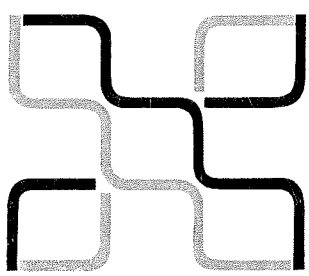
COMPUTER AWARENESS

TEACHERS GUIDE



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1 COURSE OVERVIEW

1.1 What is Computer Awareness?

People with computer awareness

People sensitized to the impact of computers and associated technology

This will be achieved by learning activities that:

a Break down any fears students may have or mystery surrounding computers and associated technology.

b Familiarizing pupils with the kinds of tasks computers can do effectively and efficiently

c Demonstrating the possibilities for social change resulting from computer technology

d Provide pupils with sufficient knowledge and skills to evaluate social change and hence allow their realistic participation in determining which of the possible choice of futures society adopts.

1.2 THE COURSE DIVIDED INTO COVERT AND OVERT EXPECTATIONS

Course Aims

To be achieved covertly

To be achieved overtly

Computer Fundamentals

Demystification of the computer

Ability to make decisions about computers and their impact

Computers and People

Uses for Computer Technology

Applications and Methods

Competence and confidence in machine usage

Familiarity with basic computer jargon

Historical Perspective

Speculation on possible choice of futures

Case Studies

Machine Intelligenc

1.3 Course Organisation

1.3.1 Structure of Material

Computer
Appreciation
Education

Introduction

Choice

Is student familiar with microcomputer use?

NO

Learn routine use through a range of computer games

YES

Activity choices

DO
Uses for Computer Technology

DO
Computers and People

DO
Case Studies

DO
Machine Intelligence

1.3.2 Cellular Structure of Course

Historic Perspective

Future

People and Computers

Effect on Society

Effect on Individuals

Present

Activities

Computer Centred Activities

Institution Centred Activities

People Centred Activities

Past

1.3.3 Learning Modules - A Brief Overview

1 Introduction

Aims to bring pupils face to face with their preconceived ideas and attitudes about computers.

2 Modelling Real World Situations

Computer use for simulating real world situations and the limitations on conclusions from such models.

3 Computers as Control Devices

The development of microprocessors and their use in smart machines and computers. The computer as a control tool. An overview of robot development.

4 Computers as Filing Cabinets

The information explosion and the development of automated methods of storage retrieval and clerical tasks. Hard copy and data bases in perspective.

5 Communications Networks

An overview of the networks meshing society together with emphasis on the new network forming with linked computers. The customisation of information and the social consequences.

6 Leisure

Leisure and work defined. The need for leisure education. The growth of a leisure industry. Computer assistance with leisure pursuits. Attitudes towards the work ethic.

7 The Impact of Computers on Work

An historical perspective on the changing nature of careers. Social reaction to the changes occurring.

8 Impact on the Family

An historical perspective on the development of our present form of family life and social relationships. Prospects for the future.

9 Privacy and Security

Social concern about personal data banks and the technological and legal safeguards possible to overcome these fears. Case study of the Wanganui Computer Centre.

10 Case Studies

A number of case studies from New Zealand organisations.

11 Machine Intelligence

The logic behind training a computer to do the tasks it does.

1.4 Teaching Approach

1.4.1 Each unit of work will involve two aspects:

a Teacher centred activities using resource material text

b Computer centred activities designed to reinforce in a practical way the key ideas in the resource units.

1.4.2 The resource units are designed for:

a Maximum pupil activity. The material should stimulate inquiry and discovery. It should challenge yet entertain

b Minimum amount of teacher talk and fact presentation.

1.4.3 The following activities dominate the teacher controlled resource material:

a Discussion and debate

b Question and answer both oral and written

c Summarising and interpreting

d Project work.

1.4.4 The resource material provided to stimulate these activities are:

a Photographs

b Cartoons

c Diagrams and charts

d Written extracts.

1.4.5 The material requires pupils to have had prior training in techniques for forming, assessing, and expressing attitudes and values.

1.5 Course Development

1.5.1 Attitude to Course Development

Most school courses in computing so far have tended to be watered down university type approaches. These have tended to be very formal and orientated towards teaching a programming language. Often they are prepared without a computer being available; so much of the material describes the physical attributes of computers and their peripherals. Basic fundamentals are stressed with lots of neat little diagrams. The approach can be likened to a

"Teach yourself to drive a car"

book prepared for people who have never seen or used a car. Imagine having to describe what a steering wheel or gear lever looked like before explaining their use; or needing little block diagrams to show how the various levers and wheels are inter-connected.

The availability of computer equipment and the increasing familiarity of youngsters to the components means a change in emphasis is possible. The descriptive material and block diagrams can be relegated to covert learning experiences rather than being a fundamental overt necessity.

1.5.2 Computer Fundamentals

Many computer courses start with a formal study of what are called "Computer Fundamentals" - organisation of a computer system, Input - Process - Output, Hardware - Software. . . . In this course this approach will NOT be employed.

The overt approach will be activities centred around the use of a computer system. This means there will not be lessons of a formal nature under various JARGON headings.

This is not to say that the jargon or the fundamentals are unimportant. They are. But rather than appearing as the main thrust of the material it is expected that they will arise incidentally as activities are worked through.

In computing we cannot avoid specialist jargon. Even news media items about computers use these terms. These terms are used in the course in context. They are necessary to the understanding of written material about computers.

1.6 The Relationship of this Course to other Aspects of Computing:

A COURSE PROBLEM IS

What to do with the student who wants to understand how to program a computer and enjoy the challenge of figuring out how to control it?

Computer Education

Course Aims — Other Aspects

Demystification Activities	Understanding Uses, Effects, etc	Programming	Engineering

Pupils requiring programming or engineering information will need courses in advance of what is offered in this course. However, this course gives essential background for a complete understanding of any advanced studies.

1.7 The Course as a Multi-purpose Exercise

Course

Flexibility

Basic Course

12 units for a Form 4 appreciation course in S.S. or Ec Studies

Extended Course

Basic course with choices and enrichment employed as up to a half-year - 60 units

Choices of approaches and ideas for each unit

Enrichment Material

1.8 Speculation

The course aims to prepare pupils to play a part in deciding which of the many possible 'tomorrows' our society will follow. In the past, change has occurred with the mass of people having to adapt rather than participate in the causal process. Regrettably, this may continue to be the case. However, it remains the hope of the writer that with the accelerating pace of change that pupils will have the skills to play a greater part in the process.

