New South Wales

POLICY AND DOCUMENTATION RELATING TO COMPUTER USE IN NSW PRIMARY SCHOOLS

by Arna Wesley
Computer Co-ordinator & Class Teacher, Barker College

Using Computers in Primary Schools - Guidelines

This document was produced by the Computer Education Unit for the NSW Department of Education, and was designed to supplement the document "Computer in Schools: A General Policy Statement" which was produced in 1983.

The minimum goals, as set out in the General Policy Statement are:

- every student should have an awareness of the implications of computers for the individual and society.
- every student should experience and be able to assess the uses of a computer as a tool for investigation and discovery.
- every student should have an understanding of the wide range of areas in which the computer may be used.
- every student should have practical experience in using appropriate computer programs in simple, well structured, problem solving situations.
- every student should be made aware of the nature of a computer program. This does not necessarily mean that the student would be able to write a program.

The Guidelines promote the concept that the use of computers alone, will not always result in a worthwhile learning experience, but that sound curriculum practice must be employed. It emphasises individual development and the growth of social skills, involved in computer use. Whilst considering each student's stage of development, it is stated that learning experiences should allow students to learn about computers by using computers for learning.

The computer as a resource for both teachers and students is another aspect treated in the Guidelines. It is also stated that learning with and about computers will help develop in students a sense of control over computers. This sense of control is to be facilitated by the provision of opportunities to use computers in learning environments controlled by the learner.

The following statements are taken from the Guidelines and describe the anticipated outcomes.

1. Feelings, Attitudes and Values

When using computers students must be given the opportunity to develop feelings, attitudes and values such as:

- confidence in the processes of using computers;
- confidence in interacting with computers;
- a sense of autonomy and self direction in their own learning;
- a positive attitude towards questioning the development of computers and related technologies learning;
- equality of access to computers;
- a willingness to work independently or cooperatively in groups;
- listen to other people's views share ideas, knowledge and skills;
- a positive and healthy self esteem.

2. Understandings

When using computers students must be given the opportunity to develop understandings such as:

- Australians have contributed to the development of computers and other technologies;
- computers are part of the technological environment;
- people use and control computers;
- computers affect everyone directly and indirectly and these effects can be planned or unplanned, beneficial or detrimental;
- computers should be used in ergonomically sound environments;
- the role of people in computer-based systems is more important than that of the machine;
- computers have a variety of uses and functions;
- computers are machines that can make some work easier to do;
- computers have the characteristics of tools;
- using computers can be fun;
- computers can help students to develop new ideas;
- computers can help students to learn how to learn.

3. Skills

When using computers students must be given the opportunity to develop:

- investigating, communicating and expressing skills;
• information, thinking and problem solving skills;
• social skills;
• computational skills;
• skills in using software.

In conjunction with these outcomes it is stressed that students should be given the opportunity and motivation to reflect on their learning experiences, which should be varied and balanced.

The Guidelines discuss in detail the use of computers as the tool, context and stimulus. It is stated that computers enable students and teacher, to learn about, and experience, new curriculum content and processes - eg database, telecommunications. It also provides directions on the development of a computer policy and program, with details of available resources and support structures. It is stressed that it is the role of ALL teachers in the primary school to make provision for students to assimilate, discuss, modify and express computing concepts which arise in across the curriculum activities. It is their responsibility to provide environments where students will gain satisfaction from their learning experiences and confidence in their capabilities in using computers.

The following statement is included in the Guidelines and is taken form the Statement of Principles.

Special attention will need to be given to evaluating the effectiveness of programs for Computer Education in terms of the degree to which they:
• enhance the curriculum;
• facilitate and create appropriate teaching/learning environments;
• create a student population aware of computer technology and its social implications and capable of responding to and influencing change;
• recognise and cater for the importance, pace and scope of technological change.

The Guidelines for Using Computers in the Primary Schools achieves its aim in providing for teachers a framework on which to build a relevant and interesting computer education curriculum.

Science and Technology K-6 Syllabus - an overview

This syllabus is the first to be issued to New South Wales schools under the direction of the Board of Studies, and was launched in June 1991. It is anticipated that all future Primary School syllabus will have the same components. Science and Technology is one of six Key Learning Areas in the Primary school curriculum.

There are two parts to the document - the Syllabus itself of 35 pages and the Support Document of almost 200 pages. The Syllabus is the mandatory section and describes the nature of science and technology and specifies the educational outcomes that should result from study in this area. The Support Document provides advice on the planning and programming of effective school courses. A Parent Document will aim at strengthening the links between learning at home and learning in the classroom. The Board of Studies has also produced a teaching kit to assist teachers by providing teaching resources and suggested lesson formats.

