Student capabilities and attitudes towards ICT in the early years

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ABSTRACT

This study investigated the use of ICT in the Early Years (R-3) in two diverse school settings. Students were surveyed to investigate their use of ICT at home and school. The findings presented, focus on student's self-assessed capabilities and attitudes using ICT and explore differences between the responses from the two schools.

The idea that a new generation of students is entering our schools has captured the attention and prompted debate amongst educators and education commentators. Advocates of the notion argue that this new generation has grown up in media-rich digital environments and therefore have a greater interest in and aptitude for using information communication technologies (ICT) (Kennedy, Dalgarno, Bennett, Judd, Grey & Chang, 2008). For these 'digital natives' (Prensky, 2001), technology has been such an integral part of their lives since birth (Aubrey & Dahl, 2008), they think and process information differently compared to older generations of 'digital immigrants' who grew up in a much more analog world (Prensky, 2006). Thus, in this technological world, children are often more comfortable than their parents and teachers. Social researchers (Strauss & Howe, 1998) labeled this generation born from approximately 1982 to 2004 as the 'Millennials' whilst others, including many teachers, often use the term 'Generation Z' (Schmidt & Hawkins, 2008); (Walliker, 2008), D-Generation (Jukes & Dosaj, 2006) or Net Generation (Oblinger & Oblinger, 2005).

The basic notion of intergenerational differences is that there are a set of experiences and social and economic conditions typically shared by people the same age during their formative years that shape their thinking, values and beliefs. Generational theory does not replace or contest psychological, medical and other paradigms for understanding individuals and groups, but sits alongside and complements these frameworks for understanding (Pendergast, 2007). Despite this, intergenerational differences have been used as the basis to argue that education must fundamentally change to keep pace with technology-driven societal change or risk alienating learners.

The debate about digital natives has been described as an academic form of 'moral panic' lacking empirical evidence (Bennett, Maton, & Kervin, 2008). The picture emerging from research is that young people's relationships with technology are much more complex than the digital native characterisation suggests (Bennett et al., 2008). There is a need to prepare students to live and work in a digital world (Australian Government, 2008) but it is not simply a matter of mapping the use of new technologies onto old curricula (Yelland, 2007). A bold new approach to curriculum is needed which encapsulates a notion of design that provides opportunities for students to explore and investigate in ways that were not possible without the new technologies (Yelland, 2007). Today's students must be able to decipher meaning and express ideas through a range of media (Hill, 2004a).

Research has shown that teachers in the Early Years can be narrowly concerned about the operational dimension of technology (i.e. the technical competence in using equipment) and therefore tend to overlook the critical and cultural dimensions of multimodal texts (Hill, 2004b). Consequently, young students, especially those 'at risk', may not come to understand how texts and technologies are used for their own and other's purposes in school or everyday life, or understand that what is communicated and studied is selective (Durrant & Green, 2000). Teachers require a significant amount of sustained experience to become technically and pedagogically accomplished using ICT.

Generally, the term 'Early Years' refers to children aged 3-8 years. However, this paper takes a more narrow focus on children aged 5-8 years that are in the Early Years of schooling (Reception to Year 3). This paper investigates students' use of ICT at home and school as well as their capabilities and attitudes in two different school settings. Students born between 2001 and 2004 are of interest in this study. These students are in the first four years of schooling in South Australia.

BACKGROUND

Before 1999, most of the available literature on ICT for young children focused on the role and use of computers. Since that time, there has been a growth in the research and descriptive literature about the use of other kinds of ICT including digital cameras, digital video, programmable toys, robots and electronic musical instruments (New Zealand Council for Educational Research, 2004). Much of this research has focused on early childhood and pre-school settings (below age 5 years). A search of the available literature on ICT in the Early Years continues to be extremely limited, not only in Australia but globally (Hill, 2004b). In addition, while policies and reports in Australia and around the world indicate the importance of including ICT in learning, few efforts have been made to engage learners in dialogue about how they would like to

see their classrooms and schools change to enable learning with technologies (Owen & Moyle, 2008).

Understanding the lived experiences and interactions of children with computer technologies in their homes is important to inform the work of educators who wish to provide effective instructional environments (Downes, 2002b). Children come to school with different orientations to learning, and with skills and literacies that have been developed from the use of technologies outside of school. Strengthening the links between home and school can deepen children's learning with ICT and enable skills to be transferred between these two environments.