With this in mind most units look both backwards and forwards in time. Looking backwards puts an historical perspective on changes that are occurring. It creates a basis of understanding.

Looking into the future of necessity is speculation. Examples from science fiction are used. Science fiction should not just be regarded as enjoyable escapism. In most stories there is an attempt to expose potential dangers, foolishness, wastefulness and stupid tendencies in our society.

The speculations in these units have this aim: To make pupils aware of possible futures both good and bad, together with the hope that this may be an influence towards ensuring a just, meaningful lifestyle for generations to come.

1.9 Teacher Attitudes

For most teachers, computer awareness courses are something new. Teachers will have their own fears and preconceived ideas. The attached structure diagram attempts to summarise some of the potential teacher problems.

You are asked to consider all these problems and have them sorted out in your mind positively before embarking on classroom teaching. Your doubts, fears and reservations will quickly be conveyed to the pupils and perhaps prejudice the course aims. Similarly, the enthusiast needs to ensure a balanced approach is presented.

Teacher
Problems?
(re computers)

Perceived Advantages?	Perceived Complexity?	Ability to Trial?	Teacher-machine Compatibility	Ability to observe
Choice of Value	May be seen as difficult to use or irrelevant	Ability to experiment before use	Potential Teacher values experiences needs	Teacher Training through observing results of computer use
high low				
Computer technology will have very positive benefits	Computer technology will be very damaging	Threatening Prefer the status quo to change	Dehumanising Antagonism to man-machine interaction	Unproductive Past innovations have not brought expected benefits	Who Uses Computers? Attitudes exist that computers are for bright pupils only

TEACHER ATTITUDES TO BE CONSIDERED IN COURSE PREPARATION

SUBJECT INTEGRATION

Uses for Computer Technology

Introduction	Social Studies	Ability to assess one's own attitudes and values.
		Value of history for understanding the present.
Using Computers to model real world situations	Mathematics	Concept of variables and optimisation
	History	War strategies
Computers as Control Devices	Science	Microprocessor Technology
	Social Studies	Electricity Value of Museums
	Engineering	Robotics Design of Appliances
	Mathematics	Logic
Computers as Filing Cabinets	Social Studies	Information explosion
	English	Methods of Indexing and Cross-referencing
	Commerce	Presentation of Information Clerical Tasks Business Records
	Science	Magnetism and Transistor Technology
	Mathematics	Machine Codes

COMPUTERS AND PEOPLE

Communications Networks	History	Industrial Revolution and effects on transportation, utilities and information
	Science and Engineering	Development of modern technology
	Social Studies	Concept of customisation and mass production
	Commercial	Office jobs and word processing
	Science	Analogues and digital waves Telephone networks
	Mathematics	Transmission codes
	English	Analysis of science fiction works. Ability to form attitudes and values.
Leisure	Health Education	The place of sport and recreation in life
		Leisure education
	Social Studies	Values placed on work
		The work ethic
	Music and Art	The place of cultural activities in life
	English	The concepts of syntax and semantics. The logic of English sentence structures.
		What makes a poem?
	Social Studies	Causes and effects of anti-social behaviour.

Impact of Computers	Social Studies and Commerce	Careers and what they involve by way of Education Interests Values, etc
	Careers	All aspects of career education
	Social Studies	Industrial relations between Government, employees, employers. History of unions and their place and impact on the work place.
	Art	Design and colour
Impact on the Family	History	The Industrial Revolution and its impact on family life-styles
		Growth of cities and urban life-styles
		Growth of mass education
	Social Studies	Family relationships
		Forming relationships with other people
		Development of appliances
Privacy and Security	English	History of Censorship and its necessity
		Laws and how they are formed
		Data banks
	Commerce	Business data banks and the need for privacy and security
	Social Studies	Concepts of privacy and security
	Engineering	Building design for security
	Mathematics	Logic of security systems

INTRODUCTION

Themes:

The Mind Machine

The concept that the computer is a tool that extends people's minds and it has the potential to make life more meaningful. Many people however, fear for the future.

People and Machines

There are a variety of human reactions to new experiences, change and the unknown. Often these reactions can be negative - fear, embarrassment, and rejection. Pupils should be encouraged to face up to any preconceived reactions they have towards computers.

Waves of Change

People and society are being dramatically affected by change, computer technology being a good example of one cause. It is necessary to have knowledge and experience before it is possible to make rational (unemotional) responses to change. People who cannot cope with change often become mentally sick and anti-social.

There is a choice of futures. Everyone has a part to play in shaping the best future for society.

The introduction should:

1 Introduce the computer as a tool

2 Let pupils know the main aims of the course

3 Bring into the open or at least clarify any pre-conceived ideas about computers. Part of the course evaluation must necessarily investigate any changes in attitude towards the computer that may have occurred during the course.

Self Assessment

In the introduction pupils are asked to assess their attitude to several situations:

1 To new technology

2 To new situations

3 To embarrassment

The self-assessment could be reinforced by a role-playing activity. One possibility follows:

AIRPLANE CONTEST

First, divide the class into equal groups. One group acts as observers, and the other as participants. Then divide the participants and observers into separate groups of four or five persons each. Each group of observers should, if possible, sit in a circle outside the circle formed by the plane-makers.

Participants' Instruction Sheet for Airplane Contest

Your group is to compete with the other groups to produce the world's best paper airplane. You must use the paper provided but can add any of your own material. Your group must produce one plane. Final planes are given points for airworthiness, accuracy when thrown, and artistic design.

Observers Instruction Sheet for Airplane Contest

You are to select one participant in the group to observe. You are to watch him during the entire contest and notice how he contributes to the group or keeps his talents from the group. Decide what role he plays in the group's attempt to design and build a paper plane. The group's task is to design and build a paper plane that will stay in the air the longest, will fly most accurately, and look best.

Here are the common roles that people play in groups:

1 Take Charge Guy: He thinks he is the only one in the group with any ability

2 The Do-nothing Guy: This person sits off to the side and makes no contribution to the group

3 The Dart Thrower: This person throws darts at almost any idea suggested by anyone else but rarely, if ever, offers a better idea

4 The Soapbox: This person talks and talks and talks

5 The Clique: This is part of the entire group that actually does the work. They make the others feel unwanted and do the work themselves.

6 The Co-ordinator: This person takes charge but accepts the ideas of others. He does feel that others in the group can help.

7 The Mediator: This person helps keep peace in the group. He acts as a go-between for people and thereby helps the smooth flow of ideas.