Science and Technology is described as the learning area in which all students learn about the natural and made environments by investigating, by designing and making, and by using technology. The integration with other key learning areas is promoted. The syllabus discusses the relationship between Science and Technology, demonstrating that the relationship will vary according to the particular learning experience.

Science is defined as being concerned with finding out about the world in a systematic way. It is not just a body of knowledge, but a process of investigation, where findings are accepted if they can be verified.

For the purpose of the syllabus, Technology is defined as being concerned with the purposeful and creative use of resources in an effort to meet perceived needs or goals. It extends beyond the tools and technical inventions of a society.

Technology education embraces computer and communication technology. This syllabus recognises the need to provide students with experiences which assist them to:
• understand computers by using them;
• understand the nature of communication technology and to become competent mass media users.

In so doing students will appreciate that these technologies influence almost every facet of our lives and are some of the most significant sources of change for people in the latter half of the twentieth century.

The aim of this syllabus is to develop in students competence, confidence and responsibility in their interactions with science and technology leading to:
• an enriched view of themselves, society and the environment and the future and
• an enthusiasm for further learning of science and technology.

The objectives are developed from this aim and are expressed in the terms of the type of performance a student is expected to demonstrate in the areas of:
• Knowledge and Understanding
• Skills
• Values and Attitudes

Outcomes have been drawn from each objective and are the specific, observable indications of learning to be expected of students at the end of a particular stage of a course. They are presented in categories corresponding to the three overlapping stages of primary schooling:
The statements of learning outcomes are organised in the following groupings:

Knowledge and understanding of:
- Built environments
- Information and Communication
- Living Things
- Physical Phenomena
- Products and Services
- Earth and its Surroundings
- Investigating
- Designing and Making
- Using Technology

Skills in:
- Investigating
- Designing and Making
- Using Technology

Values and attitudes:
- Towards themselves
- Towards others
- Towards science and technology

The Science and Technology Syllabus has six content strands:
1. Built environments - structures and spaces people construct, modify and adapt;
2. Information and communication - ways people make, store, organise and transfer images and information;
3. Living things - people, other animals and plants;
4. Physical phenomena - phenomena related to energy, space and time;
5. Products and services - goods and commodities, and their production and distribution systems;
6. The Earth and its surroundings - the Earth, its environment and how people use its resources.

The Science and Technology Syllabus requires that students will learn about and engage in:
- the process of investigating
- the process of designing and making
- the use of technology and provides detailed explanations /diagrams of each of the learning processes.

Student assessment and program evaluation receive a worthy profile, with some excellent suggestions to assist the teacher.

The Support Document offers constructive advice on the implementation of the syllabus, covering the following areas:
- principles of learning
- the nature of the learner
- learning experiences
- school planning
- developing a teaching program
- units of work

There are 39 detailed units of work, covering the three stages of primary schooling and all six content areas:
- Teaching strategies
- Managing the learning environment
- Investigating process
- Designing and making process
- Using technology process
- Using specific technologies
- Suggested Resources

The Science and Technology Syllabus is a user friendly document offering tremendous assistance to the teacher. It gives Computer Education in the primary school a boost, and in particular describes such activities as adventure games, control systems, animation etc., as teaching strategies.

Computing Studies Years 7-10

Rationale
This course recognises that there is a discrete body of knowledge which is based on a set of underlying principles specific to computing. The course was designed to be dynamic and to focus on principles and not on the specifics of some hardware/software implementation.

The Nature of the Course
The course emphasises how the computer scientist investigates and how the computer professional applies this technology. The focus is on how people operate in an environment and use computer systems to solve relevant problems. The course also emphasises the many social and ethical issues which the widespread introduction of computer have presented.

The syllabus emphasises that there is to be a balance between theory and hands on, with students involved in a wide variety of activities both inside and outside the classroom. They are to be involved in:
- investigating - observing, talking, writing, designing;
- expressing - reporting, talking, presenting;
- communicating - listening, reading, writing, designing;
- problem solving - designing, developing, debugging and documenting computer programs;
- using and evaluating - software packages.

Structure of the Course
The course is organised into a Core and six Themes as outlined below. It is emphasised that there are no firm boundaries between the Themes and schools are encouraged to design their programs to deal with the selected material in any order they wish, dealing with Themes either as an entity or integrated with other Themes or even the Core if appropriate.

Core 40% of course
Themes 60% of course
(at least 4 themes to be studied)
Information systems
Communications systems
Graphics systems
Modelling & simulations systems
Monitoring & control systems
Intelligent systems

Structure of Each Theme
Each theme is presented under the headings of the system components:

Hardware the sets of physical units or devices associated with various functions of computer sub-systems;
Software the sets of instructions which control the processing and movement of data within the computer system;
Data the raw facts which are processed in some meaningful way by the computer system to produce useful information;
Applications the various tasks carried out by the computer system for the end user;
People the people who design the computer systems for use by end users.

