could not do using a text book. Three commented that it was better than using a text book and two that here, there were no notes to lose. Three stated that they found it more interesting, another three that it was easier and a further three that it was fun and quick. One observed that it enabled the pupil to work by himself and one stressed that "we" do the work rather than the teacher. Three commented that they were working with real data.

5 What kinds of questions were you able to 'ask' the database?

Only three kinds of questions were mentioned. Sixteen children mentioned the ability to order data and twelve mentioned selecting specific data. Two mentioned the ability to query the data base to establish relationships, which is dependent on the ability to sort and select.

This matches closely the observations of the researcher. Although the groups were involved in quite demanding work in trying to develop of family trees and in creating and interpreting graphs, the children only used the basic query tools on the material. Sophisticated selections using nested selections, although very powerful, can be confusing and were avoided.

6. Are there questions that you were not able to ask? If so, say why you were not able to do so.

Nineteen children responded to this question, seven of whom said that there were no questions that they were not able to ask! The rest of the respondents pointed out quite correctly that they were limited by the data that was present. You "couldn't always say if people were related or married", said one. Another replied that one "could not ask info that was not there."

7. Is there any information that you think the data base should have had to make your 'questioning' more useful? If so, say what data you would have liked to see there.

Two children responded with "No." The rest of the responses dealt with the shortage of data. The children indicated that fuller details would have enabled them to make stronger links between the data, as in the case of accurate and more complex family trees. One child said "I would have liked to see what the

people died of. You could have been able to see if a disease was passed down in a family."

8. Did you find the computer difficult to use with respect to questioning the database?

There were twenty two responses here, five of them positive. These are summed up in the statement "It was kind of confusing remembering which keys to press to do different things."

The rest of the children stated that they had found the data base easy to work with.

9. You have normally learned history by reading from a text book or notes that you have received, or from being told about what happened in the past. Do you think using the data base enabled you to learn anything that these other methods have not provided? Explain your answer carefully.

Only one child responded negatively, suggesting that text books provided comparable information. The rest indicated that they had discovered an extra dimension in their work with the data base. Five mentioned the ability to call up and link data, and one mentioned that it enabled her to work with "real" history. One suggested that using the data base resulted in the pupil paying more attention - "because people will listen more carefully to the computer, because it will be more fun." Two mentioned the lack of bias as found in text books and one said that he/she had learned how to use a data base.

10. Should this kind of exercise be added to our normal method of learning (notes, stories)? If you think it should, say why.

One child suggested that the old method would be better, because "lots of people think it is fun to work on (the data base) and wouldn't work properly." What is most interesting about this

observation is that the respondent seems to believe that 'real' work cannot be enjoyable.

The remainder of the pupil's responses were positive. Five suggested that working with the data base was more fun, six that it was easier and three that it was easier to understand. One indicated that the interactivity provided by the data base was more satisfying, another that the ability to work with 'real' data was important and another that this kind of work enabled one to escape the biases found in text books.

6.3 Discussion arising from the pupil questionnaire.

The general impressions of the researcher, gained from working with the children and from analysing the responses to the questionnaire, is that the children enjoyed working with the data base and felt that they had gained something from the experience. This is supported by the fact that five of the pupils asked for personal copies of the data base, and were seen to be working with it by themselves. However, the researcher feels that too many of the interactions with the data base had to be initiated by him. This was also true of much of the discussion. The pupils showed a willingness and the ability to sort using the various fields, and were able to make observations with respect to the number of people per family and the frequency of ages of death. They were also able, but less willing, to select subsets of data, preferring to simply scroll through the data. In most cases, as for instance counting the number of people who had died between 21 and 30, scrolling through the data was adequate and probably quicker for them. It was not as accurate as isolating the relevant data by selecting it as a subset, however, and on several occasions different figures were given, which necessitated a recount. Whereas advanced users of data bases are able to select the relevant data quickly and accurately by using multiple matching fields when selections involve more than one set of criteria (as in selecting records that have an age of death between 61 and 70, and who died in the 20th century), the

children needed to go through several steps to accomplish this. The pupils also needed guidance with the construction of graphs, as well as the construction of the family trees.

6.4 Some limitations of the Salem data base.

The researcher had hoped to be able to adopt more of a facilitatory role with the pupils and expected a greater level of initiative from them with respect to the interrogation of the data. It soon became apparent that this was not to be. The sessions proved quite exhausting, with responses coming hesitantly in spite of the fact that this was the third data base that the group had worked on. It seems clear from this that the data querying process is one that needs a great deal of practice. The children concerned will need more exposure to and time with data bases before they are able to use them efficiently and independently. It is hoped that the children will continue to work with the data base themselves in their own time, and that further learning opportunities will come from this. In the end analysis, the package did not proved as simple to use as the researcher hoped. There are several possible reasons for this.

6.4.1 Weak data.

The data was not powerful enough, having too many gaps. This weakness was pointed out by both the teacher-trainees and the pupils and proved particularly frustrating to the children. While sophisticated users of data are able to gloss over these shortcomings and use other techniques to query the data and extract useful trends, the sort of data that best fitted the cognitive abilities of the children, such as the development of accurate and comprehensive family trees, had the biggest gaps. There were also gaps in the ages and dates of death, areas which, for some reason, proved fascinating for the pupils. Other areas where the children would have liked to see more data was in the comments field, in particular the reasons for the deaths. While it may well be illuminative to point out to pupils that these

frustrations are normal and to be expected by the practising historian, it was of little help to them.

6.4.2 Idealistic expectations.

Too much was expected of the children by the researcher. The fact that the children had worked with two data bases before led the researcher to expect a higher level of understanding of the data than they displayed. This was unfair, given that the data was of a totally different kind to that which they had dealt with beforehand. In both of the previous pieces of data base work, the children had helped develop the material. In this data base, the material was new to them.

It must also be taken into account that time was limited. The research took place after school to facilitate the use of small groups, and to accommodate the non-participant researcher. The material should have been developed more slowly, and more time provided for follow up exercises to ensure an adequate understanding of the material under development, such as graphs and their interpretation.

One has also to be aware of the level to which one can go with such material. The data triggered a greater number and a wider variety of questions when tested by the teacher-trainees who developed the material. It also necessitated a higher level of involvement from the researcher with respect to achieving useful outcomes. Some material that the data base can yield was beyond the capabilities of most of the pupils. As has already been mentioned, the interpretation of the graph which attempted to compare the distribution of ages of death by century, essentially an attempt to check correlation and of interest to a historian, was beyond the comprehension of the majority of pupils, who, capable as they were of reading a bar chart, found it difficult to discern the significance of the similar shapes of two curves.

6.4.3 Accommodating change.

The third factor concerns the ability to accommodate change. While it is generally accepted and understood that teachers find it difficult to accommodate changes in the teaching milieu, little has been said about the reaction of pupils to change. There seems no reason why children brought up on a top-down teaching methodology, will find it easier than teachers to adopt to a facilitatory approach, especially in the short term.

