

Improving Online Communication for Students in Higher Education Contexts

Dr. Sarah Ohi

Dr. Brian Doig

Deakin University,

Faculty of Arts & Education, School of Education. Victoria, Australia.

Abstract

The study reported here sought to identify Higher Education students' preferred modes of online communication whilst studying a wholly online research subject at University. The teacher education student participants from an Australian university were required to collaboratively conduct inquiry research projects in groups whilst relying upon computer-mediated communication. How do students communicate as a collaborative research group whilst only meeting online? The data were collected via the use of online pre-test and post-test surveys conducted 'prior to' and 'post' involvement in the unit of study and descriptive statistical analysis was applied. The findings revealed that important influences affecting students' choice of communication mode included their own views on the capacity of online communication, their prior experience and the availability and accessibility of the modes. Furthermore, it was found that when given a choice, students preferred the use of asynchronous forms of digital communication to synchronous forms. Recommendations for improving online teaching, learning and research contexts in Universities are provided and the importance of considering blended mode delivery for wholly online units is argued.

Keywords Higher education, information communication, online, research, distance education, educational technology, early childhood, teacher education.

Introduction

In a short space of time digital technologies have become an integral part of many people's lives, with the immediate access provided by mobile technologies blurring the boundaries between work, education and personal and social spaces in their lives. This 'emerging technology landscape' (Hanewald & Ng 2011p.1) commonly known as the 'Digital Age' is characterized by an increase in the development, use and reliance upon digital technologies on a global scale. As western society becomes increasingly dependent upon the use of online technologies, so too does the University that aspires to cater for students in the 21st Century. It is not surprising that the application of technologies is increasingly prevalent in the University sector as a form of communication, a pedagogical tool, a resource, and now even as a means of communicating in order to conduct research. Universities and an array of other educational institutions world-wide are confronted with the issue of how to engage students in communication within online

learning contexts. This study was conducted in order to better understand how Higher Education students prefer to communicate in online environments. The main focus of the study was to identify and understand the students' reasons behind the technological choices made in relation to communication and digital presentation mediums.

Utilising Online Technologies in Higher Education

Universities are attempting to capitalize on the affordances offered by technologies and have been exploring the use of electronic learning environments and the study of on-line Units, (Williams 2002) which have now become an essential part of the University's course offerings. Much of the attraction to the expansion of online modes of learning and research in Universities relates to their ability to provide increased flexibility for students who are unable to attend face-to-face sessions. Online course modes provide access and allow students the opportunity undertake university study regardless of whether they work business hours, reside long distances from the campus location or overseas and also enables participation by overcoming of other limiting factors such as illness, incarceration and unforeseen circumstances.

There is a growing body of research that is concerned with the role, application and effect of utilizing digital technologies in Education and the University sector. On-line teaching has made notable changes to University teaching pedagogies (Greenwood 2000, Williams 2002, Warren & Holloman 2005). Although learning and teaching in online spaces has benefits for students and teachers it is not without a number of associated problems. Williams (2002) identified three main issues that commonly arise and need to be addressed when designing and implementing online courses: pedagogy, participation and access. Vonderwell & Zachariah's (2005) review of research on 'e-learning' also highlighted the importance of 'participation' and how it is conceptualised and defined in online learning contexts. They argue that participation must go beyond measures of frequency alone and probe more deeply to understand how the participants feel about their participation and their level of engagement in the participation. Alexander's work (2001) identified on-line students as valuing clear course expectations, rich feedback from educators and high levels of on-line activity. Earlier research purports that the on-line learning experience is positively enhanced by the development of a nurturing, communicative culture between students and facilitators (Weller & Mason 2000, Hara & Kling, 1999).

Research concerned with the use of on-line contexts is growing rapidly in Teacher Education with a range of studies focusing upon on-line 'group work' and collaboration (An & Kim, 2006) and the use of on-line lectures (Nast, Schafer-Hesterberg, Zielke, Sterry & Rzany 2009, Bassili & Joordens 2008). Much of this research is specifically about 'teaching' and 'learning', however the current study focused upon students conducting on-line 'research' in collaborative groups. Niemiec, Sikorski & Walberg (1996) and Bassili & Joordens (2008) highlight the importance of 'learner control' in on-line learning environments and in this light, this study aimed to give its participants increased control over the technological choices made for communication.