Perspectives
To provide students with a broad approach to the subject, students are to explore computer-based systems from a number of perspectives:

The systems perspective is the unifying principle for the course. It emphasises the interacting components of the system and that computing systems are systems designed to solve peoples problems.

The historical perspective looks at people and events, the development of computer systems, why they have changed, the benefits and costs of change, how change has affected others and the future.

The environmental perspective views computer-based systems as part of a broader environment including both physical and human elements, addresses the human systems interface and the affects of computers on the environment.

The personal/societal perspective examines how the use of computers affects and is affected by individuals and society as a whole. It examines such issues as equity, ergonomics and safety, the nature of work, employment, privacy, security, access to information and the nature of available services.

The philosophical/ideological perspective examines such issues as images of computers, the nature of music, art and communications, software as intellectual property, the nature of intelligence, humanness and creativity and forms of control on computers.

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Student Assessment
Student progress is assessed using a wide range of tools, including research projects, practical assignments, fieldwork, excursions, debates and teacher observation of their student at work. It is emphasised that it is not appropriate to assess all of the objectives by traditional tests and examinations. However, the assessment program must reflect the 40%/60% weightings given to the Core and the Themes.

Computing Studies Years 11/12

Rationale
As with the 7-10 course there was community pressure for schools to provide such a course to meet the vocational and training needs of students. It was to provide a broad education in computers to help future citizens cope with their impact and to help them to be able to express an informed opinion on future technological change which may impact on their lives. It is intended as a course for a broad range of students which will positively benefit both those proceeding to tertiary studies and to those entering the work force. There is no prerequisite computer knowledge.

The Nature of the Course
Computing Studies is somewhere on the spectrum between the two extremes of Computer Awareness and Computer Science. According to the syllabus, the two major concerns of the course are:

1. The "operational and technical considerations pertaining to the use of a computer system." This is the Computer science perspective of the course.

2. "Asking questions about how computer systems are being used and what the implications are for society." This is the typical Computer Awareness perspective but this course goes beyond this in requiring students to experience "significant amounts of 'hands on' experiences with a wide variety of applications packages." This is so that they may better appreciate the technical considerations mentioned above.

It is expected that students make use of computer systems both in the classroom and in the real world including micros, minis and mainframes. Case studies of real world application are a prime method of achieving this. These may be carried out by means of visits, videotapes, newspapers, journals, books and magazine research.

The Course Structure
The course is arranged as four Core topics plus 6 Option topics which are intended to provide a range of learning experiences to suit both the capabilities and resources of the school and its pupils.
Core topics
(60% of the course)
CT1 Basic operational skills
CT2 Computer based systems
CT3 Programming
CT4 Social implications

Option Topics
(40% of the course)
OT1 Text processing
OT2 Database systems
OT3 Electronic spreadsheets
OT4 Computer graphics
OT5 Computers & communications
OT6 Computer controlled systems
OT7 Further programming

All students must study all of the core topics plus any four of the options which best reflect the local interests, concerns and expertise. Each core and option topic should be given equal weighting.

Course Design
Schools are free to devise their own courses and sequence however, the Core topics would generally be studied near the beginning of the course for the following reasons.

CT1 (Basic operational skills) teaches students how to correctly use hardware and common software applications competently as well as to be able to maintain and rectify minor faults in the system.

CT2 (Computer Based Systems) looks at general systems concepts and specifically at the computer subsystems - the hardware, software, data and personnel and procedures - as the basis for further study of specialised computing systems. For this reason these topics will probably be studied first.

CT3 (Programming) introduces a program development cycle, the programming constructs of sequence, branching, repetition and sub programs and teaches students how to incorporate these into problem solutions. These solutions are expressed as algorithms which are translated into appropriate programming language for computer execution. This core topic will also need to be studied in the first year of the course.

CT4 (Social Implications) has a social science flavour. Students are to study at least four areas of computer application and consider at least three groups of people affected by the technology in these areas. Issues such as employment, the nature of work, power, control, equity and the environment are to be considered. A major investigation and cases study is to be undertaken. By its nature this core topic may be integrated with various other computing applications including those studied in the Options. Any four of the Options may be studied in any order.

Assessment
The course is assessed in two parts. By necessity, the more practical course objectives are assessed internally and must form a major part of the school's assessment program which is used as the basis for the student's school assessment mark out of 50 for the HSC. A wide variety of assessment tools are prescribed including practical mastery tests, case studies, teacher observation, written tests, programming and database assignments and research projects.

