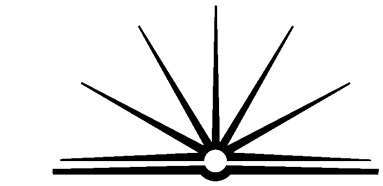

Information and Software Technology
Years 7–10

Syllabus

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1 Introduction

1.1 The K–10 Curriculum

This syllabus has been developed within the parameters set by the Board of Studies NSW in its *K–10 Curriculum Framework.* This framework ensures that K–10 syllabuses and curriculum requirements are designed to provide educational opportunities that:

- engage and challenge all students to maximise their individual talents and capabilities for lifelong learning
- enable all students to develop positive self-concepts and their capacity to establish and maintain safe, healthy and rewarding lives
- prepare all students for effective and responsible participation in their society, taking account of moral, ethical and spiritual considerations
- encourage and enable all students to enjoy learning, and to be self-motivated, reflective, competent learners who will be able to take part in further study, work or training
- promote a fair and just society that values diversity
- promote continuity and coherence of learning, and facilitate the transition between primary and secondary schooling.

The framework also provides a set of broad learning outcomes that summarise the knowledge, understanding, skills, values and attitudes essential for all students to succeed in and beyond their schooling. These broad learning outcomes indicate that students will:

- understand, develop and communicate ideas and information
- access, analyse, evaluate and use information from a variety of sources
- work collaboratively with others to achieve individual and collective goals
- possess the knowledge and skills necessary to maintain a safe and healthy lifestyle
- understand and appreciate the physical, biological and technological world and make responsible and informed decisions in relation to their world
- understand and appreciate social, cultural, geographical and historical contexts, and participate as active and informed citizens
- express themselves through creative activity and engage with the artistic, cultural and intellectual work of others
- understand and apply a variety of analytical and creative techniques to solve problems
- understand, interpret and apply concepts related to numerical and spatial patterns, structures and relationships
- be productive, creative and confident in the use of technology and understand the impact of technology on society
- understand the work environment and be equipped with the knowledge, understanding and skills to evaluate potential career options and pathways
- develop a system of personal values based on their understanding of moral, ethical and spiritual matters.

The ways in which learning in the *Information and Software Technology Years 7–10 Syllabus* contributes to the curriculum and to the student's achievement of the broad learning outcomes are outlined in the syllabus rationale.

In accordance with the *K–10 Curriculum Framework*, the *Information and Software Technology Years 7–10 Syllabus* takes into account the diverse needs of all students. It identifies essential knowledge, understanding, skills, values and attitudes. It enunciates clear standards of what students are expected to know and be able to do in Years 7–10. It provides

structures and processes by which teachers can provide continuity of study for all students, particularly to ensure successful transition through Years 5 to 8 and from Year 10 to Year 11.

The syllabus also assists students to maximise their achievement in Information and Software Technology through the acquisition of additional knowledge, understanding, skills, values and attitudes. It contains advice to assist teachers to program learning for those students who have gone beyond achieving the outcomes through their study of the essential content.

1.2 Students with Special Education Needs

In the K–6 curriculum, students with special education needs are provided for in the following ways:

- through the inclusion of outcomes and content in syllabuses which provide for the full range of students
- through the development of additional advice and programming support for teachers to assist students to access the outcomes of the syllabus
- through the development of specific support documents for students with special education needs
- through teachers and parents planning together to ensure that syllabus outcomes and content reflect the learning needs and priorities of students.

Students with special education needs build on their achievements in K–6 as they progress through their secondary study and undertake courses to meet the requirements for the School Certificate.

It is necessary to continue focusing on the needs, interests and abilities of each student when planning a program for secondary schooling. The program will comprise the most appropriate combination of courses, outcomes and content available.

Life Skills
For most students with special education needs, the outcomes and content in sections 6 and 7 of this syllabus will be appropriate but for a small percentage of these students, particularly those with an intellectual disability, it may be determined that these outcomes and content are not appropriate. For these students the Life Skills outcomes and content in section 8 and the Life Skills assessment advice below can provide the basis for developing a relevant and meaningful program.

Access to Life Skills outcomes and content in Years 7–10
A decision to allow a student to access the Information and Software Technology Years 7–10 Life Skills outcomes and content should include parents/carers and be based on careful consideration of the student's competencies and learning needs.

The decision should establish that the outcomes and content in sections 6 and 7 of the *Information and Software Technology Years 7–10 Syllabus* are not appropriate to meet the needs of the student. Consideration should be given to whether modifications to programs and to teaching, including adjustments to learning activities and assessment, would enable the student to access the syllabus outcomes and content.

As part of the decision to allow a student to access the Information and Software Technology Years 7–10 Life Skills outcomes and content, it is important to identify relevant settings, strategies and resource requirements that will assist the student in the learning process. Clear time frames and strategies for monitoring progress, relevant to the age of the student, need to be identified and collaborative plans should be made for future needs.

It is not necessary to seek permission of the Office of the Board of Studies for students to undertake the Information and Software Technology Years 7–10 Life Skills outcomes and content, nor is it necessary to submit planning documentation.

Life Skills assessment

Each student undertaking an Information and Software Technology Years 7–10 Life Skills course will have specified outcomes and content to be studied. The syllabus content listed for each outcome forms the basis of learning opportunities for students.

Assessment should provide opportunities for students to demonstrate achievement in relation to the outcomes and to generalise their knowledge, understanding and skills across a range of situations or environments including the school and the wider community.

Students may demonstrate achievement in relation to Information and Software Technology Years 7–10 Life Skills outcomes independently or with support. The type of support will vary according to the particular needs of the student and the requirements of the activity. Examples of support may include:

- the provision of extra time
- physical and/or verbal assistance from others
- the provision of technological aids.

2 Rationale

People can expect to work and live in environments requiring highly developed levels of computing and technological literacy. Current technologies are becoming obsolete at a rapid rate and new generations will need to be flexible to accommodate changes as they emerge. It is important that students learn about, choose and use appropriate information and software technology and develop an informed awareness of its capacities, scope, limitations and implications. Technological competence in the rapidly evolving area of information and software technology will require lifelong learning.

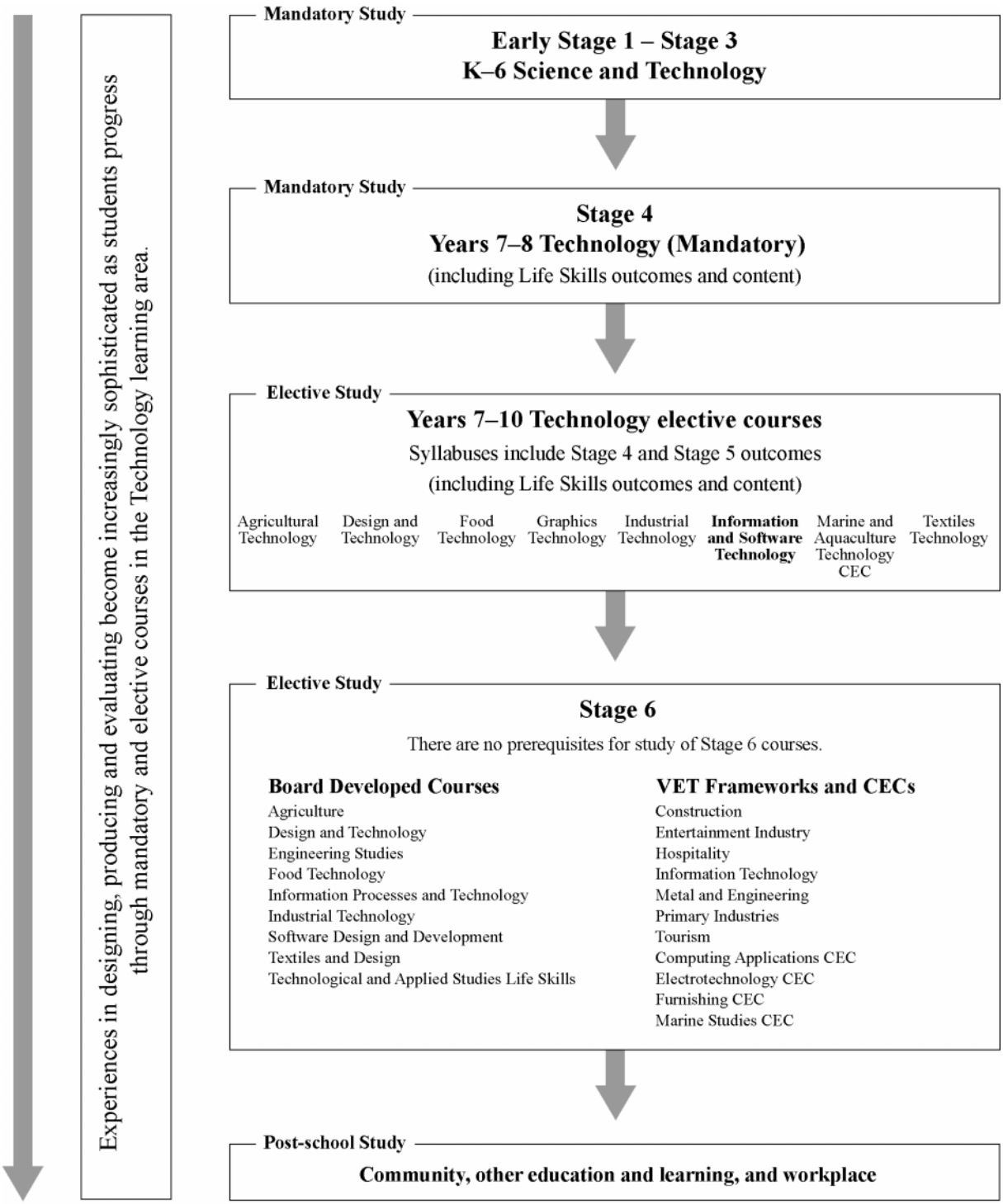
The study of Information and Software Technology Years 7–10 assists students to develop the knowledge, understanding and skills to solve problems in real life contexts. Through experiential and collaborative tasks, students engage in processes of analysing, designing, producing, testing, documenting, implementing and evaluating information and software technology-based solutions. Creative, critical and meta-cognitive thinking skills are developed through students' practical involvement in projects.