Although the field is rapidly expanding there is general consensus in the literature that there is a need for more research in the area of on-line teaching and learning and how to improve collaboration and communication on-line (Greenwood 2000, Williams 2002, Warren & Holloman 2005, Ohi 2011). Communication via digital modes is often classified as either being 'synchronous', simultaneous communication taking place live whilst on-line, or 'asynchronous' communication, such as via email or discussion board whereby communication is delayed, taking place over a period of time (Joliffe, Rotter & Stevens 2001). Asynchronous communication is commonly used in distance learning and is considered a cost effective, flexible mode (Williams 2002). Scagnelli 's (2006) review of literature on asynchronous learning in Higher Education argued that there is a need to conduct further research in the area in an attempt to identify

guidelines for the design of effective asynchronous online instruction that enhances interaction and engagement with learners.

The significance of the study reported here is that it addresses a gap in the research literature that addresses online research experiences. In order to better understand on-line research, teaching and learning this project provided opportunities for students and staff to select from an array of synchronous and asynchronous communication technologies. Also of importance was the identification of the reasons underpinning the digital decisions that they made. This project importantly explored aspects of the student's experience in relation to their views, skills, choices and expectations of the course.

Methodology

The Context and the Participants

This study was conducted with adult students from an Australian University in the South Eastern suburbs of Melbourne, Victoria. Sixty-six students were invited to participate in the project and a cohort of 39 volunteered for the pre-test survey and 17 for the post-test. The student participants held a Diploma of Children's Services (or similar) and had entered a university pathway to upgrade their qualifications. They were undertaking their second and final year of a Bachelor of Early Childhood Education. The core subject that they were studying required them to undertake an Independent Research Project whilst working solely on-line whereas their prior subjects were conducted either face-to-face or in blended mode. The project involved them working in collaborative groups to undertake an inquiry research project under the supervision of an Academic Supervisor over a 12-week period. The students were given the opportunity to identify an area of interest in the area of Early Childhood and to put together a proposal for a project of inquiry that would be undertaken during the trimester.

The participating students and staff were located across the state of Victoria with some residing hundreds of kilometres away from one another. Some were based at one of the University's three campuses, whilst others studied in distance mode from rural and overseas settings. Seventeen research groups were comprised from a cohort of 66 students, overseen by 13 assigned Academic research supervisors. One group was comprised of two students whilst all others had four group members. Each group was required to collaborate online to negotiate a research topic, identify research questions and develop a research plan and a literature review. The students were assessed on their research proposal (topic & questions), the literature review, the key findings and their final presentation reporting their research findings in digital mode. The research findings were to provide implications for the field of Early Childhood and to describe their direct application to practice. The presentation was to be in a form that could be shared on-line with their cohort as an on-line conference and that could be used in the future to present to professionals and colleagues once in the field.

The Research Questions

The purpose of this study was to investigate the experiences of undergraduate University students in Education (across multiple campuses) as they collaborated through the use of on-line technologies to engage in research processes via distance mode. The aims were to:

1. Investigate the attitudes and opinions that the participants had towards the use of ICT and its potential use within this Unit as a mode of communication and research.
2. Identify their preferred modes of online communication and to establish what influenced their choices.

Essentially, the project explored collaborative approaches of communication education during team-based learning that took place during an investigative project. As such the following questions were posed:

1. How do students view the effect of ICTs as the main form of communication during the research process?
2. When an array of technologies and related resources and training are made available to University students, what are the key influences that effect their uptake and application of the selected mediums?

The Methods

Given that the study participants were working in an online environment it was considered practical and essential that the data collection also be made in that same environment. Data was collected from the participants via the use of on-line surveys, valued for their potential to enable a quick return of data and minimal time and effort required on the part of the participants (Gillham 2000). The pre-test survey sought information about the students' pre-conceptions and expectations of on-line communication and their confidence levels and previous experience in using various aspects of technology. The post-test survey was designed to elicit specific feedback about the usefulness and effectiveness or in-effectiveness of the technologies used and the reasons behind the technological communication choices made and to receive general feedback about the structure and content of the on-line Unit.

The format of the survey questions varied and included a collection of multiple choice, Likert ratings and short answer questions. The surveys were initially trailed by the University's Education Development Unit and feedback provided to inform the development of the final survey tools. Descriptive statistics were used for analytical purposes and in most cases presented visually.

Students were invited to participate in the pre-test and post-test surveys at the beginning and end of the academic trimester via the University's online learning space and again via email. Although the research was developed and led by the students' Education Lecturer who taught, coordinated and chaired the online unit being studied, the invitation to participate was sent under the guise of the University's Education Development Unit for ethical reasons. This was to ensure that the students that volunteered did not feel coerced or obliged to participate in the research project. Also for ethical purposes, the responses to the surveys were entirely anonymous. The Education Development Unit therefore acted as a neutral third-party that sought voluntary participants. The surveys clearly stated that the purpose of the research was to improve the structure and design of this core unit of study and to understand a range of issues associated with engaging in research processes via on-line communication. Also stated was the fact that the anonymous data would be invaluable in improving this and other on-line units and that the findings could contribute to the body of knowledge about online pedagogies.

