

# Are We There Yet? The Journey of ICT Integration

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**Abstract:** “Are we there yet, are we there yet, how much longer?” This plea can be heard from teachers throughout the world. The ICT integration pioneers beam at the thought of what’s next, however the middle and late adopters shudder at the thought of what is coming next and wonder if and when they are going to get there, wherever there is? This differentiating attitude in ICT integration can be attributed to the teachers’ personal confidence in using ICTs. This paper explores the ICT integration journey of teacher’s from 10 provincial primary schools in Queensland, Australia. It will examine the teachers’ past and present attitudes toward the integration of ICTs in their classrooms and attempt to predict their future attitudes. Participants will also be invited to discuss attitudes towards ICT integration from their perspective.

## Introduction

During the 1970’s and 80’s our students were learning about computers, during the late 80’s and 90’s students were learning with computers. As educators in the 21<sup>st</sup> century we need to teach through computers and our students need to learn about and with computers (Redmond & Albion 2002). Muffoletto and Knupfer (1995) suggest that learning about computers creates a new curriculum however learning with computers results in the transformation of both the curriculum and teachers pedagogy. In Queensland many of the recent curriculum reforms have required teachers to change their pedagogical practice.

Governments, community members, parents and students have high expectations for the use of and the educational benefits of information communication technologies (ICTs) in the classrooms across the nation. Educators have had a checkered history in the use of ICTs in the classrooms over the last 25 years. As the ICT pioneers continue to traverse unmapped areas the middle and late adopters are finding it difficult to continue without knowing their destination. The range and effectiveness of ICT use within classrooms varies dramatically from those limited to using word processing, presentation software and Internet hunting to those where both students and the teachers are web savvy, where the use of ICTs is integral to the learning process and students work cooperatively to solve problems.

Schools in most western nations aim to provide ICT resources that support teachers in the creation of quality learning environments, where ICT integration can permit and assist in the development of meaningful educational activities for all students within all year levels and curriculum areas. In Queensland state schools there is an expectation that the use of ICTs within classrooms will also align with other curriculum reforms (Education Queensland 2003).

Muffoletto and Knupfer (1995, p. 163–164) note that “it is important to realize that the teachers’ existing attitudes, skills and working habits will have great influence on their acceptance, style of implementation, and outcome regarding educational computing”. Christensen (1998) and Knezek & Christensen (1996) comment that a positive teacher attitude towards ICTs will foster positive attitudes towards computers in their students. As the role of the teacher moves from the knowledge expert to that of the learning manager, the modelling of positive attitudes towards the known and unknown in a range of circumstances, not the least the use of ICTs, is critical to the development of students whose future is in a world we cannot predict.

Analysis of current research suggests that teachers' attitudes towards ICT integration is impacted by the access to ICT resources and training; which in turn impacts on their personal knowledge, skills, experience building confidence and motivation to use ICTs; this affects their attitude towards ICTs and in turn the ICT integration that occurs in their classrooms. Clark (2000) and Pribisev and Vuckovic (2000) revealed that integration and motivation to integrate were influenced by teacher's personal experience and confidence with ICTs. They also report on the positive attitude and its relationship to the teachers perceived instructional effectiveness of ICTs within the learning processes. Though some teachers who lack confidence believe that ICTs hold great promise for classroom use, they remain unable to facilitate the use of ICTs because of their own perceived skill limitations or lack of knowledge.

Internationally there has been significant financial investment in providing ICT resources in educational settings. It would be difficult to dispute that for most educators, access to ICT resources and opportunities for professional development and training in the use of ICTs has improved over the last 5 – 10 years. However, despite changes in policy and investment in terms of money and time over the last 20 years, many educators have resisted using ICTs in the classroom.

This paper examines teachers past and present attitudes towards ICT integration and will attempt to predict the future attitudes of teachers within the study. It will also discuss causal factors surrounding the development of such attitudes, namely the access to ICT resources and professional development and the impact of a teacher's perceived skill level on their attitude toward and subsequent use of ICTs in their classroom.

## **Methodology**

The second author of this paper completed much of the research as an undergraduate student while completing her honours dissertation. The other author has been working with teachers within the local school communities since 1998 in a range of roles including auditing teacher skills, team teaching, planning and providing professional development, and co-planning ICT and curriculum plans for classroom delivery.