8 The Follower: This is the "yes" man. He or she simply says "yes" whenever a strong person makes a suggestion.

9 The Traveller: This person seems more interested in the activities of the other groups than in his own.

The plane-makers should not be told what the observers' directions say. The activity should be carried out according to the rules outlined on the Participants' Instruction Sheet, and one group's design should be selected as the winner.

After 15 minutes of building and the judging, observers and participants in each group should discuss how each of the participant builders took part in the group process. Each builder should reflect back on his/her behaviour and see clearly how he/she operated and why.

The process should then be repeated with the roles reversed. The builders' behaviour might be different because they know they are being observed. Discuss the differences between the two sessions and the reasons for them. Did the second session produce a better plane with less effort?

The nine roles might be observed in other groups as well as in this exercise. This particular exercise, as we have said, may be most useful to give students additional preparation for social action, but it need not be limited to that function. The Paper Airplane Contest would be useful in seeing just how thoroughly students have grasped the notion of equal status interaction.

MODELLING REAL WORLD SITUATIONS

Themes:

What is a Model?

The concept that a model can either be a physical device or a program on the computer.

Examples of Computer Models

Modelling involves a determination of all the constants and variables involved in a problem. A facsimile of the real world situation is put into the computer. The variables are altered logically so the effects may be optimised according to a pre-determined evaluation scheme.

Two examples are used to demonstrate this theme. Both are available as computer program for the course.

1 Traffic Light Model

The traffic using a busy intersection is modelled.

2 War Games

The computer plans a campaign for a commander of a force attacking a fortress defended from a number of positions.

The Limitations of Models

Computer models are only as good as the data fed into the computer. Real world situations are always complex. Computer models are always simplifications of the real situation. Therefore predictions must be limited to trends rather than expectations.

Course
Introduction

Demystifying
the computer

Historical
Perspective of
Change
(Causes and Effects)

Participation in
Decision-making

Man - Machine
Inter-action

Reactions
and attitudes
to unfamiliar
gadgetry

A choice of
futures

Jargon used
in computing

Confidence and
Competence in
Knowing what to do

FOR INTRODUCTORY COMMENTS

COMPUTERS AS CONTROL DEVICES

Themes:

Microprocessors

What microprocessors are and the effects they are having on technology.

Smart Machines

Microprocessors are used in machines to replace mechanical parts. They also add brainpower by having the ability to remember, do simple arithmetic and make simple decisions.

Moving electrons is more efficient than mechanical parts. This theme is exemplified by an examination of the history of the washing machine as it developed from a device with an ingenious mechanical agitator powered by human muscles to a fully automated electronic gadget.

Computers Used to Control Other Machines

Microelectronics can be used either for the pure processing of information and the display of results or it can be used for the processing of information and the transformation of the result into some action.

hree examples are used. Two are available as computer programs in the course. (These two are marked with an asterisk.)

*1 Computer Control of a Tape Recorder

2 Computer Control in the Home

*3 Robotic Arm, Eye, and Movement

Robots

An assessment of progress in simulating human senses, movement and thinking. Possible laws to control robots are suggested.

One example is used. It is also available as a computer program.

Planned Robotic Movement

A method for programming robot movement in a building.

COMPUTERS AS FILING CABINETS

The Information Explosion

The concept that information is being created exponentially. To cope with the huge volume new storage and clerical techniques are needed.

Methods of Storing Information

Traditional methods of libraries, filing cabinets and archives together with modern methods of disc and microfiche are pictured. Brief descriptions are given of discs and microfiche.

Clerical Duties

Eight clerical duties are described and illustrated.

1 Indexing

2 Cross Referencing

3 Searching

4 Retrieval

5 Adding to records

6 Deleting records

7 Updating

8 Ordering.

Hard Copy and Data Bases

The facilities needed to cope with documents on microfiche and information on disc are discussed. The advantage of discs over traditional methods are described.

Example of the Computer as a Filing Cabinet

A method for using the computer as a filing cabinet for an encyclopedia of information on computers is described. The example is available as a computer program.

Machine Codes

ASCII character code is used to illustrate the concept that the computer works internally in a binary code. There has been a development from user use or machine codes to use of high level language.

COMMUNICATIONS NETWORKS

Themes:

Networks Meshing Society Together

The development of networks in transport, utilities and information is discussed. The effect of modern technology on information networks is included.

Customisation of Information

The demassification of goods and services is a possibility with network technology. Three examples are used to illustrate the idea:

1 Electronic news

2 Electronic meetings

3 Computer assisted instruction.

Word Processors and Electronic Mail

The tasks word processors can perform are listed. An example of text-editing and line control logic is given. The concept of electronic mail is introduced.

The Future

Two science fiction extracts are used to promote discussion on good and bad aspects of electronic communication networks.

1 An extract from 2001: A Space Odyssey, discusses the possibility of a newspad - an electronic newspaper

2 An extract from Nineteen Eighty-Four introduced the idea of state electronic surveillance in the home.

LEISURE

Themes:

What is Work and What is Leisure?

A threefold classification is suggested.

Section A: Career-type work producing goods and services for sale and exchange in the market place

Section B: The unpaid work done by people for themselves, their families or the community

Section C: The time when people are free of routine and are able to pursue their own interests.

It is suggested that money, status and self-worth based on Section A is a product of our society and in the computer revolution will be a cause of social distress.

The types of unhappiness experienced by the unemployed, the difficulty of retirement and the search for stimulation and excitement by the wealthy illustrate the negative possibilities from lack of Sector A work.

The lesser value placed on unpaid work is discussed using urban neurosis, attitudes to volunteer work and the selfishness of the self-sufficient in denying trades people work. It is suggested that in other cultures the division between Sector A and B has been less apparent.

The protestant work ethic is discussed. The need for a change is suggested.

The Need for Leisure Education

There is a need to learn how to use leisure time constructively. This need will have to become part of the school curriculum. Some leisure education activities are given.

Growth of a Leisure Industry

If people have more leisure time there will be an opportunity to provide employment for activities for people's leisure. Expansion of present ventures and new possibilities are suggested.

Computer Help with Leisure

The computer as a resource to help with leisure is discussed. Three examples are used, all are available as computer program in the course:

1 Music Aid

2 Computer Artist

3 Computer Poet.

THE IMPACT OF COMPUTERS ON WORK

Occupations in Change

A review of different occupations being subject to change. A variety illustrating changes in skills through to possible redundancies is given.

Employment Changes

The idea of redundancy and silent job elimination is given. This is followed by suggestions for where new types of jobs could be created. Changes in job skills may result in some jobs that are now rewarding becoming less so in the future. The need for a skill may be lost. Careers may in future not be life-long commitments. Society will have to accept that people will have periods of unemployment and retraining.

