

Cognition, Literacy and Mobile Technology: A Conceptual Model of the Benefits of Smartphones for Aboriginal Students in Remote Communities

Genevieve Marie Johnson (g.johnson@curtin.edu.au)

Rhonda Oliver (rhonda.oliver@curtin.edu.au)

School of Education

Curtin University

Perth, Australia

Abstract: Indigenous youth in remote regions of Australia are disadvantaged in school and in life. While the reasons are complex and multi-faceted, improved connectivity infrastructure, hardware such as smartphones and highly motivating Web 2.0 applications may provide mechanisms by which to improve the educational outcomes of Indigenous students in remote communities. Based upon review of the literature, a pedagogical model is proposed and presented. The model organizes the relationships between web-based applications, Indigenous learning styles and life circumstances and the potential benefits of smartphones in terms of cognitive and literacy skills. Smartphones may constitute a particularly powerful mechanism by which to improve the reading skills of Indigenous adolescents living in remote communities. The connectivity infrastructures, sophistication of devices and Indigenous adolescent motivation all currently exist.

Introduction

Australian Indigenous youth are three times more likely to be unemployed and not enrolled in educational/training programs than their non-Indigenous peers (29.1% Indigenous compared with 9% of non-Indigenous young people). Indigenous youth living in remote regions represent an even greater proportion of this group (39.5%; Steering Committee for the Review of Government Service Provision, 2009). Causative factors include low levels of school attendance, retention and completion; limited access to quality education; limited educational support from home; poor health and low social and emotional well-being; as well as other problems associated with socio-economic disadvantage and social exclusion (Purdie & Buckley, 2010). Consequently there is an urgent need to find ways to improve the literacy levels of Indigenous learners, particularly those at high school with expectations of entering the workforce or proceeding to higher education.

Relative to dominant cultures, Indigenous individuals throughout the world typically demonstrate lower cognitive abilities, and hence lower educational attainment (Lynn, 2006). White (1996) found that two-thirds of Australian Aboriginal youth scored below average on standardized measures of the verbal reasoning. Leigh and Gong (2009) reported that gaps in cognitive development between indigenous and non-indigenous Australians increased as children aged. Under-developed cognitive skills are the consequence of an array of risk factors including lack of healthcare, inadequate stimulation, substance abuse, trauma, malnutrition, chronic illness and fetal alcohol syndrome – all widely reported in Indigenous populations, particularly in remote communities (Dingwall & Cairney, 2009). In Australia, as in many industrialized nations, a range of government policies and initiatives are addressing inequalities in access to information, communication and entertainment technologies (Notley & Foth, 2007), particularly in rural and remote regions (Velaga, Beecroft, Nelson, Corsar, & Edwards, 2012).

Technology, Cognition and Literacy

Technology enhances learners' cognition and literacy development because it assists their "ability to monitor several visual stimuli at once, to read diagrams, recognize icons, and visualize spatial relationships" (DeBell & Chapman, 2006, p. 3). Further, it provides opportunities for "repeated exposure to activities that facilitate the development of culturally-valued skills such as literacy and problem solving" (Johnson, 2011, p. 66).

Kinzer (2010) argued “that literacy is being redefined as a result of the use of digital media” (p. 51). For example, text messaging (TM), used within short messaging systems (SMS) or as instant messaging (IM) has led to new forms of written language (Kemp, 2011). Used in internet chat rooms and on mobile phones, textese or digitalk includes initials for common phrases (e.g., lol for laughing out loud), homophones (e.g., gr8 for great), abbreviations (e.g., cos for because), symbols for emotions and the omission of words, vowels, punctuation and capitalization (Drouin, 2011). Crystal (2006) notes that TM satisfies the criteria of both spoken language (i.e., spontaneous, loosely structured and socially interactive) and written language (i.e., space-bound, repeatedly revisable and visually decontextualized). Reid and Reid (2007) report that approximately half of young people in their study cohort preferred to text their friends rather than talk to them. Baron (2009) reviewed the research and concluded that general use of web-based technologies improves students’ capacity to read and write. Simply stated, “the more a child uses the internet, the more he/she reads” (Jackson et al., 2007, p. 188).