6.4.4 Lack of ownership.

The researcher feels that the biggest shortfall was the fact that the children did not 'own' the data, not having collected it themselves. This impacts on the data handling process in two ways. Firstly, they missed the important dynamic that comes from the process of researching in the field and, secondly, they were forced to work with data that was foreign to them. These two factors serve to endow the data with a level of opaqueness that makes the processing of the information more difficult. The authority provided by 'owning' the data was mentioned by several of the teacher-trainees (see pages 55, 56). It has also been mentioned as an important factor in the effective use of data handling with children by Underwood and Underwood (see page 28). It is likely that many of the difficulties that the children experienced in their interrogation of the data, together with the three factors mentioned above (weak data, unrealistic expectations and accommodating change) would have been negated or been less critical had they had the opportunity to collect the data on site themselves. The reason why the children were unable to carry out the research themselves has been mentioned on page 67. The researcher recommends strongly that anyone wishing to carry out a similar exercise make every effort to enable the children to carry out such research themselves.

Although there were important limitations within the data, it was felt that the majority of exercises carried out were of value to

the pupils. They enjoyed working with the material, ordering, scrolling through the data and counting frequencies, and were able to bring an adequate level of debate to the discussions regarding child mortality and population development. Some were able to produce a good standard of written work in the creative writing exercise. They also enjoyed developing and working with the family trees that did emerge and were able to interpret the simpler graphs adequately.

6.5 Working across the curriculum.

One of the most powerful features of the exercise was its ability to provide a basis for work across the curriculum. As has been mentioned, the work with the data spilled over from history into mathematics and language work. With more time, it could be developed to spill over into other areas like geography (in which one could possibly look at the climate of the area and its suitability for wheat growing).

In the final analysis, it provided the children with an opportunity to do real historical research - and to experience the frustrations experienced by historians in the field - in spite of the fact that they had not collected the data themselves. The data was collected from a primary source and the analysis that the children were involved in is the kind of analysis that historians do. The children were thus working as real historians and the knowledge that they were doing so seemed to provide them with a certain level of empowerment. This was mentioned by several pupils in the questionnaire.

6.6 The findings of the non-participant observer.

The non-participant observer, the standard five teacher at the school who has also taught history and who shares the researcher's interest in computers in the educational environment, was generally positive about the four sessions that

he observed and felt that the use of the material was worthwhile. He did express several concerns about the exercise.

6.6.1 Time spent on task.

His first concern was the amount of time that the exercise took, when compared to a traditional lesson. Getting through the four groups had taken about five hours. Follow up work had taken even more. He wondered to what extent exercises of this could be done as a normal class activity, given the limitations imposed by time and the school timetable. A further concern was that mastery of this kind of exercise would need constant practice. The time needed for this might be beyond that which could be provided within the school day.

6.6.2 Novelty value.

Another observation he made was that while the children obviously enjoyed their interaction with the data and expressed a high level of interest, the process had a high novelty value. He was not sure how interested and involved the children would be once this novelty wore off. The researcher can only suggest that every effort be made to ensure that the data being worked with is relevant and of interest to the group concerned to ensure that an interest is maintained. This point is stressed by Underwood and Underwood (1990:68) who have stated that children need to be involved in purposeful classification, acting as research workers solving problems they find both interesting and valid for data base work to be meaningful and effective.

6.6.3 Guaranteeing comprehension.

A third observation of the non-participant observer was that while all the pupils seemed to know how to select and order data, a minority had dominated the discussion. His concern was that there was no guarantee that they all understood the data fully and he wondered to what extent one could ensure that they were

able to interpret the data usefully. He was nevertheless willing to concede that the level of participation was probably higher than with the traditional approach. Knowing the class, he observed that the children who were active in class generally were the ones that were active in the research sessions. This observation is accepted by the researcher with the qualification that the children were at least doing something. They were pushing the right buttons, and looking at the data rather than simply sitting. It is to be hoped that something would be gained from this level of activity.

6.6.4 Gaps in the data.

The final observation of the non-participant observer concerned the gaps in the data. The concern that these might ultimately lead to a high level of frustration on the part of the children and cause them to lose interest, was raised. This is a real concern, and must be addressed by the researcher finding other sources of information, and by adding data from other graveyards to the existing data.

6.7 Findings: The difficulties of using technology to restructure learning.

Both Collis (1988:6) and Balajthy (1988, in Lockard, et al., 1990:361) have noted that there are no easy answers about the use of computers in education and that implementing computers into the classroom is proving to be more difficult than teachers expected. The researcher's findings from his own research support this. The children needed a high level of support during the exercise and it is likely that this level of support will need to be maintained for some time before the pupils become effective and independent users. The fact that the children who took part in the research had only been introduced to computers some five months prior to the research being carried out is likely to have played a part here. Notwithstanding the shortcomings of the research method with respect to the

children's inability to participate in the field research, the researcher felt that the pupils would have coped better with the material and been able to work more effectively and independently with it had they been exposed to computers at an earlier age.

This raises the question of the difficulty of implementing change, especially the kinds of change that will enable education to restructure effectively, which provide learning experiences that are "student centred, placing increased responsibility for learning on the learner" (Thomas and Knezek, 1991:49), which enable students "... to apply skills, to understand concepts and solve problems... how to work collaboratively... to take responsibility for learning" (David, 1991:40) while the teacher takes on the role of facilitator. For restructuring to work, it is essential that pupils thrive rather than simply cope with changes in the classroom, be they technological or related to teaching style. Because the use of technology is closely tied to these changes, the problems of restructuring are likely to be at least as complex as those faced by teachers attempting to use computers effectively in the class. This makes it more important than ever that we begin addressing the challenges of change now.

The researcher believes that, in spite of the limitations imposed by the data, the exercise provides a useful and interesting extra dimension to the study of history. The idea of a data base grounded on 1820 Settler information was used by the researcher because he was living in the heart of 1820 Settler country at the time of the original research. However, community graveyards anywhere or other kinds of historical data could be used as effectively. Furthermore, there seems to be no reason why similar exercises should not be possible using data from other subject areas, such as geography, science, mathematics or English. The fact that the work with the data triggered questions that took the participants into areas normally covered by Mathematics (graphing, calculating means, sorting by size) and language study (alphabetising) shows clearly that data base work can be used adequately across the curriculum.

6.8 Enriching the Salem data base.

The researcher nevertheless feels that there is a need to enrich the existing Salem data by investigating further sources as part of an ongoing action research exercise. These include information provided by the parish registers of births, deaths and marriages for the Salem area, which are held in the Cory library. The records of families living in the area could also be used. However, as useful as these sources might be, they will in all likelihood fill only a few of the gaps in the data. This is a burden that students of History have to learn to bear.

6.9 Investigating further sources.

The Salem graveyard is but one of several in the 1820 Settler area with graves from the early days of settlement. The development of further data bases using these sources could help to verify or challenge the trends shown by the Salem data. For instance, will the number of burials at other graveyards show a decline between 1920 and 1940, as was the case at Salem? Will the amount of information shown on the headstones vary from settlement to settlement, and if so, why? Will other graveyards yield original Salem settlers, and if so, will this enable the data base to show movement between settlements? These are just some of the questions that further research could yield. These data bases could also be combined to form a large 1820 Settler data base. This could yield information not found in smaller, individual data bases. The researcher hopes to investigate these sources using pupils from a variety of schools when he returns to Grahamstown in 1994.

Chapter Seven.

