Progression and Continuity in Student ICT Capability

Abstract: ICT capability is a 21st century skill embedded throughout all the Learning Areas of the Australian Curriculum. Despite this and the increasing use of technology in the classroom, the level of ICT capability of students in Australia has declined as indicated by the 2014 NAPLAN ICT literacy results. This paper draws from literature that examines some of the issues that may inhibit the active development of student ICT capability such as the inability of teachers to teach ICT capability alongside their subject. It will discuss the best practices that can be implemented by teachers in all stages of education from early childhood to secondary schools. It is acknowledged that progression and continuity in student ICT capability can be part of the solution to the successful learning of ICT skills by students. However, this cannot be accomplished without the efficient assessment of student ICT capabilities by teachers. These skills and knowledge can also aide teachers in being able to plot a student's path in the ICT capability Learning Continuum of the Australian Curriculum. Finally, if students are to effectively develop their ICT capability then there needs to be a general consensus amongst all subject teachers that it is also their responsibility to ensure that this occurs.

The Importance of Progression and Continuity of Student ICT Capability

ICT capability is more than just a 21st century skill embedded in the Australian Curriculum. It is a tool for learning where students can use "ICT effectively and appropriately to access, create and communicate information and ideas, solve problems and work collaboratively in all learning areas at school and their lives beyond school" (ACARA, 2016). The core strength of ICT capability development lies in a teacher's ability to judge the decisions that students make to complete a finished product. A student needs to be able to demonstrate their knowledge of a wide variety of ICT software and hardware together with their awareness of this knowledge-base and their ability to make informed decisions as to whether this knowledge is appropriate to use.

The progression and continuity of student ICT capability in education are a crucial plan for teachers from early childhood education through to secondary education to consider. When individually examined, progression is more concerned with an individual's learning and refers to how a student can learn concepts and skills of increasingly difficult nature. Continuity focuses more on the experiences offered to students and this can be achieved by students if they are presented by the teacher with "tasks that are designed to follow on from one another with no sudden jumps and no repetition" (Kennewell, Parkinson, & Tanner, Sharing perspectives across phases of schooling, 2000, p. 166). Both aspects of ICT capability is valuable to the management of students as work that is duplicated can lead to the stagnating of learning for them and this, in turn, can result in disruptive behaviour (Kennewell, Parkinson, & Tanner, Sharing perspectives across phases of schooling, 2000). It is imperative, therefore, that teachers design activities that build on a student's previous learning and provide achievable challenges (Kennewell, Parkinson, & Tanner, Sharing perspectives across phases of schooling, 2000). The sharing of views by teachers with their colleagues is also then a key player to ensure that this occurs.

According to Kennewell et al. (2000), it is the increasing scope and transferability that defines progression in ICT capability. The development of ICT capability combines both practical and theoretical elements, and this means that teachers need to ensure that students are continually working to a higher standard while undergoing complex hands-on tasks and are demonstrating their comprehension of increasingly sophisticated ideas and concepts. The use of sophisticated software and techniques is essential then to support a students' learning if they are to progress through school (Kennewell, Parkinson, & Tanner, Sharing perspectives across phases of schooling, 2000).

Progression and continuity in student ICT capability are about teachers ensuring that their students are prepared for 21st century life by being an ICT capable student. To be ICT capable then is to have the disposition to construct ICT solutions to problem situations that are relevant to the context and are based on the knowledge of the opportunities and constraints of the ICT tools available. Teachers should provide opportunities for students to go beyond developing a knowledge of a wide range of techniques and skills.

Progression in ICT Capability

To understand the mechanisms of how a student can progress in their ICT capability, it is best first to look at the context of ICT capability. Research shows (Bennett, Hamill, & Pickford, 2007; Morgan & Siraj-Blatchford, 2009;

Kennewell, Parkinson, & Tanner, 2000) that ICT capability consists of five interrelated components – routines, techniques, concepts, processes and higher order skills. Not only are these components significant in the development and design of ICT activities but also that they play a significant role in the assessment of students' capabilities. It is imperative that teachers accurately determine the level of ICT capability a student may be currently at. Each component plays a key role in a student's progression as they need to demonstrate their ability to carry out the task at hand and it is this ability to perform the sets of processes that constitutes ICT capability (Potter & Darbyshire, 2005).