Despite research providing contrary evidence, there remains some disquiet amongst educators that the language of social media may have deleterious effects on literacy. For example, although the most common textisms are phonologically-based (e.g., C U L8R for see you later), typographical and spelling errors are routinely tolerated (Madell & Muncer, 2007) and informal spelling and grammar may actually be encouraged (Vockaert-Legrier, Bernicot, & Bert-Erboul, 2009). According to Durkin, Conti-Ramsdent and Walker (2011), some words are deliberately misspelled (nuffin for nothing) while others are phonetically distorted (da for the). The theory of situated learning suggests that the use of textese would transfer to all writing (Drouin, 2011, p. 69). Turner (2010), however, argues that the abbreviated language conventions of digital communication are not deficient but “just a different language used in special contexts” (p. 41). Further, Coe and Oakhill (2011) noted that students who were good readers used more TM than those who were poor readers. Kemp and Bushnell (2011) reported that better literacy skills were associated with greater textese reading speed and accuracy among 10 to 12 year old students and concluded that there was “growing evidence for a positive relationship between texting proficiency and traditional literacy skills” (p. 18). Unfortunately and despite the research-confirmed advantages, to date, little research has systematically examined the potential benefits of web-based applications and mobile technologies for improving the cognitive skills and literacy levels of Australian Indigenous individuals, particularly those in remote communities.

Technology and Indigenous Learners

“Indigenous nations around the world have voiced their wish to be included in the Information Society” (Brady, Dyson, & Asela, 2008, p. 385) and to “participate in all manner of media and Information Communication Technology” (Secretariat of the United Nations Permanent Forum on Indigenous Issues, 2003, p. 9). One common problem, noted by Dyson (2004), is the limited connectivity of some Indigenous communities causing a disparity between those who can access and benefit from technological innovation and those who cannot (Black & Atkinson, 2007). In Australia, a range of government policies have attempted to address inequalities in access to information and communication technologies, but despite these attempts the key determinants of access such as age, income, educational attainment and Indigenous status are proving to be persistent (Notley & Foth, 2007). However, in recent times increased connectivity is being addressed by the National Broadband Network and improved mobile phone technology, especially the rise of smart phones, is serving to overcome problems with hardware. Further, the high cost of fixed-line services and their absence in many remote communities, combined with the deregulation of telecommunications has fuelled exponential growth in mobile preference. It is also now possible to develop mobile devices which are environmentally robust and can withstand heat, dust and rain to suit the conditions where many Indigenous people live (Dyson, 2007).

Brady and colleagues (2008) provide a rich description of the adoption of mobile phones by individuals living on the Torres Strait Islands (TSI). Reportedly, within a few short weeks of the implementation of the wireless network in 2005, most adults in the community had purchased a mobile phone. This contrasted with previous studies of ICT on the Island where using the keyboard and reading the screen were viewed as barriers to computer use by older TSI people. The high rate of mobile phone adoption observed by Brady et al is supported by evidence from Australian telecommunications companies. For example, “Telstra’s own figures have shown that the introduction of mobile telephony into Indigenous communities has trebled the usage expected” (Department of Industry and Resources, 2006, p. 6). This can be attributed to the current low price of basic mobile phones compared with the purchase of a computer and service provider contracts. A major outcome of Brady et al’s study

was the propensity for texting among the basically oral community. Indeed, one respondent estimated that he/she sent 100 messages per day, that is, “yarning through text” (p. 392). Thus, in rural and remote Indigenous communities, mobile technology is actually encouraging writing among those previously disenfranchised by traditional forms of literacy. The question, however, remains – what is the impact of this change?

Culturally, digital technology lends itself to Indigenous learning styles due to the “flexible and democratic styles of teaching and learning” and particularly the way that it allows “students more autonomy and control over their learning, and gives voice to underrepresented groups” (Pirbhai-Illich, Turner, & Austin, 2009, p. 147). Indigenous students’ learning preferences have been well-documented such as learning through observation and imitation rather than verbal instruction; learning through trial and feedback - although an apparent reflective style and passive participation may be due to fear of shame or ridicule; learning as part of a group process rather than learning as an individual; holistic (global) learning in preference to sequential or analytic learning; visual-spatial learning requiring concrete and abstract imagery; contextual learning (compared with the decontextualized learning of school settings); and spontaneous rather than structured learning (Hughes, More, & Williams, 2004; Yunkaporta, 2010). Aboriginal pedagogy favours indirect rather than direct orientation to learning, evident in the avoidance of direct questioning, direct instruction and behaviour management (Harrison, 2010). In conclusion, Aboriginal pedagogies are intensely ecological and place-based, drawn from the living landscape within a framework of profound ancestral and personal relationships with place (Marker, 2006). As such, traditional Western pedagogies often are not effective, indicating the need for the implementation of new and innovative ways of learning. Adopting new technology, namely smart phones, to access social networking and information websites may provide a way forward. It is the aim of this research to investigate whether or not this is the case.

