Steiner Education Australia

AUSTRALIAN STEINER CURRICULUM FRAMEWORK 2011

Educational Foundations
Attachment 4

STEINER APPROACH TO ICT INTEGRATION

Information and Communications Technology in Steiner Schools

This ICT Supporting Document is based on the indications given by Rudolf Steiner regarding technology and humanity as well as the curriculum resource materials developed by teachers in Steiner Schools both in Australia and internationally. It is being prepared in collaboration with Steiner Schools in Australia through a process of extensive consultation with learning area consultants and the advisory panel as well as opportunities for individual school and teacher response.

1. RATIONALE

This ICT document is designed to be used by both new and experienced teachers to support and supplement their research, planning, teaching and assessment. It is informed by international and Australian Steiner Education Research and Curriculum Publications as well as broader recent science education research. Furthermore, the information presented here is based on current practice, both in Australia and internationally and it is consistent with ICT programs approved and delivered in Steiner Schools in other countries including the USA, New Zealand and the United Kingdom.

2. ICT AND CONTEMPORARY SOCIETY

ICT is an exciting field of human endeavour and it empowers us. Complex technologies also present many new ways of learning and working, often by sidestepping time and space - locating us in an infinite network of here and now. But these amazing extensions to our lives also present challenges to educators as they try to assess which ICT (extensions) are beneficial and in what educational context.

3. ICT IN THE CURRICULUM

It is internationally accepted practice that that Steiner Schools, while preparing a thorough grounding in primary school, delay the formal integration of complex technologies till high school. It is the task of Steiner Primary Schools to lay the foundation for lifelong learning - through a uniquely human and richly choreographed education. As the students' journeys continues into High School, they quickly learn to apply ICT effectively, creatively and ethically

3.1. Years K to 7 - Preparing the Foundations for Digital Technologies Steiner Primary Education is a multi-disciplinary, multiple-intelligence engaging and dynamic experience. It provides a natural and human environment where children learn to observe, question and express themselves fully. From a Steiner viewpoint, young children need to communicate and learn deeply without the mediation of complex technology. This 'unplugged' experience is seen as crucial for children to develop an uncluttered self-image as well as the most valuable form of self-efficacy – one they completely own. On the basis of their rich communications skills and their ability to produce a wide range of original creative work the students are well placed to master digital technology.

3.2. Year 8 Convergence - Digital Technologies By the end of year 8 students' ICT skills and understanding will meet or exceed the ACARA ICT Scope and Sequence requirements

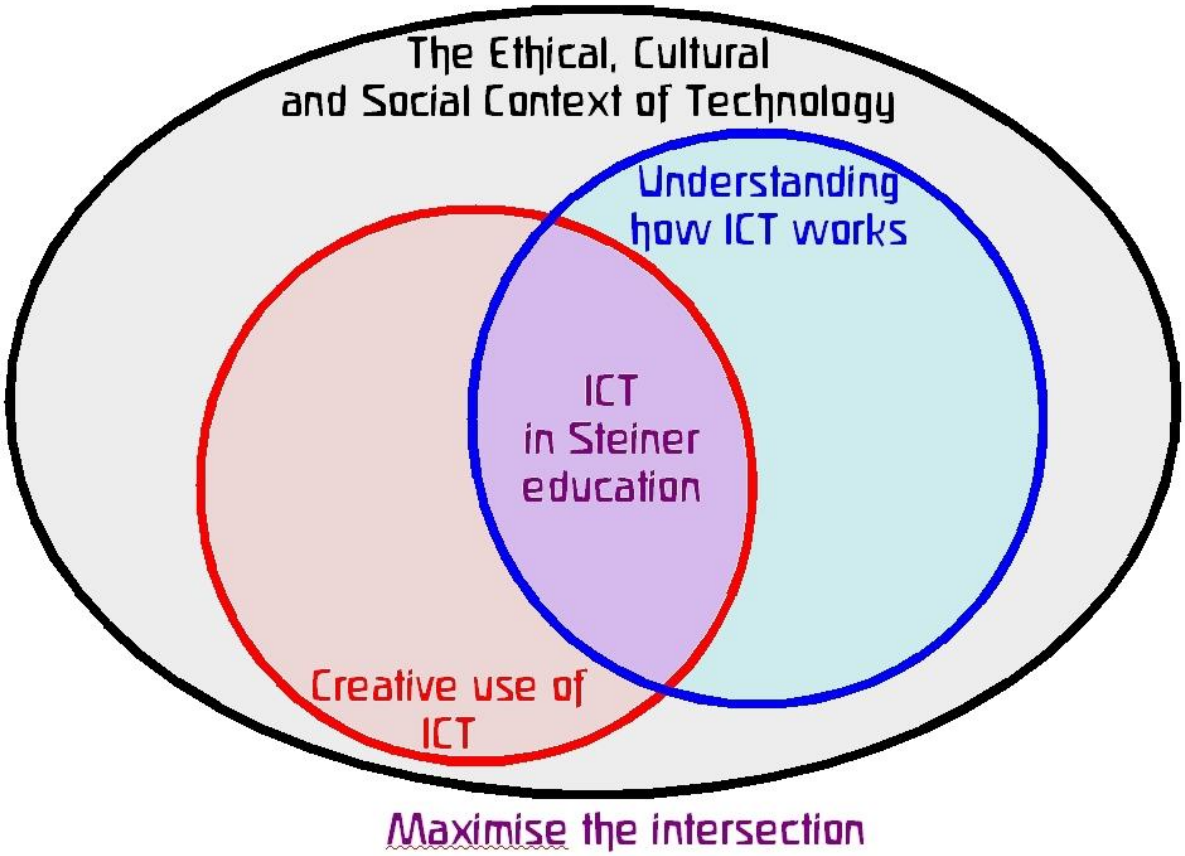
3.3. Years 9 to 12 - Digital Technologies in High School Steiner high school students have an empathetic and deep interest in the world and its humanity. They enthusiastically embrace a wide range of complex technologies, especially ICT to help them engage this interest through the Steiner High School Curriculum.