A 'digital divide' exists between students' access to, and use of, new technologies at home and school (Zevenbergen & Logan, 2008). For 'Millennials', digital technology is so much a part of their lives that they barely notice it is there (Zevenbergen & Logan, 2008). "They use DVD and CD players to select their favourite movies and music, use the remote to channel-surf, use a microwave to heat up their snacks, a mobile phone to SMS their friends, the internet to email their grandmother, and the family computer to play and learn" (Campbell & Scotellaro, 2009). According to Downes, a positive key feature of children's home computer use is the control they have over the computer and being able to choose what they explore and create (Downes, 2002a, 2002b, 2002c). Young children see computers as a play activity and enjoy various drawing programs, educational games, talking books and the Internet. They also visit online websites linked to television shows (Hill, 2004b).

In contrast to the home setting, the school environment tends to control children's ICT use. Until recently, there were many who seriously doubted the appropriateness of computers and other ICT as part of the educational provision of young children. This was because emphasis has traditionally been placed on the development of interpersonal social skills and physical coordination (Ferguson, 2005); (Miller, 2005). At school, students have little control over their use of ICT. Due to time constraints, children are often directed towards websites or given specific tasks that may need to be completed in the average 30-45 minutes allocated computer time each week (Downes, 2002b). Many teachers restrain students' use of technology in an effort to keep all students working on the same activities at the same time.

The provision of free play opportunities with more focused group work involving adult direct instruction appears to be the most desirable model to promote the effective use of ICT with pre-school children (Siraj-Blatchford & Siraj-Blatchford, 2006). It is important to point out that although this approach has been shown valuable in terms of children's early learning, evidence suggests that too often there is no adult present to provide the necessary scaffolding and support (Siraj-Blatchford & Siraj-Blatchford, 2006).

A 'digital divide' also exists between students who do and do not have access to computers at home. Without access, students may not have the opportunity of developing the skills that other students do. These skills include using a mouse, finding letters and numerals on a keyboard or screen, typing letters and words, navigating websites, retrieving files, using pull-down menus, loading CDs and DVDs, uploading photos from a digital camera, using toolbars, saving files, printing documents and files and using drawing software (Zevenbergen & Logan, 2008).

This study, while investigating students' use, capabilities and attitudes towards ICT at home and school, contrasts the results from two different socio-economic settings and highlights some of the variation that occurs within this group of 'Millennials'. One school has a high number of students that receive School Card while the other school has fewer students. The 'School Card' Scheme provides financial assistance towards the educational expenses incurred by families who meet the eligibility criteria of having a child or children from four years of age attending school full time and a gross income within identified income limits.

Data Collection

This study is part of a larger project investigating contemporary learning with ICT. The ongoing project has included individual and small group interviews with teachers and classroom observations.

School A is located 7kms from the capital city with a population of approximately 460 students (Reception to Year 7). The school has a low School Card percentage of approximately 17%. Approximately 52% of students are from a non-English speaking background. Students have limited access with only weekly sessions in the computer lab and 2 or 3 computers in their classrooms. In addition, they also receive lessons integrating ICT with support from the teacher-librarian and ICT Coordinator that work alongside classroom teachers.

School B is 7 kms from the capital city with a population of approximately 200 students in Years Kindergarten to Year 7. The school has a high School Card percentage of almost 65%. Over 51% of students come from a non-English speaking background. A specialist ICT teacher conducts weekly sessions in computer lab whilst the class teacher receives release time. Classes also access the computer lab at least once per week with their classroom teacher mostly to use online drill and practice software to support literacy and numeracy.

Twelve classes participated in the study. Due to the different number of students in each school, the numbers of students for each year level varied. Table 1 shows the student population surveyed.

Table 1: Classes and students surveyed

School A	School B
Reception – 1 class (24)	Year R/1 – 1 class (35)
Year 1/2 – 1 class (24)	Year 1/2 – 1 class (20)
Year 2 – 2 classes (53)	Year 2/3 – 1 class (21)
Year 3 – 2 classes (58)	Year 3 - 1 class (19)
Year 3/4 – 1 class (28)	
Total = 187 students	Total = 95 students

As students were aged 5-8 years, class teachers conducted the survey. Students indicated their responses to quantitative questions via a show of hands. The teacher acted as a scribe to qualitative responses. The survey questions were designed to gather basic information about children's use of ICT at home and school.