Data were collected from 65 teachers in 10 provincial state schools in the Toowoomba District of Queensland, Australia. To ensure a broad cross section of teachers from whom the data were collected, 2 schools from each band within the district were selected. Each band represents schools of different sizes and complexity and in the Toowoomba District the state primary schools range from Band 5 to Band 10. The selection of schools within this range aimed to increase the reliability of data ensuring teachers surveyed came from schools where the geographical location and the number of staff and students differed.

The teacher sample was primarily female (75%) however this is representative of the general gender composition of Education Queensland schools (Tynan, 2002). In addition the majority of participants have been teaching for over 15 years (67%). This figure also aligns with the general composition of the teaching population in Toowoomba, with the average age of teachers employed by Education Queensland in the Toowoomba district being 45 years (Tynan, 2002).

A survey was used as the primary data collection device. The survey was distributed to each school at staff meetings to enhance the response rate. The survey required respondents to provide information in 3 key areas: demographic, ICT attitudes and ICT skills. Demographic information from the respondents was in terms of gender, teacher experience, and access to ICT resources. For the attitudinal information a 5 point Likert scale was used in which respondents were required to check the box which they felt represented their attitudes and identify obstacles to their ICT integration. The skills information section required respondent to indicate their perceived level of skills within a variety of software applications and hardware devices. The levels were constructed on a 3 point scale: Beginner, Intermediate and Proficient. Respondents were also provided the opportunity to make additional comments at the end of the survey. The questions provided data of a quantitative nature and was analysed using a statistical software package.

The survey data were supported by semi-structured interviews, informal interviews and observations. These enabled the researchers to gain a greater insight into teachers' perception and attitudes toward the integration of ICT in their classrooms. In addition it provided partial triangulation of the results gained from the survey. The

semi structured interviews were conducted in associated with the survey and allowed participants to expand on the responses given and provide support for comments made.

A major limitation of the study would be the localisation of the participants. The sample participants represent teachers in the Toowoomba district and conclusions may not be easily generalised to a larger geographical area. Although the data were drawn from teachers in a local context, for the most, they align with previously studies and there is limited indication that they are not representative of a larger population.

In addition the sample size of this project was relatively small ( $n = 65$ ). Subsequently, within the sample, the groups identified to data analysis were also undersized, often too small to warrant a desired test or to validate an interpretation.

Finally, as a survey was the primary data collection instrument any weakness in this instrument impacted on the results obtained. In an effort to collect quantitative and qualitative data and to triangulate survey data semi-structured and informal interviews and observations were completed.

## **Findings and Discussion**

Results from this study support other documented studies (Clark, 2000; Owens et al. 2000; Prisisev & Vuckovic, 2000) where a positive attitude is held by the majority of teachers towards ICT integration. Teachers within this study strongly support the concept of ICT integration rather than it be taught as a stand alone curriculum. This is supported by the belief that students should be provided with a variety of opportunities to use ICTs within the classroom. The study also reveals that in spite of a positive attitude, teachers do not feel that they are provided with adequate support of guidance in their endeavours to integration ICTs effectively.

The majority of teachers in this study had not used ICTs for personal or professional purposes prior to 1998; however they commented that the use of ICTs has increased dramatically over the last 6 years for use in administration and teacher planning and by students.

This increase of ICT use may be due to systemic initiatives that have promoted use of ICTs over that time. In 1997, Education Queensland released their "Schooling 2001 Project". The aim of this project was to improve student learning outcomes through the integration of technology (Education Queensland, 1998). Funding was provided to state schools, to achieve a number of targets. These included: the use of computers in every classroom across all key learning areas and all year levels, school networks that give every classroom access to the Internet, and all teachers with a minimum level of skill in the use of computers for learning. Funding, personnel and professional development opportunities were available to assist all teachers to reach a Minimum Standards for Teachers in Learning Technology (Education Queensland 1998) by the end of 2001.

In 2002 Education Queensland introduced the ICTs for Learning Strategy (Education Queensland 2003). This is a 3 year transition strategy to support schools in creating conditions where ICTs are seen as tools for teaching and learning in all classrooms. Systemic and financial support has been given to schools to support six key drivers to promote effective integration of ICTs. These include: learning, teaching and the curriculum, learning and development, ICT infrastructure, connectivity, ICT support and innovation.