Industrial Relations

The example of the Luddite disturbances is used to illustrate possible social upheaval from new technology. Two questions are asked without solutions being given:

> Can government, employers and employees learn from history and avoid violent social disruption from computer technology?
>
> Can a fair means be found to distribute wealth to all members of society?

Example of a Job in Change

Use of a computer to mix colours on a screen is used as an example of a possible job change. The colours created can be used on a house design, on the screen, and an assessment of various colour schemes made. This example is available as a computer program.

IMPACT ON THE FAMILY

Changes to the Family Due to Industrialisation

The Industrial Revolution is used to put aspects of our present day society into perspective and to give a background to the suggestion that computers may allow a return to some positive aspects of pre-industrial society.

The ideas stressed are:

1. Family involvement in working for a living
2. Self-determined work times and work pace
3. Limited travel and contact with ideas
4. Close-knit extended families and communities
5. Cottage industry
6. Home education and health care.

Changes in the Family Due to Computerisation

It is suggested computerisation may result in a return to the majority of the work being centred in the home. Consequences are suggested corresponding to the six areas listed above.

Customised Families

The Industrial Revolution made a change in the emphasis on reasons for marrying a particular spouse. It is suggested that computerisation will require something more than just "love" for marriage.

A diversity of family styles which is already showing up in New Zealand society may grow. People used to customised products and services will become used to customisation in personal relationships.

Changes in Life's Activities

Graphs are given to show how the time people spend in various areas of life's activities have changed. Pupils are left to consider the possible changes in a computerised society.

Computer Assisted Personal Help

It is suggested that computer programs will be designed to help people with decision-making in their personal lives. Making a career choice is used as an example and is also available as a program with the course.

PRIVACY AND SECURITY

Themes:

Censorship

The ideas of computer privacy and security are introduced by considering the movie industry analogy. The impact of 1899 of movies on a small community is given in a short story followed by a discussion on the censorship laws and their need.

Data Banks

Two fears about data banks are suggested:

1. The failure to store information accurately
2. Undesirable access to personal information.

Information has always been kept, it is the new means of storage and retrieval that causes these fears.

Overcoming the Problems

The methods discussed are:

1. Technical Methods:
   - a Building design
     - i Internal and external design of buildings
     - ii Security locks with limited access card keys
     - iii Fire, earthquake-proof cabinets for storing data.
   - b Computer System:
     - i Computer systems that use operator keys and codes to access computer usage
     - ii Code passes on files or parts of files that limit their availability
     - iii Recording who accesses files and why.

Ways in Which Security of Data could be Breached

Six ways are illustrated for possible security breaches in a data bank.

TEACHER NOTES

Machine Intelligence

Themes

Training

Animal training is outlined. The process is used to introduce equivalent machine training.

instincts	ability to do arithmetic ability to store information routines for carrying out instructions it recognizes
training	programming in computer languages
orders	imput of information to be processed by the computer according to the program instructions.

Clever Machines

Computers are clever but not intelligent. They lack flexibility and the ability to adapt to new situations. Examples of computer cleverness are reveiwed.

Intelligence

Present computers have an intelligence between that of a tapeworm and earwigs. The intelligence is programmer intelligence rather than computer intelligence.

Programs

Instructions are given to the computer in special computer language. These computer languages have a syntax and semantics that like all languages must be learnt. Using a computer does not require you to know a language unless you want to program yourself. There are three steps to programming.

planning
writting
testing and de-bugging

Example of Planning a Computer Program

Pupils are introduced to the idea of a mouse running a maze. A model of this is to be built in the computer. The logic is built up.

Mouse senses and mouse movement are discussed and structure diagrams of the situation given.

Logic tables are given for various positions of the mouse in the maze. An essential activity with this work is to take the pupils outside and for them to run the maæ drawn in the playground using the mouse logic. This exercise could be done before or after the text discussion. The robotic mouse is also available as a program with the course.

Overcoming Security Problems

Examples are given in three aspects:

1. Building design and physical security measures
2. Technical design for the use of equipment and programs
3. Legal safeguards that laws could enforce to ensure data banks and people respect privacy.

Examples of a Security Code System

A simple security code system is demonstrated. The system allows access to parts of a file depending on two factors:

1. The status of the interrogator
2. The status of the files.

This system is available as a computer program.

The program also demonstrates other technical safeguards mentioned in the resource material.

The idea behind this test is to probe the students' attitudes towards computers and to highlight common misconceptions and prejudices. A test of this nature could contain many detailed questions but it has been kept to a minimum to allow the students time to think and not be confused by detail. This test should be used as a pre-test before the detailed learning of the course progresses beyond an elementary level and could then be administered as a post-test to allow the students the opportunity to show any changes in their attitudes towards computers.

With this in mind the test was designed so that in the pre-test situation a pupil was presented with a limited number of options in each question which show the main division of opinions or attitudes held in the wider community. Once the test has been administered, the students could produce graphs which show the class responses to the questions. It should be emphasised that this test is not one of "content" but of "attitude" and therefore there is no "right" or "wrong" answers. The questions in the test can be used as discussion starters throughout the course.

In the post-test, pupils should be administered the same test but with the added provision that they could clarify their response with one or two sentence comments. This means that pupils who may have got the "right" answer in the pre-test for inadequate reasons can show the depth and maturity of their thinking.

The pupils can then compare the post-test responses to their pre-test responses to see the development of their attitudes and the increasing maturity of their thinking.

COMPUTER ATTITUDES TEST

Name: _____

1 Sex: _____ Male ☐ Female ☐

2 Age: _____

3 Have you used:
(Tick boxes which apply)

A calculator	☐
A computer game	☐
School microcomputer	☐
Computer terminal, eg, in a business	☐

4 If you were part of a group of people using the school microcomputer what would be your attitude? (Please circle the number nearest the point on the scale that shows your attitude)

1	2	3	4	5
Confident and Eager				Scared of making a mistake, embarrassed and reluctant

5 If you had one hour of free time at school and were deciding what to do, in which order would you do the following activities?

i	Spend time in the library	☐
ii	Talk to friends	☐
iii	Use the microcomputer	☐
iv	Study	☐

Please put number 1 - 4 in the boxes. 1 = most likely

4 = least likely

Why did you choose your most likely activity?