4. TECHNOLOGY AS A SUBJECT

ICT is integrated across the High School Curriculum; however, students also experience technology as a subject in its own right. From finger-knitting and other crafts in the early years, through to electronics and computer logic construction in the senior years, students are evolving their technological skills, creatively and in the real world. Knitting is interesting and significant in that it is the earliest form of programmed technology – a knit/pearl sequence is binary code/instruction.

5. ICT INTEGRATION

ICT is integrated into all subjects within the following framework:



5.1 The Ethical, Cultural and Social Context of ICT

Without a firm ethical basis for the full cultural and social context of ICT, technology becomes anathema to education. And while there are obviously ethical issues seemingly unique to ICT; how children and students understand themselves, each other and the world more generally is at issue here. These fundamentally human issues are grist to the Steiner Primary School Curriculum and students, as they grow up through High School, readily accommodate ICT ethics and good social practice into their work through their deep understanding of themselves and *the other*.

Ethical considerations also include; the OH&S aspects of computer use and overuse, personal and information security, copyright/copyleft, creative commons and open education, the working conditions of hardware and software workers, software ownership and patents, and commercial/political/bureaucratic influences on ICT use in schooling.

5.2 Understanding ICT

This Curriculum aims to enable children and students to be fully engaged in and to take ownership of technology. In order to achieve this, the education seeks to help students understand the technology in its innermost nature and to direct that technology through human agency, this process most observable in the way technologies evolve from simple to complex through the Steiner Curriculum.

Through specific technology units, and more generally within the curriculum, students learn to understand and use computer networks, hardware and software. They learn how to use electrical components to build a binary adder – a fundamental logic unit in computing. They will work with binary and hexadecimal number systems and become familiar with digital colour space notation. Students will also learn to work with different file types including open document formats, and how to manage digital data. They will select appropriate software including from a wide range of Free and Open Source Software (FOSS) operating systems and applications.

5.3 Using ICT

Working ethically, and empowered by an understanding of the technology they are using, students will apply ICT in a variety of ways. And although using ICT is invariably multifaceted, it is helpful to consider the following aspects separately:

5.3.1 Relationships & Communication

Every communication involves a relationship of some kind. Students use various forms of ICT to communicate their ideas and work using social protocols and safety considerations.

5.3.2 Research and Investigation

Research and investigation with ICT can be described using the four element activity cycle. Here students learn to *plan* an investigation, the *research* is then carried out, followed by *organising* what has been found and finally *reflecting* on the process - which will often lead to planning another investigation cycle.

