Teachers' Values and Expectations of Technology in Northern Territory Primary Schools

Janet HELMER
Charles Darwin University[1]
Nazarbayev University[2]

Helen HARPER
Charles Darwin University[1]
University of New England[2]

Jennifer WOLGEMUTH
University of South Florida

Abstract: Educational outcomes are particularly poor for the 43 percent of Australia's Northern Territory students who are Indigenous, many of whom lag significantly behind their non-Indigenous peers (see ACARA, 2011.) The heavy investment by many NT schools in computers, interactive whiteboards and other educational technologies can be seen in part as an attempt to ameliorate their inherent disadvantage, thus equalising the learning opportunities in remote locations. Technology is a response to the need to better engage students and improve educational outcomes. This research examined motivational, pedagogical and systemic factors that affect the way technology is used in the classroom. Expectancy-value theory was used as a framework to organise and understand motivations when attempting to integrate technology into their teaching and how their expectation of the technology influenced their pedagogical goals. This research investigated what factors impact teachers' perceptions of ICT integration in their classes by looking at skills, practices, attitudes and ability to confidently integrate technology as a teaching tool. Data were gathered through observations of technology-based lessons and semi-structured interviews with teachers in Australia's Northern Territory schools. Results showed teachers placed high value on using technology for education; however, expectancy of its success was frequently diminished when teachers perceived barriers beyond their immediate control such as the lack of human resources to support the technology, and a lack of effective professional development resulting in teachers lacking confidence to successfully deliver a technology based lesson.

Keywords: Technology integration, Primary Schools, Teachers

Introduction

DeBortoli, Buckley, Underwood, O'Grady, & Gebhardt (2014) reported that schools in Australia are well endowed with information and communications technology resources. While injections of technology are being made by Federal, State and Territory Education Departments provide additional computers, tablets, interactive white boards and other technologies to schools, there has not always been a clearly articulated plan for implementation

In Australia's Northern Territory (NT), many schools have recently acquired a broad range of new technological equipment in a remarkably short time, including Interactive Whiteboards in every classroom, multiple laptop trolleys and other new technologies. The NT is rich in technology resources with 1:1 ratios which are very much above the international mean of 18 students per computer (Thomson, 2105). However, little is yet known about how effectively these tools are being used. Several other empirical studies have reported on teacher, school and system technology issues such as lack of professional development, minimal access to technology, lack of ICT maintenance, and confining, highly structured curriculums that end up discouraging the use of ICT (Buabeng-

Andoh, 2012). Although providing technology access to teachers is a necessary first step, this alone does not address the teacher related barriers or contradictions with knowledge, skills, value and attitudes towards the use of technology (Clarke & Zagarell, 2012; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012). Although many studies investigated the topic of technology integration among teachers, after three decades it is still an ongoing issue (Ertmer et al., 2012).

The way teachers interact with technology does not depend on its presence alone; it is also contingent on each teacher's ability to integrate the affordances of the tools within their own unique context (Hennessy, Deaney, Ruthven, & Winterbottom, 2007; Marzano, 2009). Our research examined motivational, pedagogical and systemic factors that affect the way technology is used in the classroom. In order to understand the situation it is critical to investigate the challenges teachers face and its impact on their willingness to infuse technology into their lessons (Bingimlas, 2009).

Theoretical Perspective

Expectancy-value theory has been used to explain the motivations underlying a person's behaviour, giving us a model to better appreciate and foresee actions when employing new tools. Previously used in industrial settings (Vroom, 1964), this model can accurately identify individual efforts (Kopelman, 1979). The theory holds that "individuals choose behaviours based on the outcomes they expect and the values they ascribe to those expected outcomes" (Borders, Earleywine, & Huey, 2004; Green, 2002). Using this model, successful use of technology by teachers can be attributed to whether the value derived is greater than the costs associated with it. If a teacher expects to use technology well and give positive value to what will be gained, they are more likely to persist further developing their confidence and pedagogical knowledge to use technology in their teaching.