Core content of the *Information and Software Technology Years 7–10 Syllabus* provides students with specialised knowledge of past, current and emerging technologies, data, hardware, software and people involved in the field of information and software technology. The core also includes legal, ethical, social and industrial issues. Students develop information and software technology solutions through project work, individually and collaboratively. Options provide opportunities for the contextualisation of the core and allow choices of areas of interest to be made. Options include artificial intelligence, simulation and modelling, authoring and multimedia, database design, digital media, the Internet and website development, networking systems, robotics and automated systems, and software development and programming.

Information and Software Technology Years 7–10 is a course in which diverse aspects of a students' prior knowledge and skills can be brought together. Students will be given opportunities to build on information and communication technology (ICT) skills, when using and integrating application programs and hardware devices throughout the course. Through approaches such as modelling and prototyping, and other student-centred activities, students will develop knowledge and understanding of both practical and theoretical concepts of the course.

Participation in Information and Software Technology in Years 7–10 appeals to students through practical activities and their enjoyment of learning about and using computers. As a result of studying this course, students will be equipped to make appropriate use of and informed choices about information and software technology both at a personal level and in the workplace. Students will be prepared for future developments and directions in the exciting and challenging field of information and software technology. They can develop interest in, enjoyment of and critical reflection about information and software technology as an integral part of modern society.

3 The Place of the Information and Software Technology Years 7–10 Syllabus in the Technology K–12 Curriculum



4 Aim

The aim of the *Information and Software Technology Years 7–10 Syllabus* is to develop students' knowledge and understanding, confidence and creativity in analysing, designing, developing and evaluating information and software technology solutions.

5 Objectives

Knowledge, understanding, skills, values and attitudes
Students will develop:

1 knowledge and understanding of a range of computer software and hardware
2 problem-solving and critical thinking skills in order to design and develop creative information and software technology solutions for a variety of real-world problems
3 responsible and ethical attitudes related to the use of information and software technology
4 knowledge and understanding of the effects of past, current and emerging information and software technologies on the individual and society
5 effective communication skills and collaborative work practices leading to information and software technology solutions for specific problems.

6 Outcomes

Objectives Students will develop:	**Stage 4 Outcomes** A student:	**Stage 5 Outcomes** A student:
1 knowledge and understanding of a range of computer software and hardware	4.1.1 recognises and uses software programs that are suitable for specific tasks 4.1.2 identifies and demonstrates appropriate use of a range of hardware	5.1.1 selects and justifies the application of appropriate software programs to a range of tasks 5.1.2 selects, maintains and appropriately uses hardware for a range of tasks
2 problem-solving and critical thinking skills in order to design and develop creative information and software technology solutions for a variety of real-world problems	4.2.1 identifies and uses problem-solving processes when creating solutions 4.2.2 designs, produces and evaluates appropriate solutions to a range of problems 4.2.3 justifies decisions made when creating information and software technology solutions	5.2.1 describes and applies problem-solving processes when creating solutions 5.2.2 designs, produces and evaluates appropriate solutions to a range of challenging problems 5.2.3 critically analyses decision-making processes in a range of information and software solutions
3 responsible and ethical attitude related to the use of information and software technology	4.3.1 uses ethical practices when dealing with information and software technology 4.3.2 describes ethical practices used when dealing with data and information	5.3.1 justifies responsible practices and ethical use of information and software technology 5.3.2 acquires and manipulates data and information in an ethical manner
4 knowledge and understanding of the effects of past, current and emerging information and software technologies on the individual and society	4.4.1 describes a range of past, current and emerging information and software technologies	5.4.1 analyses the effects of past, current and emerging information and software technologies on the individual and society

Objectives Students will develop:	**Stage 4 Outcomes** A student:	**Stage 5 Outcomes** A student:
5 effective communication skills and collaborative work practices leading to information and software technology solutions for specific problems	4.5.1 identifies the benefits of collaborative work practices when completing a task	5.5.1 applies collaborative work practices to complete tasks
	4.5.2 documents ideas and solutions for targeted audiences	5.5.2 communicates ideas, processes and solutions to a targeted audience
	4.5.3 identifies key roles and responsibilities of people in the field of information and software technology	5.5.3 describes and compares key roles and responsibilities of people in the field of information and software technology

Stage 4 outcomes have been provided to assist the assessment and reporting of student achievement in those schools that choose to begin elective study before Year 9. Teachers are advised to select from the syllabus content to target the specific needs of students who commence study in Stage 4.

Life Skills

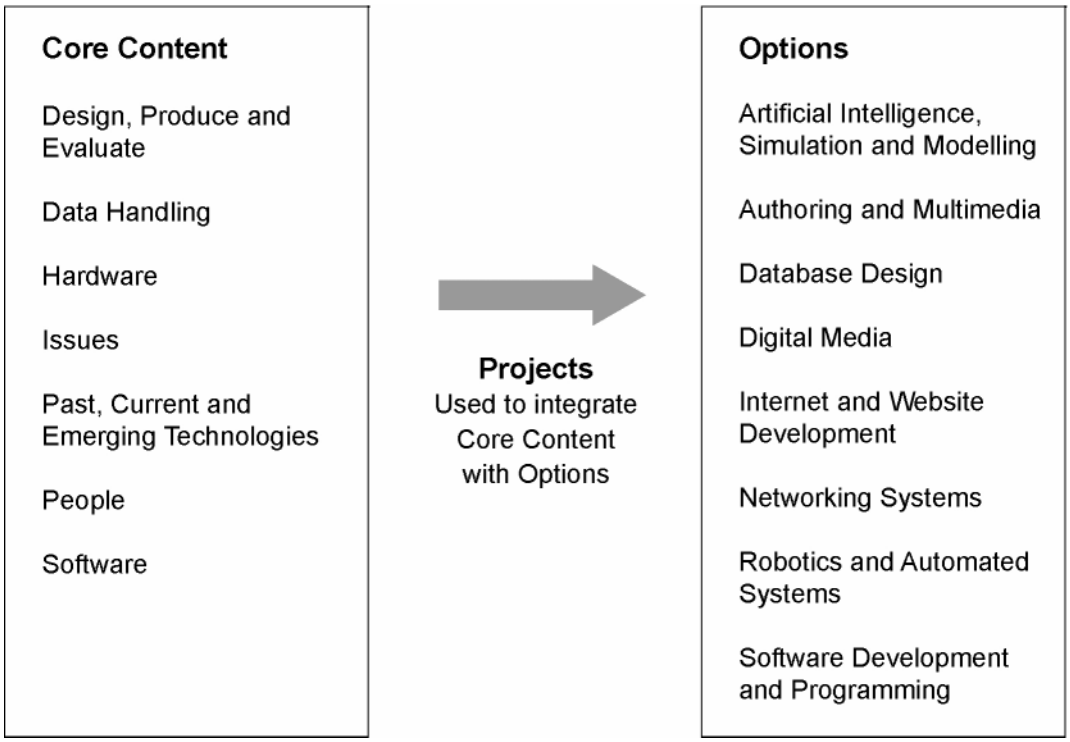
For some students with special education needs, particularly those students with an intellectual disability, it may be determined that the above outcomes are not appropriate. For these students, Life Skills outcomes and content can provide the basis for the development of a relevant and meaningful program – see section 8.

7 Content

7.1 Organisation of Content

There are no prerequisites for the study of Information and Software Technology Years 7–10. It is an elective course which builds upon the knowledge, skills and experiences developed in the *Technology (Mandatory) Years 7–8 Syllabus* and through Information and Communication Technologies (ICT) content embedded across the curriculum.

This course integrates the study of core content within the context of options delivered through projects. The following diagram shows how the content is organised.



Course Structure
Information and Software Technology Years 7–10 may be studied as a 100-hour or as a 200-hour course. Not all the core content needs to be addressed in each project, but when creating a program of study for either course, all the content of the core and selected options will be addressed through projects over the duration of the course.

In a 100-hour course, students must be introduced to all core content within the study of a minimum of two options. Students will complete a minimum of two and a maximum of four projects.

Students undertaking a 200-hour course must complete all core content within the study of a minimum of four options. Students are expected to complete a minimum of four and a maximum of eight projects that provide increasingly sophisticated knowledge, understanding and skills related to the core content.

Essential content

Core

The core content cannot be taught in isolation: it must be integrated with options in the form of projects. Options should be planned to allow all of the core to be taught over the course of study. The core is divided into the following areas:

- Design, Produce and Evaluate
- Data Handling
- Hardware
- Issues
- Past, Current and Emerging Technologies
- People
- Software.

Options

Options allow for the integration and application of the core content. Teachers should select options that use school resources and consider student interest, teacher expertise and local community resources. The options are:

- Artificial Intelligence, Simulation and Modelling
- Authoring and Multimedia
- Database Design
- Digital Media
- Internet and Website Development
- Networking Systems
- Robotics and Automated Systems
- Software Development and Programming.

Projects

Projects include organised series of activities to design, produce and evaluate information and software technology solutions for an identified need or problem. The content for projects focuses on problem-solving, generating ideas, modelling, managing, communicating, collaborating and evaluating solutions. The project should be relevant to student needs and interests and address real-world problems. Content may be delivered in a variety of ways within the context of projects. It is not required that all learning be independent.