Throughout the semester, a range of ICT communication modes offering the choice of asynchronous and synchronous on-line communication were made available to each student research group. Supported by the University's Blackboard Learning Management System, each group was provided with their own online space in which to utilise any of the following interactive e-tools and the surveys would identify if any other modes of communication were used by students (see figure 1.)

Asynchronous Communication	<i>Discussion Board</i> This space allows people to communicate via digital messaging within the University's on-line system.	<i>Email</i> Enables people to communicate via digital messaging and to share attachable documents.	<i>Wiki's</i> Enables people to communicate via digital messaging as they create and design a website that allows them to insert audio, visual, audio-visual files, documents and hyperlinks. <i>NB: All groups were required to build a wiki together.</i>	<i>Other?</i>
Synchronous Communication	<i>E-Live</i> This space allows people to communicate 'live', in 'real time', via on-line chat (text), microphone (audio) or via the use of web cameras (visual).	<i>Other?</i>		

Figure 1. The E-Tools made available to the online research groups.

It must be noted that using the use of a Wiki was a focal point in this unit of study as students were required to create a group wiki containing separate wiki pages for recording and organizing aspects of their research. A template of a wiki was provided which had the following headings (Research Questions, Literature Review, Design, Findings, Analysis, Recommendations) under which students could insert and share their information. It was the first time for the students to engage in formal research processes and so the template was structured in this rigid form, as it was believed that they would benefit from this support. The wiki was selected in light of its capacity to serve as a group meeting place for sharing, structuring and storing information. Furthermore multiple members can edit a wiki and records of all changes are viewable.

Results

The findings elicited from the pre-test and post-test surveys are reported in this section. Descriptive statistics were employed.

Students' technological capabilities prior to the semester

It was important from the outset to gain an understanding of the participants' initial views and their perception of themselves as technology users, so they were asked to rate their level of confidence in approaching new technologies in the pre-test survey. The total number of respondents to the pre-test was 39, although not everyone responded to all survey questions. All participants responded to the question: *How would you describe yourself in terms of your capabilities with Information Communication Technology (ICT)?* Some claimed to be novice users of technology 12 (31%), whilst others claimed reasonable familiarity 26(66%), and the remaining 1(3%) cast themselves as an expert user. Those who claimed to be technological novices, 12 participants, 4 agreed that they were experienced and confident, while two of this group, disagreed that they were experienced and claimed to lack confidence too. However, when asked if they considered themselves experienced in using a range of computer and on-line technologies, 24 (63%) agreed

or strongly agreed this to be true, and only 14 (37%) disagreed. This would suggest that even novices have had experience with a range of technologies. One participant failed to respond to this question.

With respect to feeling confident to try new technologies, the participants were divided between agreeing 25 (65%) and disagreeing 14 (35%). On closer inspection of these data, it was found that of the 26 participants reasonably familiar with technology, 13 maintained that they were both experienced and confident, and 6 claimed that they were neither experienced nor confident. The remaining 7 were mixed in their responses to these two questions.

The participants were asked to provide a statement about how they felt about beginning a Research Unit of study, which utilized a totally on-line environment. As expected, there was a wide range of responses, which fell into two broad categories: positive and negative feelings. In the negative category were statements like ‘a little nervous’ and ‘I am very scared’. However, some participants, while nervous or apprehensive, also suggested that this could change, ‘apprehensive but enthusiastic to learn’. Figure 2. shows the distribution of participants’ feelings about studying wholly on-line for the 38 who made a response.

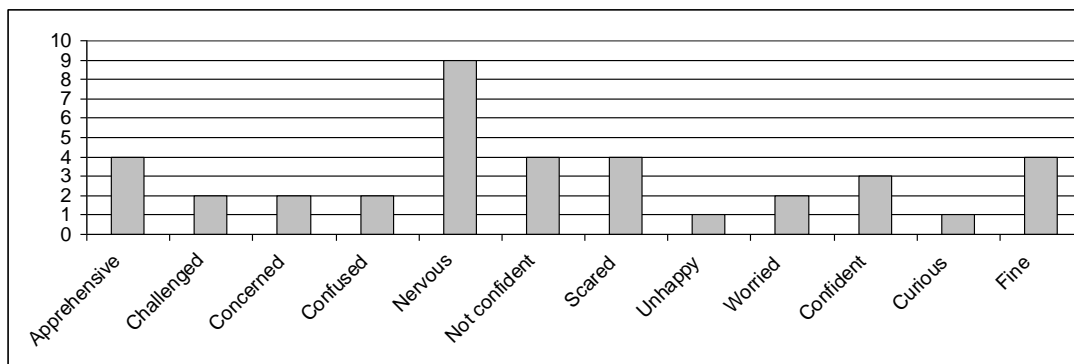


Figure 2. Students’ initial feelings about commencing research and communication in a wholly online environment

