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Capabilities for Ehealth Education: Developing undergraduate digital literacies for health professionals.

Final report 2016

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http://digitalliteraciesforhealthgraduates.com.au/

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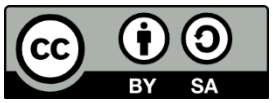

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List of acronyms used

ICT - Information Communication Technology

OLT - Office for Learning and Teaching.

OT - Occupational Therapy

Executive summary

Context

This project is a direct response to the lack of digital literacy capability amongst health science graduates, making them ill-equipped to work or innovate in the context of Ehealth. Continued advances in technology are driving an ever-dynamic process of restructuring the health sector, with requirements for interdisciplinary expertise in health care across geographically and organisationally distributed locations. An underlying premise of the project is the centrality of digital literacies beyond proficiency with Information Communication Technology (ICT), extending to broad skills and competencies, and metacognitive understanding required to scaffold lifelong learning to make best use of technology for creativity and efficiency in workplaces where digital forms of information and communication predominate. This project builds on previous Office for Learning and Teaching (OLT) projects focused on the use of information communication technology and extends the work to a much broader focus on digital literacy and embedding digital capabilities in the design of learning and teaching.

Aims

The aims of our project were:

- To identify current and projected Ehealth needs and usage amongst health service employers.
- To develop an Ehealth curricula mapping tool and pilot this by mapping health science curricula in one university to identify current Ehealth teaching.
- To develop an online Ehealth module and user guide to embed digital literacies into undergraduate health education, and make available on an open access platform, so as to provide a means of ensuring graduate Ehealth capabilities for current and future work.

Approach

The D-Cubed Dissemination Framework [1] was operationalised through a ‘Knowledge to Action’ [2] approach.

The problem identified was the inadequate preparation of health science graduates to function within a health sector undergoing rapid transformation through developments in Ehealth.

The health care context was central to the work, and three industry stakeholders were interviewed about digital literacy for health care graduates to provide contextually relevant information.

Qualitative analysis of the interviews followed a thematic framework, guided by previous published work on digital literacies of relevance to a broader context. This process resulted in six themes that formed a health care contextualised digital literacy framework.

The six themes were reviewed and developed into a digital literacies mapping tool.

Using an iterative process to refine the mapping tool, the tool was applied to the 14 core units of La Trobe University's Bachelor of Health Science/ Master of Occupational Therapy Practice. The mapping exercise involved reviewing subject learning guides and, where needed, contacting subject co-ordinators for further information and confirmation of content.

The initial goal of developing an on-line Ehealth module was changed to an open access website with all project elements, thereby providing the means for educators to develop an understanding of the broader concept of digital literacies, and apply it to their own disciplines and teaching and learning content and processes.

Outputs and Resources

Digital literacies for a health care workforce thematic framework

The digital literacies identified through the qualitative analysis of stakeholder interviews were fine-tuned with stakeholder input and provided the basis for a thematic framework. These themes are described below:

Creating understandings: reinforces the importance of context, connections, boundaries and responsibilities when considering what it means to be digitally literate in a health care context.

Developing the culture: highlights the need for health professionals to embrace technology and digital media to enhance their practice and improve service delivery.

Using the full capacity: describes one aspect of digital literacies in health practice – using the full capacity of digital technologies. It relates to the extent to which students and health professionals use this capacity.

Building connections: describes taking advantage of digital media to enable seamless communication and connectivity between consumers, health care providers, and various sources of information and sharing, including other consumers with similar conditions. Hence, building connections is the aspect of digital literacies in which health care providers communicate and share information through digital technology to empower clients to partner in the health care process.

Owning the space: relates to health professionals taking control of the clinical space of which digital technologies is a fundamental part. This theme encompasses the elements of belonging, taking control and accepting responsibility to be present.

Transformative thinking: refers to the major changes that are occurring in the thinking of health professionals and people who use health services. There are health care leaders who are actively embracing digital technologies, and consumers who are comfortable with technology use to meet their health care needs.

Curriculum Mapping Tool and Curriculum Mapping

The thematic framework provided the basis for a curriculum mapping tool, which also incorporated high level descriptors and major knowledge content for each. It also provides operational definitions of three levels for each theme of relevance to developing student skill.