5.3.3 Creative Application of ICT

Students produce original creative work using ICT. The Steiner Curriculum focus on new work is in contrast to the tendency to rehash and remix the work of others using digital technologies. The production of ICT original creative works by students includes the following areas; audio and video, graphics, word processing, presentations, data processing, publishing, calculations and modelling

6. K - 12 ICT EDUCATIONAL GOALS

K - 12 Educational Goals for ICT Integration	
ICT - FULL PARTICIPATION	
Years 11 & 12 (High School)	**The Ethical, Cultural and Social Context of ICT** For students to be ethical and confident users of a wide range of digital technologies. For students to continue to engage with ICT through historical, societal and biographical exploration, for example; The Turing Test, artificial intelligence and the trans-human dilemma. For Students to be ethical, independent, creative and active participants in digital technologies. For students to engage with a wide range of digital ICT and, as self-efficacious individuals, and to develop deep knowledge, skills and healthy attitudes about technology. **Understanding ICT** For students to explore and value the cutting edge themes in the workings of digital technologies. For students to engage with ICT mathematically by working with processes including bits and qubits, fuzzy logic and chaos theory. For students to engage with ICT scientifically, including by building a binary adding machine from electrical relays. **Using ICT** For students to employ ICT creatively and to produce original creative work. For students to reflect on, and modify their use of ICT. For students to plan, conduct and communicate rigorous research tasks using ICT.
Years 9 & 10 (High School)	**The Ethical, Cultural and Social Context of ICT** For students to be ethical and confident users of a wide range of digital technologies. For Students to explore and value central themes in the impact of digital technologies. For students to engage with ICT through historical, societal and biographical exploration, for example Alan Turing's life, the invention of the transistor or the impact of social networking. For students to develop a deep knowledge of the whole Human Being as a basis for understanding the evolution of machine "intelligence" and a continual deepening practice of the Arts (in particular the "six Arts": Architecture, Sculpture, Painting, Music, Creative Speech and Eurythmy) as a balance to the "machine" life of students. **Understanding ICT** For Students to explore and value the central themes in the workings of digital technologies. For students to engage with ICT mathematically by working with processes including Boolean logic and binary/hexadecimal number systems. For students to engage with ICT scientifically through studies in electromagnetism and materials science. For students to develop a deep knowledge and practice in ICT OH&S, ICT identity and anonymity, ICT privacy and exposure, ICT freedom and manipulation, original creative work and the copy/paste paradigm. **Using ICT** For students to apply ICT in a fully integrated way. For students to engage creatively and ethically with ICT including; computer networks and operations, word-processing, spreadsheets and databases, multimedia and graphics and with the Internet and email

6. K - 12 ICT EDUCATIONAL GOALS	
ICT - FOUNDATION YEARS	
Years 7 & 8 (Middle School)	**The Ethical, Cultural and Social Context of Technology.** For students to be ethical and confident users of a range of technologies. For students to engage with ICT through historical, societal and biographical exploration, for example mechanical programming of weaving etc during the Industrial revolution. **Understanding Technology,** For students to explore and value the central themes in the workings of digital technologies. For students to engage with ICT mathematically by working with processes including solid geometry, nets, scale and algebra. For students to engage with ICT scientifically through studies in electricity and switching (including "hallway" switching). **Using Technology. .** For students to be independent, engaged, imaginative and skilled interpreters of the world by using appropriate technologies, leading to an extensive range of ICT competencies in High School. **Year 8 Convergence** Year 8 students' skills and knowledge converge with ACARA ICT Scope and Sequence requirements
Years K to 6 (Primary School)	**The Ethical, Cultural and Social Context of Learning.** For children to develop towards a healthy self image through real relationships. For children to engage in a rich story life through imaginative lessons and whole-body learning. For children to develop emotional well being and resilience as a foil to contemporary life. For children to explore and value, through story and play, their relationship to time and place. For children to think and act cooperatively, empathetically and sustainably. **Understanding Technology.** For children to explore how technology extends their ability to do things. For children to choose an appropriate technology for a task. For children to make tools to achieve a task. For children to reflect on how well a technology they had selected and used achieved its purpose **Using Technology.** For children to be independent, engaged, imaginative and skilled interpreters of the world by using appropriate technologies