_____

_____

6 Computers are complicated machines that only specially trained people can use. Is this statement

(Please tick box) True ☐ False ☐

7 Computers are more intelligent/ smarter than humans

(Please tick box) True ☐ False ☐

8 Computers take over peoples' thinking and do it for them

(Please tick box) True ☐ False ☐

9 We are told that computers may replace a lot of the jobs people do. Do you think that this is

(Please tick box) True ☐ False ☐

10 What sorts of job do you think will be most affected by computers?
(Please tick box)

Assembly line workers in a factory ☐
Teachers ☐
Doctors ☐
Bank Tellers ☐
Engineers designing cars ☐
Typists ☐
Jeweller/Potter ☐

11 Do you think it would be more fun to have a job that used a computer than one that didn't? Yes ☐ No ☐
(Please tick box)

12 We are told that computers will mean that people will not have to work such long hours and will have much more spare time. Is this increased spare time a good idea? Yes ☐ No ☐

13 'Computers can make mistakes.'
Is this statement True ☐ False ☐

14 Do you know of any appliances in your home controlled by microprocessors?
(Please tick box) Yes ☐ No ☐ Don't Know ☐

If yes, list examples

_____ _____ _____

15 If a businessman finds that a computer can do a job better than the people working for him, what should he do?

(Please tick box)

Ask the workers to work harder ☐

Replace the workers with a computer ☐

16 If you had the opportunity to use the school microcomputer during your free time how much time would you spent on it?

(Please tick box)

All the time ☐

Most of the time ☐

Some of the time ☐

None of the time ☐

17 There is a large computer in Wanganui which is used by the Government to store a lot of personal information such as how much tax people pay, whether they have a criminal record, where they live, etc. This sort of information has always been kept, but now it is all kept in one place.

Do you like the idea that information like that may be kept about you?

(Please tick box) Yes ☐ No ☐

18 If you were going to be replaced in your job by a computer what would your reaction be?

(Please tick box)

Let yourself be retained for another job ☐

Work harder to prove you were worth keeping on ☐

Leave and find another job ☐

Get your Union to strike in protest ☐

19 We are told that computers are going to make changes in our lives. Will this happen?

(Please tick box) In five years ☐

In 10 years ☐

In 40 years ☐

Already happened ☐

Introduction

Throughout the course pupils are asked to discuss attitudes and form values. The following section presents methods for training pupils in skills to meet this type of problem.

Three methods are discussed for:

1 How to evaluate ideas

2 How to make a decision

3 Considering consequences.

4.1 The Treatment of Ideas - PMI Method

P = Plus The good things about an idea - why you like it

M = Minus The bad things about an idea - why you don't like

I = Interest What you find interesting about an idea.

Instead of just saying that you like an idea, or don't like it, you can use a PMI. When you use a PMI you give the good points first, then the bad points, and then the points which are neither good nor bad, but are interesting. You can use a PMI as a way of treating ideas, suggestions and proposals.

Example

Computer networks will result in electronic mail.

P: Mail can become a conversation.
Communication between people can be quicker and easier.

N: Possible bad effects on post office services.
Paper replaced by electronics.

I: Possibility of electronic dating.
Possibility of electronic meetings.
Possibility of electronic libraries.
Possibility of electronic news.

Value of a PMI

a The PMI is important because without it you may reject a valuable idea that seems bad at first sight

b Without PMI you are very unlikely to see the disadvantages of an idea that you like very much.

c The PMI can show that ideas are not just good or bad but can also be interesting if they lead to other ideas

d Without a PMI most judgments are based not on the value of the idea itself but on your emotions at that time

e With a PMI you decide whether or not you like the idea after you have explored it instead of before.

4.2 The Treatment of Factors - CAF Method

When you have to choose or make a decision or just think about something there are always many factors that you have to consider. If you leave out some of these factors your choice may seem right at the time but will later turn out to be wrong. When you are looking at other people's thinking you can try and see what factors they have left out.

Example

What will be the effect on society of increased leisure time?

1 People will be bored

2 Increased anti-social behaviour

3 More time for family life

4 Greater appreciation of culture.

Value of a CAF

a Doing a CAF is useful before choosing, deciding or planning

b It is better to consider all the factors first and then pick out the ones that matter most

c You may have to ask someone else to tell you whether you have left out some important factors

d If you have left out an important factor your answer may seem right but will later turn out to be wrong

e If you do a CAF on someone else's thinking you may be able to tell the person what has been left out.

4.4 The Treatment of Consequence - C and S Method

The invention of the petrol engine made possible motor-cars, aeroplanes, the oil industry and a great deal of pollution. If all the consequences could have been foreseen at the time electric or steam engines might have been used for cars. A new invention, a plan, a rule or a decision all have consequences that go on for a long time. In thinking about an action the consequences should always be considered.

Immediate consequences:

Short-term consequences: 1 - 5 years

Medium-term consequences: 5 - 25 years

Long-term consequences: over 25 years.

Example

A new electronic robot is invented to replace all human labour in factories. The invention is announced. Do a C and S on this.

Immediate consequences include massive unemployment and misery, opposition to the idea, strikes, etc.

Short-term consequences include shift to service industries and retraining and changes in the method of distributing income.

Medium-term consequences might include the idea of two people for every job (taking it in turns), hobbies, crafts and boredom.

Long-term consequences might include people only working for two months a year as a matter of course - rather like a reverse holiday.

Value of a C and S

Other people may be able to see the consequences of your action more easily than you can yourself.

It is important to know whether the consequences are reversible or not.

The immediate consequences and the long-term consequences may be opposite. Immediate consequences may be good and long-term consequences bad or the other way round.

You should look at the consequences not only as they affect you but as they affect other people as well.

You should do a full C and S before deciding which consequences you ought to bother about. (Taken from Cort Thinking, Edward de Bono.

The Types of Job Computers Can Do

Modelling real world situations	- Traffic control
Control of other devices	- Robotic eye, arm, and movement
	- Tape recorder control
Storage and retrieval clerical tasks.	- The computer used as a filing cabinet

Computers and Institutions

Computers in service sector tasks	- Optimisation and planning
Computers in industry and commerce	- Computer accountant
Computers in primary industry	- Pest control.

Computers and People

Changes in Communications	- Word processing and electronic mail
Changes in work patterns	- Colour and design
Personal help/assistance	- Career choice assistance
Leisure	- Creativity Package; music, poetry, art
Privacy and security	- Simulated security system.

Machine Intelligence

Machine intelligence	- Mazes and the robotic mouse.

COMPUTER CONTROL

The program is designed to demonstrate how the computer can be used to control other devices.

A tape recorder is the device controlled.

Using a programme questionnaire pupils establish a schedule for the tape for:

a Time

- i Starting time
- ii Playing time
- iii Finishing time

b Place

- i The starting place on the tape
- ii The finishing place on the tape.