Student achievement is also assessed in the external Higher School Certificate. Theoretical aspects are covered in the two hour paper. Students are not expected to write computing code but are expected to be able to interpret and write algorithms in any of the three prescribed forms. This also produces a mark out of 50.

Design and Technology Years 7-10
The course follows on from Science and Technology K-6 syllabus. It brings together a wide range of disciplines including Industrial Arts, Home Economics, Textiles, Agriculture and Computing. It will be trialled in schools in 1992 and will be implemented in all government schools in 1993 and by all secondary schools in New South Wales by 1995. While this is not a Computing Studies course it specifically includes the use of computers and so will make some study of computers compulsory for all high school students in New South Wales.

Excellence and Equity states that all students should "have access to a broad and coherent range of experiences in a design and technological study in a mandatory course in the secondary curriculum". The D & T syllabus emphasises the breadth of technological experiences while the electives in this KLA such as Computing Studies 7-10 provide more specific technological experiences.

In the words of the syllabus: 'This syllabus is concerned with learning about technology and learning through technology. It involved practical experiences in a process of designing, making and evaluating.'

Design is the concept which links human ingenuity to selected activities in order to meet challenges and find solutions through existing or new technologies.

Technology is the know-how and creative process that may assist people to 'utilise tools, resources and systems to solve problems and to enhance control over the natural and made environment in an endeavour to improve the human condition' (UNESCO 1985).

Rationale for the Course
Since technology affects all of our lives, learning about technology is considered to be one way of ensuring that future generations will be able to use technology as its servant to improve the quality of life. Australia's future and quality of life of its people will depend on the population becoming innovative, creative, flexible and highly skilled, technologically aware, literate, capable, responsible, informed and aware that technological progress must be balanced against the management of sustainable resources.

Some Important Terms
A Design Project is "a planned..."
undertaking to meet an identified need or want through designing, making, evaluating, communicating, managing and marketing. It results in an end product.

A Design Process is a planned series of steps of achievement of a practical purpose. It is applied to an identified need and, in this syllabus, results in an end product.

A Prescribed Context is a field of endeavour in which technologies are used by people to solve problems which provides the focus for a design project and allows a range of technologies.

A Prescribed Dimension is an area of study which must be considered within each design project. A number of these are specified in the syllabus and provide a perspective on the use of specific technologies and their impact on society and the environment.

The Role of Computers in Design and Technology
All students are expected to develop the basic operational skills and awareness of the use of computers in society. At least 50 hours of the 200 hour course must be devoted to learning about using computers. This requirement will be achieved by integrating the use of computer technology in appropriate Design Projects. Computers may be selected as the focuses of study in the Information and Communications Context. Teachers should use computer technology as a teaching/learning tool in the delivery of this course as well as in the management of projects.

The Role of Graphics in Design and Technology
The importance of written, oral and graphical communication in the process of design is stressed in this syllabus. Graphics involves preparing and presenting design ideas in a graphical form using appropriate techniques and technologies. Graphics will be an integral part of all design projects and may be selected as a project for study in the Information and Communications Context.

Course Structure for the Mandatory 200 Hour Course
The Design Projects must provide equal opportunities for boys and girls from different cultures to experience technologies of interest and should be planned to provide progressive development of skills and technological experiences.

At least six Design Projects must be selected from the 10 prescribed contexts:
- agriculture
- the built environment
- clothing and accessories
- engineered systems
- food
- health and welfare
- information and communications
- leisure and lifestyle
- manufacturing
- transport and distribution

Each Design Project must address all of the Prescribed Dimensions:

- Resources - people, materials, tools, energy, time, skills, finance, information
- Domains - personal, commercial/industrial, global
- Human impact - cultural issues, environmental sustainability, ethics, gender issues, historical issues, motivation, quality

Each Design Project must use a Design Process and develop the following skills:
- designing
- making
- evaluating
- marketing
- communicating
- managing

Student Assessment
Assessment is not only to assess student performance to award grades at the end of Year 10. It must also provide feedback to them in order that they may improve their performance and to provide information for the production of reports to parents, employers and students. Therefore, a variety of assessment tools are appropriate:
- plans
- design briefs
- models
- audio-visual presentations
- photographic essays
- design projects
- graphical presentations
- computer exercises
- group reports
- research assignments
- case studies
- structured interviews
- experiment work
- debates
- orals reports.

Summary
The above article provides a general overview of three of the current courses from the KLA of TAS. It is not to imply that this is the only area in which computers are being used effectively in the New South Wales secondary schools. Many teachers are using computers as a tool for achieving their objectives in a wide range of courses across all KLAS. It is not possible to even start to describe these here.

Bibliography