7. ICT SCOPE AND SEQUENCE

Year K to 7	The Ethical, Cultural and Social Context of Learning	Understanding Technology	Using Technology		
			Relationship and Communications	Research and Investigation	Creative Application of Technology
	Children: Develop a strong sense of self through the rich story life they experience through the Curriculum and by working creatively with each other in both formal settings and in unstructured free play. Explore time, place and space through stories and activities – an important aspect of identity building and an important basis for future exploration of the timeless, placeless ICT environment. Work with each other cooperatively and empathetically through mediated and unmediated activities. Respect the personal space of others and understand that the space of others includes their creative work	Children: Explore how technology extends their ability to do things, for example dig a small hole in the garden using a trowel. Choose an appropriate technology for a task such as the selection of appropriate craft materials Make tools to achieve a task for example make their own knitting needles from wooden dowel. Reflect on how well a technology they had selected and used achieved its purpose, for example was the thickness of a particular paintbrush appropriate.	Children: Explore a wide range of communications both with themselves and each other. Learn to communicate creatively and effectively; orally, with imagery and gesture, and with written texts Choose friends but do not exclude others – the value of real friendship is especially important in the often superficial friendship world of social networking Communicate to a group taking into account the nature of that particular audience Conduct a wide range of oral communications including; soliloquy, one-on-one conversation, group discussion, oration and various forms of dramatic performance	Children: Observe the natural world and built environment, and value the questions and responses they find arising from their observations Use a wide range of resources to help them find answers to questions, for example; oral tradition, books, magazines, drawings, people with various backgrounds etc Record investigations and research using appropriate media including; tables or graphs, images, written or spoken text or a combination of the above. Reflect on investigations - did I find out what I wanted to know. Discuss reflections	Children: Initiate ideas, plans and activities, often requiring many-step processes Select the appropriate technology to facilitate the following works: ***Presentations*** Supported by posters or other augmentation. ***Written Text*** Including elegant handwriting in form and content. ***Two and Three dimensional Artistic Works*** A wide variety of creative works including painting, drawing, weaving, sculpture and architecture. ***Dramatic Performance*** A range of performance including music (instrumental), music (singing), poetry recitation, drama and Eurythmy (Life Movement) ***Exposition of Scientific or Mathematical Data*** Creative representation of scientific and mathematical data through tables, graphs and texts

ICT SCOPE & SEQUENCE continued

Year 8 (Middle School)	The Ethical, Cultural and Social Context of Technology	Understanding Technology	Using Technology		
			Relationship and Communications	Research and Investigation	Creative Application of Technology
8 (Middle School)	Students: Maintain a strong sense of self by working creatively with each other in both formal and informal settings. Respect the personal space of others and understand that the space of others includes their creative work **Intellectual Property**. Recognise ethical dilemmas that arise within legal boundaries and explain the purpose and application of laws in protecting intellectual property. e.g. pirating denies musicians payment for their work; secondary and tertiary use of data (ACARA)	Students: Explore how technology extends their ability to do things, for example using a slide rule to multiply and approximate solutions. Develop an understanding to ICT through activities and discussion including: **How have computing machines and their relationship with people evolved?** • Finger math. • Counting with stones. • Implement an abacus. **Mechanical adder**. Story of Blaise Pascal and his calculator of 1642. Implement the essential mechanism. How many cogs wheels can you follow imaginatively until the mechanism becomes too complex? **Multiplication machines** • Story of John Napier. • Implement Napier's rods.	Students: Explore a wide range of communications both with themselves and each other. Learn to communicate creatively and effectively; orally, with imagery and gesture, and with written texts Choose friends but do not exclude others – the value of real friendship is especially important in the often superficial friendship world of social networking Communicate to a group taking into account the nature of that particular audience Conduct a wide range of oral communications including; soliloquy, one-on-one conversation, group discussion, oration and various forms of dramatic performance **DIGITAL TECHNOLOGY** Accessing and producing a wide range of text including visual texts	Students: Observe the natural world and built environment, and value the questions and responses they find arising from their observations Use a wide range of resources to help them find answers to questions, for example; oral tradition, books, magazines, drawings, people with various backgrounds etc Record investigations and research using appropriate media including; tables or graphs, images, written or spoken text or a combination of the above. Reflect on investigations - did I find out what I wanted to know. Discuss reflections	Students: Initiate ideas, plans and activities, often requiring many-step processes Select the appropriate technology to facilitate the following works: ***Presentations*** Supported by posters or other augmentation. ***Written Text*** Including elegant handwriting in form and content. ***Two and Three dimensional Artistic Works*** A wide variety of creative works including painting, drawing, weaving, sculpture and architecture. ***Dramatic Performance*** A range of performance including music (instrumental), music (singing),