According to Kennewell et al. (2000), progression in ICT capability can be divided into two major groups. The first comprises of "strategies, processes and personal qualities relating to the application of ICT to the solution of problems" (Kennewell, Parkinson, & Tanner, 2000, p. 39). In this particular aspect of progression it is important that the student demonstrates strategic planning, evaluation and a deep understanding and transferrable knowledge of ICT. Research indicates that these qualities enable an individual to survive the practical ICT demands of an ICT-integrated life as they have an insight into the ICT potential of situations. Progression in the second aspect of ICT capability (see Figure 1) is concerned with the student learning to solve increasingly sophisticated problems with a fluent and comprehensive range of techniques. Both aspects of progression should form an integral part of the assistance of similar learning in other subject disciplines including those that are directly supported by ICT (Kennewell, Parkinson, & Tanner, 2000).

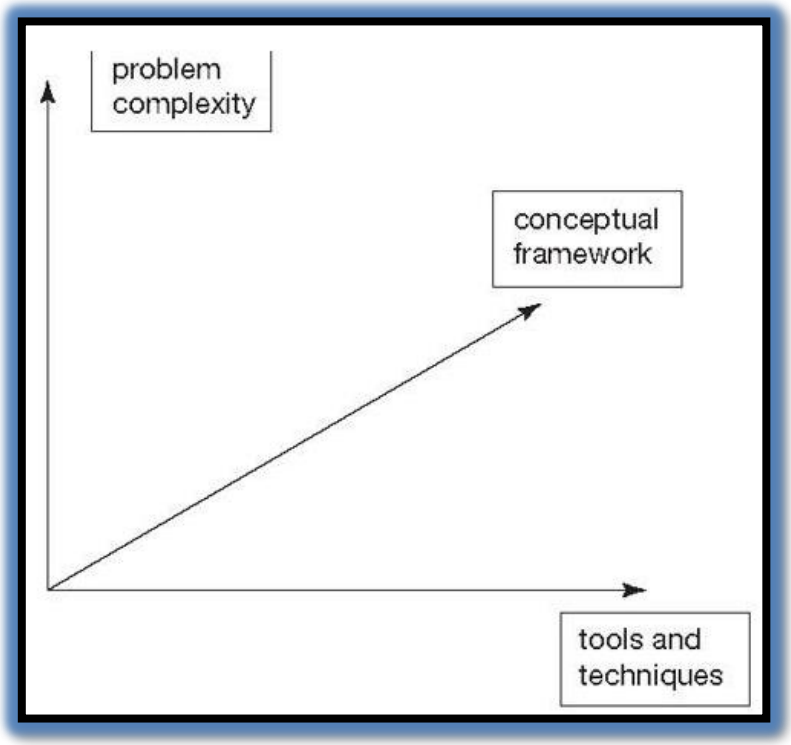

Figure 1. Dimensions of progression in ICT capability (Kennewell et al., 2000, 40)

The key attributes of progress in student ICT capability include:

- Students demonstrating greater autonomy in their selection and use of information sources and tools;
- An increased awareness of the benefits and limitations of the systems which they use;
- The student is able to share their ideas in an increasing variety of ways with a developing sense of audience;
- There is the use of ICT-based models that grows more complex as students use them for increasingly complex lines of enquiry involving greater decision making and personal autonomy and;

- A student's ability to evaluate their work grows as they become more able to discuss and appreciate social, political, legal and moral issues.

  (Kennewell, Parkinson, & Tanner, 2000)

Progression in ICT capability can be facilitated if teachers broaden and elaborate the contexts and ICT environments. It is best to use the most sophisticated software as a consequence of increasing elaborations in the curriculum contexts (Kennewell, Parkinson, & Tanner, 2000). An important point to remember is that the use of sophisticated software does not constitute progression in ICT capability. Teachers should encourage students to use the most sophisticated software only if the task demands it and not just for the sake of it. Progression in ICT capability will occur when students are required to work on increasingly difficult tasks that arise from subject curricula. Learning will occur once students have been able to successfully overcome any difficulties that may occur.

