COMPUTER STUDIES IN VICTORIA

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The study and use of information technology in the Victorian secondary education system is highly valued and popular. This article focuses primarily on the information technology curriculum offerings in the post-compulsory years, with an overview of the curriculum framework at years 8–10.

VCE INFORMATION TECHNOLOGY – AN OVERVIEW

In Victoria, students undertake a two-year program to gain their Victorian Certificate of Education. For the majority of students, this certificate is acquired during years 11 and 12. From 2001, students will be able to study a program selected from 59 studies. Generally a study comprises four semester units – unit 1 and unit 2 are independent, non-sequential and are usually attempted by year 11 students; units 3 and 4 are treated as a pair, are sequential and are usually studied by year 12 students.

The study of Information Technology is an exception to this generalisation – it has a branching structure, which consists of six units. **Information Technology** (IT) is offered as units 1 and 2. Branching from this gateway are two studies, **Information Processing and Management** (IPM) Units 3 and 4 and

Information Systems (IS) Units 3 and 4. When the study was initially implemented there was an additional unit 3 and 4 pair called Information Technology in Society. Due to the significant decline in enrolments from 631 students to 157 (in 1997), it was not reaccredited for the period commencing 1998.

Information Technology

Units 1 and 2 aim to provide students with a balanced understanding of those main factors that contribute to the effective and efficient application of information technology in a range of settings. There is a core of knowledge, skills and conceptual underpinnings that students are required to demonstrate and these include:

- using information technology to solve problems or meet information needs
- understanding the operating principles of items of information technology
- examining how information technology has affected society, and how society has influenced information technology developments.

Information Processing and Management

This pair of units allows students to specialise their study on how information is processed and managed in organisations. To achieve this students must also study the technical aspects of automation and investigate how individuals, organisations and society are affected by the use of this technology.
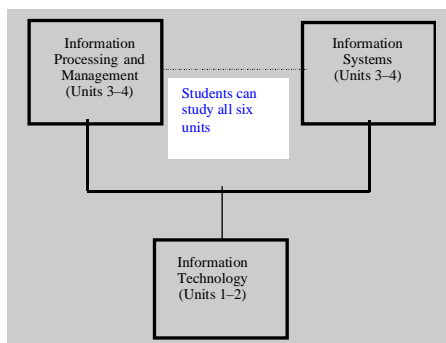
Information Systems

The main focus of this study is on the structure, design and implementation of information systems. To achieve this students must also study one programming language and address

factors influencing the design of information systems and the effects of these systems on individuals, organisations and society.

VCE DEMOGRAPHICS

In 2000, as with previous years, enrolments in four of the six Information Technology units have been very strong. Information Processing and Management (Unit 3) has the fourth largest enrolment after English, Further Mathematics and Mathematical Methods. Similarly Information Technology (Unit 1) enjoys this same ranking. Enrolments in Information Systems are considerably smaller, but rising.

Figure 1 provides the gender breakdown for Unit 1 from 1996–2000, as well as total enrolments.

When this VCE study was initially being developed (1987–1989), the redressing of gender imbalances was a major consideration in the formulation of the curriculum. The preceding subjects of Computer Science and Secretarial Studies both had content that was highly specialised and primarily of interest to one gender (Computer Science, 90 per cent male; Secretarial Studies, 98 per cent female).

The introduction of VCE Information Technology (Unit 1) in 1990, saw a significant shift in male/female participation rates, with equal numbers enrolled in the study. Similarly, Information Processing and Management enjoyed a relatively healthy female participation rate (55 per cent), however both offerings have experienced a decline in female enrolments in the past two years (IT currently, 43 per cent; IPM currently, 45 per cent).

Of more concern is the sharp decline in the female participation rate in Information Systems. Between 1992 and 1998 there was a 13.6 per cent decline. However, the past two years have seen an improvement on this situation.

While Information Technology Unit 1 has experienced significant growth since its introduction in 1991, its tapering from 1999 may be explained by the growth of Vocational Education and Training (VET) programs offered in schools. This year there has been a 15 per cent increase in the number of students enrolled in certificate programs, which have affected enrolments in particular VCE studies.

Figure 2 shows Unit 1 enrolments as a proportion of English. As English is a compulsory VCE study, this is the best indication of the total size of the cohort.

At the units 3 and 4 level, enrolments have been increasing, as indicated in Figure 3. Again English enrolments are provided to indicate the size of the total cohort.