As teachers move through the Apple Classrooms of Tomorrow (ACOT) stages of Entry, Adoption, Adaptation, Appropriation, and Invention the patterns of teaching and learning in their classroom changes as does the integration of ICTs (Dwyer, Ringstaff & Sandholtz, 1990). As indicated previously Muffoletto and Knupfer (1995) suggest that learning with computers requires teachers to modify their pedagogy. The researchers in this project have noted, through formal and informal interviews and observation that since 1998 not only has the use of ICTs in these classrooms developed but also the teachers' pedagogical practice. Their style of curriculum planning and teaching has moved from the traditional transmission style to one more closely aligned with the constructivist approach. Teachers now have different expectations of themselves and their students through the use of integrated authentic tasks where the use of ICTs has a clear relationship to off computer activities. They have created different relationships with students acknowledging that sometimes the students have more expertise in ICTs than the teachers do and are learning from and with the students to build skills and confidence

in the use of ICTs. With this change in position from expert to novice, teachers often felt that they had not only moved out of the driver's seat but in many cases the students took over the navigator's role also.

As can be expected the study revealed that participation in professional development has a positive correlation with teachers' attitudes towards the integration of ICTs in their classroom. However, teachers commented that they are less likely to participate in ICT professional development at this time than 3 - 5 years ago. One teacher suggested that it was because they needed time to assimilate and be comfortable with their current skills and knowledge before moving on, another commented that "something new always comes along and I'll never be able to learn it all so I've stopped trying". This feeling of "will it ever stop" appears to be common amongst primary teachers in the Toowoomba district. This could be part of change fatigue felt by many educators as community and systemic expectations give rise to new programs to be implemented. The decrease in participation in professional development may also be due to reduced availability of local face-to-face professional development opportunities. There has however been a marked increase in online professional development opportunities although most teachers within the study did not feel confident in participating in this medium.

Clarke (2000); Owens et al. (2000) and Ertmer et al. (1999) suggest that the number of computers teachers and students have access to contribute to the teacher's attitudes toward and use of computers. Interestingly this study showed no statistical significance between the number of computers provided and the attitudes toward ICT integration. Nor did the study show a link between the number of computers provided and the teachers perceived skills level in use of ICTs. Teachers commented on the increased access to technology however in some schools the increased availability appeared to be in locations such as the administration, library and computer labs rather than in classrooms. Teachers spoke of the difficulty in booking into those areas and of the difficulty in taking advantage of the "teachable" moment without ease of access to ICT resources.

Over the last 3 years most schools within the study have been funding the replacement of classroom computers and the provision peripheral hardware not previously available within the school such as scanners, digital cameras, and digital video cameras rather than significantly increase the number of computers in classrooms. Internet access for all computers is a priority with schools beginning to develop local networks also. The teachers within the study found that access to current and reliable ICT resources gave them increased choices within their classroom. This parallels the findings from the US where educators found that ICT offers them more choices in the delivery of instruction and assessment, their ability to meet the needs of diverse learners, and locate and participate in professional development (n.d. U.S. Department of Education). It was found that teachers frequently used ICTs to locate and present information and they found an increasing range of software and hardware tools were available for teacher and student use. Teachers commented that the increased choice often made it easier to meet the individual needs of their learners. Another benefit teachers found was the increase range of software which has an Australian context.

92% of the respondents indicated they had private (home) access to a computer with Internet access. This is significantly higher than that for the Australian population at large, as indicated in the Australian Bureau of Statistics data for 2000 which reported 56% of households had computers. Given the nature of the profession and the pressure for educators to become effective ICT users this could probably be expected. Many teachers however commented on the fact they had to wait in line to use their home computer, with their children often claiming first right of use. This may not be the case for a sample of teachers whose average age was significantly less than 45 and whose children were not in upper primary, secondary or tertiary education.