Documentation is used as a tool for student learning. It provides a means of recording the student's solution development and reflection.

Additional content

Additional content is provided within each option. It provides opportunities for students to broaden, deepen and extend their learning. Teachers may develop their own additional content based on interest and resources available within their community.

Life Skills

Life Skills outcomes and content are in section 8.

Cross-curriculum Content

Cross-curriculum content assists students to achieve the broad learning outcomes defined in the Board of Studies *K–10 Curriculum Framework*. It is incorporated in the content of the *Information and Software Technology Years 7–10 Syllabus* in the following ways:

Information and Communication Technologies (ICT)

ICT skills are fundamental to and provide an introduction to the study of the Information and Software Technology syllabus. Relevant ICT skills and applications have been addressed in the syllabus including:

- word processing
- databases
- spreadsheets
- multimedia/presentations
- graphics
- electronic communications and research
- hardware and software management.

Work, Employment and Enterprise

In all aspects of the course students study appropriate industry standards and work practices. Students gain an understanding of specific career opportunities related to information and software technology. Technical literacy is integral to the study of the course, preparing students with an understanding of and skills in the use of software and hardware devices. Problem-solving, workplace communication, collaborative work practices, occupational health and safety issues are embedded in the syllabus.

Aboriginal and Indigenous

All students of Information and Software Technology are encouraged to become confident and skilled users of technology. In all core and option modules the syllabus considers the importance of accessing technologies by different cultural groups in the community, including Aboriginal and Indigenous students. The issue of cultural inclusiveness and the impact of information and software technology on Indigenous groups is explored.

Civics and Citizenship

The collaborative work practices in the core content foster in students a sense of identity and establish a community in the learning environment. This enables students to contribute meaningfully to society. The Information and Software Technology course promotes ethical considerations in the development of information and software technology solutions.

Difference and Diversity

The *Information and Software Technology Years 7–10 Syllabus* provides opportunities for all students to develop an appreciation of the contributions of others and an acceptance of a variety of views and opinions. These are fostered through feedback activities and peer evaluations of individual and collaborative project work.

Environment

Students develop an understanding of the effects of emerging technologies on the individual, society and the environment and consider the recyclability of obsolete technologies.

Gender

All students are encouraged to become confident, proficient and responsible users of information and software technology. A broad range of options is included to cater for all student needs and interests, and the syllabus promotes the integration of core, project work and option areas so that teachers have sufficient flexibility as they develop programs to cater for the needs and interests of all students. The core study of *people* allows students to examine the contribution of females and males and to critically analyse possible stereotypes. In addition, the study of *issues* focuses on Equity and Equal Opportunity principles and their

application to equitable work practices in information and software technology industries. Students will explore career opportunities and pathways for females and males.

Key Competencies

The syllabus provides a structured context within which to develop the key competencies considered essential for the acquisition of higher-order thinking skills. Students learn to:

- ***collect, analyse and organise*** data and information
- ***communicate ideas and information*** in a variety of hard copy and electronic forms to specific target audiences
- plan, prepare and present individual and group project work, developing competence in ***planning and organising activities***
- cooperate with individuals and groups in structured and informal learning activities to develop competence in ***working with teams***
- design, develop and present solutions to specific information technologies, developing competence in ***solving problems***
- ***use mathematical ideas and techniques*** when conducting calculations in databases and spreadsheets, algorithm data representation and binary notations
- engage with a variety of software and hardware when developing competence in ***using technology***.

Literacy

The syllabus encourages and reinforces literacy strategies, especially the development of technical and technological literacy. Students communicate their ideas and solutions to problems in oral, written and graphical forms.

Across the Years 7–10 curriculum there are other areas of cross-curriculum content that all students will experience through the mandatory curriculum. The additional areas of cross-curriculum content are Multicultural and Numeracy.

7.2 Content for Years 7–10

Core

Core Topic 1: Design, Produce and Evaluate

Outcomes
A student:
5.2.1 describes and applies problem-solving processes when creating solutions
5.2.2 designs, produces and evaluates appropriate solutions to a range of challenging problems
5.2.3 critically analyses decision-making processes in a range of information and software solutions
5.3.1 justifies responsible practices and ethical use of information and software technology
5.3.2 acquires and manipulates data and information in an ethical manner
5.5.1 applies collaborative work practices to complete tasks
5.5.2 communicates ideas, processes and solutions to a targeted audience
5.5.3 describes and compares key roles and responsibilities of people in the field of information and software technology.

Students learn about:	**Students learn to:**
Defining and analysing the problem	
• identification of need or problem to be solved	• identify the need or problem to be solved
• factors that impact on problem solving: – technical such as hardware – operational – financial – ethical	• analyse the problem and a range of possible solutions • identify and analyse the factors that may impact on the solution
Designing possible solutions using techniques such as	
• concept mapping	• generate ideas using a range of methods
• brainstorming	• apply set criteria to choose the most appropriate software solution
• observation	• develop a storyboard of ideas and/or solutions
• research	• use electronic communication to research data and information relevant to solutions
• prototyping	• summarise research data when generating creative solutions
• input/processes/output table	• model possible solutions using a range of methods
• storyboarding	• evaluate the suitability of solutions by testing and experimenting • examine, evaluate and modify existing solutions
Producing solutions	
• producing the solution	• develop and implement the stages involved in the completion of a solution • apply set criteria to choose the most appropriate solution

Students learn about:	**Students learn to:**
Evaluation criteria	
• functionality of solution • quality of information such as – accuracy – relevance – integrity – timeliness • ethics • environment	• establish criteria for the evaluation of solutions • evaluate solutions using established criteria
Methods of evaluation	
• individual • groups such as peer, end user, specific target group	• use feedback evaluation in order to modify solutions • reflect upon and document feedback
Management	
• planning • resources such as – time – finances – people	• apply management plans and techniques
Communication techniques including	
• verbal • written • graphical and visual	• document decision-making and problem-solving in the development of solutions • outline a range of communication techniques appropriate to the solution • communicate ideas, processes and solutions to a targeted audience
Collaboration and group work	
• criteria for group formation such as expertise and group dynamics • roles and responsibilities of group members • effective collaboration strategies	• identify and negotiate roles and responsibilities of group members • establish and use strategies for effective collaboration • outline and reflect on the benefits/advantages of collaboration during group work • evaluate individual and group contributions to the project • apply collaborative work practices when developing solutions

Core Topic 2: Past, Current and Emerging Technologies

Outcome 5.4.1:	A student analyses the effects of past, current and emerging information and software technologies on the individual and society.
Students learn about:	**Students learn to:**
• the impact of past, current and emerging information and software technologies on the individual and society including different cultural groups such as Aboriginal and Indigenous	• explore and discuss current information and software technologies relevant to the option • identify a variety of past, current and emerging information and software technologies • evaluate the appropriateness of current and emerging information and software technology for specific purposes
• environmental considerations such as: – disposal of obsolete technologies – recycling	• assess the effects of past, current and emerging information and software technologies on the individual, society and the environment in the context of the chosen options

Core Topic 3: Data Handling

Outcome 5.3.2:	A student acquires and manipulates data and information in an ethical manner.
Students learn about:	**Students learn to:**
Data and information	
• importance of information to society, particularly in electronic form	• define and compare data with information • explain the process of deriving information from data and apply the process to a given scenario
Data forms	
• analogue • digital	• convert data between analogue and digital forms
Data coding such as	
• decimal and binary • ASCII	• describe and compare coding methods • perform simple calculations on data coding
Data sources such as	
• books • internet • magazines • journals	• acquire, manipulate and acknowledge data and information in solving a specific problem • analyse a case study to observe ethical practice in the use of data and information
Data types such as	
• text and hypertext • graphics	• describe and manipulate data types for a range of purposes

Students learn about:	**Students learn to:**
• audio • video • animation	
Data transmission types	
• serial • parallel	• define transmission types • investigate the advantages and disadvantages of serial and parallel transmission methods
Data storage and function	
• primary storage such as RAM and ROM • secondary storage such as random and sequential access	• contrast primary and secondary memory • describe the functions of primary and secondary memory • select and use the appropriate data storage media for a given situation in an ethical manner
• secondary storage media such as tape, disk and optical media • bits and bytes such as kilobytes, megabytes, gigabytes and terabytes • file types	• state the reasons for the range of data storage and media formats • discuss the units used when measuring data storage • recognise file extensions and their use within chosen options
Data compression techniques	
• lossy • lossless	• explain the purpose of data compression techniques • perform data compression on a file
Data security	
• need for data security • basic security methods	• explain the reasons why data needs to be secured • compare and contrast basic security methods used to protect data

Core Topic 4: Hardware

Outcomes A student: 5.1.2 selects, maintains and appropriately uses hardware for a range of tasks 5.3.1 justifies responsible practices and ethical use of information and software technology.	
Students learn about:	**Students learn to:**
Functions that hardware performs	
• input • process • output	• describe and classify hardware devices • identify and use hardware devices in the context of the chosen option

Students learn about:	**Students learn to:**
• storage • control	
Hardware components	
Components of a hardware system and their functions such as • motherboard • central processing unit (CPU) • coprocessor chips • memory: random access memory (RAM), read only memory (ROM) • hard disk • controller cards • graphics adapter cards • power supply • expansion slots • bus lines • input/output ports • display	• examine a hardware system and identify the components and their functions
Microprocessors such as those found in • cameras • digital watches • monitoring devices	• identify and describe the use of microprocessors in a range of devices
Classification of computer hardware systems according to capabilities	• devise criteria for the classification of computer hardware systems
Hardware solutions	
• developing hardware solutions – defining the problem – designing a solution – evaluating a solution	• apply an approach to develop hardware solutions • apply set criteria to choose the most appropriate hardware solution • select and use hardware to solve a problem • evaluate the suitability of hardware devices for particular solutions
Troubleshooting	
• working through hardware problems	• identify simple operating faults using a computer manual • perform safe troubleshooting procedures when dealing with hardware problems
Care and maintenance of hardware systems	• develop basic procedures for the care and maintenance of hardware