Of interest, is the significant increase in the number of students studying Information Systems from 1999–2000. A possible explanation is that the revised study introduced in 2000 is of more appeal to students, particularly females. Only one programming language is studied and there is a greater emphasis on systems engineering.
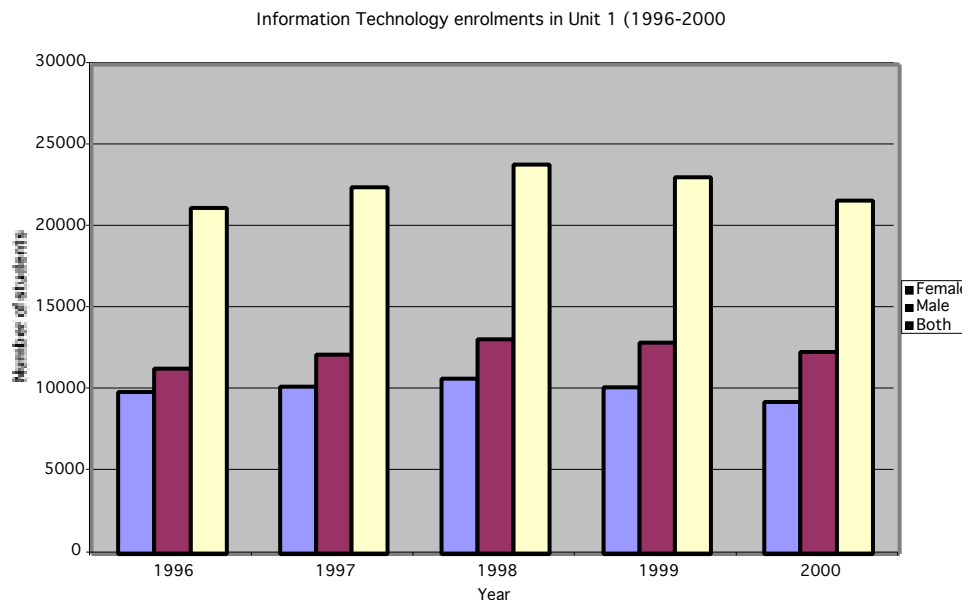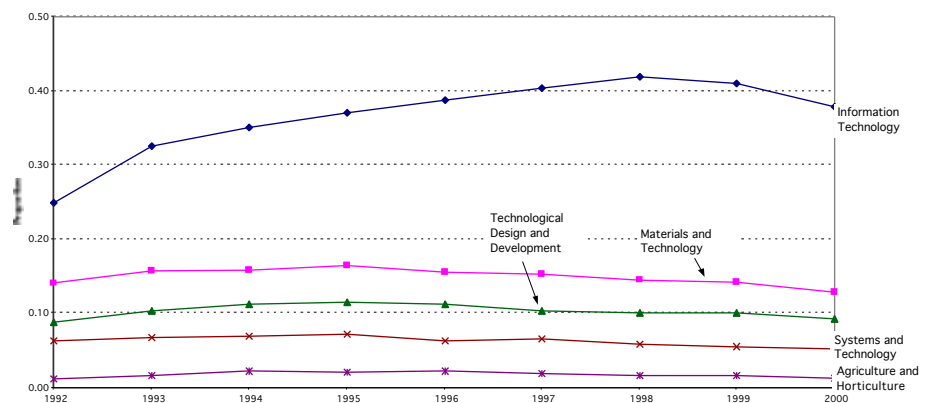

Information Technology enrolments in Unit 1 (1996-2000

Figure 1: Information technology enrolments in Unit 1

Figure 2: Enrolments in Unit 1 Information Technology shown as proportions of English

		1996	1997	1998	1999	2000
Information Processing & Management (Unit 3)	Female	6 290	6 166	6 402	6 416	6 564
	Male	6 174	6 435	7 105	7 478	7 965
	Both	**12 464**	**12 601**	**13 507**	**13 894**	**14 529**
English (Unit 3)		*47 347*	*47 266*	*47 450*	*48 170*	*48 869*
Information Systems (Unit 3)	Female	209	195	232	265	361
	Male	1 602	1 833	1 884	2 085	2 613
	Total	**1 811**	**2 028**	**2 116**	**2 350**	**2 974**

Figure 3: Enrolments in Unit 3: 1996–2000

The following table indicates the percentage change in enrolments 1992–1999. Information Technology has shown strong and sustained growth since 1992.

Study	Change % 92–99
Information Technology (Unit 1)	64.1
Information Processing & Management (Unit 3)	73.6
Information Systems (Unit 3)	58.5

Figure 4: Percentage change in enrolments in Information Technology, 1992–1999

UNIT DESCRIPTIONS

The study of Information Technology focuses on the processing data and the management of information to meet a range of individual and societal purposes. There are no prerequisites for entry to Units 1 and 2 and students may undertake all six units in the study.