In Queensland and internationally the computer to student ratios are declining. The National Council for Accreditation of Teacher Education (1997) estimated that the ratio was 50:1 in 1985; 20:1 in 1990 and 9:1 in 1997. They comment that the reduction in this ratio is affecting "traditional classroom practice and even the culture of the schools" (1997). In Queensland the current target ratio is 1 computer per 5 students in Years 3 – 12 (Education Queensland 2003). Almost half of the respondents (49%) indicated they had 3 – 4 computers in a room for 30 students in addition to access within libraries and computer labs. Access to peripheral devices was not as high with 13% of respondents indicating access to a data projector, 55% have access to a scanner, 70% have access to a digital camera and 93% having access to a printer. It is interesting to note that while teachers had access within the school there was normally only one of these devices for the whole school and ease of access was an issue. It is not surprising that access to data projectors is less than for other devices given the high

financial outlay when compared to scanners and digital cameras. Also, ease of access and the type of printers made available for the teachers ranged dramatically. An analysis of the data reveals no statistical significance to indicate that the number of computers influences teachers' perceived skill level when using computers. This finding opposes findings by Clark (2000) and Ertmer et al. (1999). This contradictory finding may be influenced by the high degree of home access by the participants.

Previous studies have highlighted diverse range of teachers perceived skill level in use of ICTs. This study found there was a positive correlation between the teachers perceived skill level and their attitude toward integration of ICTs in their classrooms. Areas that the teachers within the study felt most proficient included word processing, sending and replying to emails, using the Internet to locate information and using CD Rom programs. Observation of the teachers undertaking these activities revealed however that the teachers had the skills to perform only the basic operations in these areas. It is believed that many of the teachers were not aware of the additional tools available to them within these areas. The areas where teacher felt least proficient were web publishing, use of Internet and collaborate projects, operating data base and presentation software and operating peripheral devices such as scanners and digital cameras in addition to technical skills.

One of the interviewee's commented "There is definitely a link between a teacher's skill and attitudes towards ICTs – the more confidence in their skills a teacher has, the more enthusiastic they are and the more likely they are to integrate ICTs, it's like a chain of events."

The study also revealed that female, lower and middle primary teachers have a lower perception of their level of skills and as such are less likely to integrate ICT into their classroom. This data however may be skewed due to the small sample size of male respondents and may not be representative of teachers throughout the state. However analyses of the data reveal that the teachers in the upper primary perceive their skills to be higher than that of their lower and middle primary teaching colleagues.

As previously mentioned this study found that the attitudes of primary teachers are positive towards the integration of ICTs in their classrooms. The study indicates that there is a direct correlation between teacher's attitude and their perceived level of skills when using ICTs and that there is a positive correlation between professional development and teacher's attitudes towards ICTs supporting the findings of Clark (2000), Pribisev and Vuckovic (2000) and Ertmer et al. (1999). In particular teachers within the study indicated 4 main elements which indicated a positive attitudes towards ICT integration: that integration ICT in the classroom was appropriate, that ICTs should be integrated with all curriculum areas, that it is important to provide students with a variety of uses of ICT and that professional development is a key issue in the implementation of effective ICT integration.

Within the study the teachers' perceived obstacles to classroom ICT integration align with other studies. The respondents indicating that access to adequate hardware, software, technical support, and guidance in effective ICT integration strategies impacted on their integration of ICT.

## **Future attitudes**

When asked about what next for them in terms of use of ICT in their classrooms one teacher commented that she is feeling "excited yet fatigued". Many of her colleagues also voiced similar emotions where they were excited about the possibilities and at other times too tired to consider how they could be used with their classroom.

Cuban (2001) and others lament that the full power of ICTs have yet to be engaged within classrooms. The educators that are middle and late adopters of ICTs dread to think where the journey may lead them and their students. There is a feeling of frustration of not knowing when they will arrive at the destination, perhaps because they have yet to see the use of ICTs as a life journey. The ICT pioneers continue to look for ways to manipulate the ICTs to gain learning and pedagogical advantages. From the Toowoomba perspective the digital divide between the early and late adaptors of ICT integration appears to be getting wider.