As expected, the majority of participants were suggesting nervousness or apprehension at the thought of researching and studying in an online environment whereby communication was wholly online. They expressed this in a variety of ways, not all fearful.

‘I am scared and hoping that I am able to understand what is written and use it to the best of my ability. I also feel some sort of accomplishment, as this will be a challenge for me. I look forward to the challenges and the "not so good" moments. This will be all new to me!’

Interestingly, those who felt positive included one who was ‘curious’. Several participants (6) said at this initial stage, that they would prefer face-to-face classes.

The participants enrolled in the ICT-based university unit were also asked whether they believed that ICT could be used effectively as the main form of communication during the research process the semester. The participants were over-whelming positive about this prospect. Thirty of the 39 participants agreed, or strongly agreed, that ICT could be used effectively. Seven participants disagreed, and two did not give a response. The main reasons underpinning these views were that they believed online communication has benefits in terms of accessibility, ease of and flexibility of timing; all viewed as important as the modern world uses ICT and they need to become ICT capable. ‘It is more convenient as you can work on the assignments without having to physically meet with other team members or teachers’.

Interestingly, in the pre-test three participants who were not native speakers of English seemed anxious and raised their concerns about communicating in a wholly online environment. One of the comments made was, I feel ... ‘a bit unconfident because of me English skills. I need some face-to-face communication to clarify my doubts’. It is possible that these participants were competent oral English language users, but were concerned about their English proficiency in utilising other forms of English language such as writing.

The 39 participants were asked to indicate any of the technological items listed (Wiki, Discussion Board, e-Live, Email, Live Chat) of which they had heard. The following table shows the participant responses.

Table 1.

Wiki	Discussion Board	e-Live	Email	Live chat
9	17	15	26	22

Unremarkably, email and live chat are the best known of the technological tools, as they are in the public domain. The Wiki was the least known, which was not unexpected.

Participants were asked to indicate the technology items, as above, of which they had a working knowledge. The results are shown in the table below.

Table 2.

Wiki	Discussion Board	e-Live	Email	Live chat
6	15	6	25	17

As expected, the pattern of responses in the second table closely follows the pattern in the first table. The most interesting difference is the responses for e-Live, where working knowledge responses are very much fewer than those for having heard of e-Live.

At the end of the 12 weeks of study the student cohort were invited to participate in the online post –survey. The 17 participants that volunteered were asked to reflect on their experiences in the Unit. Figure 3. shows their responses to four questions that focussed on this aspect of the survey.

Question 10 asked for a reaction to: *It was important for me to have a choice to use a range of technologies in this Unit.* The majority of participants (14) agreed it was important, with 2 responding that they strongly agreed. A similar pattern can be seen for Question 11, where participants were asked to respond to: *Ideally, under different circumstances, I would have engaged in the use of other technologies to improve my research.* For this question, 14 responses were either agree or strongly agree. However, 3 participants responded in a different way to these two questions. These included two who strongly agreed to Question 10, but simply agreed to Question 11.