Information Technology (Units 1 and 2)

As stated earlier, these units have been developed on the basis of a balanced approach to studying information technology. As a consequence, approximately equal emphasis is given to the three aspects of information technology: solving problem using information technology, learning about the technology, and examining the role of information technology in society. In all topics, students are required to solve problems containing different data types that require processing by a range of software tools. If students have completed Unit 1 without doing so, they must study at least one new software tool in Unit 2. In each of Units 1 and 2, students are required to demonstrate achievement of three outcomes, which are school assessed.

The areas of study and a summary of the outcomes for Unit 1 appear in table 1.

Contextually this unit is studied from the viewpoint of the users of information technology and information.

Unit 2 focuses on information systems: their components, their purposes and their effects. The applications and effects of information systems are studied from the viewpoint of the providers of information such as government departments, sports clubs, and businesses. The areas of study and a summary of the outcomes for Unit 2 appear in table 2.

Areas of study	Summary of outcomes
• Information technology techniques	• Develop a solution to an information problem that meets users' needs
• Information technology: applications and effects	• Explain why information technology is used in a particular setting and evaluate the impact of the information technology on its users
• Information technology tools: hardware and software.	• Investigate how information technology can produce information valued by its users.

Table 1.

Areas of study	Summary of outcomes
• Processing data and managing information	• Devise and implement a plan to coordinate the development and documentation of a solution that meets a provider's information needs
• Information systems	• Outline the purposes and technical features of a developing technology and explain some ethical considerations associated with its widespread application
• Impact and action.	• Explain how the use of an information system can cause conflict between its providers and users and present a course of action for minimising the extent of this conflict.

Table 2.

Information Processing and Management (IPM) (Units 3 and 4)

The units offered at this level, allow students to specialise in one of the three aspects of information technology. In this pair of units, students devote approximately 60 per cent of their time to the acquisition and demonstration of knowledge and skills required to solve information problems.

IPM focuses on how individuals, organisations and society use information, and how information systems are used to process and manage information. This entails identification and analysis of information needs or problems, and the design, development, implementation and evaluation of information technology solutions. In both units students develop an ability to use the diverse capabilities of some software tools. In Unit 3, one of two tools studied must be capable of producing a publication that can be published on the Internet. The focus is particularly on the components of information systems and how these components are managed to produce information that achieves particular requirements. In Unit 4, students can use either or both of the tools studied in Unit 3 to solve an information problem.

The areas of study and a summary of the outcomes for Unit 3 appear in table 3.

With respect to assessment, teachers use guidelines provided by the Board of Studies to assess these outcomes. The score gained by students in the pair of units contributes 50 per cent to their final assessment (25 per cent for each unit). This score is statistically moderated against the final examination, which is externally set and marked.

In addition to the usual requirement of solving information problems using a range of tools and techniques, students study in Unit 4, a range of techniques and procedures associated with managing changes to information systems and the effects of information technology applications on individuals, organisations and society. The areas of study and a summary of the outcomes for Unit 4 appear in Table 4.

Information Systems (Units 3 and 4)

Specialisation occurs in these units through the study of the structure, design and implementation of information systems. In keeping with the conceptual underpinnings of the other units, the use of a programming language for problem solving (software component of information systems) and the factors influencing the design of information systems and the study of the effects of these systems on individuals, organisations and society form the minor elements of this study.

Students are required to study one programming language, selected from a list provided annually by the Board of Studies. This language is studied in both units. Prior to 2000, students were required to study two languages: the informal feedback to date indicates that the new requirement is working well.

Assessment comprises two components: school-assessed coursework and an examination. As with IPM, school-assessed coursework contributes 50 per cent to final assessment, and the classroom teacher assesses it. For each outcome, optional assessment tasks are provided. Tasks must be completed mainly in class and within a limited timeframe. These same conditions apply to IPM. Within this new assessment regime, the final examination will cover all of the outcomes, excluding the program coding aspects of the relevant outcomes. For IPM, this exception relates to the use of computers to generate a solution. Previously, only specific aspects of units 3 and 4 were tested by examination.

Unit 3 is about information systems engineering, with a particular emphasis on the techniques and

Areas of study	Summary of outcomes
• Information processing	• Analyse an information problem and produce a solution that takes into account goals and information needs of an organisation
• Organisations and information	• Produce an electronic product for publication on the Internet and describe and evaluate the technical capabilities of the equipment used to produce and access the publication
• Information systems	• Propose and justify strategies to protect the value of information produced and communicated by an organisation

Table 3.

Areas of study	Summary of outcomes
• Problem solving	• Propose and apply organisational and processing strategies to produce a solution that meets current and future information needs
• Managing change	• Formulate and justify strategies for analysing, designing, implementing and evaluating an information system and predict likely consequences resulting from its implementation
• Issues and effects	

Table 4.