Core Topic 5: Issues

Outcome 5.3.1:	A student justifies responsible practice and ethical use of information and software technology.
Students learn about:	**Students learn to:**
Legal issues such as	
• copyright and/or licensing • piracy • intellectual property • security and protection including viruses • legislation such as Anti-discrimination, Equal Employment Opportunity, Occupational Health and Safety	• examine legal issues as they apply to the development of information and software technology solutions
Ethical issues such as	
• code of practice and conduct • privacy and security	• research and report on ethical issues relating to the development of information and software technology solutions
• inappropriate use including hacking	• identify the ethical responsibilities of software users
• accuracy, validity and bias of data	• examine and judge the accuracy, validity and bias of data and information
Social issues such as	
• the changing nature of work and enterprise such as employment, telecommuting, virtual office, video conferencing	• contrast the nature of work in the information and software technology industry, past and present
• equity, access and control for all users with respect to gender, disability, and culture including Aboriginal and Indigenous	• examine and discuss equity and cultural inclusiveness in the information and software technology industry • explore the impact of cybercultures on perceptions of gender
Industrial issues such as	
• rights and responsibilities of users of Information and Software Technologies	• identify rights and responsibilities of users of Information and Software Technologies
• ergonomic principles and industry standards	• identify ergonomic principles and industry standards • recognise ergonomically unsound practices

Core Topic 6: People

Outcome 5.5.3:	A student describes and compares key roles and responsibilities of people in the field of information and software technology.
Students learn about:	**Students learn to:**
Roles and responsibilities of people working in the information and software technology field such as • project manager • data entry operators • systems analyst • users • technicians such as repair, maintenance • multimedia specialists • software engineers • support staff such as help desk • training specialists • programmers	• describe key roles within the information and software technology field and critically analyse possible role stereotypes • examine the contribution of people to the field of information and software technology • examine roles of people working in the field of information and software technology
Careers in information and software technology • career paths	• explore career opportunities and pathways for people within the field of information and software technology • discuss the use of information technology skills across industry and for self employment

Core Topic 7: Software

Outcomes A student: 5.1.1 selects and justifies the application of appropriate software programs to a range of tasks 5.2.2 designs, produces and evaluates appropriate solutions to a range of challenging problems.	
Students learn about:	**Students learn to:**
Software systems • the purpose of a software system	• define and describe a software system • explain the purpose of a software system
Types and examples of software • system including – operating – utility	• distinguish between types of software • select and justify the use of software for a given situation

Students learn about:	**Students learn to:**
• application including – customised	• compare and contrast the features of packages, including relationships to other packages • list the features of software packages appropriate to particular users and a range of tasks
Factors affecting hardware requirements such as • central processing unit (CPU) speed • demands on memory • communication and peripheral devices	• discuss how software packages affect hardware requirements • calculate memory requirements for specific purposes
Interface design • the function of the user interface • interactivity with the user • communication with application and operating systems	• explain the function of the user interface • compare and contrast types of user interfaces
Features and elements of a graphical user interface (GUI) such as • consistency of elements • functionality • navigation • radio buttons, list boxes • borders and white space • instructions to the user • inclusive design factors	• explain the features and elements of GUI in a range of applications • design, produce and manipulate features of GUI • establish the criteria for the evaluation of GUI • evaluate the effectiveness of GUI features and elements for a specific purpose

Options

Option 1: Artificial Intelligence, Simulation and Modelling

This option involves students making decisions in order to solve real-world applications. Students experience the use of an expert system as well as neural network application and are able to compare the two methods for solving problems. Students have the opportunity to manipulate variables in a simulation program in order to observe trends and subsequent results. Models can be related to generate solutions to real-world problems.

Outcomes
A student:
5.2.1 describes and applies problem-solving processes when creating solutions
5.2.2 designs, produces and evaluates appropriate solutions to a range of challenging problems
5.2.3 critically analyses decision-making processes in a range of information and software solutions.

Students learn about:	**Students learn to:**
Artificial intelligence	
• definition of intelligence and artificial intelligence	• define and describe artificial intelligence
• historical perspective of artificial intelligence	• investigate the work of pioneers of artificial intelligence, for example Alan Turing
Areas of artificial intelligence such as:	
• intelligent systems • knowledge bases • demons • agents • expert systems • neural networks	• identify a range of intelligent systems including games • examine a range of expert systems • explore and contrast the uses for demons, agents, expert systems, neural networks and knowledge bases • investigate the creation of an expert system shell for a particular purpose
Requirements of artificial intelligence	
• software • hardware	• research the requirements of artificial intelligence for a range of situations
Modelling and simulations	
• definition of a model and a simulation	• define and describe models and simulations
• purposes of models and simulations	• investigate the purposes for models and simulations in a range of situations

Students learn about:	**Students learn to:**
Requirements of models and simulations such as	
• hardware needs such as speed, storage • simulators such as flight, driving	• examine the hardware needs for operating simulation programs
• software requirements including languages	• explore a range of simulations • identify software requirements for models and simulations
Project development	
• processes and techniques	• design, produce and evaluate a simple project for a real-world application either separately for this option, or integrated with other options
Advantages and limitations of models and simulation programs for:	
• predictions such as global warming, ozone layer changes • trial situations such as weather forecasting	• investigate the use of educational simulations and games • propose advantages and limitations of simulation and modelling programs • investigate and evaluate predictions and trial situations that used model and simulation programs
Using model and simulation programs	
• variables to ensure accuracy • spreadsheets	• examine a range of simulation programs and describe how variables are adjusted to ensure accuracy
• what-if predictions for spreadsheets such as goal seek and look ups	• use spreadsheets to make predictions • critically analyse the effectiveness of spreadsheets when solving a problem for a particular situation

Additional Content	
Students learn about:	**Students learn to:**
• spreadsheet design	• design, produce and evaluate a predictive spreadsheet including macros for a specified situation
• simulation software	• examine and explain the operation of selected simulation software

Option 2: Authoring and Multimedia

This option provides an opportunity for project development in multimedia. It will allow students to develop skills using authoring software in developing multimedia products. The project should incorporate three data types into a multimedia product controlled by a computer.

Outcomes
A student:
5.2.1 describes and applies problem-solving processes when creating solutions
5.2.2 designs, produces and evaluates appropriate solutions to a range of challenging problems
5.2.3 critically analyses decision-making processes in a range of information and software solutions.

Students learn about:	**Students learn to:**
Multimedia products for areas such as	
• education	• define and describe the types of multimedia products
• entertainment	• assess the effectiveness of a range of multimedia products
• information	• recognise the integrated nature of multimedia products
Data types	
• commonly used in multimedia products	• recognise features of data types for multimedia products
• features of data types imported to multimedia products	• describe the processes of acquiring and/or capturing, manipulating, storing, displaying and distributing data types
Authoring software systems	
• the combining of data types into a multimedia presentation using existing application products such as HyperStudio and Macromedia software	• discuss advantages and limitations of authoring software • justify the selection of the authoring software to be used for the multimedia product
Project development	
• processes and techniques	• design, produce and evaluate a simple project for a real-world application either separately for this option, or integrated with other option/s
• GUI design for the multimedia product	• apply interface design features used for the production of the multimedia product
• design principles including layout and balance of data types	• examine and analyse design principles used in a range of multimedia products • create a storyboard and script

Additional Content

Students learn about:	**Students learn to:**
• innovation in a selected data type such as animation	• research in detail a data type and produce an original product

Option 3: Database Design

Students are presented with a scenario from which they need to design and produce a solution. Outputs of the system will be considered, data will be entered and manipulated through searches and sorts, and reports will be generated.

Outcomes

A student:

5.2.1 describes and applies problem-solving processes when creating solutions

5.2.2 designs, produces and evaluates appropriate solutions to a range of challenging problems

5.2.3 critically analyses decision-making processes in a range of information and software solutions.

Students learn about:	**Students learn to:**
Database development	
• purpose of a database	• define and describe a database
• components of a database	• explain the purpose of a database
• inputs of a database	• describe the relationships between a database, file, record, field and data, character
• outputs of a database: reports, forms, data/information	• list input data
• data types required to solve a problem	• identify outputs when designing a database • create a data dictionary to illustrate and describe data types
Collecting, organising and storing data	
• sources of data to solve a problem	• document and acknowledge data sources
• database storage on a storage medium considering file size, portability and updatability	• use validation and verification checks on the data for a database
• validation and verification checks of data	• input data and store for a given problem
Methods of processing and analysing data	
• editing, searching, sorting records • mathematical calculations	• construct query searches and sorts on given data • edit existing fields and records within a database • design and perform calculations on data • create macros to perform repetitive tasks
Methods of presenting information	
• presentation of reports: header, body text, footer	• prepare a range of report layouts for presentation
• report layouts	• create an effective design for database form
• design features on forms and reports	

Students learn about:	**Students learn to:**
Integration	
• importing from existing electronic data	• import data, such as a graphic element, from a different source
• exporting data for other uses	• create a mail merge from stored data
Project development	
• processes and techniques	• design, produce and evaluate a simple project for a real-world application either separately for this option, or integrated with other options

Additional Content	
Students learn about:	**Students learn to:**
• expert systems	• research and report on a database system incorporating an expert system

Option 4: Digital Media

This option examines and analyses different digital media products and their uses across a variety of contexts. It allows students to develop skills in the design and production of a digital media product of at least two data types.