(a) Basic/ introductory – includes content, activities or use of technologies or platforms that develop basic skill in the target digital literacy;

(b) Intermediate – requires more developed skills in that there is demonstration of digital literacy, which is required to complete an activity, or the competency in the digital literacy is made explicit, but full mastery is not expected or required; and

(c) Advanced – elements of the digital literacy are evident in activities or platforms that students use, and the digital literacy is made explicit.

The curriculum mapping tool is provided as a resource in the form of a grid for use with any curricula.

Application of this tool to the 14 core units of La Trobe University's Bachelor of Health Science/ Master of Occupational Therapy Practice revealed the following:

- In years one and two, students were exposed to technologies that were specific to the tertiary environment.
- Most opportunities to develop digital literacies occurred in years three and four, at basic and intermediate levels, particularly Developing the culture, Building connections, and Owning the space.
- In general, digital literacies were implicitly rather than explicitly embedded in subject content and student activities.

Online Module and User Guide

The module is available through open access. It steps the academic through the contextualised digital literacy framework, provides a direct link to the mapping tool to encourage direct application of the framework to an academic's own course and, in doing

so, promotes consideration of the digital literacies already present and how these can be made more explicit and expanded across the whole curricula.

Links to Outputs and Resources

All resources are available at:

digitalliteraciesforhealthgraduates.com.au

The video that was developed as part of this project can be accessed at:

https://www.youtube.com/watch?v=hQPVN_ck9Ww

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Chapter 1 Project context and original project aim

Digital Literacy is the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyse and synthesise digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process [3].

Introduction

The aim of this project was to develop, implement and pilot an Ehealth mapping tool, module and user guide designed to ensure that students in health science degrees have the Ehealth capabilities necessary for contemporary practice in a rapidly changing health care system. Ehealth capability is a knowledge and skill gap in current health science degrees and is deemed a serious limitation of the current health workforce [4]. The project addressed the priority, *curriculum design*, focusing on the development of contemporary curricula that meets student and employer needs. Building on a recent Office for Learning and Teaching (OLT) report [5] and drawing on literature that articulates the interdisciplinary demands and technological changes in health practice [6], the focus was on the "literacies of the digital" in health professional curricula.

Project rationale

Gray et al. [5] stated, "new initiatives in professional education, training, learning and development are required to build the capabilities that the Australian health workforce needs to work in a national Ehealth system" (p. 4). Technology is restructuring the health sector, with requirements for interdisciplinary expertise in health care across geographically and organisationally distributed locations. Mobile technologies for home care of people with chronic disease, management of information networks of care across tertiary, secondary, primary health and home environments, and the integration of health information and services across complex hospital and community health organisations are current examples [6]. Whilst transformation is rapid, a "serious limitation on the Ehealth capabilities of current and future clinicians is their lack of access to high-quality, widespread formal education in Ehealth and the underlying discipline of health informatics" [5]. This project is a direct response to this lack of Ehealth capability and responds to the assertion that "engaging with Ehealth requires a skill set, or literacy, of its own" [7].

Whilst previous OLT projects have focused on the use of Information Communication Technology (ICT) in higher education discipline contexts, and embedding digital capabilities in the design of teaching and learning [8,9] strong arguments for the centrality of digital literacies beyond proficiency with ICT have been mounted [10]. We contend that digital literacy is central to ensure health science graduates understand digital technology and have the metacognitive processes and scaffolding for lifelong learning to make best use of technology for creativity and efficiency in workplaces where digital forms of information and communication predominate [10]. International commentators on digital literacy emphasise a need for broad skills and competencies, arguing that skills-based definitions are

inadequate for the complexity of professional settings. The emphasis is on “lifelong digital learners” and digital literacies as complex social and technological engagements [10].

Technological change in disciplines and professions is highlighted in a range of reports on higher education [11,12,13]. All emphasise the effects of new mobility devices and digital practices, resulting in “the need for universities to adopt a more strategic and innovative approach to the use of digital technologies in the future” [12]. Gray et al. [5] highlight the need for teaching resources in Ehealth, but caution that the development of Ehealth education cannot be founded on a curriculum built around computer skills or information literacies. In this project we respond to the call for Ehealth curricula that builds “the more integrated, resilient form of knowledge, skill and attitude expected of a graduate professional” [5] (p. 10).