7. Conclusions and recommendations for further research.

7.1 Concluding remarks.

The literature on restructuring suggests that there is an urgent need for teachers to re-evaluate their teaching methodologies and to embrace approaches that will provide pupils with the investigative and problem solving skills that are required in the information age. The research undertaken, essentially a small scale study into the efficacy of using a modern electronic tool as a method of introducing investigative learning techniques in the primary classroom, attempted to fill this requirement. The researcher believes that there is a need to encourage more inquiry based teaching and recommends that experts in the field of computers in education act now to make schools, colleges of education and teachers aware of the way that computers can be used to develop analytical procedures. How successful these efforts are will depend on the extent to which teachers can be convinced of the merit of using new approaches.

7.2 Recommendations for further research.

The researcher suggests that further research into the use of data bases in schools should concentrate on:

1. developing effective and relevant material for use by teacher training institutions, teachers and pupils, including material which addresses under-represented sections of the curriculum

2. encouraging educators and pupils to use data bases as learning tools and providing support for those carrying out their own research

3. developing structures that facilitate collaborative learning

4. merging data bases with other software.

7.2.1. Developing effective demonstration and training material.

The researcher believes that data bases are most effective as learning instruments when developed from original source material by the users themselves. Nevertheless, the use of existing material developed by others has relevance, especially for demonstration and training purposes. Hunter (1985:22) has suggested that there are three distinct stages of learning with data bases, the first of which is using files created by others for hypotheses testing, discovering relationships, identifying commonalities, looking for trends and problem solving.[28] There is, therefore, a need for further research to develop effective and relevant material, covering all areas of the curriculum, to meet these requirements. The researcher's motivation for enriching the Salem data base and developing an 1820 Settler data base (refer to page 92) is based on the belief that such sources can be used effectively by others.

There is also a need to ensure that data base material addresses the curriculum more effectively. Most data bases described in the literature have looked at data of a historical, geographical or scientific nature, or what is often referred to as the 'content subjects'. The researcher sees no reason why data bases cannot be designed to look at information that is language and number related. Well designed data bases built around this kind of information could well provide a tool that would allow pupils to analyze mathematical and language related data in new ways, providing them with new insights into these subjects. Qualitative research into the use of data bases using this kind of data is recommended.

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[28] Building files designed for them in template form is the second. Designing and developing one's own database is the third.

7.2.2 Providing support for beginner data base users.

Teachers who are willing to use data bases with their classes need support, both in the initial stages of their work and when they venture into the field to carry out their own research. The support of an expert as facilitator could be essential for success. Effective ways of providing such support requires further research, given that suitable facilitators are few and far between and often remote from the institutions that require their expertise. Using electronic mail (e-mail) to communicate efficiently could well be a long term solution. The viability and efficacy of such a system needs further research. The use of electronic mail is discussed more fully under point 7.2.3.

7.2.3 Developing and supporting collaborative learning structures.

Structures which enable schools to work collaboratively on shared data need to be researched and developed. Certain kinds of research requires close cooperation between investigators who live far apart. For example, a nation-wide (or world-wide) investigation by pupils testing local air or water samples for pollution for inclusion in a central data base could be very powerful, but would require an efficient means of sharing data. Schools in South Africa have begun to access the Internet and to use electronic mail. The use of this medium for exchanging and sharing both data and ideas would seem to have a great deal of potential. While this vehicle has been used by schools in the United States for several years, it is new to South African teachers and pupils. Ways of using this tool to establish centralised but shareable data bases which can be accessed easily and effectively, requires investigation.[29]

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[29] The number of South African schools applying for this service is likely to grow rapidly during 1994. Detailed and up to date information on the nature and structure of the Internet can be found in the following recent publications:

7.2.4 The development of multimedia systems incorporating data bases.

A further recommendation is the use of the data base in conjunction with other software, such as hypermedia. The development of this kind of software, which enables the compiler to combine traditional text, moving video, still graphics, graphing and statistical modelling into a single presentation package, can be extremely powerful. While the Salem data base supplements traditional learning methods, multimedia software is capable of combining several learning tools into a seamless whole. The researcher believes that further developments in technology and software in the not too distant future will enable the development of this kind of learning opportunity. Research based on the development of such packages will need to be carried out.

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Appendix 1.

Stemmer, Brown and Smith provide a comprehensive list of employability skills for the future. These encompass:

1. academic skills;
2. personal management skills; and
3. team work skills.

1. Academic skills.

These include the ability to:

- read and understand written materials;
- understand charts and graphs;
- understand basic math;
- use mathematics to solve problems;
- use research and library skills;
- use specialised skills to get a job done;
- use tools and equipment;
- speak in the language in which business is conducted;
- write in the language in which business is conducted;
- use scientific method to solve problems.

2. Personal management skills.

- attend school/work daily and on time;
- meet school/work deadlines;
- develop career plans;
- know personal strengths and weaknesses;
- demonstrate self-control;
- pay attention to details;
- follow written and oral instructions;
- follow written and oral directions;
- work without supervision;
- learn new skills;
- identify and suggest new ways to get the job done.

3. Teamwork skills.

- actively participate in a group;
- know the group's rules and values;
- listen to other group members;
- express ideas to other group members;
- be sensitive to the group members ideas and views;
- be willing to compromise if necessary to best accomplish a goal;
- be a leader or a follower to best accomplish the goal;
- work in changing settings with people of differing backgrounds. (Stemmer, Brown and Smith, 1992:33).

Appendix 2. 'Shells' database by Goldberg.

REC#	Group_name	Shell_col	Shel	Shell_shape	Shell_text
1	Dolphins	white	1	rectangle	smooth
2	Dolphins	orange	4	circle	rough
3	Dolphins	blue	3	oval	rough
4	Dolphins	white	1	oval	smooth
5	Dolphins	grey	2	oval	smooth
6	Sharks	white	1	circle	smooth
7	Sharks	grey	2	circle	smooth
8	Sharks	grey	2	oval	smooth
9	Sharks	orange	4	circle	rough
10	Sharks	white	1	oval	smooth
11	Squid	orange	4	oval	rough
12	Squid	grey	1	oval	smooth
13	Squid	white	1	circle	smooth
14	Squid	grey	2	oval	smooth
15	Squid	blue	3	oval	rough
16	Swordfish	white	1	circle	smooth
17	Swordfish	grey	2	circle	smooth
18	Swordfish	orange	4	rectangle	rough
19	Swordfish	white	1	rectangle	smooth
20	Swordfish	blue	3	oval	rough
21	Whales	grey	2	circle	smooth
22	Whales	orange	4	oval	rough
23	Whales	white	1	oval	smooth
24	Whales	white	1	rectangle	smooth
25	Whales	grey	2	rectangle	smooth

Appendix 3.

Graveyard Data

Location:

Surname	First Names	DOD			Age	Comments and other details

Graveyard Data

Location: SALEM ANGUS SHOLTO-DOUGLAS & JACKIE WORKMAN.

Surname	First Names	DOD			Age	Comments and other details
HILL	JESSIE	29	12	1896	27	
HILL	GEORGE HENRY	8	2	1928	62	
HILL	CHARLES JAMES	8	10	1959	48	
HILL	MYRTLE GWENDOLINE	26	7	1982	102	
HILL	BERNARD					NO DATES
HILL	ERNEST	9	2	1870	78	
BLITT	W G	11	2	1926	57	
A GRAVE NO	NAME OR DATES					
HILL	IVY (SISTER)	6	12	1971	93	
HILL	MALDE FLORENCE	7	5	1950	92	DOB: 11·1·1858

Appendix 4.