The digital revolution has created highly innovative and effective alternatives to traditional ways of learning (Johnson & Johnson, 2006a) which appear particularly well-suited to Aboriginal orientations to learning (Dyson, 2004, 2007). Jorgensen and Lowrie (2011) report on the use of a digital game in a remote Aboriginal school. The digital media provided new learning spaces and resulted in unintended learning outcomes including improved social and numeracy skills. Moreover, curriculum offerings were not compromised, but enhanced as was students’ desire to participate. Through technologies such as podcasts and weblogs, story-sharing is facilitated (Richardson, 2006) providing further advantage for Indigenous learners. Support for the use of technology with adult Indigenous learners is provided by Eady, Herrington and Jones (2010) who report literacy improvement through blogging, Facebook, email, Skype, Elluminate and online pinball games for social networking, Microsoft PowerPoint and Publisher for presentations and Photo Story and Movie Maker for digital storytelling. The teachers in their study also reported that these computer applications incorporated literacy skill-building opportunities such as driver’s license preparation, tax filing skills, banking and opportunities for higher education courses. The teachers also noted that digital technologies support Aboriginal orientation toward visual literacies, oral memory and spatial relations. A further advantage of working with digital technology is that it can be made culturally appropriate and supportive of trans-generational groups sharing their knowledge. Mobile technology can also help to provide literacy and learning opportunities in a learner’s own environment lessening isolation and shame that Aboriginal people experience through public exposure. Indeed, digital forms of communication are particularly compatible with individuals who are shy, anxious and non-verbal (Hertel, 2008; Johnson & Johnson, 2006b). Websites are most easily interpreted holistically with hyperlinks that may function as learning maps. Digital images and icons (e.g., Facebook) are also fundamental to these and suit the visual orientation of Indigenous users. Kral (2012) reports ethnographic findings that explain the social mechanisms responsible for Indigenous adolescent adoption of mobile and digital technologies. With respect to youth occupying the Ngaanyatjarra Land in the south-east of Western Australia, Kral observes:

As small mobile digital technologies - digital camera, USB sticks, mp3 players and mobile phones – have become more affordable, yarning [people or person] are purchasing these devices as individual everyday social objects. The size of these objects is important: most are small enough to fit in pockets and bras and can be slept with at night. In an environment predicated upon demand sharing, these are items of personal ownership that don’t have to be shared. These technological artefacts are an extension of yarning sociability; they represent a medium of identity expression and a way of maintaining connectedness with others, and, as such, they are objects to be looked after for future use. Affective significance is embedded in these new artefacts. They make sense because they enable communication and enrich social relationships, albeit at a distance, thus illustrating that when the adaptability of material artefacts is immediately evident, new social

practices emerge, corporeal dispositions alter and new resources are woven into an existing system to fulfil an essentially expressive function (p. 230).

Digital technologies have progressed rapidly including improved functionality (i.e., increased uses and ease of use) and access (i.e., improved connectivity and reduced costs). Recently, the web has undergone drastic changes as it transitioned from a source of information posted by a small group of content experts (Web 1.0), to a read-write platform (Web 2.0) that enables content contribution, sharing, remixing and participatory practices (Greenhow Robelia, & Hughes, 2009). Web 2.0 technologies include social networks (e.g. Facebook), media-sharing sites (e.g. YouTube), blogging platforms (e.g. Wordpress), microblogging platforms (e.g. Twitter), content aggregators (e.g. Google Reader), social bookmarking sites (Veletsianos, 2012). Schools and teachers often struggle to incorporate meaningful digital learning activities and the most remote locations are the most digital disadvantaged (Brady et al, 2008). Efforts to promote use of ICT in Indigenous communities and schools typically focus of providing computer access and basic computer skills (Wallace, 2008); social media and mobile phones are characteristically unpopular with teachers (Johnson 2012). In some cases, instructional efforts to incorporate digital and popular culture literacy activities into school literacy lessons are ineffective and misguided (Honan, 2012). “Teachers colonise youth literacies when they insert them into pedagogies built around epistemological assumptions more appropriate to the modern print world than contemporary digital worlds” (Dooley, 2010, p. 113). Teacher control, student passivity, individual ownership and reproduction of prototypes are among the misguided practices that result in student disengagement in the processes of multiliteracies learning.