Year 8 (Middle School)	The Ethical, Cultural and Social Context of Technology	Understanding Technology	Using Technology		
			Relationship and Communications	Research and Investigation	Creative Application of Technology
	Computers in our lives - ICT Survey. Example: Observe and describe how are computers used in the school, e.g., school office, library. Observe and describe how are computers used on the road, e.g., traffic counters, toll debit machines, car engine control. Observe and describe how computers are used in the home, e.g., compact disk player, personal computer, washing machine, telephone/answering machine, robot toy. Observe and describe how computers are used in the neighbourhood, e.g., price from bar code on goods, Inventory-control in stores, health monitoring in hospitals, Internet Service Providers	• Implement the essential mechanism of a mechanical multiplier. • Implement a slide rule. **Human computing teams** • Story of Baron Prony and division of computing labour, inspired by Adam Smith's Wealth of Nations. • Implement a computing team **Difference engine** Story of Charles Babbage and Ada Lovelace. **Mechanization of instructions: towards the stored program control machine.** • Theory of Babbage's analytical Engine designed to enable a choice of programmed numerical calculations, 1832. • Story of Jacquard mechanizing the loom weave pattern, 1862. • Story of Herman Hollerith's Census Coding Machine mechanizing	**ACARA General ICT** Experiencing, listening, reading, writing digital (including multimodal) texts **ACARA English ICT** Plot and compare linear equations using ICT **ACARA Maths ICT** Spreadsheets to record scientific data and create simple graphs **ACARA Science ICT**	**DIGITAL TECHNOLOGY** Conducting on-line research **ACARA General ICT** On-line collaboration such as conferencing **ACARA History ICT**	poetry recitation, drama and Eurythmy (Life Movement) ***Exposition of Scientific or Mathematical Data*** Creative representation of scientific and mathematical data through tables, graphs and texts **DIGITAL TECHNOLOGY** Working with spreadsheets (recording data, analyzing and graphing) **ACARA General ICT** Making presentations **ACARA General ICT** Working with digital images **ACARA General ICT**

Year 8 (Middle School)	The Ethical, Cultural and Social Context of Technology	Understanding Technology	Using Technology		
			Relationship and Communications	Research and Investigation	Creative Application of Technology
		manipulation of non-numerical census data, 1890. • Story of John von Neumann and the von Neumann architecture, 1940s. • Human emulation of a von Neumann machine. • Disassemble and assemble a PC again and identify the subsystems corresponding to the von Neumann architecture. **Electronic calculator** • Limitations of capacity leading to overflow and underflow. • Limitations of accuracy due to limitations of precision due to limited capacity of number representation. **Comparison of the above computing machines** • Can the user understand how the computing machine works? • What is the relative power, in terms of			

Year 8 (Middle School)	The Ethical, Cultural and Social Context of Technology	Understanding Technology	Using Technology		
			Relationship and Communications	Research and Investigation	Creative Application of Technology
		speed and scope of operation, of each machine? • What is the functionality of each machine in terms of the components of the von Neumann architecture? • What are the limitations of each machine? • How much judgment does the user delegate to each machine?			

Year 9 & 10 (High School)	The Ethical, Cultural and Social Context of ICT	Understanding ICT	Using ICT		
			Relationship and Communications	Research and Investigation	Creative Application of Technology
9 & 10 (High School)	Students: Maintain a strong sense of self by working creatively with each other in both formal and informal settings. Respect the personal space of others and understand that the space of others includes their creative work. **Intellectual Property**. Recognise ethical dilemmas that arise within legal boundaries and explain the purpose and application of laws in protecting intellectual property. e.g. pirating denies musicians payment for their work; secondary and tertiary use of data (ACARA) **Information Security.** develop and maintain strategies for securing and	Students: **ICT Systems**. Effectively, efficiently and ergonomically use typical networked systems and peripherals, and independently configure some settings (e.g. duplex print, set proxies) to optimise for a particular task. Independently select and efficiently use software functions for navigation, formatting, setting parameters, and transferring data. e.g. altering toolbars, sorting and layout functions. Solve routine hardware, software, and network problems; protect computers, networks, and information; and access online help and user documentation to solve common problems. e.g. update virus checkers, backup strategies – USB/external hard drive (ACARA) **Selecting ICT.** Explain the value of the hardware and software they are required to use . e.g. page layout software good for posters (ACARA)	Students: **Collaboration**. Select and use a range of appropriate ICT tools to share and exchange information and to support group collaboration. e.g. online documents and management tools for collaborative projects; exchange data, joining virtual communities (access, protection etc) (ACARA) **Social Protocols**. Discriminate between protocols suitable for different communication tools when collaborating in virtual communities. e.g. appropriate use of salutation; adjusting length and formality of message to suit form of communication; appropriate identification of contributor (ACARA) **Security**. propose and apply a range of techniques and strategies appropriate to participation in virtual communities, while assessing the risk. e.g. modify default parameters at social networking site (ACARA)	Students: **Planning Research**. Select and use appropriate ICT to analyse information in order to frame questions and plan research strategies. e.g. create wikis; concept maps with hyperlinks; create relational databases of information (ACARA) **Research Tasks**. Use specific digital tools including search engines, advanced search functions or peripheral devices to locate, retrieve and record precise data and information in a variety of file formats. e.g. using Boolean logic; search within fields or for data type; open, select or save in different formats; access an academic directory; access a register-only website; site maps; bread crumbs, recognise icons; use data logger to capture soil temperatures (ACARA)	Students: **Ideas and Plans.** Select and use appropriate ICT to develop effective designs and efficient plans for the creation of solutions or answers to questions, e.g. use features of software such as links, tables and tracking to: propose multiple plans; show selections; modify plans; show reviewing and consultation. ACARA) **Students Select and Use**: a range of appropriate ICT tools and techniques to create multi-dimensional solutions that consider the purpose, the characteristics of users and the results of testing. e.g. movies; music; formulas and chart parameters in spreadsheets; developing models; animations; websites; programming (gaming) tools; databases (ACARA) **Publishing & Presentation** Create effective digital media layouts of various types. e.g. multi-component online or handheld layouts