Questioning the Salem Data File

1. What question or questions were you able to ask of the Salem file?

2. What were some of the difficulties you encountered in attempting to get an answer to your questions?

3. Were you able to learn anything from manipulating the data file that you would not have learned using traditional methods?

4. Do you think that the process of data collection, data file creation and file interrogation is a worthwhile exercise for primary school children to carry out? If so, why?

5. Discuss some of the difficulties that you might encounter as a teacher attempting this sort of exercise with a class of children.

6. Discuss the use of technology of this sort.
   a.) Does it get in the way?
   b.) Was the software (Rapidfile) difficult to use?
   c.) Was it difficult to access, to input data, to query the file?
   d.) In what way, if any, did the computer facilitate the exercise?

7. Would it be necessary to first teach children about data bases in general and Rapidfile in particular, before engaging on an exercise of this sort?

8. Does one need to develop new learning skills when using this sort of application?

   a.) If so, what are they?
   b.) How can they be best developed?
   c.) What difficulties are we likely to face?

9. Does this style of learning have a place in the New South Africa? If so, why?

10. Does this kind of learning justify the use of more time?

11. Do you think this kind of learning is cost effective? Why?

12. What is the greatest challenge to the teacher using this style of learning?

13. What are the short term and long term benefits to the pupil using this approach to learning?

Appendix 5.

Questionnaire - The Salem Database - Standard Four

1 Did you enjoy working with the Salem database? If so, say what you enjoyed about it.

2 Do you think you learned anything useful about the people of Salem from working with the database? If so, say what.

3 If you did not enjoy working with the Salem database, say what you disliked about it.

4 Do you think this is a useful way to learn about history? If so, why? If not, why not.

5 What kinds of questions were you able to 'ask' the database?

6 Are there any questions you were not able to ask? If so, say why you were not able to do so.

7 Is there any information that you think the database should have had to make your 'questioning' more useful? If so, say what data you would have liked to see there.

8 Did you find the computer difficult to use with respect to questioning the database?

9 You have normally learned history by reading from a textbook or notes that you have received, or from being told about what happened in the past. Do you think using the database enabled you to learn anything that these other methods have not provided? Explain your answer carefully.

10 Should this kind of exercise be added to our normal method of learning (notes, stories)? If you think it should, say why.

Appendix 6.

The Salem Database.

(Ordered by surname and date of death)

REC#	Surname	Firstname	Dod	Age	Comments
1	?	Martha	09/07/1862	68	
2	?	Richard?	/ /1867	76	Pastor? 1820 Settler
3	Ackland	Ronald	26/04/1928	18	
4	Amm	Jason Edward	02/02/1875	.835	Son of Simon and Sarah
5	Amm	Abby	26/05/1896		
6	Amm	Philip Evans	02/06/1900	1.25	Only son of Harry and Alice
7	Amm	Simon Evans	24/09/1911	68	Husband of Sarah; son of Philip
8	Amm	Alice	10/03/1913	43	Daughter of Simon and Sarah
9	Amm	Violet	01/01/1929		Nee Lake; wife of S.G. Amm
10	Amm	Sarah	12/09/1929	92	Wife of Simon
11	Amm	Marion Eileen	10/12/1946	35	Died at Lyncrest
12	Amm	Maude	27/07/1948	79	Nee Haynes
13	Amm	Grace	25/01/1958	78	Daughter of Simon and Sarah
14	Amm	Simon George	13/02/1958	84	Son of Simon and Sarah Amm
15	Amm	Henry	16/10/1979	77	Lindale :Family farm
16	Amm	Elizabeth	22/08/1991	89	Nee Van Schonberg
17	Amos	Percival, Cyril	08/07/1966	73	
18	Amos	Emma, Gwendoline	02/08/1973	80	Wife of Percival
19	Asson	Ethel Choice	25/07/1943	67	Ministers wife
20	Attwell	Harriet Emily	20/10/1928	73	Died in Avondale, Salem.
21	Attwell	William Hamilton	20/05/1932	62	Died at Salem.
22	Attwell	George Robert	16/11/1932	82	Died in Avondale, Salem.
23	Attwell	Charlotte (Aunt)	16/01/1936	92	Died in Avondale, Salem.
24	Attwell	Robert, Percy	05/06/1953	77	
25	Attwell	Francis Sophia	20/02/1956	84	nee Hall.
26	Attwell	Blanche P. (Bill)	20/05/1956	69	Died in Avondale. Shares grave with husband, Rosten.
27	Attwell	Florence, May	22/08/1961	82	
28	Attwell	Rosten E.	19/08/1975	80	Died in Grahamstown. Shares grave with wife, Blanche.
29	Attwell	Iris , May	21/04/1978	70	

REC#	Surname	Firstname	Dod	Age	Comments
30	Bartlett	Steven	07/11/1989	20	
31	Bradfield	Richard	/ /1912		
32	Bradfield	Emma	/ /1926		
33	Bradfield	Melvie	30/11/1936	58	
34	Bradfield	Fletcher	19/01/1957	64	Shares grave with wife, Mary Gladys.
35	Bradfield	Mary Gladys	06/03/1960	70	Maiden name: Dugmore.
36	Bradfield	Irene	18/06/1960	66	Organist and W.A. president.
37	Bradfield	Reuben	08/05/1964	75	Local preacher and president of Grahams-town local preachers
38	Bradfield	Grace Elma	01/07/1984	88	Wife of Melvie. nee Penny
39	Brookes	Thomas Charlton	22/04/1849	21	
40	Butt	W.G.	11/02/1926	57	
41	Childs	George	08/03/1886	78	Two grandchildren - Winnie and Nettie
42	Cholwich	M.	/ /1911	78	
43	Claridge	Deborah	06/07/1889	51	Wife of Charles Henry Hill
44	Cragg	Wilfred Napier	19/10/1976	79	
45	Cragg	Anne Rucastle	10/10/1983	82	Nee Gush
46	De La Harpe	Hubert, Charles	24/07/1980	50	
47	Dicks	Benjamin	13/03/1859	21	
48	Edwards	Jane Elizabeth	29/06/1874		died 45 days after arrival from England. Wife of Rev John
49	Eyre	Peter (Rev)	17/07/1917	45	
50	Filmer	John	19/09/1853	83	Was an 1820 Settler.
51	Fisher	Florrie			Child of George and Ellen
52	Fisher	George			Child of George and Ellen
53	Fisher	George	14/06/1899		
54	Fisher	Ellen	14/08/1917		
55	Fletcher	Mary Jane	09/03/1971		nee Kent
56	Fletcher	John	21/10/1971		
57	Gallaghan	Gladwyn Percival	06/10/1975	35	
58	Gardener	Charles	08/12/1940	83	