As with all empirical research, this study has limitations and these must be considered when considering the results. The gender of respondents was not identified and there is an unequal distribution of students across the Early Years age range in each school. This means that it is not possible to interpret the results in terms of gender differences or specific year levels. As there were more older students in School A than School B, this may also have influenced the results. It was also not possible to record the qualitative responses of all students. This means that for the qualitative questions, the frequency of students' items within each class was not recorded. Due to the limited sample size, the results should not be generalised. Despite these limitations, the results provide a general overview of students' use of ICT at home and school.

RESULTS

Table 2 shows the results of the quantitative survey questions by school. The questions investigated students' ownership of ICT, their capabilities and attitudes. The results indicate a substantial difference in the level of ownership of a home computer: 93% of students from School A and 59% of students from School B. Students in School A also had a higher percentage of ownership of other technologies such as a mobile phone, digital camera, Mp3 player and Xbox. Only 7% of students in School B indicated that they use a computer at home for their school work compared to 69% for School A. The difference in percentage for students using a computer everyday was only 9%.

Results of questions asking students to self-assess their capabilities shows that the students in School A had a higher percentage of students that indicated that they knew how to:

- Turn on a computer and find things by themselves
- Find information by themselves on the Internet
- Use email
- Use a mobile phone
- Use SMS
- Use a digital camera

Concerning students' attitudes, the results show that a greater percentage of students in School A like using the computer compared to School B. The students in School A also think that using computers at school makes learning more fun and are more likely to ask a family member for help to search for information on the Internet. There was only a 6% difference between the students in School A and School B for their preference to working on a computer with a friend. It is interesting to note the percentage of students that think their teacher likes using the computer: 95% of students in School A and 67% in School B. This result may reflect the attitude and level of knowledge and skills of the teachers of these students and the frequency and type of use of ICT in these teachers' classrooms.

Overall, the results suggest that students in School A have a higher level of ownership and use of ICT at home, have more knowledge and skills, use it more at home to support their learning, and have a more positive attitude towards using ICT at school.

Table 2: Comparison of quantitative survey results by school

Questions	School A	School A %	School B	School B %
No. of students	187		95	
Who has a computer at home?	179	96	56	59
Who knows how to turn it own and find things on the computer by themselves?	165	88	49	52
Who likes using the computer?	182	97	66	69
Who uses the computer nearly every day?	106	57	44	46
Who plays games on the computer?	182	97	64	67
Who uses the computer at home for their school work?	133	71	7	7
Who likes to work on the computer with a friend?	133	71	60	63
Who asks Mum or Dad or their brothers or sisters to help them search for information on the Internet?	89	48	29	31
Who can find information by themselves on the Internet?	123	66	32	48
Who likes using the computer at school?	186	99	59	62
Who would like to use the computer more often at school?	142	76	46	48
Who thinks that using computers at school makes learning more fun?	172	92	46	48
Who thinks their teacher likes using the computer?	182	97	64	67

Questions	School A	School A %	School B	School B %
Who likes using the interactive whiteboard?	158	84	66	69
Who knows how to email?	136	73	21	31
Who sends emails to their friends, grandma, grandpa, uncle, aunty, or cousins?	120	64	30	32
Who owns a mobile phone?	47	25	18	19
If you don't own mobile who knows how to use a mobile phone?	111	59	29	31
Who knows how to SMS?	116	62	13	14
Who can use a digital camera?	148	79	58	61
Who owns a digital camera?	100	53	26	27
Who owns an Mp3 player or an iPod?	95	41	25	26
Who owns an Xbox, play station or Wii?	139	74	46	48

Table 3 shows a selection of students' responses to the question: What games do you like to play on the computer? No prompts of games were provided to students when asking this question. The games have been classified into three categories (Strausburger, Wilson, Jordan, 2009).

- Educational or informative: Games that have been specifically designed to teach people about a certain subject, expand concepts, reinforce development, understand an historical event or culture, or assist them in learning a skill as they play.
- Sensorimotor: Action games, arcade games, fighting and shoot-em-up games, and driving and racing simulators.
- Strategy: Adventure games, war games, strategic simulations, role-playing games, and puzzles.

The numbers in brackets next to some items indicates the number of times the item was identified. The games (or games websites e.g. PrimaryGames.com) identified by students in both schools are mostly available free of charge online. The items that require a subscription or purchase are indicated with the $ symbol. The item marked as * indicates that this game is clearly identified on the website as not being suitable for children as it contains extreme animated violence.