Year 9 & 10 (High School)	The Ethical, Cultural and Social Context of ICT	Understanding ICT	Using ICT		
			Relationship and Communications	Research and Investigation	Creative Application of Technology
	protecting information .e.g. use filters to divert junk mail (ACARA) **Personal Security**. Understand the need for codes of conduct and procedures for ICT use in different contexts. e.g. identify possible consequences of posting revealing personal information on social networking sites; recognise the range of ways of using ICT that can result in cyber bullying; take responsibility for the effect of communications on other people (ACARA) **ICT and Society**. Reflect on the use of ICT to assess its impact and future needs in the workplace and society and consider their role in influencing ways in which ICT is used. e.g. enhanced	**Understanding Systems**. Identify visible components of ICT system, their fundamental functions, and describe them using basic ICT terminology. e.g. hardware/software; input/output/storage; network; data; recognise basic conventions such as the 'shut-down' command; recognise the function of simple peripherals such as USB drives; recognise commonly used types software such as web-browsers; connections between mouse and actions on the screen (ACARA) **Understanding what is going on with and within modern computers?** • Identification of components within a modern computer. • Identification of components and the internal organization of a PC. • PC disassembly. • De-manufacture components, e.g., take apart an old disk drive.	**Managing Data**. with guidance, use basic software commands to manage and maintain digital files on common types of storage medium e.g. "run" programs; save and retrieve files from directories; provide unique names for files; apply basic functions such as opening and dragging-and dropping files on the desktop; use 'save as' (ACARA)	**Research Evaluation.** Develop and use guidelines and appropriate criteria for evaluating the quality of located information (accuracy, bias and comprehensiveness) and establishing the credibility of the source. e.g. establish protocols, for the inclusion or omission of potential resources and apply them to select a set of 'best' resources from a larger set; compare objective data from multiple sources to evaluate the likely credibility of the information provided (ACARA)	**Word Processing** Create effective text layouts of various types and sources. e.g. for online or handheld viewing, speech recognition, language translation **Graphics & Animation** Create effective graphic and photographic images and animations. e.g. for online or handheld viewing **Audio/Music** Combine sounds, incorporate effects and original music **Video** Edit and combine original video with complex effects for a variety of platforms. e.g. handheld and mobile viewing **Data Processing** Create digital repositories for a range of different data types and delivery mechanisms. e.g. simple relational databases, online data entry

Year 9 & 10 (High School)	The Ethical, Cultural and Social Context of ICT	Understanding ICT	Using ICT		
			Relationship and Communications	Research and Investigation	Creative Application of Technology
	inclusivity for people with special needs; opportunities from convergence of technologies; redundancy of routine skills due to technological developments (ACARA)	• Reassembly and configuration of the PC. • Loading, installing, and configuring a commercial application **Understanding the Lifecycle care of a modern computer** • How applications drive requirements for upgraded capabilities. • How required capabilities plus von Neumann architecture drive component design. • Upgrade the PC due to a new requirement. • Tasks for routine maintenance. • Troubleshooting and repair using a systems approach. • Recycling obsolete components - where do all the old computers go?			**Control/ Programming** Use ICT to measure, record, respond to and control events by planning, testing and modifying sequences, repetitions and branching of instructions. e.g. using automatic weather stations, data logging in fieldwork and experiments, using feedback to control devices, automating frequently used processes **Computation and modelling** Use ICT to test predictions and discover patterns and relationships, by exploring, evaluating and developing models and changing their rules and values. e.g. formulae, graphs and calculations in spreadsheets, graphic calculators and other applications (ACARA)