REC#	Surname	Firstname	Dod	Age	Comments
59	Gardener	Mary Anne	14/01/1953	93	Wife of Charles. nee Fisher
60	Gardiner	John	07/01/1856	2	
61	Gardiner	Mary Ann	01/01/1858	7	
62	Gardiner	Hezekiah	13/08/1866	3	Son of J and M Gardiner
63	Gardiner	John	04/07/1892	71	Died in Grahamstown
64	Gardiner	Mary Ann	02/05/1904	78	Mother
65	Gilfillan	H.E.	29/07/1959	82	
66	Gravett	William	26/02/1872	69	An 1820 settler.
67	Gravett	Charlotte	26/06/1905	94	Wife of William.
68	Gush	John	/ /1835	7	Son of Margaret and Richard
69	Gush	George Archibald	/10/1847	78	Parent of George, Bertram and Rodney.
70	Gush	Thomas	/ /1853	16	Son of Margaret and Richard
71	Gush	Elizabeth	14/10/1854	80	Nee Muncasten. Mother of George, Bertram and Rodney.
72	Gush	Richard	29/09/1856	69	British settler
73	Gush	Richard	/ /1881	45	
74	Gush	Margaret (nee Evans)	20/04/1881	91	British settler
75	Gush	Charlotte	14/04/1893	74	Wife of Joseph
76	Gush	George	23/03/1896	50	Richard and Margaret's grandson; Joseph's son
77	Gush	Joseph	02/04/1907	86	Son of Margaret and Richard
78	Gush	Ivan Henry	31/10/1954		
79	Gush	Mary	03/11/1967	72	Sister of Priscilla
80	Gush	Hilda	11/09/1972	80	
81	Gush	Brenda	13/03/1978	28	
82	Gush	Grant	13/03/1978		
83	Gush	Bertram	02/09/1978	75	
84	Hall			.019	Infant son of W. and F. Hall
85	Hall	Felix	19/06/1938	30	
86	Hall	William Joseph	04/08/1950	90	
87	Hall	Mary Florence	22/09/1956	83	Wife of William, died in Durban, and was cremated

REC#	Surname	Firstname	Dod	Age	Comments
88	Hall	Leonard Redvers	26/04/1987	86	
89	Hall	Susan	07/01/1988	85	Nee Palmer
90	Harper	Heather, Denise	06/07/1954	26	
91	Hewson	Viola		1.3	
92	Hewson	John	02/08/1875	74	
93	Hewson	John	03/10/1877	48	
94	Hewson	Leslie Arthur	26/01/1885	.09	
95	Hewson	Eliza	16/08/1900	87	died Salem
96	Hewson	Eliza	20/05/1902	65	
97	Hewson	Gertrude Ellen	24/03/1905	23	
98	Hewson	John William	04/09/1919	63	
99	Hewson	Louie Jane	03/08/1922	31	
100	Hewson	Elizabeth Ann	01/05/1932	76	Wife of John William
101	Hewson	Gail	26/10/1945	.008	
102	Hewson	Hilton John	08/01/1948	65	65
103	Hewson	George H.	04/12/53		
104	Hewson	John	23/04/1959	67	
105	Hewson	Ida	27/04/1987		nee Dickason
106	Hewson	Gerald	24/11/1987		
107	Hill	Bernard			No dates
108	Hill	Lilian Engenie			Daughter of Margaret and George
109	Hill	Mary Ann	17/09/1839		
110	Hill	Ernest	09/02/1870	78	
111	Hill	Agnes Margaret	26/07/1888	32	Wife of Henry Hill
112	Hill	George	18/07/1893	42	
113	Hill	Jessie	29/12/1896	27	
114	Hill	Emma	27/11/1899		No DOB or age
115	Hill	Thomas Franklin	22/02/1908		No DOB or age
116	Hill	Annie Margaret	24/11/1911		No DOB or age

REC#	Surname	Firstname	Dod	Age	Comments
117	Hill	Stella Florence	18/06/1918	24	Nee Lake
118	Hill	Charles Henry	26/11/1919	83	
119	Hill	George Henry	08/02/1928	62	
120	Hill	Maude Florence	07/05/1950	92	DOB: 11/1/1858
121	Hill	Sidney Gilbert	05/07/1956	66	
122	Hill	Charles James	08/10/1959	48	
123	Hill	Ivy	06/12/1971	93	Sister
124	Hill	Jack Jesse	24/06/1981	85	
125	Hill	Myrtle Gwendoline	26/07/1982	102	
126	Impey	Gordon Everton			Child of Annie, died ininfancy
127	Impey	Olive Laura			Child of Annie, died ininfancy
128	Impey	Anne Frances	24/01/1848		wife of George Impey
129	Impey	Harry	13/03/1852		child of George Jun and Eliza
130	Impey	Minnie	02/08/1862		child of George Jun and Eliza
131	Impey	Annie	29/10/1895	35	
132	King	Thomas James		.013	Child of William and Jemima.
133	King	Judith Elizabeth	24/02/1846		Child of William and Jemima King
134	King	Thomas Sellom	13/10/1859	87	1820 Settler
135	King	Frederick	28/09/1879	.684	
136	King	Pemberton	07/02/1884	.002	
137	King	Jesse	19/11/1885	.013	
138	King	W.E.	04/09/1894	80	1820 Settler
139	King	William	06/08/1905	62	
140	King	Jemima	30/12/1906		Wife of W.E.
141	King	Olive	18/03/1907	.082	
142	King	Minnie	11/07/1907	19	
143	King	Sarah Matilda	01/03/1930	82	
144	King	Alice	22/07/1950	70	
145	King	Phyllis, Doreen	/ /1963	47	

REC#	Surname	Firstname	Dod	Age	Comments
146	King	Alfred, Alwin	13/01/1989	83	Husband of Phyllis
147	Kingwill	Lilian Constance	30/05/1907	22	Beloved niece
148	Kulling	Grannie	11/07/1961	94	
149	Lake	Annie Hilda	21/04/1903	23	
150	Lloyd	Olive May	10/04/1978		nee Penny
151	Long	Jeremiah	11/05/1809	72	Son of Jeremiah who died at Eshcol in 1844
152	Long	Edna Mary	/05/1844		Unreadable
153	Long	Hamilton	20/05/1844		Unreadable
154	Long	Jeremiah	/11/1844		Died at Eshcol
155	Long	Emma	11/04/1869	51	
156	Long	Jesse Daubigne	24/05/1889	6	Son of Jesse and Georgina.
157	Long	A. Stanley	28/12/1947	48	
158	Long	Harold Ayliff	15/05/1967	70	
159	Long	Clifford Rex	17/08/1970	23	
160	Long	Margeret Emma	23/12/1971	47	
161	Long	Oswald Jos	25/05/1974	57	Husband, dad and grampa
162	Long	Elizabeth E. (Bessie)	10/03/1978	81	Devoted mother
163	Long	Susie	03/12/1979	85	nee Oosthuizen
164	Marks	Clarence, Amy	17/05/1976	58	
165	Masson	George	22/12/1899	45	
166	Masson	Elizabeth	06/09/1902	55	Sister of George
167	Masson	Iris Olive	06/11/1948	38	
168	Masson	Priscilla	06/06/1950	87	Sister of Mary
169	Masson	George Dennison	26/07/1974	75	
170	Masson	Helen Gibb	29/04/1988	97	
171	Mathews	William, Henry]	02/07/1907	71	S.J.P of Salem
172	Mathews	Margret, Ann	10/04/1908		Wife of William
173	Mathews	Marion, Sarah	03/05/1955	80	
174	Matthews	Reginald Croxton	21/04/1944	72	