Outcomes
A student:
5.2.1 describes and applies problem-solving processes when creating solutions
5.2.2 designs, produces and evaluates appropriate solutions to a range of challenging problems
5.2.3 critically analyses decision-making processes in a range of information and software solutions.

Students learn about:	**Students learn to:**
The purpose of digital media such as	
• e-music • digital newspaper • interactive TV • games	• define digital media • assess the effectiveness of a range of digital media products
Types of digital media products such as	
• desktop publishing magazine, newspaper • graphical design • audio sequences • musical compositions • animation sequences • video production	• describe a range of digital media • select and use appropriate file formats for the digital media product
Data types for digital media products such as	
• used in specific digital media products	• recognise and select data types used in digital media products • produce samples of work for a range of data types • describe how data types combine to produce and enhance a digital media product
Manipulation techniques such as	
• cropping, rendering, special effects, time coding, sampling • morphing, tweening	• manipulate data types for specific digital media products
Digitisation process of data types such as	
• frame grabbing • scanning • bit mapping • optical character recognition (OCR)	• explain the digitisation process for a selected data type • digitise selected data types using appropriate hardware

Students learn about:	**Students learn to:**
Factors affecting file size such as	
• memory size • processing speed • colour palette • compression • sampling rate • frames per second	• discuss factors that affect file size • describe factors affecting file size and observe the effects on the digital media
Display and distribution	
• considerations including mode of delivery and intended audience	• examine display and distribution considerations for the digital media product • select and deliver the digital media product for a targeted audience
Project development	
• processes and techniques	• design, produce and evaluate a simple project for a real-world application either separately for this option, or integrated with other options

Additional Content	
Students learn about:	**Students learn to:**
• evaluation of digital media products	• critically analyse a range of digital media products based on identified evaluation criteria

Option 5: The Internet and Website Development

Students undertake a study of the historical development of the internet. Tools and uses of the internet are explored particularly in the area of the World Wide Web. Students manipulate tools to design, produce and evaluate a website for a given purpose.

Outcomes
A student:
5.2.1 describes and applies problem-solving processes when creating solutions
5.2.2 designs, produces and evaluates appropriate solutions to a range of challenging problems
5.2.3 critically analyses decision-making processes in a range of information and software solutions.

Students learn about:	**Students learn to:**
The internet	• define and describe the internet
Historical perspective of the internet	• identify and discuss key historical events for the internet by developing a timeline
Intranet	• examine the features of a school or other intranet
	• compare and contrast an intranet with the internet
Uses of the internet such as	
• email	• email a file to a set location
• research	• describe email etiquette
• chatting	• research using the internet for a given task
• messaging	• assess the use of the internet for communication in a variety of situations
• access to information via search engines	• use search engines to undertake internet research
	• discuss the advantages and limitations of search engines
Internet software such as	
• browser software • authoring software	• describe and use a range of internet software packages
Types of protocols such as	
• transmission control protocol/internet protocol (TCP/IP) • hypertext transfer protocol (http) • simple mail transfer protocol (smtp) • file transfer protocol (FTP)	• identify the types of protocols used over the internet and describe their purpose

Students learn about:	**Students learn to:**
World Wide Web (www)	
• information medium for the dissemination of information	• discuss the purpose of the World Wide Web
• interactive medium	• examine the features and strategies used in the design of a range of websites
	• critically analyse the effectiveness of a website to convey its message
Control of access to information on the web such as	
• cookies • security content • proxies • firewalls • virus protection	• identify and discuss settings for web browsers as well as settings for information access and the protection of data
Website development	
• home page (index page) • website	• identify a home page within a website
Features of a website such as	
• address • GUI design • graphics • links (hot words, hot spots) • tables	• investigate a website and identify the features • use a variety of features when designing and building a website • develop a website for a particular task or purpose
Project development	
• processes and techniques	• design, produce and evaluate a simple project for a real-world application either separately for this option, or integrated with other options

Additional Content	
Students learn about:	**Students learn to:**
Interactive web-based projects	• design and produce a web-based project such as webquest for a selected topic
	• evaluate the effectiveness of a web-based project
Collaborative projects	• register online and participate in a collaborative project in an area of interest

Option 6: Networking Systems

This option introduces the nature of networking systems. File management, users and groups for any operating system are investigated. Students gain hands-on experience with setting up servers and protocols in a networked environment.

Outcomes
A student:
5.2.1 describes and applies problem-solving processes when creating solutions
5.2.2 designs, produces and evaluates appropriate solutions to a range of challenging problems
5.2.3 critically analyses decision-making processes in a range of information and software solutions.

Students learn about:	**Students learn to:**
A communications network	
• nature and role	• describe the nature and role of a communications network
• advantages and disadvantages of a communication network such as – sharing of peripheral devices – application programs – data – security of information – access to databases	• discuss the advantages and disadvantages of establishing a network
Protocols such as	
• TCP/IP	• define and describe the purpose of a protocol
• IPX/SPX	• identify and describe types of protocols
• netbui	
• appletalk	
Data transmission modes	
• simplex	• recognise different modes of transmission
• half duplex	
• full duplex	
Data transmission rates	
• baud rates	• discuss and compare the methods used to measure transmission rates
• bits per second	
Data transmission media	
• wire	• examine the range of media for data transmission
• wireless	

Students learn about:	**Students learn to:**
Types of networks such as	
• Local Area Network (LAN)	• design a small network of at least two workstations to allow for file sharing
• Wide Area Network (WAN)	• graphically represent a LAN or WAN using ICT such as graphics software
• Virtual Private Network (VPN)	• explain the school communications link to the outside world
Client server and peer-peer networks	• compare a client/server network with a peer-peer network
Components of networks such as	
• servers-file sharing servers • print servers • mail servers • workstations • hubs • switches • routers • gateways • repeaters • bridges • network interface card	• describe and compare servers for a particular network • download and upload files to a host • describe the purpose of network connectivity devices
Security of information	
• storage • backup • security	• describe the appropriateness of different storage media including backup requirements • discuss the implications of storage and backup techniques • investigate a range of security techniques that apply to networks
Network topologies including	
• star • ring • bus	• graphically illustrate network topologies • critically analyse a given network topology for a particular situation
Network operating systems	
• purpose	• recognise the purpose of a network operating system software
• management such as establishing users and groups users and groups, security permissions and policies and profiles, use of compression technology	• examine and describe the network operating system in a given situation • discuss effective network management strategies

Students learn about:	**Students learn to:**
Factors influencing media transmission such as • cost • distance • extension limitations such as the number of nodes and sustainability	• assess the impact of factors influencing the choice of transmission media
Project development • processes and techniques	• design, produce and evaluate a simple project for a real-world application either separately for this option, or integrated with other options

Additional Content	
Students learn about:	**Students learn to:**
Peer-peer network	• assemble a simple peer-peer communication system
Setting up a LAN	• design and construct an intranet • evaluate the performance of a given network in terms of bandwidth, speed of device and cables • propose industry links with networking organisations

Option 7: Robotics and Automated Systems

This option provides the possibility to design, produce and evaluate a range of projects based around automated control, from traffic lights to computer assembly and probes to other planets. It allows students the opportunity to explore a range of automated systems and robots.

Outcomes
A student:
5.2.1 describes and applies problem-solving processes when creating solutions
5.2.2 designs, produces and evaluates appropriate solutions to a range of challenging problems
5.2.3 critically analyses decision-making processes in a range of information and software solutions.

Students learn about:	**Students learn to:**
Robotics	
• definition of robots and robotics	• define and describe robots and robotics
• historical perspective of robotics	• investigate the image of robots from Hollywood and the scientific community
• the contribution of Asimov to the concept of robots, leading to the Laws of Robotics	• examine the work of Asimov and discuss the concept of the Laws of Robotics
Types of robots	
• industrial such as a welding arm • domestic such as toys	• develop and conduct a study of industrial and domestic robots
Purpose of robots including	
• repetitive or dangerous tasks • operating in remote locations	• explain the purpose of robots and the roles they perform
Use of robots such as	
• exploration • assembly	• investigate and evaluate the use of robots in a range of situations
• maintenance and repair	• design and construct a robot for a particular purpose
Function of robots	
• technical aspects of robotics such as the number of degrees of freedom	• investigate the technical aspects of the real-world use of robots
• hardware to control robots such as sensors, actuators and computer control	• explore the use of robotics in a range of situations and investigate the use of hardware and software
• software programs to control robots	• examine and discuss the need for sensors, actuators and computer control • use software to control the actions of the robot constructed

Students learn about:	**Students learn to:**
Automated control	
• definition of automated control	• define and describe automated control
• historical perspective of automated control	• research the origins of automation and the growth of its use with industrialisation
Sensing devices such as	
• traffic lights	• examine and discuss the types of sensors used in a range of situations
• navigation systems in cars	
• security systems	• critically analyse the effectiveness of a sensing device used in a particular situation
Actuators such as	
• motors to open and close doors	• examine and discuss the types of actuators used in a range of situations
Controlling devices such as	
• a microprocessor	• discuss the use of controlling devices
• use of feedback to the controller	• demonstrate the operation of an automated system using Lego or similar
	• investigate feedback to vary the operation of an automated system
	• design, produce and evaluate a solution
Project development	
• processes and techniques	• design, produce and evaluate a simple project for a real-world application either separately for this option, or integrated with other options

Additional Content	
Students learn about:	**Students learn to:**
Innovations in robotics	• investigate and report on an innovation in robotics

Option 8: Software Development and Programming

This option involves students undertaking a range of activities that will lead them to modifying and writing their own code when developing software products. Initially students will work with existing code to identify data types and control structures, leading to the development of algorithm descriptions.