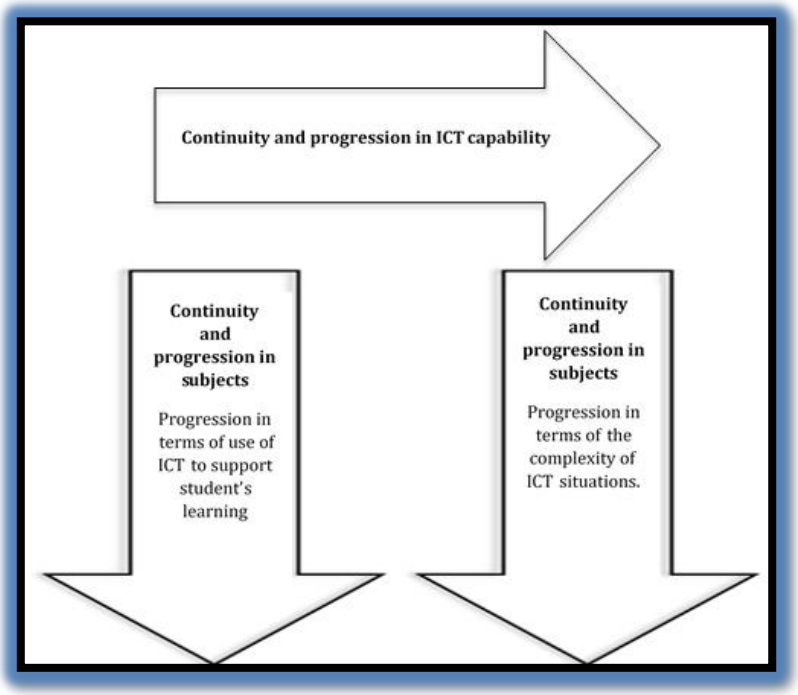

Figure 2. The two dimensions of continuity and progression in ICT capability (Kennewell et al., 2000, 167)

Lastly, the key to being able to ensure progression occurs is to have the right affordances available. The environment where the students will learn has to enable students to achieve their goals within a particular problem situation. Affordances could include the "intentional support in the form of the scaffolding, the assisted performance or the contingent support for learning provided by the teacher and the other students or by the technology" (Kennewell, Parkinson, & Tanner, 2000, p. 51). These affordances need to be manipulated by the teacher along with the context about the student's existing abilities if learning is to occur. It is essential that there is a gap to bridge between the students' existing abilities and the affordances of the environment. Progression in ICT capability will not occur if there is little or no gap involved in the use of application of software. Learning will only be enhanced in areas such as techniques and processes if the gap is manageable in these areas. The manipulation of these affordances is central not only to a teacher's role, but it is also fundamental to management roles as well.

Determining progression in student ICT capability

For teachers to determine if progression has occurred, there is a need for them to know exactly where a student

has started from, where they ought to be and where they are going (Bennett, Hamill, & Pickford, 2007). Accurately determining the level of capability of a student is the key then to acquiring this information. Once this information has been gathered it should be made easier for teachers to plot a course for that student. According to Potter et al. (2007, p.85), the principles of assessment of ICT should include some or all of the following:

- Observing how the child goes about a piece of work;
- Diagnosing difficulties which become apparent over a series of lessons;
- Observing which planning strategies appear to work and allow the child to succeed in a given area;
- Collecting significant pieces of work in a portfolio of development;
- Noting the context of the work and any factors which were significant: the grouping, the time taken, the level of concentration etc.;
- Noting the views of the child about the piece of work and asking her or him what made the activity so successful/significant;
- Feeding the information back into the planning process;
- When appropriate, making a judgement about the child's level in terms of the level descriptions in the attainment targets for ICT in the National Curriculum (at the end of the key stages in the primary school);
- At all times keeping a clear focus on the objective; this is very important as well as having a general awareness of other learning taking place.

As it can be seen in the list above, the use of observation by the teacher is highly regarded as the best method to assess a student's ICT capability. Monitoring a student's ICT work is particularly important as teachers can not only observe a student's progress on a task and, therefore, ICT skills but also, it has significant behaviour management ramifications. For example, when it comes to using ICT it is common for students to appear to be working productively. However, they may, in fact, be working inefficiently and failing to exploit the full potential of the ICT tool (Kennewell, Parkinson, & Tanner, 2000). A good approach is to give students something productive to do and then to monitor their progress towards the completion of the task.

One such example of how a teacher can monitor a student's progress is by using a tracking system such as a checklist of ICT skills they want to the student achieve. It is imperative that the tracking system is effective to ensure that each student's skills are recorded accurately to help in the determination of their progression. If carried out correctly, the teacher can then use the data for future planning which would then ensure continuity in the student's learning.