Based upon review of the literature, Figure 1 organizes the relationships between web-based applications accessed via smartphones, Indigenous learning styles and life circumstances and the potential benefits of smartphones in terms of cognitive and literacy skills which impact on school achievement, employability and quality of life. There is reason to infer compatibility between Indigenous learning style and life circumstances and web-based mobile applications. Although human learning is influenced by a wide array of forces, accumulating research evidence establishes that prolonged and supported use of web-based applications improves a range of cognitive and literacy skills and is associated with enhanced motivation, employability and school achievement. Smartphones may constitute a particularly powerful mechanism by which to improve the reading skills of Indigenous adolescents living in remote communities. The connectivity infrastructures, sophistication of devices and Indigenous adolescent motivation all currently exist.

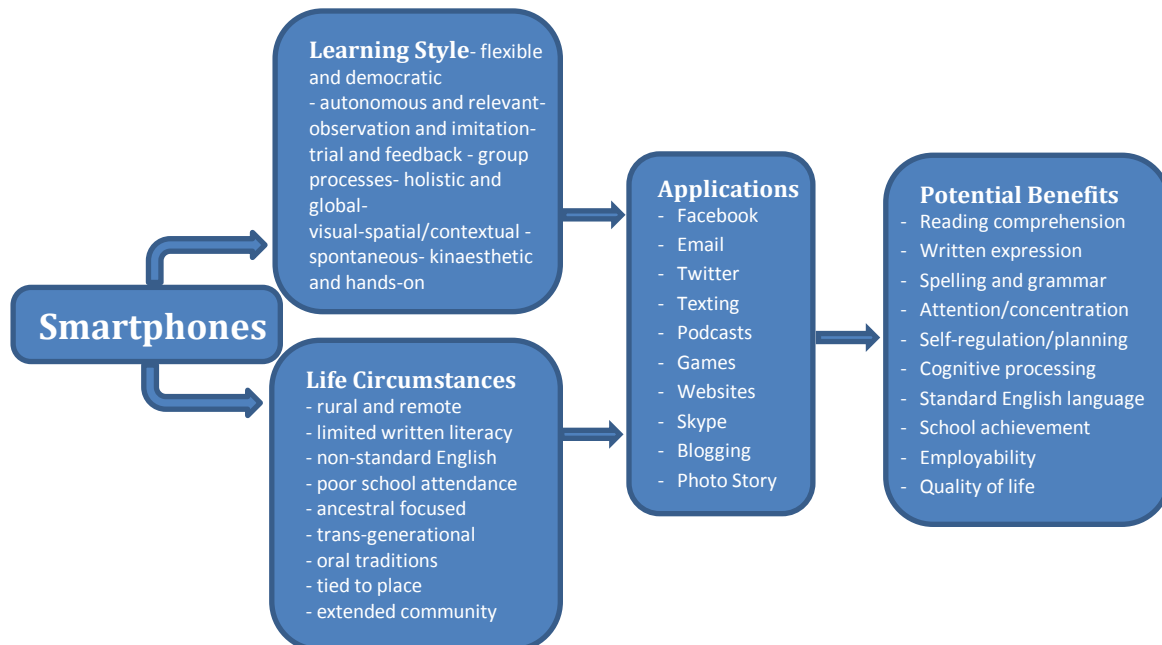


Figure 1: A Conceptual Model of Potential Benefits of Smartphones for Aboriginal Students in Remote Communities