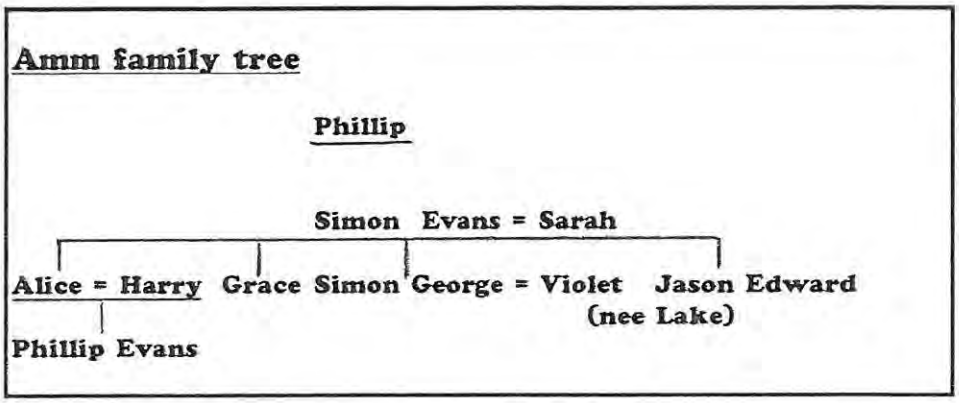
REC#	Surname	Firstname	Dod	Age	Comments
175	Miller	Thelma, May	12/07/1964		Born in Eyre
176	Moss	Meryck, Neville	02/09/1989	85	
177	No name				No detail
178	Norman	Jane	20/10/1852	70	1820 Settlers
179	Norman	William	22/03/1854	81	1820 Settlers
180	Paterson	Christopher Vernon	26/08/1949	7	
181	Paterson	Vernon Greenshields	11/10/1985	81	
182	Penny	Susannah	13/01/1870	74	
183	Penny	Charles	12/06/1870	83	
184	Penny	Harriet	09/05/1911	66	
185	Penny	William	21/12/1912	83	
186	Penny	Hubert Claude	21/03/1917	13	
187	Penny	John	13/09/1918	45	
188	Penny	Ann	01/02/1922	88	
189	Penny	Margaret	25/03/1927	65	
190	Penny	W.G.	09/08/1940	81	Husband of Margaret.
191	Penny	Winifred Violet	27/05/1953	48	
192	Penny	Charles Thomas	14/09/1954	84	
193	Penny	Edgar Walter	24/09/1954		
194	Penny	Margaret Violet	09/10/1963	79	Wife of Charles Thomas
195	Penny	Victor George	20/08/1969	55	
196	Penny	Kathleen Rhona	30/03/1975		
197	Rae	William	31/12/1947	95	Carving on headstone had weathered and was very difficult to read.
198	Rae	Louise Jane	26/12/1967	89	Carving on headstone difficult to read. Shares headstone and grave
199	Richardson	Ethel Maud	13/08/1943	64	Nee Brookshaw
200	Richardson	Aubrey Levin	10/04/1944	47	CPL. SAMC
201	Richardson	James Glenulin	28/10/1955	80	
202	Richardson	T.J (Mac)	12/02/1961	52	Husband of Winnie
203	Richardson	Winnie	17/04/1982	73	

REC#	Surname	Firstname	Dod	Age	Comments
204	Riddin	Dorothy Mary	28/12/1958	2	Could be the child of Florence and Bertram Riddin as Grave was
205	Riddin	Bertram Montague	10/11/1960	77	Husband of Florence Mary. They share a grave.
206	Riddin	Denis Montague	20/02/1966	40	
207	Riddin	Florence Mary	22/06/1966	74	Wife of Bertram Montague Riddin. They share a grave.
208	Robbey	Harold, Graham	28/07/1989	76	
209	Sansom	Joey	18/06/1987	46	
210	Shaw	Edward	28/04/1877	.043	Twin son of Samuel
211	Shaw	Samuel Best (Boysie)	12/09/1888	11	Twin son of Samuel
212	Shaw	Samuel Best	24/06/1889	60	
213	Shaw	Hettie	16/11/1893	15	Daughter of Samuel
214	Shaw	Samuel Charles	17/01/1930	73	
215	Shaw	Mildred Amelia	7/01/1937	74	
216	Slater	Sophia			Wife of Thomas.
217	Slater	Thomas			1820 settler. Sailed on February 6th 1820, on the Aurora.
218	Slater	John Francis	04/08/1876	59	Born at CarnarvonDale, Bushman's River.
219	Slater	Sarah	31/08/1912	86	Wife of John.
220	Slater	Sarah	/12/1985	99	
221	Smit	Pieter Alexander	10/09/1911	64	Born in Zurich, Switzerland. Died in Eschol, Cape Province.
222	Smit	Sarah	05/06/1937	92	Born in Eschol, Cape Province. Died in Grahamstown.
223	Snijman	Blanche, Grace	07/05/1991	60	
224	Starkey	Reginald, Arthur	25/06/1981	79	
225	Steyn	Martha, Aletta	28/09/1979	93	
226	Suttie	CPT. George Todd	05/05/1946		Of the 7th Gordon Highlanders (51st reg)
227	Thomas	Dulce Gabrielle	29/09/1942	40	Nee Wallace
228	Thompson	Ena	26/08/1978	38	
229	Thurston	Colin Southwell	30/07/1979	73	
230	Thurston	Margaret Grace	03/02/1987	78	nee Matthew
231	Tree	Florence, Floss	25/06/1983	68	
232	Tree	William, Robert	28/07/1988	75	Husband of Florence, Floss

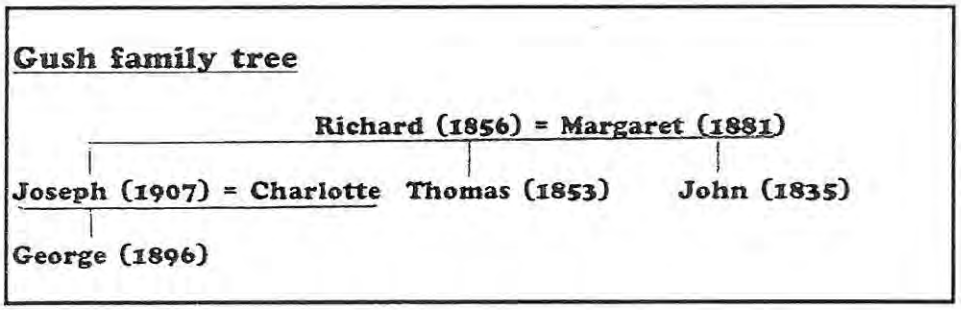
REC#	Surname	Firstname	Dod	Age	Comments
233	Veall	Alice	16/03/1981	56	
234	Veall	Edwin, Victor	20/06/1989	83	
235	Webb	Leslie H.	25/10/1911	24	Erected by sister
236	Webb	Brian Lansdell	21/03/1970	45	Left a space for his wife.
237	Webber	Louis B.	23/10/1934		
238	Webber	Ada	12/09/1944	71	Wife of Louis.
239	Wilmot	John	03/11/1876	8	
240	Wilmot	Valmai Wendy	25/05/1951	.835	Infant daughter of Norman and Thora
241	Wilmot	Garry, Kenneth	04/02/1961	2	
242	Wilmot	Alfred Denton	17/02/1962		
243	Wilmot	Derek Maurice	21/02/1963	20	
244	Wilmot	Norman	23/04/1982		
245	Wilmot	Nicky	03/07/1990	29	Pregnant with son also killed
246	Wright	John Cecil	08/11/1847	52	
247	Wylde	Clara	24/07/1958	75	