Planning for Appropriate Learning Experiences

Planning for the appropriate learning experiences with ICT will only ensure progression and continuity if the teacher has a "good level of knowledge of each students' capabilities" (Kennewell, Parkinson, & Tanner, 2000, p. 167). The effective assessment of student's ICT capability is, therefore, an essential element in a teacher's planning when deciding to use ICT in the classroom. ICT capability is also effectively developed if ICT is planned as a meaningful activity that is embedded in a subject-related context. Teachers can also include differentiation in their planning as ICT is a great tool for allowing teachers to adjust activities to meet the needs of students. It is important to ensure that students do have the support they need for them to develop their ICT capability.

When planning for progression in ICT capability, Kennewell et al. (2000, p.90) suggests that the following questions first be considered by teachers.

- What is the educational purpose of the activity – to develop ICT capability, to support learning in another area of the curriculum, or both?

- Will the children need to be monitored to identify opportune moments for teacher intervention to enhance their skills?

- Does it provide children with experience of using ICT as a tool?

- Are there opportunities to assess children's ICT competence?

- Will the children work co-operatively or collaboratively? How will this be introduced and supported?

Laying the Foundations: Effective Progression in Early Childhood Education (ECE)

Effective progression and continuity in ICT capability development in ECE is crucial for the solid foundation and development of student ICT skills. ICT capability is a 21st century skill or general capability that is embedded in the national curriculum from the Foundation Stage through to the end of Year 10 (Level 6 ICT Capability Learning Continuum). The analogy that 'a house cannot stand without good foundations' is symbolic of how significant it is for educators in ECE to learn how to ensure that the children in their care are progressing in their development of ICT capability. Furthermore, it is imperative that they learn how to accurately determine a child's capabilities. By doing so, they will be setting a precedence for everyone else to follow.

For educators in ECE, the learning environment is different to that in primary and secondary classrooms. However, the principles of using ICT in the learning environment remain the same. Planning for the integration of ICT means that you are ensuring that ICT will be viewed as a tool for teaching and learning (Kennington & Meaton, 2009). ICT capability can be enhanced when specific skills are taught and learnt, and the appropriate knowledge has been obtained and understood by the child. When a child has mastered essential ICT skills it gives them mastery and control over the equipment, and this is how educators can help their children obtain the full benefits from ICT. As Potter et al. (2012, p.82) states "planning for ICT means developing an understanding of the ways in which young children think and learn." Effective planning is the key to ensuring that there is progression already occurring in the early learning setting.

The following guidelines are suggested by the QCAA (2006) for planning in ECE:

- Identify technology as products or ways of doing things (artefacts, systems, processes and environments);

- Investigate products of technology and make connections with ways products are used in everyday life (e.g. candles, electric lights, emails and computers);

- Investigate ways technology is used in their local areas (systems such as garbage collection, factories that manufacture goods, designed environments e.g. parks, mobile phone network).

- Reflect on and discuss how technologies affect people's lives;

- Use a range of technologies, including computers, to support their interaction with others;

- Investigate ways that information and communication technologies can be used to communicate (email, telephone, television, Internet, radio).

In the early learning setting, continuity shares similar attributes as it does in the other education sectors. Some examples of continuity in ICT for children include the following (O'Hara, 2004, p. 45):

- Encouraging the children to use the correct terminology when talking about their work with ICT;

- Encouraging younger children to work in pairs on the computer to foster cooperative and collaborative work as well as communication, language and literacy skills;

- Ensuring experience of a wide and varied range of ICT equipment and skills throughout the children's nursery and reception. This includes using programmable toys/vehicles, listening stations, musical keyboards and real world applications as well as computer keyboards, operating the mouse, printing out work, saving work and using a range of word processing, graphics and data handling software;

- Using ICT in both indoor and outdoor contexts.