Year 11 & 12 (High School)	The Ethical, Cultural and Social Context of ICT	Understanding ICT	Using ICT		
			Relationship and Communications	Research and Investigation	Creative Application of Technology
	Students: As role models, take on mentoring tasks within the school student body. Respect the personal space of others and understand that the space of others includes their creative work **Research and discuss how computing relate to human intelligence?** **Computing and human intelligence** • Examples of computing "intelligence". • Limitations of computing. ○ *Algorithms* ○ *Limitations of abstraction.* ○ *Electronic calculator - review of limitations of capacity, precision, and accuracy* ○ *Relationship between accuracy and*	Students: **Where does the power of a modern digital computer come from?** **Algorithms** Method of differences algorithm via the human computing team. Everyday procedures contrasted with algorithms Review algorithms the students already know, e.g., decimal vertical addition History of algorithms from Ancient Egypt through Knuth. Relative efficiency of alternative sorting algorithms; practical limitation of machine processing capacity due to an intractable amount of computation. **Stored program control** The fetch-decode-execute cycle. Instruction set. Machine language.	Students: **Collaboration**. Select and use a range of appropriate ICT tools to share and exchange information and to support group collaboration. e.g. online documents and management tools for collaborative projects; exchange data, joining virtual communities (access, protection etc) (ACARA) **Social Protocols**. Discriminate between protocols suitable for different communication tools when collaborating in virtual communities. e.g. appropriate use of salutation; adjusting length and formality of message to suit form of communication; appropriate identification of contributor (ACARA) **Security**. propose and apply a range of techniques and strategies appropriate to participation in virtual communities, while assessing the risk. e.g. modify default parameters	Students: **Planning Research**. Select and use appropriate ICT to analyse information in order to frame questions and plan research strategies. e.g. create wikis; concept maps with hyperlinks; create relational databases of information (ACARA) **Research Tasks**. Use specific digital tools including search engines, advanced search functions or peripheral devices to locate, retrieve and record precise data and information in a variety of file formats. e.g. using Boolean logic; search within fields or for data type; open, select or save in different formats; access an academic directory; access a register-only website; site maps; bread crumbs, recognise icons; use data logger to capture soil temperatures (ACARA)	Students: **Ideas and Plans.** Select and use appropriate ICT to develop effective designs and efficient plans for the creation of solutions or answers to questions, e.g. use features of software such as links, tables and tracking to: propose multiple plans; show selections; modify plans; show reviewing and consultation. (ACARA) **Students Select and Use**: a range of appropriate ICT tools and techniques to create multi-dimensional solutions that consider the purpose, the characteristics of users and the results of testing. e.g. movies; music; formulas and chart parameters in spreadsheets; developing models; animations; websites; programming (gaming) tools; databases (ACARA) **Publishing & Presentation**

Year 11 & 12 (High School)	The Ethical, Cultural and Social Context of ICT	Understanding ICT	Using ICT		
			Relationship and Communications	Research and Investigation	Creative Application of Technology
	meaning. ○ *Undecidability.* ○ *Emil Post's correspondence problem.* ○ *Universal Turing Machine and the halting problem*. • Turing test for "intelligence". ○ *Definition of the test, the Loebner Prize.* ○ *Eliza program, Eliza's successors, e.g., ALICE, Ella.* ○ *Anonymity on the Internet – machine or person on the other end?* • Searle's Chinese Room Experiment. **Good use of computers** For what tasks are electronic computers a match? - an approach to using computer products with judgment. Moral action with computers – discussion topics. Postulate guidelines for the operator concerning when to	**Bit level logic "below" the instruction set level.** Binary digits *Henry Morse and the first telegraph system, to introduce a binary system.* *Review of Jacquard's loom and Hollerith's census counter use of bits,* Implementing logic gates. *George Boole.* *Human analogue -> mechanical analogue -> DC electric circuits using batteries, resistors, manual switches, and relays -> transistor circuits.* *Applications, e.g., binary adder, tic-tac-toe machine, traffic light controller.* Implementing "memory". *Flip-flop.* *Shift register*. Microprocessor **Application level logic "above" the instruction set level**	at social networking site (ACARA) **Managing Data**. with guidance, use basic software commands to manage and maintain digital files on common types of storage medium e.g. "run" programs; save and retrieve files from directories; provide unique names for files; apply basic functions such as opening and dragging-and dropping files on the desktop; use 'save as' (ACARA)	**Research Evaluation.** Develop and use guidelines and appropriate criteria for evaluating the quality of located information (accuracy, bias and comprehensiveness) and establishing the credibility of the source. e.g. establish protocols, for the inclusion or omission of potential resources and apply them to select a set of 'best' resources from a larger set; compare objective data from multiple sources to evaluate the likely credibility of the information provided (ACARA) .	Create effective digital media layouts of various types. e.g. multi-component online or handheld layouts **Word Processing** Create effective text layouts of various types and sources. e.g. for online or handheld viewing, speech recognition, language translation **Graphics & Animation** Create effective graphic and photographic images and animations. e.g. for online or handheld viewing **Audio/Music** Combine sounds, incorporate effects and original music **Video** Edit and combine original video with complex effects for a variety of platforms. e.g. handheld and mobile viewing **Data Processing** Create digital repositories for a range of different data types and delivery mechanisms. e.g. simple relational databases, online data