Closely tied to expectancy-value theory or the motivations behind a person's behaviour are the emotions evoked by it. Emotions, whether positive or negative, are integrally connected with cognition and action, and can determine how much energy a teacher will put into taking on a new educational innovation, or avoiding it (Hargreaves, 2001).

The Context of the Study

Education in Australia's Northern Territory (NT), where this research was carried out, carries some specific challenges. The NT is sparsely populated, with 41 percent of the population of living outside of the two small urban centres of Darwin and Alice Springs. Educational outcomes are particularly poor for the 43 percent of NT students who are Indigenous, many of whom lag significantly behind their non-Indigenous peers (see ACARA, 2011). Hiring and maintaining skilled teachers outside of the town centres is an ongoing challenge (Ladwig & Sarra, 2009). The recent heavy investment by many NT schools in computers, interactive whiteboards and other educational technologies can be seen in part as an attempt to ameliorate their inherent disadvantage, and as a response to the need to better engage students thus improving educational outcomes.

Purpose

The primary aim of this research was to gather detailed information about primary teachers' technology use in NT schools. This research was guided by the following research questions:

RQ1: What are the teachers' attitudes, skills and practices when using technology for their teaching?
RQ2: What factors influence the teachers' use of technology?
RQ3: What teaching strategies are teachers employing when using technology?
RQ4: In what ways are teachers supported when integrating new technologies?

Design and Methods

Nine primary schools (4 urban, 5 remote) agreed to take part in this qualitative study. Two researchers visited the schools to observe technology-based lessons for approximately one week over one school semester in 2011. In each school one to four teachers agreed to be observed teaching technology-infused lessons with a total of 39

teachers Participants included 32 women and 7 men which represents the typical gender balance in primary schools. Observed lesson included literacy, mathematics, science, art and music. Teacher experience ranged from 2 years to 35 years. See Table 1

To further interrogate the research topic, semi-structured interviews were conducted to develop a deeper understanding of teachers' perceptions of how technology impacted on student learning. These interviews provided a further check on the researchers' interpretation of the lesson. The observational notes and interview recordings were then iteratively analysed throughout both the data collection and analysis to produce a thematic organisation of the data. Our analysis involved coding key emerging patterns (Saldana, 2013) that occurred between rural and urban locations, and age groups

Findings

Themes emerged from the interviews and observations that included both external barriers and internal barriers. External barriers included professional development and tech support while examples of internal barriers were teacher confidence and attitudes about the value of educational technology

Teachers' Perceptions of Educational Value

Despite often lacking confidence, the majority teachers placed a high value on the potential pedagogical benefits of the tools to 'engage' students. Teachers overwhelmingly agreed that technology by providing a more interactive experience better motivates and interests the student and thus potentially improves student outcomes. Learning about technology was seen as an avenue for preparing students to be part of a digital world beyond school.

> Robyn, a teacher from a remote Indigenous school commented;
> *The [...] Indigenous kids don't have computers at home, you know, they don't have a lot at home. [...] technology is vital for any future jobs, or just particularly being remote, it's the way to stay connected or to explore the world when you haven't got the money or the means to leave your community.*

Others saw this shift in teaching as an opportunity to learn about technology and improve their own skill level. In one urban school, teachers had developed a community of learners with those who were more confident offering support on a weekly basis to those who wanted to improve their skill set. In this school, teachers in similar grade levels would pair together to develop a lesson and attempt to find ways to integrate technology where appropriate. Teachers mentioned that as they developed more confidence they would push each other to try new ideas. In this this school, teachers often went and observed lessons of colleagues to get new idea and look at how the lesson was structured. However, this school was an exception to the others in our research.