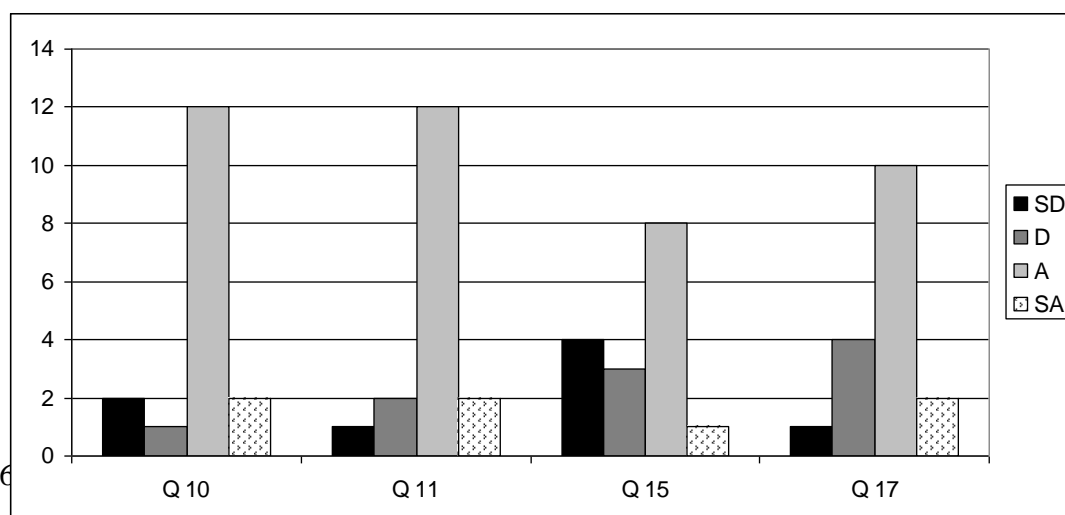


Figure 3: Outcomes of the Unit with respect to technology.

Question 15, which asked for a response to: *I believe that ICT can be used effectively as the main form of communication during the research process*, was agreed to by slightly more than half the participants (9 out of 17). This is an improvement over the responses to the pre-Unit survey, where face-to-face communication figured strongly as the preferred communication medium. In addition to this change, there was an obvious change shown by responses to Question 17, *I am more confident now, than I was before this Unit, about trying out new technologies*. Apparently, using the new technologies was a positive experience, and raised confidence levels in the participants. The proportion, 12 out of 17, of positive responses to this question is a very positive outcome from a single semester Unit. When asked why they felt this way about the effectiveness of online communication six (35%) of the 17 participants did not respond, whilst seven (41%) agreed ICTs could be used effectively to communicate because it's easy to use, effective, efficient and fast.

Communicating within Research Groups

In terms of communication technology, the students chose to use a number of modes. The most frequently used technology was email, followed by asynchronous communication *via* the Discussion Board, then the Wiki. These were followed closely by telephone, e-Live, and Facebook, in that order. The least popular modes were the synchronous modes of the Live Chat and, not unexpectedly for an on-line Unit, Face-to-face (see Figure 4, below).

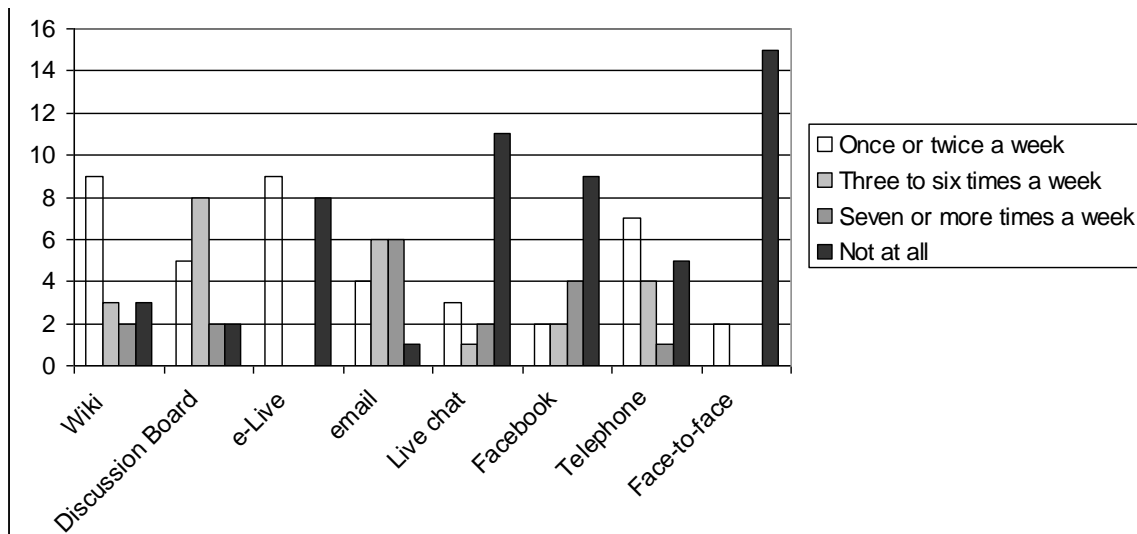


Figure 4: Communication within Research groups.

An important question arises from Figure 4 above: Why did students choose to use particular modes for communication in preference to others? This study offered the students the following seven reasons: availability of resources, familiarity with the technology, ease of communication, joint decision making, suitability of the technology and their eagerness to trial a new technology, and other (see Figure 5).