Timing controls take precedence over place controls.

A default tape is provided for demonstrating this program although it is generally applicable to any tape.

THE COMPUTER USED AS A FILING CABINET

This program is designed to provide activities that demonstrate the clerical tasks that may have to be done on a data base.

The Data Base

The data base is encyclopedic in form. It is a file consisting of records describing three aspects of computing.

1. Words (jargon) used in computing and should be familiar after this course
2. Devices used in computer systems
3. Careers, jobs that are available in the computer field.

Each file record consists of four parts.

1. Item, a word for what the record is about
2. Description - the type of record - word, device or career
3. Key Words, a list of the most important words used in the entry. Keywords are used for cross referencing entries
4. Entry, a brief outline of the item.

Clerical Tasks

1. List all items alphabetically
2. List items by description

   A list in alphabetical order of all items in one of the three areas: Word, device or career
3. Examine one record

   See the whole of one record referred to by item
4. Add a record to the file
5. Update a record - change a record on file
6. Delete a record
7. Key Word Search - place up to three words in the computer. Any record with these words as keywords will be displayed.

Method

Pupils are given a written list of tasks to perform. They must use the menu and instructions to do these jobs.

To give the program some interest and flexibility an hour-glass timer is included. The hour-glass gives variety to the usual digital timer. It also allows an element of competition to be introduced into what could otherwise be a dull exercise. Pupils can compete against themselves or one another to get the task sheet completed in the minimum time.

Sorting Algorithm

A simple sorting algorithm is studied in detail using both numeric and alphabetic data. The idea that what is efficient for the computer is not necessarily so for people.

Machine Code

Machine code for both alphabetic and numeric data is illustrated. Pupils are given the opportunity to see:

a Names translated into code

b Simple arithmetic done in code.

OPTIMIZATION

The purpose of this program is to demonstrate that computers can be used to make optimal decisions when strategies are being planned.

1 Scheduling an Overseas Holiday

Pupils choose a city of departure, a destination and up to two intermediate stop-overs. The computer picks the shortest plane route, displays it on a world map and lists the cities visited and distances covered.

2 War Game

The pupil is the commander of a force attacking a fortress defended from six positions. Information is supplied to the computer or by the computer on:

i Enemy strengths

ii Acceptable loss of troops

iii Expected loss ratio - attackers/defenders.

The computer produces the best strategy for capturing the fortress or recommends retreat if losses will be excessive.

3 Wastage

A common industrial process requires the reduction of large stock sheets of material to a production size. This must be achieved with minimum wastage. Pupils experience this problem by choosing some shapes to be cut from a larger sheet. The computer plans the layout for minimum waste.

COMPUTER ACCOUNTANT

This program is designed to demonstrate four aspects of money that can usefully be controlled by the computer.

1 Automatic Teller

An automatic teller is simulated. Pupils key in an amount of money up to $250. The computer returns the minimum number of notes and coins required to make up this amount.

The logic of the method is displayed and the concept of step-by-step solution reinforced. The teller could well be a wages clerk.

2 Inventory Billing System

A small inventory is displayed. Pupils choose items they wish to purchase.

An invoice is produced and the inventory updated. The simulation includes a check on:

a Over-ordering

b Credit-worthiness.

3 Loan Repayments

Pupils are given the opportunity in the simulation to "borrow" a sum of money for a period of time. Two checks are made:

a The interest rate chosen is reasonable

b The ability of the pupil to repay is satisfactory.

From the input information regular monthly repayments are calculated and a table for each month is given showing:

a The interest paid

b The principal repaid

c The balance owing

d The accumulated interest

The final payment is given.

As well as a table, a graphical analysis is included.

4 Regular Investments

A table and a graph are given to show the growth of regular savings over a ten-year period. The size, regularity and interest rate for the savings are chosen by the pupil.
Throughout all the simulations pupils participate by putting in realistic variables of their choice.

PEST CONTROL PROGRAM

The aim of this program is to simulate a pest control program in an apple orchard.

The Pest

The pest is "red spide mite" (Panonuchus Ulmi) which sucks juices from the leaves causing bronzing. Severe infestation can cause loss of vitality and hence smaller fruit.

The Control

Control makes use of spraying and natural predator - a mite called Typhlodromus Pyri. In the simulation, P-mite, is used to refer to P. Pyri. Selective chemicals which are more toxic to Red Spider Mite than P-mite are available.

Spraying costs money and should be done as little as possible. If P-Mite are present in sufficient quantities spraying is unnecessary.

What the Pupils See by Way of Information

1 The degree of infestation of Red Spider Mite is presented at fortnightly intervals together with P-Mite density. The information is presented graphically and as averages.

2 A summary of all fortnightly averages for the season for both mites is presented graphically, together with an indication of any spraying dates. Long term trends can be watched.

From the information given pupils must decide whether to spray or not. All information is based on 100 leaves supposedly taken at random from trees in the orchard.

Recommended Spraying Levels

Spraying is recommended if:

1 There are on average 2 or more Red Spider Mite per leaf and no P-mites.

2 There are on average 2-5 Red Spider Mite per leaf and more than 7 times as many Red Spider Mites as P-Mites.

3 There are on average more than 5 Red Spider Mite per leaf and more than 4 times as many red mites as P-Mites.

Effect of Spraying

The concentration of spray can be adjusted to provide a specified percentage kill of the Red Spider Mite. It is often desirable to kill a low percentage of the mite to keep below an excessive damage level but kill rates of:

30% 50% 70% 90% 95%

are allowed.

ROBOTIC ARM, EYE, AND MOVEMENT

The program is designed to demonstrate the possibility of robotic senses - in particular how a robot might see shapes and colours and use this information.

1 Identification of the Outline of a Shape

The pupil will draw the outline of a shape on the screen using a light pen. The computer will identify the name of the shape. A set of HELP screens are available if the pupil disagrees with the computer.

2 Working Robotic Arms

The pupil will control three robotic arms on the screen. Each arm will be able to identify a component on a conveyor belt by either colour, symbol or letter. The machine will relabel the component by either colour, symbol or letter. Pupils will be able to program each arm for the task they wish it to do:

a What component to identify

b What label to use.

3 Controlling the Movement of a Robot

Pupils will control the movement of a simulated robot on the screen by using shapes to lay a path the robot will identify and follow.

Movement within a building has to be planned by the pupil. The robot has to be programmed to move around the floor plan designed by the pupils and to enter different rooms in sequence.

The chemical is 5 times as toxic to Red Spider Mite as P-Mite, ie it is selective.