Areas of study	Summary of outcomes
• Information systems engineering	• Propose and justify a set of aims and objectives for an information system by applying a range of systems analysis tools and methods
• Information systems: applications and effects	• Explain and justify the detailed design of a proposed information system
• Tools: programming environments.	• Produce software module and verify its performance against the design specifications

Table 5.

Areas of study	Summary of outcomes
• Software development	• Apply program development principles to produce purpose-designed software that enables defined information system objectives to be achieved
• System platforms	• Propose and justify implementation and evaluation strategies for introducing a software tool to a networked information system
• Impact and action.	

Table 6.

> **"THE STUDY AND USE OF INFORMATION TECHNOLOGY IN THE VICTORIAN SECONDARY EDUCATION SYSTEM IS HIGHLY VALUED AND POPULAR.."**

procedures to analyse and design information systems to meet specific needs. The implementation and evaluation phases of information systems design are studied in depth in Unit 4.

The areas of study and a summary of the outcomes for Unit 3 appear in table 5.

Unit 4 focuses on how the hardware and software components of information technology are combined to form information systems. Exploration of the software components is achieved through the use of the programming language commenced for study in Unit 3. The minor studies involve the examination of some technical and human factors that need to be considered when implementing a system, and the effects of proposed information systems on individuals and organisations.

The areas of study and a summary of the outcomes for Unit 4 appear in table 6.

YEARS 8–10 PROGRAMS

The Curriculum and Standards Framework (CSF) describes what students should know and be able to do in the eight key learning areas (KLA). In the Technology KLA the major knowledge and skills are arranged in three main strands – Information, Materials, and Systems. At both the primary and secondary levels, all government schools are expected to provide students with the opportunity to demonstrate the learning outcomes in the Information strand.

The learning outcomes and indicators of this newly revised framework cover the standards component, (what students are able to do). Students are required to demonstrate two outcomes at each level (previously four outcomes).

Essentially one outcome focuses on a key concept related to that level, for example, at level 6 (typically years 9–10), students predict the likely uses and effects of a limited range of emerging technologies if they were to be widely applied. The other outcome focuses on the solving of information problems using a range of information technology skills, processes and equipment. For example, at level 5 (typically years 7–8), students justify, develop and modify preferred solutions to information problems to meet specific audience needs.

Embedded in this outcome are the phases of the technology process, which is the underpinning problem-solving methodology. In Victoria the phases of the technology process are:

- Investigating
- Designing
- Producing
- Evaluating.

Originally four outcomes existed at each level, one linked to each of these phases. While it was expected that these outcomes were viewed as a set, in practice

this was not always the case. Consequently many students were only producing solutions and output, with scant regard for the other process phases.

Diversity exists within schools as to how they deliver the Information strand program. Some schools opt for a specialised curriculum program that delivers the Information strand as a single subject. For others, the curriculum focus and outcomes are integrated within other strand offerings. Schools are free to make these decisions.

PROFESSIONAL SUPPORT

Professional support for teachers in this dynamic field is provided from a range of agencies in varying forms.

VCE support

The key agencies for supporting teachers in the delivery of the VCE are the Board of Studies and the subject association, the Victorian Information Technology Teachers Association (VITTA). The Board has provided, and continues to provide, a range of print, audio-visual (videos) and electronic material (CD-ROM) to assist teachers in the delivery and assessment processes. Teacher queries can be submitted via the Board's web site and regular updates are provided.

An extensive series of professional development programs has been conducted in 1999 and 2000 to prepare teachers for the implementation of the revised VCE studies. Some of these activities have been delivered by VITTA.

The subject association has been very active in its support of VCE teachers. Through its auspices a very active electronic community exists, particularly supporting the teachers of IPM and IS. The association's web site is a fertile source of materials, and its professional development programs are very well patronised.

Years 8–10 support

These years of schooling are supported by three main agencies: the Computers in Education Group of Victoria (CEGV), the Department of Education, Employment and Training (DEET), the Board of Studies.

CEGV provides a host of professional development activities, catering for both primary and secondary teachers. Of course in July this subject association is hosting the Australian Computer Education Conference in Melbourne. Printed material is regularly published that keeps teachers abreast of the latest technological and educational developments.

On a practical note, DEET, through its professional development programs Computers Across the Primary Curriculum, and Computers Across the Secondary Curriculum, reaches a very large number of teachers.

Electronically, DEET uses its web site as a medium for delivering a host of professional support material for teachers. In the near future a CD-ROM will be distributed that provides units of work to support the implementation of the revised Curriculum and Standards Framework.

The Board of Studies has provided on a CD-ROM and on its web site, a set of Information and Communications Technology charts that provide short examples of how the learning and assessment processes can be assisted through the use of technology in each of the KLAs. Printed charts are also available. Shortly, a set of software charts for the major software tools, identifying software functions typically associated with each level, will be electronically published.

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