Appendix 7

Family Trees Developed from the Salem Database



Group 1, Standard Four. Kalk Bay Primary School, September 1993

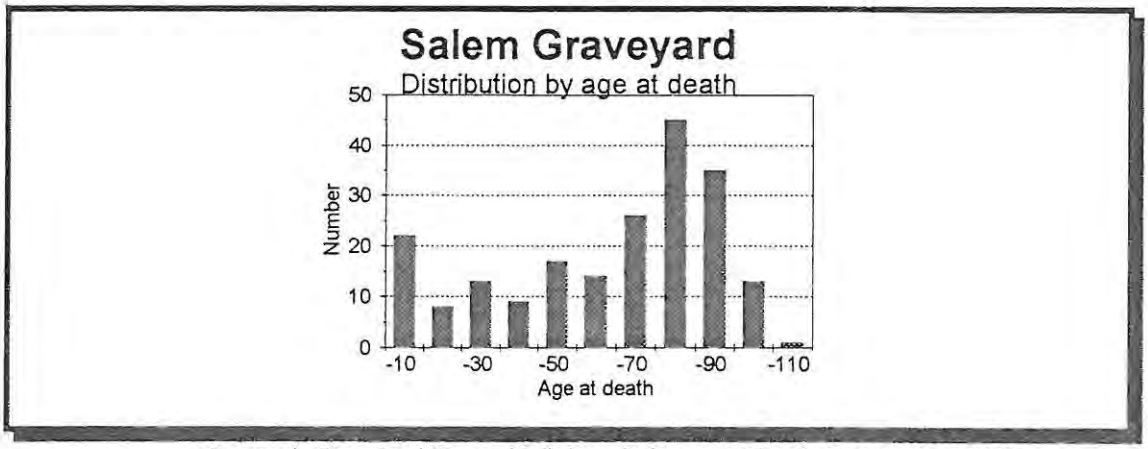


Group 2, Standard Four. Kalk Bay Primary School, September 1993

Appendix 8

Salem Graveyard, Cape Province, South Africa
Distribution of records by age at death

0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	Age Group
22	8	13	9	17	14	26	45	35	13	1	Numbers

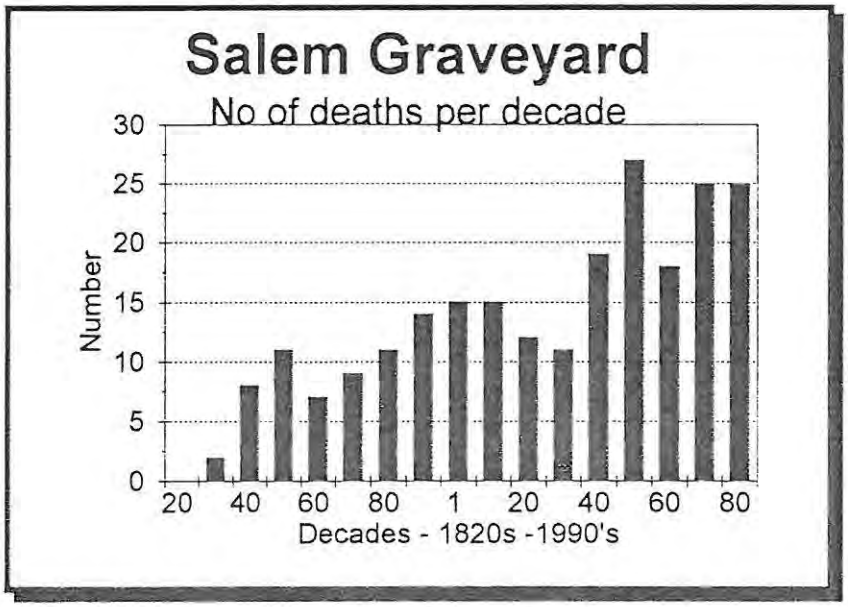


Group 1, Standard Four. Kalk Bay Primary School, September 1993

Appendix 9

Salem Graveyard, Cape Province, South Africa
Distribution of burials by decade

Decade	No.
1820-30	0
1831-40	2
1841-50	8
1851-60	11
1861-70	7
1871-80	9
1881-90	11
1891-19	14
1901-10	15
1911-20	15
1921-30	12
1831-40	11
1941-50	19
1951-60	27
1961-70	18
1971-80	25
1981-90	25



Group 2, Standard Four. Kalk Bay Primary School, September 1993

Appendix 10

Salem Graveyard. Eastern Cape. SA
Family names listed by alpha order

Ackland	1	Mathews	3
Amm	13	Matthews	1
Amos	2	Miller	1
Asson	1	Moss	1
Attwell	10	Norman	2
Bartlett	1	Paterson	2
Bradfield	8	Penny	15
Brookes	1	Rae	2
Butt	1	Richardson	5
Childs	1	Riddin	4
Cholwich	1	Robbey	1
Claridge	1	Sansom	1
Cragg	2	Shaw	6
De La Halpe	1	Slater	5
Dicks	1	Smit	2
Edwards	1	Snijman	1
Eyre	1	Starky	1
Filmer	1	Steyn	1
Fisher	4	Suttie	1
Fletcher	2	Thomas	1
Gardiner	7	Thompson	1
Gush	16	Thurston	2
Hall	6	Tree	2
Hewson	16	Veall	2
Hill	19	Webb	2
Impey	6	Webber	2
King	15	Wilmot	7
Long	13	Wright	1
Marks	1	Wylde	1
Masson	6		

Group 3, Standard Four. Kalk Bay Primary School, September 1993

Appendix 11

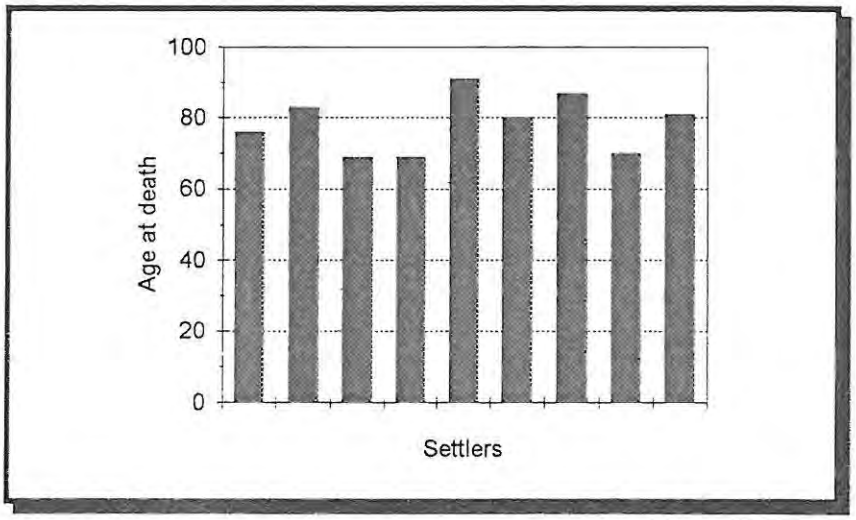
Salem Graveyard, Eastern Cape, SA
Family names listed by frequency