The educational games identified are frequently played at school as part of the curriculum or free play. These games often relate to children's popular culture e.g. movies, television shows and toys. The sensorimotor games are generally played for entertainment at home as some are inappropriate for school (e.g. Boxhead is a shoot the Zombies game). The strategy games that cost money are only played at home.

Table 3: Student responses to the question: What games do you like to play on the computer?

	Educational Games	Sensorimotor Games	Strategy games
School A	PrimaryGames.com (2) Solitaire (2) Disney Channel Monopoly Happyland Dora Science Lab Star Fall Fun Brain ABC Kids	Snowline (4) Lego.com (3) Deep Freeze (2) Club Penguin (2) Miniclip.com Stormhawks Boxhead Moonscape Hit the Cyclist Little Princess	Runescape Age of Empires $ Fate $ Even More Contraptions $ Pokémon Scorpion Island Lego Indiana Jones Madagascar $ WallE game $
School B	Disney Channel (2) Dora (2) Blue's Clues Playschool In The Night Garden Lazy Town Games ABC Kids Cards Matching Games Targeting Maths	Ben10 (4) Tom & Jerry Scooby Doo Cookie Mama (2) * Scary Maze Square Pants Racing Games Spirit Fashion Designer Bakagon	World of Warcraft (3) $ Pokémon (2) Barbie Batman 3 Battlegone $ Scorpion Island Storm Hawks

The results shown in Table 3 indicate that the games played by students at the two schools were different. In the category of educational games, there were only three games that were similar between the students in School A and School B. These were the Disney Channel, Dora and ABC Kids. In the category of sensorimotor games, there were no common games identified between School A and School B students. In the category of strategy games, two similar games (Pokémon and Scorpion Island) were identified by students in both School A and School B. Furthermore, students in School A identified five games that required purchase or a subscription compared to the students in School B that identified two. Overall, the results suggest that there are more differences than similarities between the types of games played by students in School A and School B, especially in terms of sensorimotor games that are freely available online for entertainment.

Table 4 shows a selection of what information students said they like to search for on the Internet. Much of this information relates to popular culture and topics of interests to young children that are investigated as part of learning activities at school. There does not appear to be a significant difference in the topics searched for by students.

Table 4: School A responses to the question: What information do you like to search for on the Internet?

School A	School B
Games (3)	Games (7)
Animals (3)	Hannah Montana (2)
Game cheats	Animals (6)
New releases (movies/games)	China
Pictures	Submarines
Bugs	Who is the author?
Mini-beasts	What is real?
Birds	Masks
Eggs	Volcanoes
Yabbies	Dora
History and how things evolve	Princess Movie
Ice	Fairies
Space	Music
Lego	Wrestling
Episodes You Tube	Bratz
Video clips	Videos
Sport	YouTube

Table 5 and Table 6 show students' responses to the question: What do you like to do on the computer at school? The results suggest that students in School B like to access the Internet more than students in School A. The students in School B identified mathematics resources that were not mentioned in School A. SuperClubs Plus, Targeting Maths and Multemaths are only accessible via subscription. Personalisation by Pieces is a curriculum assessment initiative from the UK being trialed by a teacher in School B. Overall, the results suggest that students from School A are familiar with a wider range of ICT tools used to create new texts.

Table 5: School A responses to the question: What do you like to do on the computer at school?

Games (6)	Making-movies	Copy and paste
Kidpix (4)	Pivot (animation)	German
Internet (4)	Copacabana	Videos
PowerPoint (3)	Lego	Sharing slideshows
Typing (3)	Email	Songs
Mind maps (3)	Writing	Photostory
Blog	Word	
Research (2)	Tux Paint	

Table 6: School B responses to the question: What do you like to do on the computer at school?

Internet (13)	Children's Encarta (2)	Audacity
Games (6)	Word (2)	Personalisation by Pieces
Kidpix (3)	Targeting maths (3)	Super Clubs Plus
Work using Easiteach (3)	Photostory	Adelaide Now
Multemaths (2)	Google maps	Painting
	Money	

Discussion of Results

A comparison of all results between School A and School B indicates that there were greater differences than there were similarities between the groups of students in the two schools. The two groups were similar in:

- Their level of use of a computer everyday
- Their preference for working on a computer with a friend
- A few educational games (ABC Kids, Dora and Disney Channel)
- A few strategy games (Scorpion Island and Pokémon)

There were substantial differences between the two groups of students. Compared with School B, School A students reported:

- A higher level of ownership and use of ICT at home
- More knowledge and skills
- A higher frequency of use of a computer at home to support their learning
- A more positive attitude towards using ICT at school
- Increased access to online games that require purchase or subscription
- A preference for using the computer to access a range of digital tools. In comparison, more students in school B identified that they liked using the computer to access the Internet.