To promote life long and life wide learning particularly in terms of ICTs, the National Council for Accreditation of Teacher Education (1997) suggest that teachers need a “fearless” attitude in the use of ICT and to work in an environment which encourages them to take risks. This “fearlessness” is something that we would hope to develop in our students as they enter a world of rapid and continuous change. While modeling approaches to ICT use we now know that teachers are impacting on how their students will use ICTs also. Can we model this fearlessness to the many teachers who feel that using ICTs within their classroom is like speeding down a steep windy road without their seatbelt on? This is a risk they would prefer not to take. Many teachers within the study admitted they had an early attitude of “so what, it is another fad that will soon be over”, as time has gone on these teachers have become supportive of ICT integration in their classrooms. However some teachers are starting to feel that effective use of ICTs where they are integral to the learning process has become a journey to which there is no end in sight. To them this journey appears to be continuous, with no clear roadmap to check if they are on the right track and no navigator sitting beside them.

Professional educators who are familiar and comfortable with with use of ICTs and are teacher leaders within their school have a role to congratulate others on their ICT integration journey so far, to celebrate their success and to show them how far they have come. In addition middle and late adopted should be reminded that there are a number of routes you can take within this journey. Often the ICT zealots forget that others are apprehensive when faced with this ICT journey.

It is of note that over the last 6 years teachers within this study their attitudes have moved along the ACOT stages from Entry to that of Adaptation where they firmly believe that the use of ICTs will bring about increased productivity and student engagement. However in practice they have failed to move much beyond the adoption stage. In addition many of these teachers are still threatened by the depth and regularity of change in ICTs, so much so that they are asking “Are we there yet? How much more can we be expected to learn?”

This study indicates a possibility that the middle and late adopters may fail to continue to move forward because they can't see an end in sight? During an interview a teacher remarked they felt that learning to effectively use ICTs within their classroom was more like “a learning cliff rather than a learning curve”. Perhaps there is a need to provide a parachute!! What will it look like?

## **Conclusion**

In Queensland and elsewhere in the world, teachers are grappling with significant changes in educational initiatives, curriculum, societal expectations and the concept of teaching in the 21<sup>st</sup> century. What does it mean to teach in a world of multiliteracies where life long learning is promoted more highly than the traditional content; where the knowledge of information is surpassed by the process of locating and synthesizing information for a purpose; where the traditional 3 R's have been replaced by the 3 T's (thinking, team work and technology); and where ICTs pervade?

Fluency in the use of ICTs can be gained through both access to ICT resources and effective professional development. As teachers perceptions of their personal knowledge and skills develop and with increased familiarity, their anxieties and fears are reduced and confidence increased. As teacher confidence increases so does a positive attitudes and conversely effective ICT integration. Continued support for improved access to ICT resources and quality professional development should occur to ensure teachers continue to develop skills, attitudes and teaching approaches towards ICT integration and promote life long learning.

Ertmer et al. (1999) note that depending on where teachers are in their development and use of technology, different strategies may be needed to advance and sustain their efforts. The ICT zealots are well aware that there are a number roads leading to effective use of ICT as integral to the learning process and perhaps their role should be one of assistant navigator rather than the driver of schools ICT plans and professional development.

Is ICT integration a question, a journey or a destination? Perhaps the answers or a mud map will develop as teachers form learning communities, either face-to-face or virtual. If we can increase the number of teachers who

feel they no longer need to “know it all” prior to continuing the journey we may be able to see increase effective ICT integration. An indicator from teachers within this study appears to require teachers being comfortable with just in time learning where teachers are learning with and from their students.

The integration of ICTs into classrooms can no longer be denied or ignored by educators of the 21<sup>st</sup> century. We know that teachers knowledge and experience in the use of ICTs has a significant impact on their attitude towards ICTs and in turn the ICT integration which occurs in their classroom. Practicing teachers continue to need support to assist them to develop the skills and aptitudes of an effective 21<sup>st</sup> century educator. A positive attitude towards ICT integration will assist teachers to develop students who are technologically literate, successful and productive members of future society.

Recently I watched my 9 year old daughter talking with her 96 year old great grandmother about her choir cutting a CD and an orchestra accompanying her on the electric piano; and not to be outdone, my 6 year old son discusses how he has changed the computer’s wallpaper to his favourite Disney movie image and that he regularly “speaks” with his Godfather 1500 kilometres away using the eyeball camera and the computer. It seems to me our children are already on the journey of life long ICT integration and the destination is irrelevant. ICT is part of our children’s daily routine life at home and part of their leisure. However, what further steps can we take to gain a critical mass of teachers who feel the same way and make it part of our students routine school life?

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