Project aims

The aims of our project were:

- To identify current and projected Ehealth needs and usage amongst health service employers.
- To develop an Ehealth curricula mapping tool and pilot this by mapping health science curricula in one university to identify current Ehealth teaching.
- To develop an online Ehealth module and user guide to embed digital literacies into undergraduate health education, and make available on an open access platform, so as to provide a means of ensuring graduate Ehealth capabilities for current and future work.

Chapter 2 Project approach and methodology

The underpinning methodology for the project was the D-Cubed Dissemination Framework [1] operationalised through a "Knowledge to Action" approach [2]. This methodology consists of a cyclic process of identifying the problem, adapting knowledge to local context, assessing barriers to use, selection, tailoring and implementing interventions, and monitoring knowledge use, outcomes and sustainability. An ethics application was submitted to the La Trobe University Human Ethics Research Committee and approval was given for all processes outlined in this report (HREC number S15/7).

Identification of the problem

The problem to be addressed was the inadequate preparation of health science graduates to function within a health sector undergoing rapid transformation through developments in Ehealth. The identification of this problem was supported by the foundational work of Gray et al. [5] who argued that current approaches to health education are inadequate to prepare graduates to function within a rapidly changing digital environment.

Adapting knowledge to local context

In identifying the problem, it was clear that the health care context should be central to the work conducted. A review of international literature was conducted and yielded a dearth of health care research beyond engagement with ICT. The need to draw from a wider body of work was identified. Broader searches of international literature outside health care resulted in engagement with Doug Belshaw's 2011 book, *The Essential Elements of Digital Literacies* and his Ed.D thesis [14].

The work of Belshaw

Belshaw [14] describes eight elements of a digitally literate individual. The following is adapted from his work:

Cultural – acquired by immersing in different digital environments and being able to move seamlessly between digital environments. Belshaw describes this as the ability to understand digital contexts and cultures through different lenses.

Cognitive – acquired by exposure to different devices, software's and platforms. Belshaw argues that learners must be exposed to a variety of approaches because sequential, step-by-step approaches do not work.

Constructive – acquired by understanding how existing resources can be reused, redeveloped and put together in new and interesting ways.

Communicative – acquired by understanding how people can communicate in different ways, using different digital approaches, and how effective communication relies on knowledge, understanding and application of ethics, norms and assumptions.

Confident – acquired by reflection on practices and one's own use of digital technologies, personal learning environments and the networks needed to support skills and capabilities.

Creative – acquired by risk taking and doing new things in different ways. This element requires confidence in randomness and discovery. Making sense is at the core of creativity. Belshaw describes this as “joining the dots”.

Critical – acquired by understandings of the power and assumptions that underpin digital practices and tools.

Civic - acquired by using digital technologies to self-organise and connect locally and globally.

Belshaw (2014) states that the eight elements are contextual. In this project the understanding of these elements was used to underpin the thinking about the context of health care.

The identification of current and projected Ehealth needs and usage amongst health care experts.

Consistent with the original project plan, three interviews were conducted with key informants. Questions were asked about current and projected future uses of Ehealth in the stakeholder’s service, skills and attributes required to work in health contexts, extent to which new graduates have been prepared for an Ehealth context, how Ehealth capacity would be demonstrated, and what is required in undergraduate education of health care professionals, including content for an Ehealth module. The interview schedule is provided in Appendix B. The interviews were imported into NVivo qualitative analysis software and were coded at the basic level. Belshaw’s work was used to guide the analysis but there was recognition that the work needed to be contexualised to the health care context. Basic codes were clustered into higher order organising codes and then into themes that reflected the major pattern across the data set (a summary of analysed date is presented in appendix C).

The primary purpose at this point was to develop a thematic framework to guide thinking about digital literacy, framed by the complex social and technological context of a future health care environment. The themes that were developed were tested through a blog and broad input was sought across health care and university environments. The themes were refined and a final group of six were developed: *Creating understandings, developing the culture, using the full capacity, building connections, owning the space and transformative thinking.* Each of the developed themes links to Belshaw’s work.