References

- Baron, D. (2009). *A better pencil: Readers, writers, and the digital revolution*. New York: Oxford University Press.
- Black, R., & Atkinson, J. (2007). *Addressing the digital divide in rural Australia*. Southern Cross University. Retrieved from <http://ausweb.scu.edu.au/aw07/papers/refereed/black/paper.html#HREF7>
- Brady, F., Dyson, L., & Asela, T. (2008). Indigenous adoption of mobile phones and oral culture. In F. Sudweeks, H. Hrachovec & C. Ess (Eds.), *Proceedings: Cultural Attitudes towards Communication and Technology* (pp. 384-398). Perth, Australia: Murdoch University.
- Coe, J. E. L., & Oakhill, J. V. (2011). 'txtN is ez f u no h2 rd': The relation between reading ability and text-messaging behaviour. *Journal of Computer Assisted Learning*, 27, 4-17.
- Crystal, D. (2006). *Language and the internet*. Cambridge, UK: Cambridge University Press.
- DeBell, M., & Chapman, C. (2006). *Computer and Internet use by students in 2003*. National Center for Educational Statistics. U.S. Department of Education, Washington, DC. Retrieved from <http://nces.ed.gov/pubs2006/2006065.pdf>.
- Department of Industry and Resources. (2006). *Response to the Department of Communications, Information Technology and the Arts Discussion Paper on Mobile Connect: Improving Regional Mobile Phone Coverage*. Perth: Government of Western Australia.
- Dingwall, K., & Cairney, S. (2009). The importance and challenges of assessing cognition in Indigenous Australians. *Australasian Psychiatry*, 17(1), 47-50.
- Dooley, K. (2010). Multiliteracies and pedagogies of new learning for students of English as an additional language. In A. Healy, (Ed.), *Multiliteracies and diversity in education* (pp. 102-125). South Melbourne, VIC: Oxford University Press.
- Drouin, M. A. (2011). College students' text messaging, use of textese and literacy skills. *Journal of Computer Assisted Learning*, 27, 67-75.
- Durkin, K., Conti-Ramsdent, G., & Walker, A. J. (2011). Txt lang: texting, textism use and literacy abilities in adolescents with and without specific language impairment. *Journal of Computer Assisted Learning*, 27, 49-57.
- Dyson, L. E. (2004). Cultural issues in the adoption of information and communication technologies by Indigenous Australians. In F. Sudweeks & C. Ess (Eds.), *Proceedings: Cultural Attitudes towards Communication and Technology* (pp. 58-71). Perth, Australia: Murdoch University.
- Dyson, L. E. (2007). Wireless applications in Africa. In L. E. Dyson, M. Hendriks & S. Grant (Eds.), *Information Technology and Indigenous People* (pp. 286-294). Hershey, PA: Information Science Publishing.
- Eady, M., Herrington, T., & Jones, C. (2010). Literacy practitioners' perspectives on adult learning needs and technology approaches in Indigenous communities. *Australian Journal of Adult Learning*, 50(2), 260-286.
- Greenhow, C., Robelia, B., & Hughes, J. (2009) Learning, teaching, and scholarship in a digital age: Web 2.0 and classroom research: What path should we take now? *Educational Researcher* 38, 233-245.
- Harrison, N. (2010). *Teaching and learning in Aboriginal education*. South Melbourne, Australia: Oxford Press.
- Hertel, G. (2008). Do shy people prefer to send e-mail? Personality effects on communication media preferences in threatening and nonthreatening situations. *Social Psychology*, 39(4), 231-243.
- Honan, E. (2012). A whole new literacy: Teachers' understanding of students' digital learning at home. *Australian Journal of Language and Literacy*, 35(1), 82-98.
- Hughes, P., More, A., & Williams, M. (2004). *Aboriginal ways of learning*. Paul Hughes, Adelaide, SA.
- Jackson, L., Samona, R., Moomaw, J., Ramsay, L., Murray, C., Smith, A., et al. (2007). What children do on the internet: Domains visited and their relationship to sociodemographic characteristics and academic performance? *CyberPsychology and Behavior*, 10, 182-190.
- Johnson, G. M. (2011). Internet activities and developmental predictors: Gender differences among digital natives. *Journal of Interactive Online Learning*, 10(2), 64-76.
- Johnson, G. M. (2012). Comprehension of Standard English text and digital textism during childhood. *Internet Journal of Culture, Language and Society*, 35(1), 1-6. Retrieved from <http://www.educ.utas.edu.au/users/tle/JOURNAL/issues/2012/35-01.pdf>
- Johnson, G. M., & Johnson, J. A. (2006a). Computer technology and human learning: Review of recent quantitative syntheses. *Technology, Instruction, Cognition, & Learning*, 4, 287-301.