Outcomes

A student:

5.2.1 describes and applies problem-solving processes when creating solutions

5.2.2 designs, produces and evaluates appropriate solutions to a range of challenging problems

5.2.3 critically analyses decision-making processes in a range of information and software solutions.

Students learn about:	**Students learn to:**
Basic programming concepts	
• input, process, output	• examine the code of an existing software program to describe the input, processes and output
• functions • assignment statements	• examine an existing program and identify functions, assignment statements, variables and constants
• variables • constants	• modify an existing program to assess the effects of changing variables on the output of the program
GUI layout including	
• graphics tools	• experiment with an existing GUI layout in a selected software program
• objects such as textboxes, list boxes and command buttons	• design a simple GUI layout for a specific problem and apply simple programming code • conduct a peer evaluation on the designed GUI
Data types such as	
• character, integer, string, real, Boolean	• identify data types in existing code and explain their purpose • compare the use of data types
Data operators	
• relational • logical • arithmetic operators	• distinguish between various operators within existing code

Students learn about:	**Students learn to:**
Algorithms	
• definitions and descriptions • representing algorithms • examples such as recipes, directions, appliance instructions	• define algorithms and describe examples in daily life • represent algorithms by using either flowchart or pseudocode • explain the purpose of an algorithm when solving problems
Control structures	
• sequencing • selection such as binary and case • repetition and/or iteration such as pre and post test	• devise algorithms to solve everyday problems incorporating the use of control structures • examine and analyse the existing code of a selected example and identify control structures • develop prototypes using basic control structures
Desk checking	• conduct a desk check on a selected algorithm • modify an algorithm to produce the required output
Sub-programs	
• purpose • examples	• examine existing code and algorithms to identify the purpose of sub-programs for a range of examples • incorporate sub-programs into algorithms and working code
Programming language	
• function of programming language • examples of a programming language	• define and describe the function of a programming language • convert algorithms into basic code using a given language syntax
Data structures	
• record • file • array	• examine data structures in existing code • demonstrate the use of an array • modify existing code to allow for changes to the array
Testing	
• test data • boundaries	• test programming code using test data to check for the desired outcome

Students learn about:	**Students learn to:**
Error detection including	
• syntax • logical • run-time	• identify and describe errors in a sample of given code • eliminate sources of error to create working code
Error correction	
• software tools	• debug all errors in code using peer checking, desk checking or software debugging tools
Documentation of programming code	• create appropriate user support documentation for code • apply meaningful variable names and comments to code
Project development	
• processes and techniques	• design, produce and evaluate a simple project for a real-world application either separately for this option, or integrated with other options
• modifying an existing program • creating a new software solution	• write code to solve a real-world problem

Additional Content	
Students learn about:	**Students learn to:**
Random and sequential files	• compare and contrast existing code for processing random access and sequential files
Object-oriented software development	• investigate developments of object-oriented software development

Life Skills

For some students with special education needs, particularly those students with an intellectual disability, it may be determined that the above content is not appropriate. For these students, Life Skills outcomes and content can provide the basis for the development of a relevant and meaningful program – see section 8.

8 Life Skills Outcomes and Content

The Board of Studies recognises that a small percentage of students with special education needs may best fulfill the mandatory curriculum requirements for Information and Software Technology by undertaking Life Skills outcomes and content. (Requirements for access to Life Skills outcomes and content are detailed in section 1.2.)

Life Skills outcomes will be selected on the basis that they meet the particular needs, goals and priorities of each student. Students are not required to complete all outcomes. Outcomes may be demonstrated independently or with support.

In order to provide a relevant and meaningful program of study that reflects the needs, interests and abilities of each student, schools may integrate Information and Software Technology Life Skills outcomes and content across a variety of school and community contexts.

8.1 Outcomes

Objectives Students will develop:	**Outcomes** A student:
1 knowledge and understanding of a range of computer software and hardware	LS1.1 uses information and software technology to participate in and manage their environment LS1.2 uses a range of hardware LS1.3 uses a range of software programs
2 problem-solving and critical thinking skills in order to design and develop creative information and software technology solutions for a variety of real-world problems	LS2.1 uses information and software technology in solving a range of problems LS2.2 evaluates information and software technology solutions
3 responsible and ethical attitudes related to the use of information and software technology	LS3.1 recognises the need for responsible use of information and software technology
4 knowledge and understanding of the effects of past, current and emerging information and software technologies on the individual and society	LS4.1 explores the impact of past, current and emerging information technologies
5 effective communication skills and collaborative work practices leading to information and software technology solutions for specific problems	LS5.1 demonstrates communication skills in the development of information and software technology solutions LS5.2 uses collaborative skills in the development of information and software technology solutions LS5.3 uses a variety of techniques to present information and software technology solutions

8.2 Content

The content forms the basis for learning opportunities. Content will be selected on the basis that it meets the needs, goals and priorities of each student. Students are not required to complete all of the content to demonstrate achievement of an outcome.

The examples provided are suggestions only.

Outcome LS1.1: A student uses information and software technology to participate in and manage their environment.	
Students learn about:	**Students learn to:**
• the ways in which information and software technology can be used to enhance daily life	• recognise personal technology devices such as switch activated electronic equipment, computer, mobile phone, pocket organiser • recognise that technology can be used to make choices and express preferences for activities and to meet needs and wants such as turning equipment on and off using a switch, requesting help • use personal technology devices for a variety of purposes, such as recount a story line, indicate the next event in a sequence

Outcomes A student: LS1.2 uses a range of hardware LS1.3 uses a range of software programs.	
Students learn about:	**Students learn to:**
• the range and type of hardware which can be accessed in school and community contexts	• recognise a range of hardware, such as adaptive keyboard, printer, scanner, digital camera or video, barcode scanner • recognise the purpose of a range of hardware
• the range and type of software which can be accessed in school and community contexts	• use a range of available software, such as database, specialised word processors which speak or write with pictures/symbol, search engines, games • recognise the purpose of a variety of software, such as a word processor to write a report
• how a variety of hardware and software programs can be used for a range of purposes in a variety of school and community contexts	• operate a range of hardware/software • use a range of hardware/software for a variety of purposes in a range of contexts, such as voice output to gain teacher assistance

Outcome LS2.1:	A student uses information and software technology in solving a range of problems.
Students learn about:	**Students learn to:**
• matching appropriate technology strategies to a specific problem	• select an appropriate strategy for a given problem, such as choosing voice output to express needs and wants, use picture software to create a timetable of class activities • use appropriate technologies to address a problem, such as use Internet and word processing software to access and download written and pictorial material for a project

Outcome LS2.2:	A student evaluates information and software technology solutions.
Students learn about:	**Students learn to:**
• evaluating a project in terms of available resources, time, cost, effectiveness	• evaluate strategies, such as did the hardware work? was the software appropriate? could you open the email attachment? • make suggestions for improvement, such as use the internet rather than the phone to obtain information outside business hours, save a project on a floppy disk, choose a graphics program to insert illustrations in a report • implement changes if needed

Outcome LS3.1:	A student recognises the need for responsible use of information and software technology.
Students learn about:	**Students learn to:**
• safe use and care of technology equipment	• demonstrate safe procedures in caring for and operating equipment, such as recharging batteries for communication device, turning computer on and off correctly • recognise security and privacy issues, such as keeping password private, accessing appropriate sites on internet, seeking permission prior to publication
• responsible use of technology	• demonstrate responsible use of personal information, such as PIN, passwords, chat rooms • recognise appropriate protocols for sending information

Outcome LS4.1:	A student explores the impact of past, current and emerging information technologies.
Students learn about:	**Students learn to:**
• the impact of changing technology in school and community contexts	• explore the changes that technology has made to daily life, such as phone banking, mobile phone, email • use current technologies in a specified project, such as send a text message, check bank balance on the internet, send email request • investigate emerging technology • explore the ways in which technology is likely to impact on daily life in the future, such as communication, travel, entertainment, household activities, commerce, recreation and leisure and the career opportunities available for females and males

Outcomes

A student:

LS5.1 demonstrates communication skills in the development of information and software technology solutions

LS5.2 uses collaborative skills in the development of information and software technology solutions

LS5.3 uses a variety of techniques to present information and software technology solutions.

Students learn about:	**Students learn to:**
• communicating effectively across a range of contexts in relation to developing solutions	• experience group discussions to find solutions, such as listens to group members, maintains eye contact with speaker, lifts head to acknowledge speaker • demonstrate independent group membership, such as takes turns, listens to opinions of others
• participating in group activities	• participate in group discussions to find solutions, such as student makes comments using communication board, answers questions in discussion, offers suggestions/ideas/strategies, discusses choices available • use voice output device to present information to a group, such as giving news or oral presentation
• using technology to present solutions	• use a word processor to present information to a group, such as use adaptive keyboard using picture/symbol software to complete a written project, use word processor to complete a written task • use a digital camera or video to present information to a group, such as download pictures to include in school newsletter, publish digital images on school website • use multimedia software to present information to a group, such as student participation in selection of colours, graphic, sound and design

9 Continuum of Learning in Information and Software Technology K–10

9.1 Stage Statements

Stage statements illustrate the continuum of learning in the *Information and Software Technology Years 7–10 Syllabus* and are summaries of the knowledge, understanding, skills, values and attitudes that have been developed by students as a consequence of achieving the outcomes for the relevant stage of learning.

Early Stage 1 – Science and Technology

Students who have achieved Early Stage 1 show a growing awareness of, and interest in, the natural and made environments. They demonstrate confidence in proposing ideas for designs they develop through play and modelling. They demonstrate curiosity about artefacts, events, phenomena, places and living things around them.