Table 1. Progression in ICT capability in ECE (O'Hara, 2004)

Progression in ICT	Examples
Showing an interest in ICT	Asking/learning about the uses of ICT around the nursery/school. Asking/learning about the uses of ICT in the world. Playing with ICT in the home.
Operating simple equipment	Using the tape recorder/listening station to listen to taped stories and music. Asking/learning about switching on and closing down procedures for the PC. Incorporating ICT into role play and situations. Operating the pelican crossing during an out of school visit. Knowing names of examples of ICT(e.g. computer, mobile)
Performing simple functions	Rewinding, fast forwarding and ejecting tapes. Taping and playing back own stories and music. Using letter keys, Delete and spacebar on the PC. Programming the roamer or Pixie to follow route. Using the mouse/arrow keys to select items on a computer screen. Extending technical vocabulary.
Recognizing everyday applications and using ICT to support learning.	Printing and saving work on the PC and changing colour or pen width using a painting and drawing package with help. Navigating CD ROM materials including nonfiction and talking stories. Sharing ICT skills and knowledge with peers.

Progression and continuity within a school

Progression and continuity in student ICT capability not only needs to occur within the individual classroom but also between the teachers of various year levels within the school itself. The effective assessment of ICT capability has already been noted earlier in this paper. Once teachers have achieved this then the accurate information needs to be shared amongst the teachers at the school when the student moves onto the next year level. As a result, these teachers can then effectively plan for further progression and continuity in ICT capability.

Progression in the ICT capability Learning Continuum

In the Australian Curriculum, there are six levels of progression in ICT capability. Four levels are within the realm of primary education (from Foundation Year – Year 6) while the remaining levels fall within that of secondary education (Year 8 – 10). It is important to note that there are gaps in the learning between each level. For example, it is stated that students are expected to achieve various levels of abilities at the end of every two years. As a consequence, the ability of teachers to accurately determine a student's capability is the key to being able to effectively help them progress in the ICT capability Learning Continuum. Such information is crucial not only for future planning but in providing meaningful information for parents.

Sharing perspectives between schools

So far in this paper it has been discussed how progression and continuity in ICT capability can be achieved within the school setting. Students who move from school to school are at risk of losing this key aspect of their learning if accurate information on a student ICT capability is not recorded and shared with the school with which the student will attend. The lack of progression and continuity as discussed earlier can then cause behavioural problems

for the new school with the student as boredom sets in as a result of their learning stagnating. It is imperative then that whether a student goes from either primary to secondary school or moves to another secondary school, that this does not occur. Consequently, progression and continuity in ICT capability should flow naturally from the beginning of their first education days in early childhood education to primary education and then finally secondary education.

The Challenges that lie ahead

For there to be effective progression and continuity in student ICT capability several issues need to be addressed. Firstly, as the development of ICT capability stems from the classroom teachers need to learn how to effectively accomplish this alongside the curriculum context they teach. The two dimensional nature of continuity and progression in ICT capability has been demonstrated earlier in Figure 2. It illustrates the complexity of being able to teach two subjects effectively at the same time. Regardless of the difficulties it may pose ICT capability is best developed by incorporating it in wide range of context. Every subject teacher should therefore see it as part of their job to improve students' ICT capability. As Kennewell et al. (2000, p.166) points out "progress in ICT will occur as each student is required to work on increasingly complex situations that arise from subject curricula."

Another issue of concern is the well-known fact that teachers today are 'time-poor'. The lack of time that teachers have is often used as an excuse to avoid doing something that has low priority (Kennewell, Parkinson, & Tanner, 2000). Planning for continuity is something, however, that would save time by excluding any repetition of work that a student may have done in their previous learning at another school for example.

Also contributing to the lack of progression is in the areas where a secondary school may have a large number of contributory primary schools. Research in the UK (Jones & Jones, 1993 as cited in Kennewell et al., 2000) has indicated significant problems in the progression of student ICT capability.

The repetition of subject content is also a inhibiting factor to the progression of student ICT capability. In the past secondary teachers in particular have assumed that students have little or no knowledge of their subjects and as a consequence they from scratch with their content. This approach is untenable and it should be "planned in full knowledge of what has gone before, rather than left to chance and circumstance" (Kennewell, Parkinson, & Tanner, 2000, p. 168).

Earlier in this paper it was discussed how imperative it is that teachers accurately determine a student's ICT capability. The quality and nature of the information transferred stems from the same process. If teachers at a previous school or year level fail to determine the level of capability of a student it could impede their progress. Also if the volume of information shared is overwhelming for teachers it may also have a negative impact on the progression and continuity.