Nevertheless, stress associated with technology frequently outweighed the value associated with it. Eighty per cent of the teachers in this research agreed that technology adds an additional level of stress and pressure to their job, a cost which sometimes outweighs the value of persevering with it when things are going wrong in a particular lesson. Older and more experienced teachers felt pressured to learn how to use technology in their lessons even if they didn't see the value associated with it. While their tried and trusted methods were no longer respected. Teachers mentioned feeling anxiety to have to learn technology even though there was little support to do this. A teacher in a remote school stated,

> *I hope to retire soon as people see me as a dinosaur since I prefer to use my traditional methods. However, those methods work and I get very good student outcomes which is why they give me all the challenging students so why would I use something I am not confident in or sure it even will make a difference in a student's learning.*

Teachers who placed a high value on technology attempted to use it more frequently than those who wanted to dismiss its value. Self-efficacy beliefs about what teachers believe they are capable of also impacts their willingness to use technology in their lessons (Lee & Tsai, 2010). Teacher participants in this study often while wanting to use it in their lessons were fearful of all the things they perceived could go wrong. Men overall had a higher level of self-efficacy and were more willing to give it a go as they were not as concerned about what might go wrong.

Technology Driving the Task

While many of the younger less experienced teachers were confident in their ability to use technology and did not shy away from using it as a regular part of their teaching, they often only had a very superficial experiences with technology as a teaching tool and had little understanding for how to choose developmentally appropriate tasks to support student learning. Observations and interviews revealed that in many instances teachers used technology as the driver of the pedagogical task and frequently pedagogical decisions appeared to be oriented primarily to the availability of the technology rather than to the instructional goal. Examples include the organization of time (waiting for programs to load) and space (seating arrangements for computer access); software use taking precedence as a teaching goal; as well as differentiation of access (children benefiting more or less in their learning, depending on their ability to manipulate the tools). It appeared in some instances that teachers expected the technology focus of the lesson to work of itself to motivate the students. In highly diverse classrooms, the lowest achieving children often had a broad scope for being 'off task' when using the tools, particularly when teachers were preoccupied with moving between computers troubleshooting technical issues rather than instructional ones (e.g., lost documents, inability to log in) and were thus often unaware of the degree to which students were off task.

Word processing was considerable overused for young children who had barely mastered how to write / recognise the alphabet. Children as young as six or seven often being asked to word process their written work, there was evidence that many became frustrated by the exercise and spent considerable time off task. This was a challenging exercise as young children searched for each individual letter as they attempted word process their writing.

We found no evidence of any broad plan in any of the schools for teaching word processing skills. Students in the upper grades already had developed poor typing habits. Although teachers agreed that word processing skills were important, only one teacher indicated that she was using an online program to teach keyboarding skills. Our research thus supports the work of other researchers who have found that "word processing and basic skills practice" are the usual classroom uses of technology for learning (Hart, Allensworth, Lauen, & Gladden, 2002). (This may be partly the result of the emerging test-oriented culture in Australia that is being fostered by the move to national high stakes testing in the past decade). After word processing the type of programs most used were PowerPoint, videos and educational games or drills. There was little evidence that students were being exposed to skills that enabled them to become producers of technology rather than consumers of technology.

While this younger generation of teachers have been labelled by some as 'digital natives' having grown-up with computers, research has revealed that this assumption is flawed as studies have shown that the most common use for technology is word processing, emailing and using the internet (Kvavik, Caruso & Morgan, 2004). Results from other studies have similar results (see Oliver & Goerke, 2007; Kennedy, Karause, Judd, Churchward & Gray, 2008). This explains our findings that while there was lots of technology use by younger teachers, in many cases it was generally used as an add on or as a way to better engage the students. Most the lessons could have been taught as effectively without the use of technology.

Human Resource Support for Technology

Teachers in this study linked much of their frustration to a lack of structural support, and for many, this diminished the value of use of technology in teaching. While all teachers agreed that they had plenty of access to equipment, over 85% discussed their constant annoyance in terms the external barriers around effectively integrating technology in their classrooms. Only two of the nine schools had a technology support person with instructional expertise and a role that allowed them to help teachers. Teachers expressed praise and appreciation for those in this support role, and spoke of their relief at being able to rely on someone who could troubleshoot problems Mostly, however, teachers had minimal technological support: while they were all able to identify colleagues they held to be more technologically savvy, they were reluctant to always call on those colleagues who also had full time teaching positions. In one school the Interactive whiteboards had not been interactive for several months. Teachers in remote schools reported waiting six weeks before someone came to fix things. This barrier greatly lowered the expectancy of success as teachers were fearful that a well-planned lesson would go amiss and they would be unable to deal with any technical issues that might arise. Extra demands on the job associated with technology use: preparing the tools (especially in the case of younger students), fixing technical problems, researching and learning the software and monitoring the students are generally seen by teachers as "increased work –load or wasted time"(Al-Fudail & Mellar, 2008, p. 1107).