Early Stage 1 students use play to explore ideas, manipulate materials and trial solutions. They develop and begin to refine their understanding of environments, materials, equipment and other resources through trial and error. They ask questions, suggest ideas, propose their own explanations and are able to report verbally and graphically on their actions and observations.

Students in this stage use their senses to observe features of their immediate environment and to explore the properties of a range of common materials. They identify and group living and non-living things according to some common characteristics.

Students explore and identify the needs of people and other living things. They recognise the use of some forms of energy and their ideas about it are beginning to develop as they experience energy in different contexts.

Students generate their own ideas, using make-believe, and express these verbally, pictorially and through modelling. They are unlikely to perceive the steps in a designing and making process as they often work in situations where these aspects occur at the same time. They identify what they like or dislike about their designs or explorations.

Students in Early Stage 1 recognise that information can come from a variety of sources, including other people and from different media, for example, books and videos. They demonstrate an awareness of a range of uses for computer-based technology as well as showing an emerging confidence in their ability to explore and use computer-based technologies, with assistance, to create text, images and play games.

Students show growing awareness of the appropriate use and maintenance of a range of classroom equipment. They give reasons for safe working practices and organisational procedures related to the use of equipment, resources and materials. Students develop ideas through the use and manipulation of concrete materials as a means of progressing towards abstract thought.

Stage 1 – Science and Technology

Students who have achieved Stage 1 are developing an awareness of the wider world and are applying their scientific and technological understanding to new and different situations. They are starting to develop the social skills required to investigate, design and make products and services.

Students are starting to appreciate the interdependence of living things and their environments. They recognise that people create products, services and environments to meet their own needs. They build on their existing understanding of some of the forms of energy.

Students are able to interpret information and make predictions based on their own observations. They are better able to accept that the result of a test may be different from what was originally expected.

Students are able to recognise the purpose of an investigation and seek further information as a result of their own curiosity. They begin to see that an investigation is a series of orderly steps. They use their senses to identify similarities and differences. Students show curiosity about natural and made environments and seek explanations that allow them to interpret their observations.

Using plans, drawings and models, Stage 1 students begin to generate and select ideas to best meet design task objectives, and give simple explanations of why they have chosen a certain idea. Students in this stage can draw plans for a design and can explain some of the features and materials to be used. They can write labels and simple explanations when creating images.

Students recognise and discuss with others some of the strengths and limitations of what they have done and identify some changes that could be made to improve plans or models, for example in appearance. They make comparisons about what they like and dislike about familiar products, systems or environments.

Students effectively manipulate materials that are available in the classroom environment, and show a growing awareness of the different properties of such materials and how they affect the way in which the materials are used. They recognise that some materials occur naturally, while others are made.

Students have a developing awareness of a range of media and information products. They are able to use computer technology to start and open files or applications, save and shut down. They are able to use computer-based technologies where appropriate for a given task.

They are able to identify the different forms of technology in their immediate environments and explain how they help us. They safely use, maintain and store equipment such as scissors, magnifying glasses, computers and disks.

Stage 2 – Science and Technology

Students who have achieved Stage 2 are able to initiate their own investigations as a result of something that has aroused their curiosity. They ask perceptive questions and respond to design tasks in innovative ways. They identify ways of improving their own scientific and technological activities by considering issues such as how well something works, its appearance and how it might affect the environment.

Students develop the capacity to ask questions to clarify understanding. They predict outcomes by proposing explanations and testing to see if their predicted outcomes eventuate. As students develop skills in predicting, testing, recording results and drawing conclusions, they begin to form understanding about 'fair testing' that takes into account the need for consistent conditions combined with one variable, in order to ensure accurate results.

Students who have achieved Stage 2 are able to explore ideas for investigations and their design proposals in order to identify where decisions still need to be made, and to suggest possible courses of action. Students may suggest modifications to improve their initial proposals, including the selection of different solutions to arrive at a suitable outcome.

Students are able to explore the properties, capabilities and working characteristics of both natural and manufactured materials and components. They recognise that materials are varied and have different properties that affect their use. They can select, maintain and safely use classroom tools and equipment, hardware and software, and justify their selection for particular tasks.

Students give consideration to issues such as function and aesthetics when designing and evaluating products, services and environments. They can identify some limitations when carrying out a design task. Students develop plans that show some consideration of the types and quantities of materials required and an awareness of the need for accuracy in a plan for production purposes.

Students recognise the function of some hardware and software and are able to select and use these to meet the requirements of a task. They can discuss the possibilities and limitations of using a range of technology including computer-based technology.

Students are developing a capacity to understand relationships in the natural world. They can identify and describe some aspects of the structure and function of living things and some of the ways living things interact. They can also identify and describe some of the interactions of the Earth with other parts of the solar system. Students in this stage devise systems that inform or utilise their understanding of some forms of energy.

Students also demonstrate a greater understanding of and control over a design process. They recognise the importance of evaluation throughout a design cycle.

Stage 3 – Science and Technology

Students who have achieved Stage 3 are able to undertake investigations independently in order to satisfy their own curiosity. They demonstrate a willingness to initiate their own investigations; this might include designing appropriate fair tests to evaluate a range of possible explanations for the results of their investigations.

Students select and use appropriate language, structures and media and demonstrate skills in critically examining and communicating scientific and technological ideas and issues. Students can relate their scientific and technological understanding to new tasks or different situations.

Students research and investigate to identify phenomena and processes that have influenced Earth over time. They build on their existing understanding of forms of energy.

Students are aware of the skills and processes involved in designing and making, investigating and using technology. They manage the design process including aspects of time management, design constraints and needs of the target audience. At this stage, they can make decisions involving some conflicting interests or issues, for example ethical, aesthetic, environmental and cultural.

Students use two- and three-dimensional drawings and models to develop and modify their design ideas and to communicate details to others. They recognise and use some conventions and symbols related to developing plans and diagrams, such as measurements and some use of scale. They can observe the form and detail of objects carefully in order to produce accurate drawings from different views and they reflect on their drawings, sketches or computer models.

Students are aware of a range of issues related to scientific and technological achievements. They are capable of acquiring information from a variety of sources and are able to experiment with new techniques and skills as technologies change. Students identify emerging trends by using data, diagrams and a range of tools and equipment to assist with observations.

Students recognise that computer-based technologies have a wide range of applications in society and can identify and describe some of the effects of such technologies on individuals and communities. Students who have achieved Stage 3 can confidently and competently use a range of computer-based hardware and applications. Students at this stage can identify alternative uses and can be creative in adapting available software to the requirements of a task.

Students reflect on the methods used and positive and negative results of technological and scientific activity both throughout their own projects and in personal, local and global contexts.

Stage 4 – Technology (Mandatory)

Students at Stage 4 are able to independently initiate design projects and investigations that reflect an understanding of needs and opportunities. They demonstrate the ability to research and extract information from a variety of sources and a willingness to use experiments and tests to enhance the development of a design project. They describe factors that influence design.

Students select and use a broad range of media and method and appropriate language and structures to accurately communicate design ideas to a diverse audience. This may include recounting the process of designing, producing and evaluating used when developing design projects. Students are aware of the skills and processes involved in designing and are able to generate and communicate design ideas and solutions. They develop knowledge and understanding of a range of design processes, roles of designers and associated work opportunities. They can identify what makes good design and are able to creatively develop quality design projects.

Students responsibly, safely, confidently and accurately apply a range of contemporary and appropriate tools, materials and techniques and understand the implications and applications of these in the wider community. Students demonstrate competence when using a range of ICTs and have the ability to select and use them appropriately in developing design projects.

Students recognise the importance of safety, quality and management in the design and production of design projects. They learn to manage their own time by sequencing processes of designing, producing and evaluating to plan ahead. They work collaboratively and learn to work safely with others in technological environments.

Throughout the design process students reflect on and evaluate their design projects. They consider the impact of innovation and emerging technology on society and the environment and identify and explain ethical, social, sustainability and environmental considerations related to design projects.

Stage 4 – Information and Software Technology

Students undertaking the study of Information and Software Technology at Stage 4 enhance and enrich the experiences gained through Technology (Mandatory). In particular, they focus more directly on using software programs and hardware for specific tasks.

They can describe a range of past, current and emerging information and software technologies and can describe ethical practices related to dealing with data and information.

Stage 5 – Information and Software Technology

Students at Stage 5 demonstrate competence in using a range of generic software applications and are able to select and justify software choices for set tasks and project work. Students are competent users of a range of hardware devices when solving problems.

Students analyse problems and initiate independent research. They ethically acquire and manipulate a broad range of data sources when solving problems. Students document and acknowledge data sources where appropriate and format the information to communicate their ideas to targeted audiences.

Higher-order thinking skills, and problem-solving strategies are applied to all projects. Students design and produce appropriate solutions to a range of problems with varying complexity. Students assume and demonstrate responsibility for their learning by displaying competence in self-management skills including time and resource management during project work.

Through reflective writing in logs and journals students further develop meta-cognitive skills. They communicate and document their thoughts and understandings about their learning and the solutions to problems encountered during the task or project.

Students can evaluate processes and solutions for a variety of real-world problems. They have an appreciation of and value working cooperatively with others in the achievement of common goals when solving information and software technology problems. Students demonstrate collaborative approaches to projects, leadership, negotiation, interpersonal skills and positive relationships within the community of student learners.

Students articulate knowledge of current and emerging technologies and analyse their effects on the individual, workplace and society.

10 Assessment

10.1 Standards

The Board of Studies *K–10 Curriculum Framework* is a standards-referenced framework that describes, through syllabuses and other documents, the expected learning outcomes for students.