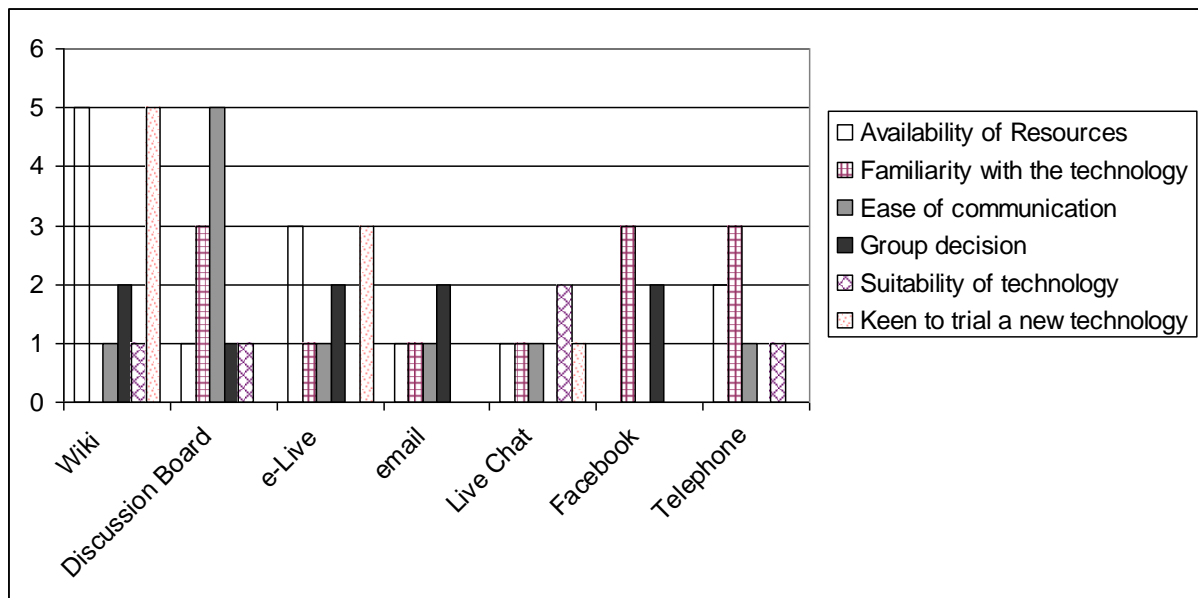


Figure 5: Reasons for selecting a communication technology.

The clear reasons for using the Wiki were the availability of resources and eagerness to try a new technology, whereas the reasons for using email were availability, familiarity, ease of use, and a group decision (for two groups). Other modes of communication that scored highly on familiarity were Discussion Boards, Facebook, and Telephone, while ease of communication was cited often as another reason for using Discussion Boards.

Although a range of reasons were cited for each of the modes of communication, it is noteworthy that the Wiki, e-Live, and Live Chat were the only modes to receive mentions for the category ‘Keen to trial a new technologies’. A Group decision was cited as a reason for using all the technologies except Live Chat and Telephone.

In the post-test surveys students were asked also to identify how important it was to them that they had a choice to use a range of technologies in this unit. They were asked whether, under different circumstances, they would have engaged in the use of other technologies to improve their research. The majority of the 17 students (14) indicated that having a choice amongst an array of technologies was important and that they would consider using other forms of technology next time, while only three indicated that this was not important to them (see Figure 6).