Spraying kills only juveniles and adults - the eggs are not affected. The hatching of eggs can lead to a rapid resurgence of the population.

Number of Decision Times

Control is needed over the summer/autumn periods, November to April. The simulation provides 12 fortnightly assessments of mite numbers and pupil decision requirements. Ideally no more than one or two sprayings should be needed per season. The season is evaluated in economic terms and a summary given.

Evaluation

Pupils are evaluated according to how they keep costs to a minimum.

Costs

a Spraying

Assume the orchard is 5 ha

Cost/ha = 40 + K*20

Where K = kill rate or concentration level, ie total cost

30% kill = $230	80% kill = $280
50% kill = $250	90% kill = $290
70% kill = $270	100% kill = $295

b Mite Damage

Economic damage is assessed in average mite days ie each day average number of mite per leaf is assessed by the program. A total of average mite days is kept.

Economic damage starts to occur once the number of mite days exceeds 500.

Once 500 mite days is exceeded damage starts at a cost of $2m/day where m is the mite average for that day.
ie damage is accumulative.

1 mite for 10 days does the same damage
as 10 mites for 1 day.

Mite Biology

The pupils are given the opportunity to view some screens showing the life cycle of the Red Spider Mite and associated statistics. A film - "Integrated Mite Control in Orchards" has been purchased by the Department of Education.

TRAFFIC CONTROL

The program is designed to demonstrate that computers can be used to model real world situations.

The traffic and pedestrian flow at a busy intersection are controlled by traffic lights. The lights themselves are either under:

a Computer control

b Pupil control.

The computer screen shows a "bird's eye" view of the intersection with lanes marked, vehicles as small, moving squares, and pedestrians as dots. All movement is in accordance with the normal rules of the road.

Pupils can control the traffic density but the ratio of cars arriving at the intersection from each direction and using particular lanes is fixed.

During the simulation the screen shows as well as the intersection:

1 Light phase change controls

2 The current state of the lights

3 The number of vehicles waiting in each direction and the number of pedestrians

4 The maximum time vehicles or pedestrians have been waiting in any direction.

The performance of control is evaluated according to:

1 Successful phase changes without an excessive time delay or queueing numbers

2 Penalties for time delays and excessive queueing.

Realistic times and densities are used throughout.

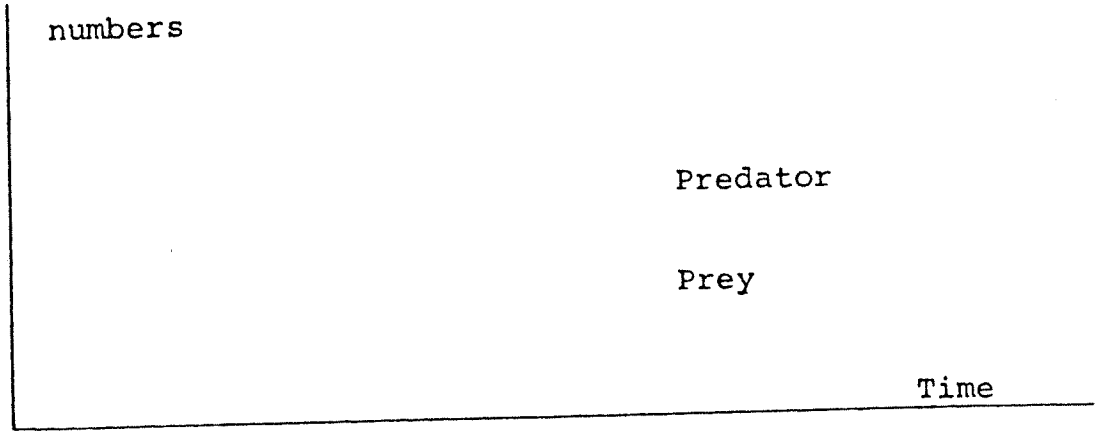
The Mathematics

Predation Model

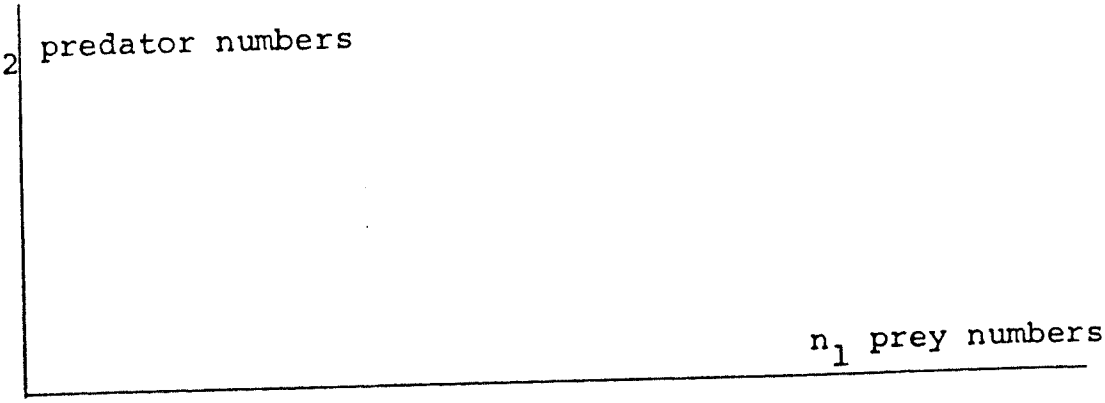
The relationship between the Red Spider Mite and P-Mite is modelled using a modified

Lotka-Volterra Theory.

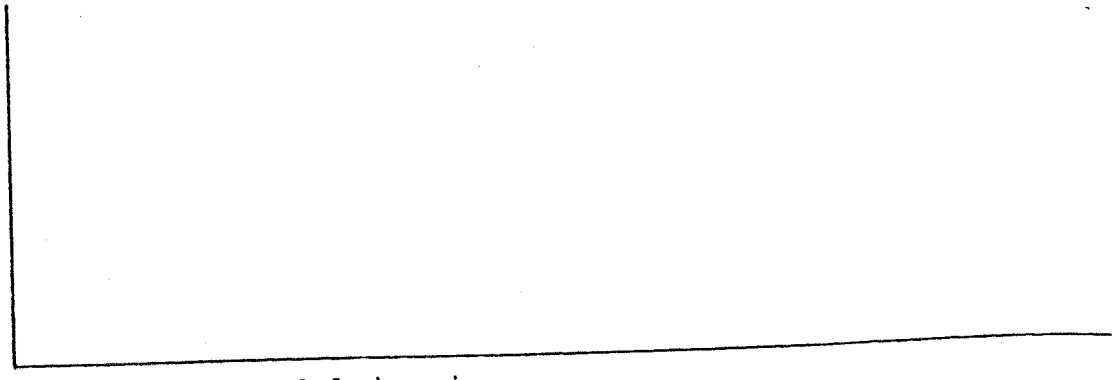
The assumption is that over time the predator-prey numbers will vary sinusoidally out of phase and with different amplitudes.