Conclusion

The progression and continuity of student ICT capability is of vital importance to teachers from early childhood education to secondary education. The grass roots for the development of ICT capability with students has to come from the classroom where teachers need to learn how to effectively teach it alongside of the curriculum context. Determining the level of capability a student is at then becomes part of this process as it not only provides accurate information for teachers to include in their future planning but also to help eliminate behavioural problems too. Accurate information should also be shared amongst teachers within the school itself and also when transitions occur between schools. In relation to the ICT capability Learning Continuum this information provides teachers with significant data to help them plot a student's path in the Australian Curriculum. While technology in the classroom may be widely accepted by many teachers the issues that inhibit a student's progression and continuity in ICT capability need to change direction. Planning for progression and continuity is therefore essential for educational leaders and indeed teachers themselves if positive experiences in the development of ICT capability with students is to be achieved.

References

ACARA. (2016, February 4). *Australian Curriculum*. Retrieved from Information and Communication Technology Capability: http://www.australiancurriculum.edu.au/GeneralCapabilities/information-and-communication-technology-capability/introduction/background

Allen, J., Potter, J., Sharp, J., & Turvey, K. (2012). Planning for ICT in the Early Years Foundation Stage. In J. Allen, J. Potter, J. Sharp, & K. Turvey, *Primary ICT:Knowledge, Understanding and Practice* (pp. 64-69). London: Sage Publications.

Beauchamp, G. (2013). ICT in the Early Years. In G. Beauchamp, *ICT in the Primary School: From Pedagogy to Practice* (pp. 188-104). Routledge.

Bennett, R., Hamill, A., & Pickford, T. (2007). Assessment. In R. Bennett, A. Hamill, & T. Pickford, *Progression in Primary ICT* (pp. 67-88). David Fulton Publishers.

Bennett, R., Hamill, A., & Pickford, T. (2007). *Progression in Primary ICT.* Abingdon: David Fulton Ltd.

Berry, C. (2003). *Early Learning in the Knowledge Society.* Bassingstoke: IBM. Retrieved January 28, 2016, from http://www.psicoeducacion.eu/eduinfantil/conferencia%20kidsmart,%20cv.pdf

Imison, T., & Taylor, P. (2001). What is ICT capability. In T. Imison, & P. Taylor, *Managing ICT in the Secondary Classroom* (pp. 75-82). Oxford: Heinemann Educational.

Kennewell, S. (2003). The Nature of ICT as a Subject. In S. Kennewell, J. Parkinson, & H. Tanner, *Learning to ICT in the Secondary School: A companion to school experience* (pp. 18-36). Oxon: RoutledgeFalmer.

Kennewell, S., Parkinson, J., & Tanner, H. (2000). Developing ICT capability. In S. Kennewell, J. Parkinson, & H. Tanner, *Developing the ICT Capable School* (pp. 48-49). London: RoutledgeFalmer.

Kennewell, S., Parkinson, J., & Tanner, H. (2000). Sharing perspectives across phases of schooling. In S. Kennewell, J. Parkinson, & H. Tanner, *Developing the ICT capable school* (pp. 165-170). Routledge Falmer.

Kennewelll, S., Parkinson, J., & Tanner, H. (2000). ICT in the Primary Classroom. In S. Kennewell, J. Parkinson, & H. Tanner, *Developing the ICT Capable School* (pp. 90-111). Routledge Falmer.

Kennington, L., & Meaton, J. (2009). Integrating ICT into the Early Years Curriculum. In H. Price, *The Really Useful Book of ICT in the Early Years* (pp. 4-25). Routledge.

Morgan, A., & Siraj-Blatchford, J. (2009). Developing ICT capability in the Early Years. In A. Morgan, & J. Siraj-Blatchford, *Using ICT in the Early Years* (pp. 7-10). Practical Preschool Books.

O'Hara, M. (2004). Planning for ICT. In M. O'Hara, *ICT in the Early Years* (pp. 41-60). London: Continuum.

Potter, F., & Darbyshire, C. (2005). The Nature of ICT Capability. In F. Potter, & C. Darbyshire, *Understanding and Teaching the ICT National Curriculum* (pp. 17-24). Oxon: David Fulton Publishers.

Potter, J., Sharp, J., Turvey, K., & Allen, J. (2007). Assessment and recording in Primary ICT. In J. Potter, J. Sharp, K. Turvey, & J. Allen, *Primary ICT: Knowledge, Understanding and Practice* (pp. 84-93). British Library Publications.

QCAA. (2006). Early Years Curriculum Materials: Learning about technology. Brisbane, Queensland, Australia.