Professional Development

All teachers in this study, even those from the 'digital native' generation, identified a need for more professional development. Teachers' expressed the expectation that their success and growth with technology would be enhanced through quality professional development that addressed needs with their unique context.

The majority of the teachers in this study reported either being self-taught or having received after school workshops. Only one teacher reported having a semester long unit in technology for education during her undergraduate studies. Some of the more creative users in this study were older mature teachers. Having placed high value on the possibilities of technology but low expectancy of their ability to succeed, they had invested to improve their level of competence by sourcing and paying for their own professional development opportunities.

> Natalie a teacher from an urban school said:
> *I think there could always be more training we have the equipment and we've been given a lot of this equipment but then if you're not using it properly it's not effective and you're just wasting time really. I could still use a lot more training for using it in the most effective way, just really getting the most out of it rather than wasting time. So just effectively using it and using it for educational outcomes.*
>
> Wendy a teacher in a very remote school commented:
> *I am spending a lot of time just trying to find programs that suit the level of the students. It would be nice to have a person who could recommend or shows us age-appropriate activities to use.*

The teachers felt that they would have more confident if they knew there was always going to be support in learning about new tool as the technology is always changing and therefore there needs to be built professional development that happens on a regular basis. In similar research teachers have stated that to integrate computers into their regular instruction required time to play and learn the applications available (Butler & Sellbom, 2002; Shamburg, 2004; Wozney, Venkatesh, & Abrami, 2006). This was confirmed by teachers in this study who felt that teaching with technology has made teaching more time consuming as they need to find, learn and review the programs and tools before using it with students. Teachers wanted to be able to observe other teachers and students and be provided with the time to have pedagogical dialogue with teachers from similar contexts. These findings confirm that of other research (Wozney et al, 2006) that well designed professional development will increase teachers' expectations of success technology can offer as a tool to enrich and improve their pedagogy. Without this they will not have the confidence to persevere when frustrated and the degree to which they expect to succeed will diminish.

As confirmed by teachers in this study it is necessary to steer the attention on professional development toward ways to integrate technology in a way to better strengthen pedagogy as opposed to just offering training that is focused on the technical skill without helping teachers gain an understanding for how to work around individual contextual situations rather than a "one model fits all" (Palak, & Walls, 2009). Research into technology attitudes in primary schools in the US found that needs based professional development on technology integration over the duration of a school year lead to a improvement in attitudes toward technology but participants still feared how quickly technology advanced, which suggests the necessity for regular ongoing professional development (Christensen, 2002).

Any type of major change in behaviour must be seen as something that will take years, not weeks or months with success most often occurring when teachers have been involved and respected as important contributors to the change process (Timperley, Wilson, Barrar, & Fung, 2007; Darling-Hammond, 2000; Fullan, 2001). Darling-Hammond, Wei, Andree, Richardson & Orphanos (2009) recommend that professional development be given "continually, collaboratively and on the job" (p.2). Traditional one off sessions with no follow-up have proven to not have any enduring change on practice (Mouza, 2002). Only through extended exposure to technology with built in support systems such as guided opportunities to use new technologies, the provision of relevant tasks for individual contexts, development of peer support networks and a clear vision for integration to enhance student achievement will teachers feel confident enough to evaluate technology and educational software and how they can infuse it into their current pedagogical belief system (Adelman, Donnelly, Dove, Tiffany-Morales, Wayne, & Zucker, 2002; Baylor & Ritchie, 2002

Significance and Conclusion

Despite the increasing presence of technology in Northern Territory schools, creating and supporting technology rich learning environments will require more than just the money spent on new hardware. Teachers in general seem to have accepted that technology is a part of their lives and that of their students are now just want the support to use it effectively. However, using technology as an educational tool continues to be laden with external issues that are beyond the immediate control of the individual teacher. This analysis serves to create awareness that having school wide technology goals that encompass both the infrastructure and human support is absolutely essential when taking on new tools. These results are similar to other reports in Australia with teachers reporting that the factors impeding the use of ICT in their instruction was issues around professional development and the time needed to learn how to use new tools successfully (Thomson, 2015).