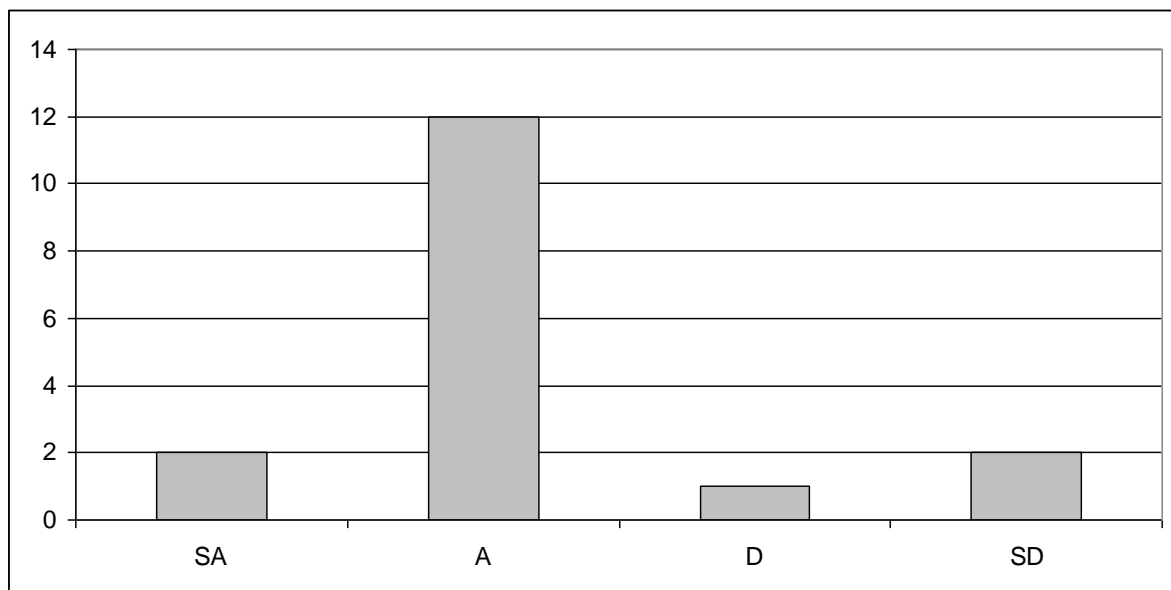


Figure 6: Student agreement with having a choice of technologies.

An important part of this research was also to gauge whether research processes could be undertaken wholly on-line and to evaluate and improve the Unit content and its organization as it was the first iteration of this newly developed approach. When asked to reflect upon whether the Unit was well planned and organized (Question 18), and if it was valuable in allowing them to expand their knowledge and engage in the research process in an area of interest (Question 19). As is clear from Table 3, the overwhelming view (83%) of the 17 students was that the ‘On the whole, this Unit was well planned and organized’ (Question 18) and they responded similarly to Question 19: *This Unit was valuable in allowing me to expand my knowledge and engage in the research process in an area of interest* (77%). From these figures we contend that the Unit was a success, and provides guidance as to how to construct and conduct future Units.

Table 3*

	Q18	Q19
SD	6%	6%
D	12%	18%
A	65%	59%

* All percentages rounded up

As mentioned earlier, in the pre-test data some participants were clearly afraid and nervous about working collaboratively in groups to conduct research. Despite this initial hesitance, comments provided in the post-test as final reflections associated with engaging in on-line research processes via on-line communication were much more positive,

- “I developed my research skills”*
- “Assignments were challenging and interesting to complete”*
- “Great to be able to research an area of interest”*
- “Team-based learning can be rewarding, but challenging!”*
- “Mastering the use of new technologies takes time”*
- “Research processes can be engaged in, via on-line communication.”*

These results indicate that the online Unit of study was valuable in allowing students to expand their knowledge in an area of interest and to engage in research processes whilst studying via distance mode in an online context.

The participants were asked, *Were there any barriers that prevented you from trialling any of the technologies made available to you within this unit? If so, what were they?* Seven (41%) participants reported no barriers at all, 5 (34%) felt lack of sufficient time to do their study and learn about ICTs was limiting and 4 (24%) found their own lack of knowledge to be a hindrance. One student who was studying abroad identified poor internet service as a barrier.

When asked to describe ideal circumstances that would improve their research in this unit, nine (53%) of the 17 students wanted some face-to-face interaction with either or all of the following: the lecturer, their research supervisor, other students or to engage in ICT instructional workshops. The participants were asked to indicate if they would make the time to engage in a free online professional learning workshop about ways of communicating online. Most of them (27 people) said they would as it had benefits for them for the future and it would help them use ICT more effectively. Five said ‘Yes’, but time permitting and four were adamant that they lacked the time to engage in such things.

When asked what kind of strategies they used to receive help when using the selected technologies 9 out of 17 people indicated that they did either or all of the following: persisted and tried again, asked a colleague or asked their Supervisor or Lecturer. Other sources of support were family and friends (4) outside of the university, Google (1) and a Guide document. Interestingly none of the participants contacted the university’s ICT specialists who could be contacted during extended business hours by telephone.

Discussion

The findings identified key aspects of the unit of study that hindered online communication and others that supported effective online communication. These aspects and core issues that arose whilst engaging in research processes in an on-line environment are discussed below.

Learning by doing

This study revealed that the participant’s capabilities and levels of confidence in using unfamiliar technologies were raised by their involvement in the Unit of study and the online research context. The results revealed that participants highly valued the opportunity to exercise choice over which digital modes of communication they would master and utilize. They grew in confidence and competence in using online modes for communication purposes over the

semester period. Furthermore, when given a choice, they preferred the use of asynchronous forms of digital communication to synchronous forms for a range of reasons.