Year 11 & 12 (High School)	The Ethical, Cultural and Social Context of ICT	Understanding ICT	Using ICT		
			Relationship and Communications	Research and Investigation	Creative Application of Technology
	use a computer. **Future potentialities of computers.** Types of distributed computing, e.g., human computing team, SETI project, peer to peer computing, cluster computing. Nano-computers, including an imagination of pervasive nano-computing. Beyond silicon, e.g., quantum computers, DNA computers. Evolutionary algorithms. Fuzzy logic.	Programming. *A procedural programming language.* *Contrasts of an object-oriented language.* *Components of a development environment.* *How a specific application program works, e.g., text editing.* *HTML or XML.* *User-centred design*. Operating system, including kernel distinction from bundled applications. **Computer networking** Set up a computer network with PCs, a printer, and Internet access. IP networking and how the Internet works. The Internet as intersecting international communities.			entry **Control/ Programming** Use ICT to measure, record, respond to and control events by planning, testing and modifying sequences, repetitions and branching of instructions. e.g. using automatic weather stations, data logging in fieldwork and experiments, using feedback to control devices, automating frequently used processes **Computation and modelling** Use ICT to test predictions and discover patterns and relationships, by exploring, evaluating and developing models and changing their rules and values. e.g. formulae, graphs and calculations in spreadsheets, graphic calculators and other applications (ACARA)

NSW School Certificate (Year 10) Computing Skills Results 2006 - 2010 (with permission)

Lorien Novalis School for Rudolf Steiner Education, Sydney

year	Formal ICT Started	Exam Online? Pen/Paper?	Absentees	How Many Sat	Result spread			Board of Studies Statistics				
					CND	C	HC	School EM Mean	School EM SD	State EM Mean	State EM SD	z-score
2006	Yr 8	Pen/Paper	3	21	0	5	16	84.32	5.7	80.55	10.46	0.36
2007	Yr 8	Pen/Paper	7	22	0	8	14	82.23	9.25	80.28	10.56	0.18
2008	Yr 8	Pen/Paper	0	20	0	9	11	82.8	7.96	80.71	10.7	0.2
2009	Yr 8	Pen/Paper	3	16	0	3	13	84.13	8.45	81.67	10.2	0.24
2010	Yr 8	Online	3	20	0	9	11	78.55	9.21	79.44	10.84	0.08
2011	Yr8	Online										

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year	Formal ICT Started	Exam Online? Pen/Paper?	Absentees	How Many Sat	Result spread			Board of Studies Statistics				
					CND	C	HC	School EM Mean	School EM SD	State EM Mean	State EM SD	z-score
2006	Yr 7	Pen/Paper	5	49	0	12	37	83.04	8.15	80.55	10.46	0.24
2007	Yr 7	Pen/Paper	0	49	0	10	39	84.88	8.24	80.28	10.55	0.44
2008	Yr 7	Pen/Paper	0	22	0	6	16	83.53	11.48	80.71	10.7	2.82
2009	Yr 5	Pen/Paper	6	38	0	11	27	81.57	8.43	81.67	10.2	0.01
2010	Yr 5	Online	8	16	0	8	8	77.06	11.96	79.44	10.84	2.38
2011	Yr 5	Online										

CND	Competency Not Yet demonstrated	0 <= 50
C	Competent	51 <= 79
HC	Highly Competent	80 <= 100