There are cycles of predator and prey numbers about an equilibrium value.



In fact the first two cycles of population are build up periods. A more realistic graph would be:



Mathematics of basic model is given.

In the more complex model reasonable equilibrium values are:

	Prey	Preditor
First generation	.25 m/leaf	.25 m/leaf
Second generation	1.5 m/leaf	.40 m/leaf
Other generations	4.0 m/leaf	3.0 m/leaf
Amplitude	1-10 m/leaf	.4-8m/leaf

Required Function Types

WORD PROCESSING

The program is designed to demonstrate three aspects of word processing.

1 Text editing

2 Storage and retrieval of documents

3 Electronic Mail.

1 Text Editing

Pupils learn how to use the computer screen for

1 Over-writing

2 Insertions and deletions.

They use special symbols in a rough draft which is reproduced by the computer in copy-type form.

A scheme for line control in a word processor is examined in detail.

2 Storage and Retrieval of Documents

A choice of letters is stored in the computer in both formal and informal styles:

1 Greetings

2 Christmas greetings

3 Invitations

4 Thank you and replies.

The pupils choose a letter then:

1 Add any details required

2 Add any personal messages.

3 Electronic Mail

Pupils can send the letter they have produced to other machines in the computer system. An alternative print-out of the letter is provided.

DESIGN AND COLOUR

The program is designed to demonstrate the use of a computer in familiar design and colour tasks.

1 House Plans

Three house plans are given. These plans consist of:

a A floor plan

b A side elevation

c An end elevation.

The computer combines these into a three-dimensional perspective of the house.

2 Design with the Computer

From six simple plane shapes pupils choose a base and side for a solid shape. The computer chooses an appropriate end and displays a drawing of the solid on the screen.

3 Mixing Colours

The pupils will make a colour chart. From eight basic colours the pupils will be able to mix colours in varying quantities and store those they like.

4 House Colour Schemes

Pupils will be able to use their colour charts to design colour schemes for one or all of the houses, with plans stored in the computer.

PERSONAL INFORMATION SERVICE

The program is designed to demonstrate how the computer might help people in personal decision-making. To do this, a program giving career choice help is used.

Pupils are given guidance in making a career choice. The process includes four steps.

a Educational Qualifications

Educational qualifications are examined. The suggested classifications of job suitability based on qualifications are:

i Professional - highly skilled

ii Technician

iii Skilled trades and crafts

iv Practical ability not requiring special educational qualifications.

Help is available to explain briefly:

i On-the-job training

ii Apprenticeships and apprenticeship training

iii Technicians and New Zealand Certificates

iv University degrees and diplomas.

Pupils must choose an educational category they believe they fit in.

b Interest Areas

Pupils are asked to choose three interest areas from a list of 11.

1 Artistic/Creative

2 Clerical/Administrative

3 Computational

4 Engineering/Technical

5 Literary

6 Manual/Practical

7 Medical

8 Outdoor

9 Personal contact with people

10 Scientific

11 Social Service.

Help is available with their choices.

1 An abilities questionnaire is provided

2 Some suggestions are made as to the sort of leisure time pursuits pupils might have engaged in and enjoyed under each classification heading.

c Career Lists

Careers have been divided into 44 areas according to educational and interest classifications. Pupils see the lists appropriate to their previous entries. From each list pupils choose up to four careers of interest. Pupils are given the opportunity of adding other personal choices.

d Evaluation

Pupils are asked to assess how reasonable their list of careers is based on:

i A personality questionnaire

ii A health questionnaire

iii A values questionnaire.

Pupils are given the opportunity to eliminate careers from the list. No judgments are made by the computer, all require pupil decisions.

At the end it is suggested that pupils should discuss the results of the program with:

1 Their parents

2 Their careers teacher.

CREATIVITY PACKAGE

The purpose of this program is to demonstrate the potential for computer assistance in the arts: Music, poetry and art.

1 Music

Twelve two-bar phrases of music are provided. Pupils choose any number of phrases in any order. The computer plays the choice. The music itself is displayed but in fact pupils need no knowledge of music to participate in this activity.

2 Poetry

Two aspects are provided:

a The computer creates a love poem using a poetry robot and data words stored in the machine

b Pupils are guided through the creation of a five-line sequain. The requirements for each line are explained and pupil input is edited.

3 Art

Two aspects are provided:

a The computer presents a range of patterns for pupils to view

b Pupils are shown a picture produced by the computer. Pupils are told how to do such drawings. A calendar is included with the drawing when it is printed out.

COMPUTER PRIVACY AND SECURITY

The program is designed to provide activities that demonstrate computer techniques for ensuring people's privacy is respected and data files are secure.

Each pupil makes up a file as questions appear on the computer screen. The file can be a personal or imaginary one. The file has three parts:

1 General information

2 An identikit picture

The identikit picture is made by the pupil using facial features provided by the computer on police identikit methods

3 Personal information.

Throughout the file creation stage pupil entries are stringently error checked. Appropriate error messages and editing facilities are provided.

Each pupil has a code which includes a status level and a parity check. Pupils attempt to interrogate one another's files. The parts of the files that are available depend on:

a The status code of the interrogator

b The status code of the file being accessed.

A burglar alarm facility is included if pupils repeatedly key in false codes or attempt to access files of higher status.

Information is provided on:

a Status codes and parity checks

b How status codes control file access

c Cryptography techniques.

Pupils are given the opportunity to create their own code. They can translate messages into or from code.

MAZES AND THE ROBOTIC MOUSE

The program is designed to demonstrate the type of logic that has to be employed in "training" a computer to do the tasks people require.

The program shows a mouse which runs through a computer chosen maze. The pupils then design a maze for themselves and run the mouse through it.

The logic of mouse movement is examined.

1 What mouse movement involves

2 What mouse sense involves

3 The need for logic is demonstrated by running a race between mice going through the same maze one using logic and the other random movement

4 The logic of the program is described

5 Pupils move a mouse through a maze step by step. At each stage a logic table displays the information collected using mouse senses and the appropriate preferred mouse movement.

The pupils are given the opportunity to run the mouse through a large computer-generated maze.