Successful technology use by teachers can be attributed to whether the value derived is greater than the costs associated with it. If a teacher believes they have the skills to use it well and value what will be gained they are more likely to persevere. However, a mismatch between demands of the technology, teacher skill and needs leads to technology-related stress and an associated negative impact on teachers' attitudes.

Importantly, teachers in this study were observed frequently 'handing over' control of their teaching to the affordances (positive and negative) of the technology, and this guided many pedagogical decisions. Thus, the technology framed how lessons were played out. Further research is warranted to learn more about the factors that enable teachers to balance their pedagogical expertise with effective use of advanced technologies in the classroom.

With these barriers to integrating technology students in the NT are falling further behind in their computer and information literacy knowledge. Thomson (2015) reported that student achievement for students in Australia's lowest socio economic quartile which includes all of the Northern Territory's remote and very remote schools was 30% at or below the average base level of competence. Unless there is more support to ameliorate these barriers, students will remain at basic level of competency rather than becoming innovator or producers or technology

References

ACARA. (2011). NAPLAN National Report. Retrieved from http://www.nap.edu.au/Documents/National%20Report/NAPLAN_2011_National_Report.pdf.

Al-Fudail, M., & Mellor, H. (2008). Investigating teacher stress when using technology. Computers & Education, 51, 1103-1110.

Bingimlas, K. (2009). Barriers to the Successful Integration of ICT in Teaching and Learning Environments: A Review of the Literature. *Eurasia Journal of Mathematics, Science & Technology Education, 5*(3), 235-245.

Borders, A., Earleywine, M. & Huey, S. (2004). Predicting problem behaviours with multiple expectancies: Expanding Expectancy Value Theory. *Adolescence. 39,* pp. 539-551.

Buabeng-Andoh, C. (2012). Factors influencing teachers' adoption and integration of information and communication technology into teaching: A literature review. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, 8(1), 136-155.

Butler, D., & Sellbom, M. (2002). Barriers to adopting technology for teaching and learning. EDUCAUSE Quarterly, 2, 22-28.

Christensen, R. (2014) Effects of Technology Integration Education on the Attitudes of Teachers and Students. *Journal of Research on Technology in Education, 34*(4), 411-433. DOI: 10.1080/15391523.2002.10782359

Clarke, G & Zagarell, J. (2012).Technology in the classroom: Teachers and technology: A technological divide. Childhood Education, 88(2), 136-139. DOI: 10.1080/00094056.2012.662140

Darling-Hammond, L., Wei, R., Andree, A., Richardson, N., & Orphanos, S. (2009). Professional learning in the learning profession: A status report on teacher development in the United States and abroad. National Staff Development Council. Retrieved June 12, 2012 from http://www.nsdc.org/news/NSDCstudy2009.pdf.

DeBortoli, L., Buckley, S., Underwood, C., O'Grady, F., & Gebhardt, E. (2014). ICILS 2013: Australian students' readiness for study, work and life in the digital age. Camberwell: ACER. http://research.acer.edu.au/ict_literacy/6/

Ertmer, P.A., Ottenbreit-Leftwich, A.T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integrated practices: A critical relationship. *Computers & Education, 59*, 423-435.

Green, S.K. (2002). Using an expectancy-value approach to examine teachers' motivational strategies. *Teaching and Teacher Education, 18*, 989-1005.

Hargreaves, A. (2001). Emotional Geographies of Teaching. *Teachers College Record, 103*(6), 1056-1080.