- Johnson, G. M., & Johnson, J. A. (2006b). *Personality, internet experience, and e-communication preference*. Paper presented at the Annual Conference of the International Association for Development of the Information Society. Murcia, Spain. (ERIC Document Reproduction No. ED494002).
- Jorgensen, R., & Lowrie, T. (2011). Both ways strong: Using digital games to engage Aboriginal learners. *International Journal of Inclusive Education*. Retrieved from <http://www.tandfonline.com/doi/abs/10.1080/13603116.2011.605912>
- Kaufman, S. (2012). Are cognitive g and academic achievement g one and the same g? An exploration on the Woodcock-Johnson and Kaufman tests. *Intelligence* 40(2), 123-139.
- Kemp, N. (2011). Mobile technology and literacy: Effects across cultures, abilities and the lifespan. *Journal of Computer Assisted Learning*, 27, 1-3.
- Kinzer, C. K. (2010). Considering literacy and policy in the context of digital environments. *Language Arts*, 88(1), 51-61.
- Kral, I. (2012). *Talk, text and technology: Literacy and social practice in a remote Indigenous community*. Bristol, UK: Multilingual Matters.
- Leigh, A., & Gong, X. (2009). Estimating cognitive gaps between Indigenous and non-Indigenous Australians. *Education Economics*, 17(2), 239-261.
- Lynn, R. (2006). *Race Differences in Intelligence: An Evolutionary Analysis*. Augusta, GA: Washington Summit Publishers.
- Madell, D. E., & Muncer, S. J. (2007). Control over social interaction: An important reason for young people's use of internet and mobile phones for communication? *CyberPsychology and Behavior*, 10(1), 137-140.
- Marker, M. (2006). After the Makah whale hunt: Indigenous knowledge and limits to multicultural discourse. *Urban Education*, 41(5), 482.
- Notley, T. M., & Foth, M. (2008) Extending Australia's digital divide policy: An examination of the value of social inclusion and social capital policy frameworks. *Australian Social Policy*, 7. Retrieved from <http://eprints.qut.edu.au/12021/>
- Pirbhai-Illich, F., Turner, K. C., & Austin, T. Y. (2009). Using digital technologies to address Aboriginal adolescents' education: An alternative school intervention. *Multicultural Education & Technology Journal*, 3(2), 144-162.
- Purdie, N., & Buckley, S. (2010). *School attendance and retention of Indigenous Australian students*. Issues Paper No 1 produced for the Closing the Gap Clearinghouse. Retrieved from http://www.aihw.gov.au/closingthegap/documents/issues_papers/ctg-ip01.pdf
- Reid, D. J., & Reid, F. J. M. (2007). Text or talk? Social anxiety, loneliness, and differential preferences for cell phone use. *CyberPsychology and Behavior*, 10(3), 424-435.
- Richardson, W. (2006). *Blogs, wikis, podcasts, and other powerful web tools for classrooms*. Corwin Press.
- Rowen, D. (2005). The write motivation: Using the internet to engage students in writing across the curriculum. *Learning and Leading with Technology*, 32(5), 22-23.
- Secretariat of the United Nations Permanent Forum on Indigenous Issues (2003). *Report of the Global Forum of Indigenous Peoples and the Information Society* (pp. 1-34). Geneva: World Summit on the Information Society.
- Steering Committee for the Review of Government Service Provision. (2009). *Overcoming Indigenous disadvantage: Key indicators 2009 report*. Canberra, ACT: Productivity Commission.
- Turner, K. H. (2010). Digitalk: A new literacy for a digital generation. *Phi Delta Kappan*, 92(1), 41-46.
- Velaga, N. R., Beecroft, M., Nelson, J. D., Corsar, D., & Edwards, P. (2012). Transport poverty meets the digital divide: accessibility and connectivity in rural communities. *Journal of Transport Geography*, 21, 102-112.
- Veletsianos, G. (2012). Higher education scholars' participation and practices on Twitter. *Journal of Computer Assisted Learning*, 28(4), 336-349.
- Volckaert, O., Bernicot, J., & Bert-Erbpoul, A. (2009). Electronic mail, a new written-language register: A study of French-speaking adolescents. *British Journal of Developmental Psychology*, 27, 163-181
- Wallace, R. (2008). *Engaging remote and very remote Indigenous students with education using in information and communication technologies (ICTs)*. Darwin, NT: Charles Darwin University. Retrieved from <http://www.deewr.gov.au/Schooling/DigitalEducationRevolution/Documents/FinalICTReport.pdf>
- White, C. (1996). Verbal reasoning ability of Aboriginal and Torres Strait Islander tertiary applicant. *The Australian Journal of Indigenous Education*, 24(2), 27-32.
- Yunkaporta, T. (2010). *8 Aboriginal ways of learning*. Retrieved from <http://8ways.wikispaces.com/>