A digital literacies matrix (see appendix D) was developed to illustrate each theme, and overall descriptors and then level descriptors for basic, medium and advanced capabilities.

The development of an Ehealth curricula mapping tool and piloting of the tool

The developed contextualised digital literacy framework was used as the basis for the mapping tool. Using an iterative process, the six themes were reviewed and applied to the 14 core units of La Trobe University’s Bachelor of Health Science/ Master of Occupational Therapy Practice. As a course co-ordinator, subject co-ordinator and academic involved in

the accreditation processes of the Occupational Therapy Council and World Federation of Occupational Therapists Minimum Educational Standards, Dr Carol McKinstry has a detailed knowledge of the Occupational Therapy (OT) curriculum. Dr McKinstry and Professor Teresa Iacono worked together to apply the developed framework across core OT subjects, including first year subjects that form a foundation first year for the majority of La Trobe University health science courses.

The mapping exercise involved reviewing subject learning guides. Where the digital literacy content was not evident from the learning guides, the subject co-ordinator was contacted for further information and confirmation of content. The mapping involved consideration of assessments and the weekly learning tasks.

In each subject, digital literacies were identified and tabulated with explanatory notes. Developmental levels were identified using the following operational definitions:

(a) Basic/ introductory – includes content, activities or use of technologies or platforms that develop basic skill in the target digital literacy;

(b) Intermediate – requires more developed skills in that there is demonstration of digital literacy, which is required to complete an activity, or the competency in the digital literacy is made explicit, but full mastery is not expected or required; and

(c) Advanced – elements of the digital literacy are evident in activities or platforms that students use, and the digital literacy is made explicit.

All information was transferred to a grid to provide visual representation of digital literacies across the course. Other team members reviewed this information, areas of inconsistency were identified and refinement occurred. This grid formed the basis of the mapping tool, which was revised and reapplied to the OT curriculum.

The development of the online Ehealth module and user guide in open access format

The initial plan was to host the Ehealth module as part of an existing online educational package. There was some lack of clarity around the future of the existing package and its accessibility on an open access platform, so the decision was made to develop the module as a stand-alone web based resource in fully open access format. Through prolonged engagement with the extensive literature in this area, and current work on digital literacies across La Trobe University, it became clearer that the development of digital literacy capabilities must begin with educators who are well placed to move them from being implicitly embedded throughout multiple learning and teaching opportunities to explicit student awareness.

There is increasing interest in digital processes, applications and methods across universities, and the development of a multitude of different digital tools and techniques are embedded in most contemporary curricula. In this project, there was a view that university strategic directions can create an environment in which there is a proliferation of innovation for innovation's sake. Pressure on educators to be innovative risks an ad hoc approach to curriculum development within a narrow frame of computer skills or

information literacies. This understanding allowed for the identification of digital literacy as a threshold concept for academics and students. Meyer and Land's [14] seminal work on threshold concepts influenced thinking. A threshold concept has been described as a notion that has the potential to transform understanding. By comprehending a threshold concept, in this case digital literacy, individuals have the potential to alter their views on a subject under consideration.

The identification of digital literacy as a threshold concept was informed by the focus on ICT within curricula and the international literature. The need to create an understanding of digital literacy beyond ICT skills was acknowledged and work commenced with a team of educational and creative designers to produce an innovative short animated video that would be at the core of the planned module.

As we progressed through the project, the links between the reviewed literature, interviews, developed themes, the contextualised digital literacy framework, the mapping tool and mapping exercise were strengthened and this work formed the content for the module and simple guide to how people might want to engage with the developed materials.

Chapter 3 Project outputs and findings

The project was designed to improve the capacity of Australian higher education institutions to deliver Ehealth education and ensure that graduates have the capabilities to enter a health sector undergoing rapid transformation through developments in Ehealth. It was designed to directly address the urgent need to prepare the future health workforce with Ehealth capabilities through outcomes focused on the distinction between information literacy as a set of skills or competencies, and the range of practices that apply to complex professional settings.