Hart, H.M., Allensworth, E., Lauen, D.L., & Gladden, R.M. (2002). Educational technology: It's availability and use in Chicago's public schools. Chicago: Consortium on Chicago School Research. Retrieved Nov. 2010 from http://www.consortium-chicago.org/publications/pdfs/p56.pdf

Hennessy, S., Deaney, R., Ruthven, K., & Winterbottom, M. (2007). Pedagogical strategies for using the interactive whiteboard to foster learner participation in school science. *Learning, Media and Technology, 32*(3), 283-301.

Kennedy, G., Krause, K., Judd, T., Churchward, A. & Gray, K. (2008). *First year students' experiences with technology: are they really digital natives?* Melbourne, Australia: University of Melbourne. Retrieved April 10, 2007, from http://www.bmu.unimelb.edu.au/research/munatives/natives_report2006.rtf

Kvavik, R. B. (2005). Convenience, communication, and control: How students use technology. In D. G. Oblinger & J. L. Oblinger (Eds.), Educating the net generation (pp. 7.1–7.20). Boulder, CO: EDUCAUSE. Retrieved May 27, 2007, from http://www.educause.edu/educatingthenetgen

Kopelman, R.E. (1979). Directionally different expectancy theory predictions of work motivation and job satisfaction. *Motivation and Emotion, 3*, 299-317.

Ladwig, J.G., & Sarra, C. (2009). *Structural review of the Northern Territory Department of Education and Training: Delivering the goods*. Darwin: Northern Territory Department of Education and Training.

Lee, M.H. & Tsai, C.C. (2010). Exploring teachers' perceived self-efficacy and technological pedagogical content knowledge with respect to educational use of the World Wide Web. *Instructional Science, 38*(1), 1-21. Doi: 10.1007/s11251-008-9075-4

Marzano, R. (2009). Teaching with interactive whiteboards. *Educational Leadership, 67*(3), 80-82.

Mouza, C. (2009. Does research-based professional development make a difference? A longitudinal investigation of teacher learning in technology integration. *Teachers College record,111*(5), 1195-1241.

Oliver, B. and Goerke, V. (2007). Australian undergraduates use and ownership of emerging technologies: Implicatons and opportunities fro creating engaging learning opportuniites for the Net generation. *Australian Journal of Educational Technology, 23*(2), 171-186. Retrieved May 23, 2018 from https://ajet.org.au/index.php/AJET/article/view/1263

Palak, D, & Walls, R.T. (2009). Teachers' beliefs and technology practices: A mixed methods approach. *Journal of research on technology in education, 41*(4), 417-441.

Saldaña, J.(2013). *The coding manual for qualitative researchers*, 2nd edition. Los Angeles, CA: Sage.

Shamburg, C. (2004). Conditions that inhibit the integration of technology for urban early childhood teachers. *Information Technology in Childhood Education Annual*, 227-244.

Timperley, H., Wilson, A., Barrar, H. & Fung, I. (2007). *Teacher professional learning and development: Best evidence synthesis iteration*. Wellington, New Zealand: Ministry of Education. Retrieved 19 April 2008 from http://educationcounts.edcentre.govt.nz/goto/BES.

Thomson, S. (2015). *Policy Insights: Australian students in a digital world*. Australian Council for Educational Research, 3, June 2015.

Vroom, V.H. (1964). Work and Motivation. New York: Wiley & Sons.

Wozney, L., Venkatesh, V., & Abrami, P.C. (2006). Implementing computer technologies: Teachers' perceptions and practices. *Journal of Technology and Teacher Education, 14(1)*, 173-206.

Author Information

Janet Helmer
Graduate School of Education
Nazarbayev University
53 Kabanbay Batyr Avenue
010000 Astana, Republic of Kazakhstan
+7 7172 704970
Contact e-mail: Janet.helmer@nu.edu.kz

Helen Harper
School of Education
University of New England
Armidale, NSW 2351, Australia
+61 2 67734374

Jennifer R. Wolgemuth
Department of Educational and Psychological Studies
College of Education
University of South Florida
 Tampa, FL 33647