The possible reasons for these differences are likely to be related to the different socioeconomic status between the two school groups. School A had a much lower number of

students receiving School Card financial assistance compared with School B. A relatively higher family income can provide students with increased likelihood of access to a home computer with fast and reliable Internet. In addition, parents may also have developed knowledge and skills using digital technologies as part of their education and occupation.

It is noteworthy to point out some of the major contextual differences between both schools that may influence the results' In particular, 90% of students in School A think that computers make learning fun whilst only 48% of students in School B think this. In the past, Early Years teachers in School B have had a narrow understanding of using ICT for literacy and numeracy and have predominantly used drill and practice types of software as well as the Internet. Teachers' ICT knowledge, skills and confidence were also low. In contrast, School A has focused on the use of ICT as an integral part of collaborative curriculum unit planning. This has included the use of ICT to support inquiry learning as a whole class activity, with clearly identified learning outcomes, explicit instruction in literacy, and assessment tasks shared with parents. The teachers in School A also have a high level of ICT technical skills. As a result, students in School A have had a wide range of experiences in designing, critiquing, producing and distributing multimodal texts (Durrant & Green, 2000). The data suggests that School A is using the computers in more creative ways compared with School B who are focusing on giving students skills to use computers and develop their content knowledge rather than integrating them into the curriculum.

The implications of these results for teachers is that they must ensure that ICT is not narrowly focused on the technology and content knowledge but focused on using it in ways that takes a three-dimensional view of literacy-technology learning (Hill, 2004b). The three dimensions are the operational, critical and cultural dimensions. The operational dimension refers to the 'how to' knowledge of operating the technology. The critical dimension considers the context, history and power of a text (Durrant & Green, 2000). The cultural dimension focuses on understanding the purpose of each literacy practice and making meaning of it.

Getting this balance right is crucial for teachers in low socio-economic schools where students may not receive the adult support to develop these capabilities at home. The curriculum in low socioeconomic schools must engage students appropriately with all three dimensions to empower them to participate effectively and creatively in their associated cultures, and critique them (Hill, 2004b). This means that priority must be given to curriculum that develops students' experience with using digital tools for learning, rather than instruction. The use of the inquiry learning approach, that requires students to consciously make decisions about what digital tools are appropriate and when to use these for specific audiences and purposes, may prove valuable in facilitating this curriculum design and balance. Guided inquiry during the Early Years at school would also provide an effective transition from the emphasis on play in pre-school settings. This approach is best supported by flexible access to ICT in schools that is not restricted to regular timeslots in specialist computer rooms.

The study was not without limitations. For example, the quantitative survey questions could have been refined to clarify students' use of computers at home. Specifically, the survey would have been improved if there had been a question asking students to indicate if they had access to a computer at home and if, and how, they used it other than for school work. Only 7% of students in School B indicated that they used a computer at home for their school work compared to 69% of students in School A. However, it was not explicit to what extend children used the computer at home for non-school work related activities such as playing online games. Due to the lower rate of ownership of ICT in School B, it is most likely that students do not have the same level of access for non-school work related activities. As teachers are aware of the problem of limited access in School B, they also do not expect high levels of computer use by students at home.

CONCLUSION

This study has shown that although students may be described as 'Millennials', their relationship with technology is far more complex than a simple characterisation of this generation. Clearly, socioeconomic factors and limited access constrain young students' capabilities, attitudes and experiences using ICT. Understanding students' lived experiences with ICT in their homes is important to inform the work of educators who wish to provide effective instructional environments. Strengthening the links between home and school can deepen students' learning with ICT and enable skills to be transferred between these two environments. Preparing young students to live in the digital world means, providing opportunities for them to investigate in ways that were not possible without the new technologies, and designing curriculum that blends 'play' with focused group work involving adult direct instruction. Further research is needed about the type and frequency of computer use at home and gender preferences. It would be valuable to investigate students' perceptions about the value of ICT for learning, how they feel about its use at school, the difficulties they encounter and what they would like to see changed. Also further insight is needed on how students would like to see their teachers using ICT for their learning.

BIOGRAPHY

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