Hill	19	Webb	2
Gush	16	Webber	2
Hewson	16	Ackland	1
King	15	Asson	1
Penny	15	Bartlett	1
Amm	13	Brookes	1
Long	13	Butt	1
Attwell	10	Childs	1
Bradfield	8	Cholwich	1
Gardiner	7	Claridge	1
Wilmot	7	De La Halpe	1
Hall	6	Dicks	1
Impey	6	Edwards	1
Masson	6	Eyre	1
Shaw	6	Filmer	1
Richardson	5	Marks	1
Slater	5	Matthews	1
Fisher	4	Miller	1
Riddin	4	Moss	1
Mathews	3	Robbey	1
Amos	2	Sansom	1
Cragg	2	Snijman	1
Fletcher	2	Starky	1
Norman	2	Steyn	1
Paterson	2	Suttie	1
Rae	2	Thomas	1
Smit	2	Thompson	1
Thurston	2	Wright	1
Tree	2	Wylde	1
Veall	2		

Group 3, Standard Four. Kalk Bay Primary School, September 1993

Appendix 12

Salem Graveyard, Eastern Cape, SA
1820 Settlers and age on death

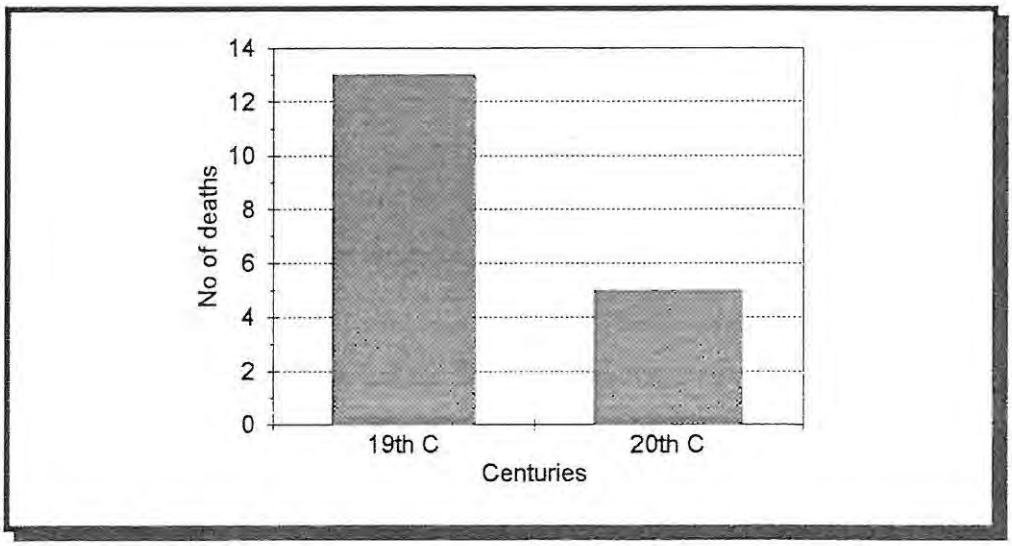


Group 3, Standard Four. Kalk Bay Primary School, September 1993

Settler	Age	Settler	Age
?	76	King W	80
Filmer	83	King T	87
Gravell	69	Norman J	70
Gush R	69	Norman W	81
Gush M	91	Slater T	?

Appendix 13

Salem Graveyard, Cape Province, South Africa
Comparison of no of 'child 'deaths by century



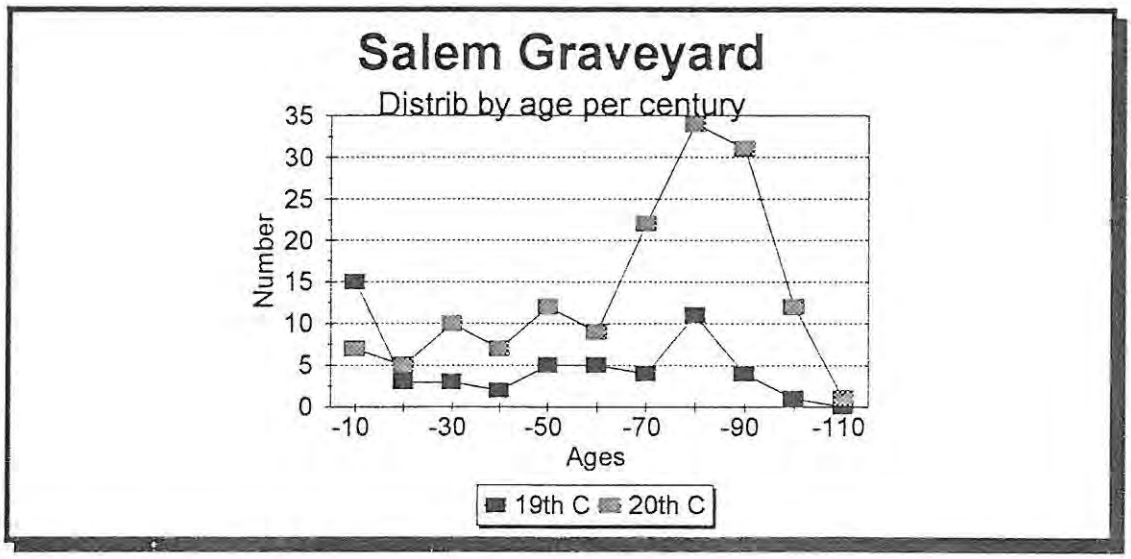
Group 4. Standard Four. Kalk Bay Primary School, September 1993

19th Century (1830-1900)	13	'Child' refers to a person under
20th Century (1901-1991)	5	the age of 11 years.

Appendix 14

Salem Graveyard, Cape Province, South Africa
Distribution of clients by age at death by century

0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	Age groups
15	3	3	2	5	5	4	11	4	1	0	19th C
7	5	10	7	12	9	22	34	31	12	1	20th C
22	8	13	9	17	14	26	45	35	13	1	Totals



Appendix 15.

Hunter suggests six broad ways of leading students through data bases.

1. Explore (browse) to see general structure (fields, layout, etc.)

2. Ask questions. Use the data to pose and answer questions. Encourage students to experiment, to try things, to discover the limitations of the database, to find questions that will stump a partner.

3. Define information needs. After becoming familiar with the database, these skills can be applied in solving problems. Such problems need to be challenging - the purpose is to get students to use higher order thinking skills. Students should be encouraged to break the problem down into smaller bits, and to write these in their own way. Work in pairs is encouraged so as to make best use of the group dynamic. Worksheets are encouraged to help student plan the information they need from the file in order to help answer questions/solve problems. Children need to decide how to search for the particular data needed, what data items from the file need to be printed out, what order to print out in and which formats to use.

4. Interpret and debug. Hunter stresses that no one gets exactly the right information needed to solve a problem in the first attempt. There is a need to examine results to analyze how well it helps answer the problem and to refine by posing other questions. One must always ask whether a better result is possible.

5. Update the file. Further information from additional research needs to be added to make the database more powerful. The more data the better, generally speaking.

6. Design projects. Students should be encouraged to use the file for projects of their own.

Hunter, B. (1985). Problem solving with data bases. The Computing Teacher, 12(8), 20-27.