Resources/outputs available to the higher education sector

The major resource/output from this study is a web based online module. This module is designed to support the reader to think differently about digital literacies and broaden thinking to extend beyond ICT competencies. A contextualised digital literacy framework with capability descriptors is presented in this module that was developed through a review of the literature and expert interviews with key health service staff. The framework provides a mapping tool, which was applied to a curriculum as part of a process of testing and refinement. The mapping and tool are available within the module for those in health services and the higher education sector to utilise. The module is in open access format, and therefore available for all stakeholders, including health professionals, multidisciplinary academics and students. The module can be accessed at:

digitalliteraciesforhealthgraduates.com.au

The video that was developed as part of this project can be accessed at:

https://www.youtube.com/watch?v=hQPVN_ck9Ww

Detail of the outputs and findings against each of the aims.

Interviews with key informants and the development of a thematic framework.

The aim of this component was to identify current and projected Ehealth needs and usage amongst health service employers.

Consistent with our initial project plan (see Chapter 2 for further detail), in-depth interviews were conducted with three key informants. The analysed interview data informed the development of the themes and is presented in Appendix C. The following outlines the themes, the high-level descriptors and the major knowledge content that relates to each theme:

Theme one: Creating understandings

The theme *creating understandings* reinforces the importance of professional practice context, connections, boundaries and responsibilities when considering what it means to be digitally literate in a health care context. This theme reflects three of Belshaw's elements: Cultural, Critical and Communicative. Belshaw suggested the cultural element is best

achieved through immersion within cultural norms, expectations and understandings, and is a key consideration for planning learning.

The major knowledge content areas in this theme are:

- Identifying the best solutions in any given situation based on best evidence and practical wisdom
- Building on foundational knowledge and translating this to different situations
- Understanding professional boundaries and responsibilities

The capabilities related to this theme are presented in Table 1.

Table 1: Creating understandings - Capability levels

BASIC	INTERMEDIATE	ADVANCED
Works within boundaries according to the context set by instructors and the learning management system.	*Demonstrates appropriate behaviour when using digital tools in varied closed and open access digital spaces for learning and health care.*	*Establishes and maintains professional boundaries when working in closed and open access digital spaces, and understands the implications when boundaries are exceeded.*

Theme two: Developing the culture

The theme *developing the culture* highlights the need for health professionals to embrace technology and digital media to enhance their practice and improve service delivery. This theme reflects two of Belshaw's elements: Cultural and Critical.

The major knowledge content areas in this theme are:

- ICT systems need to be simple to enable uptake and use by health professionals
- Health is lagging behind other industries in the use of digital technologies, and consumers may be leading health professionals and requiring them to increase uptake
- Those teaching health students are not proficient in digital media; therefore, they are not enabling students and future graduates to develop adequate digital skills
- Health professional interactions with clients via digital media will be different to those that occur face-to-face

The capabilities related to this theme are presented in Table 2.

Table 2: Developing the culture - Capability levels

BASIC	INTERMEDIATE	ADVANCED
Highlights the need for health professionals to embrace technology and digital media to enhance their practice and improve service delivery.	*Demonstrates understanding of the value of working collaboratively using digital tools and in digital spaces to solve problems and share with fellow students, instructors and external audiences (e.g., clinical supervisors)*	*Contributes to open access or community of practice digital spaces for current and future sharing of information and resources with colleagues and health care consumers.*

Theme three: Using the full capacity

The theme *using the full capacity* describes one aspect of digital literacies in health practice – using the full capacity of digital technologies. It relates to the extent to which students and health professionals use this capacity.

Drawing on participants' accounts of digital practice, the theme *using the full capacity* links digital literacy to the use of digital technologies in health curricula and practice. This theme reflects three of Belshaw's elements: Cognitive, Confident and Constructive.

The major knowledge content areas in this theme are:

- Embedding the capacity of digital technologies
- Capacity in student learning
- Capacity in health systems
- Capacity through connecting communities

The capabilities related to this theme are presented in Table 3.

Table 3: Using the full capacity - Capability levels

BASIC	INTERMEDIATE	ADVANCED
Uses digital tools and spaces appropriate to the task at hand and activity goals.	*Applies various digital tools and in varied digital spaces to solve problems, or find new ways to complete tasks and achieve goals.*	*Identifies the need for and learns skills in using different digital tools or to work in new digital spaces to extend students' own capacity and efficiency.*

Theme four: building connections

The theme *building connections* described taking advantage of digital media to enable seamless communication and connectivity between consumers, health care providers, and various sources of information and sharing, including other consumers with similar conditions. Hence, building connections is the aspect of digital literacies in which health care providers communicate and share information through digital technology to empower clients to partner in the health care process. This theme reflects three of Belshaw's elements: Civic, Critical and Communicative.