Standards in the framework consist of two interrelated elements:
- outcomes and content in syllabuses showing what is to be learnt
- descriptions of levels of achievement of that learning.

Exemplar tasks and student work samples help to elaborate standards.

Syllabus outcomes in Information and Software Technology contribute to a developmental sequence in which students are challenged to acquire new knowledge, understanding and skills.

The standards are typically written for two years of schooling and set high, but realistic, expectations of the quality of learning to be achieved by the end of Years 2, 4, 6, 8, 10 and 12.

Using standards to improve learning
Teachers will be able to use standards in Information and Software Technology as a reference point for planning teaching and learning programs, and for assessing and reporting student progress. Standards in Information and Software Technology will help teachers and students to set targets, monitor achievement, and, as a result, make changes to programs and strategies to support and improve each student's progress.

10.2 Assessment for Learning

Assessment for learning in Information and Software Technology is designed to enhance teaching and improve learning. It is assessment that gives students opportunities to produce the work that leads to development of their knowledge, understanding and skills. *Assessment for learning* involves teachers in deciding how and when to assess student achievement, as they plan the work students will do, using a range of appropriate assessment strategies including self-assessment and peer assessment.

Teachers of Information and Software Technology will provide students with opportunities in the context of everyday classroom activities, as well as planned assessment events, to demonstrate their learning.

In summary, *assessment for learning*:
- is an essential and integrated part of teaching and learning
- reflects a belief that all students can improve
- involves setting learning goals with students
- helps students know and recognise the standards they are aiming for
- involves students in self-assessment and peer assessment
- provides feedback that helps students understand the next steps in learning and plan how to achieve them
- involves teachers, students and parents in reflecting on assessment data.

Quality Assessment Practices

The following *Assessment for Learning Principles* provide the criteria for judging the quality of assessment materials and practices.

Assessment for learning:

- **emphasises the interactions between learning and manageable assessment strategies that promote learning**
  In practice, this means:
  – teachers reflect on the purposes of assessment and on their assessment strategies
  – assessment activities allow for demonstration of learning outcomes
  – assessment is embedded in learning activities and informs the planning of future learning activities
  – teachers use assessment to identify what a student can already do.

- **clearly expresses for the student and teacher the goals of the learning activity**
  In practice, this means:
  – students understand the learning goals and the criteria that will be applied to judge the quality of their achievement
  – students receive feedback that helps them make further progress.

- **reflects a view of learning in which assessment helps students learn better, rather than just achieve a better mark**
  In practice, this means:
  – teachers use tasks that assess, and therefore encourage, deeper learning
  – feedback is given in a way that motivates the learner and helps students to understand that mistakes are a part of learning and can lead to improvement
  – assessment is an integral component of the teaching-learning process rather than being a separate activity.

- **provides ways for students to use feedback from assessment**
  In practice, this means:
  – feedback is directed to the achievement of standards and away from comparisons with peers
  – feedback is clear and constructive about strengths and weaknesses
  – feedback is individualised and linked to opportunities for improvement.

- **helps students take responsibility for their own learning**
  In practice, this means:
  – assessment includes strategies for self-assessment and peer assessment emphasising the next steps needed for further learning.

- **is inclusive of all learners**
  In practice, this means:
  – assessment against standards provides opportunities for all learners to achieve their best
  – assessment activities are free of bias.

10.3 Reporting

Reporting is the process of providing feedback to students, parents and other teachers about students' progress.

Teachers can use evidence gathered from assessment to extend the process of *assessment for learning* into their *assessment of learning*. In a standards-referenced framework this involves teachers in making professional judgments about student achievement at key points in the learning cycle. These may be at the end of a year or stage, when schools may wish to report differentially on the levels of knowledge, understanding and skills demonstrated by students.

Descriptions of levels of achievement for Stage 4 and Stage 5 in Information and Software Technology have been developed to provide schools with a useful tool to report consistent information about student achievement to students and parents, and to the next teacher to help to plan the next steps in the learning process. These describe observable and measurable features of student achievement at the end of a stage, within the indicative hours of study. Descriptions of levels of achievement provide a common language for reporting.

At Stage 5 there are six levels of achievement. Level 6 describes a very high level of achievement in relation to course objectives and outcomes. Level 2 describes satisfactory achievement, while the level 1 description will help identify students who are progressing towards the outcomes for the stage.

At the end of Year 10, teachers of Information and Software Technology Years 7–10 will make an on-balance judgement, based on the available assessment evidence, to match each student's achievement to a level description. This level will be reported on the student's School Certificate Record of Achievement.

At Stage 4 there are four levels of achievement. Level 4 describes a very high level of achievement; levels 2 and 3 describe satisfactory and high achievement that should provide a solid foundation for the next stage of learning. The level 1 description will help identify students who are progressing towards the outcomes for the stage.

For students undertaking Life Skills outcomes and content in Years 7–10, the content listed for each identified Life Skills outcome forms the basis of the learning opportunities for these students. It also provides examples of activities on which teachers can base judgments to report student progress in relation to individual learning goals.

10.4 Choosing Assessment Strategies

Planning for assessment is integral to programming for teaching and learning. In a standards-referenced framework, teachers assess student performance on tasks in relation to syllabus outcomes and make on-balance judgements about student achievement. Assessment relies on the professional judgement of the teacher and is based on reliable data acquired in a fair and challenging environment, from multiple performances in a variety of contexts. Assessment is fundamental for furthering student learning.

In planning programs, teachers, individually and collaboratively, review the syllabus and standards materials. They use these materials to describe for themselves what students should know and be able to do at a particular stage, and they consider the kinds of evidence their students could produce to show they have learnt what they needed to learn.

Students are provided with a description of the learning expected to be accomplished, opportunities to discuss the criteria on which judgements will be based, time to learn, and where possible, examples of what that learning looks like.

Assessment is used to determine the students' initial knowledge, understanding and skills, to monitor student progress and to collect information to report student achievement. The assessment cycle is continuous; students receive and give themselves feedback on what they have learnt, and what needs to be done to continue their learning. Students gain information about their learning through feedback from teachers and from self-assessment and peer assessment. The challenge and complexity of assessment tasks increase to enable students to develop evaluative independence as they assess their own knowledge, understanding and skills, and determine ways to improve their learning.

Teachers of Information and Software Technology should employ a range of assessment strategies to ensure that information is being gathered regarding the knowledge and understanding that are being acquired, and the skills that are being developed. Strategies should be appropriate to the outcomes being addressed, be manageable in number and be supportive of the learning process. Teachers could work collaboratively in planning appropriate assessment strategies. Working collaboratively leads teachers to develop a shared understanding of the syllabus standards and also supports teachers in making consistent and comparable judgements of student achievement in relation to these standards.

In planning for assessment in Information and Software Technology it is important for teachers to consider:

- the requirements of the syllabus
- the accessibility of the proposed activity in terms of language requirements
- the appropriateness of the challenge presented to individual students
- resource availability
- how the task will be administered
- the way in which feedback will be provided.

In planning for assessment, teachers of Information and Software Technology need to consider how results will be recorded, with a view to ensuring that there is sufficient and appropriate information collected for making an on-balance holistic judgement of the standard achieved by the student at the end of the stage. The evidence collected should enable teachers of Information and Software Technology to make consistent judgements to meet the various reporting requirements that the system, school and community may have.

Information and Software Technology particularly lends itself to the following assessment techniques, keeping in mind that a range of strategies should be used to assess the outcomes of the course.

Practical projects
Practical experiences include activities such as designing, producing and evaluating, the production of prototypes and information and software technology solutions. These activities are readily assessed through the use of direct observation and holistic judgement.

Written reports
These may include documentation, portfolios, log books, surveys, questionnaires, evaluation reports, documentation of solutions, plans, storyboards, documentation of experimental work, field trip reports, interviews and essays. When students produce a written report, they could be assessed on their ability to:

- show appropriate depth of analysis
- summarise key findings in a concise manner
- use appropriate detail
- use appropriate language consistent with the information and software technology industry.

Research activities
Research activities provide students with opportunities to investigate a range of issues and can be used to develop in students analytical, organisational and problem solving skills. Assessment activities include Internet research projects and case studies that focus on both process and product. When using research activities as an assessment technique, students could be assessed on their ability to:

- apply basic research techniques
- select and interpret relevant information
- present information in a logical manner
- apply ethical practices.

Written and practical tests
Written and/or practical tests can be used to determine if students have the necessary skills, can use correct techniques and can recall, interpret, comprehend and apply knowledge at a level that is appropriate for them to move on to the next step in the learning process. Tests can provide information prior to commencing a unit of work, or along the way, about students' understanding of concepts and allow the teacher to plan further learning activities. It is important that feedback is provided on test performance in order to enhance student learning.

Presentations
Presentations allow students to develop skills in communicating their ideas in oral, graphic and written forms using a variety of subject-specific concepts and content. They provide opportunities for students to develop and demonstrate their skills and reflect on the performances of others. Assessment strategies may include prepared and impromptu oral presentations, multi-media presentations and various forms of display techniques. When presentations are used for assessment purposes, students could be assessed on their ability to:

- select and apply appropriate information
- present information in a creative and logical manner
- apply an appropriate level of ICT skills.

Peer assessment
Information and Software Technology encourages the active involvement of students in the learning process. Opportunities exist for individual and collaborative work. Activities involving peer assessment might include evaluating the contribution of individuals to a group task, and reflecting on a peer presentation.

Self-assessment
In Information and Software Technology students are encouraged to acquire basic skills to become self-directed learners. Opportunities exist for students to reflect on their progress towards the achievement of the syllabus outcomes. This reflection provides the basis for improving their learning. Developing self-assessment skills is an ongoing process, becoming increasingly more sophisticated and self-initiated as a student progresses.