Barriers hindering effective online research and communication

Most of the participants agreed that online communication could work effectively for research and communication purposes. They also largely agreed that the University Unit Chair and Research Supervisors were approachable, very helpful and supportive, however, when asked how to improve the Unit a prominent theme that arose was that they nonetheless desired more contact and support from University staff (Supervisors & Lecturer). Their recommendations included that the Unit could involve further support by the provision of some level of face-to-face contact. This contact could be at planned intervals throughout the semester, either in person or via videoconference so that students could receive further guidance and support. The introduction of online instructional workshops or videos was also suggested as a possible form for this support, for example, a session on how to build and use a wiki.

More than a third of the students felt there were no barriers preventing them from trialling any of the available, new technologies for their online research and communication, whilst a third felt they lacked the time needed to learn about the ICTs to be used. One quarter of the participants identified their own lack of knowledge of ICTs as a barrier preventing them from exploring unfamiliar ICTs and one person had issues with internet connectivity and reliability.

In summary, some of the barriers experienced are dependent upon the lecturer/teacher in terms of curriculum design and pedagogy ie. modes of delivery, time needed to learn about new ICT's and requirements to use particular ICTs. Other barriers however are more reliant on factors that are in the student' control such as time management and a willingness to increase their knowledge.

Suggested improvements to enhance communication for online research and study

A strong theme that was prominent in both the pre-test and post-test data was that many students, particularly, those who hadn't engaged in online study before believed that they would have benefited from a mix of both face-to-face, live classroom learning and online modes of learning and communication. The suggestions were largely that the unit be taught partly online and partly face-to-face with opportunities to work with their research group, lecturer and research supervisor. Some felt that face-to-face interactions could be replaced or supplemented with the use of E-live and online explanatory or instructional workshops.

This particular mixed method mode of delivery is renowned as *blended learning*. There is a growing body of knowledge about blended learning (Ginns & Ellis 2007, Picciano, Bonk & Graham 2012, Ziuban & Graham, 2013). Lim, Morris & Kupritz (2014) recently conducted a comparative study of students taught in blended versus wholly online modes. They reported that although student-learning outcomes were similar, students studying in blended mode reported less problems in relation to interpreting instructions, gaining understanding and difficulties with workload. It must be noted however, that they view their research findings as limited and identify the area worthy of further research.

Choice of Digital Communication Modes

The evidence suggested that as students engaged in collaborative online research, they made use of an array of provided online communication methods and additionally also made use of Facebook and mobile telephones which were part of their existing communicative repertoires outside of the university context. The students agreed it was effective and important for them to be provided with the freedom to *choose the digital communication* modes by which they would

communicate throughout the study period. Research groups collectively made decisions about preferred communication modes. They favoured asynchronous modes of online communication (email and group online discussion board) to engage with their student peers, largely because of their familiarity and the ease of its use, whilst preferring to largely communicate with their academic Research Supervisors via email. The results showed that students grew in confidence and competence in using online modes for communication purposes over the trimester period.

Valuing the right to make technological decisions

This study highlighted the importance of providing online students (in this case at University) with the opportunity to exercise some level of choice in relation to the digital tools and resources adopted for communication and presentation purposes. The participants valued the fact that apart from the requirement to use a wiki, they had control over what would be used,

The study also found that the main factors affecting their choices included group decision-making, existing familiarity with the technology, their perception of the suitability of particular technologies to suit their purpose and also the availability and accessibility of the technology. Most students and Supervisors indicated that ICT can be used effectively as the main form of communication during the research process, but that having autonomy and choice over which digital modes would be used was both satisfying and effective in supporting their engagement in the online research process.

Conclusion

This research investigated how pre-service teachers (Education students) viewed the effect of Information Communication Technologies (ICT) as the main form of communication during the research process and also identified the influencing factors that affected their choice of E-tools for communication and presentation purposes. The survey data elicited core issues that arise for students working in an entirely on-line research environment.

Students generally preferred the use of asynchronous forms of digital communication to synchronous forms and this choice of E-tools for communication purposes were related to their perception of their capacity to use ICTs, their previous experience and the availability and accessibility of these modes. They largely believed that it was important to become ICT capable and perceived communication via ICT to be valued for its ease, accessibility and time flexibility. In contrast however, most notable was the participants' desire for greater support and a hunger for face-to-face interaction via live or video-conference facilities; the preference for a blended mode of delivery and interaction.

These research findings have application to organisations conducting online research, teaching and learning. Leaders of learning and research in online spaces are reminded of the importance of providing opportunities for participants to exercise choice about the digital tools and repertoires that they will need to master, adopt and utilise. Furthermore, the argument is made that a 'blended learning' learning approach, where possible, may well be more effective than wholly on-line approaches and that further research is warranted in this area.

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