The major knowledge content areas in this theme are:

- Service providers letting go of ownership of clients and their information, and instead entering into a collaborative partnership
- Empowering consumers to manage their health care, and drive activity that will address health problems
- Enabling care through collaboration

The capabilities related to this theme are presented in Table 4.

Table 4: Building connections - Capability levels

BASIC	INTERMEDIATE	ADVANCED
Applies existing skills to new digital tools and spaces.	*Selectively chooses digital tools and spaces to communicate with others who have a shared interest in the content.*	*Selectively chooses digital tools and spaces to share content students have created or collated to meet the needs of specific target health care professionals and/or consumers.*

Theme five: Owning the space

The theme *owning the space* relates to health professionals taking control of the clinical space, of which digital technologies is a fundamental part. This theme encompasses the elements of belonging, taking control and accepting responsibility to be present. The theme reflects two of Belshaw's elements: Confident and Constructive.

The major knowledge content areas in this theme are:

- Valuing digital technologies as an integral part of clinical care and practice
- Recognising the need to take control of the clinical space of which digital technologies are a part
- Accepting responsibility for digital technology in the clinical space, and influencing the functionality of digital technologies to enhance clinical practice

The capabilities related to this theme are presented in Table 5.

Table 5: Owning the space - Capability levels

BASIC	INTERMEDIATE	ADVANCED
Demonstrates willingness to have a presence in various digital spaces, and creativity in design or content.	*Identifies own authorship of contributions in varied digital spaces.*	*Takes control of digital spaces, such as through editing or moderating content, as well as self censoring contributions.*

Theme six: Transformative thinking

The theme *transformative thinking* refers to the major changes that are occurring in the thinking of health professionals and people who use health services. There are health care leaders who are actively embracing digital technologies, and consumers who are comfortable with technology use to meet their health care needs. This theme reflects two of Belshaw's elements: Creative and Constructive.

The major knowledge content areas in this theme are:

- The need to think creatively and recognise that problems have multiple solutions
- The future is already happening
- A transformative change in thinking is needed by health professionals and consumers to recognise that using technology does not mean substandard care

The capabilities related to this theme are presented in Table 6.

Table 6: Transformative thinking - Capability levels

BASIC	INTERMEDIATE	ADVANCED
Supports peers in learning and applying digital tools or working in digital spaces. *Identifies problems that can be addressed through technology.*	*Leads peers and those senior to them in using digital tools and working in spaces accessible to health care consumers in specific projects.*	*Initiates changes that require transformative ways of working within health care settings, including through the use of consumer-accessible and friendly digital resources.*

The curricula mapping tool and mapping of curricula

A major outcome of the project was a digital literacy mapping tool that was developed and applied to a university health science curriculum. The purpose of this activity was to identify existing digital literacies and opportunities to further develop metacognitive awareness of digital literacy capabilities. By engaging in the process of mapping we hypothesised that academics would extend their thinking beyond ICT capability and identify existing and future opportunities to provide the scaffolding necessary to create lifelong digital learners.

To test the validity of the tool, an academic familiar with the OT curriculum, but not involved in the project, reviewed the mapping results. He provided comments indicating his agreement that the activity identified did reflect the specific digital literacy described and the level assigned to it. Findings from the mapping exercise were also presented to La Trobe University's occupational therapy academic team who are revising the curriculum. The findings stimulated discussion around the need to embed digital literacies throughout the curriculum, conscious of what occurs before and what is to come in subjects in later years. The experience of mapping reinforced the position that the engagement of academics in thinking broadly about digital literacy, through engagement with content, mapping and in-depth discussion provided the opportunity to explore digital literacy as a threshold concept. Through this process those involved developed understanding that enabled the identification of where digital literacies were covered in existing curricula. This process was important as in the early stages staff focused on ICT competencies, but as they engaged more deeply with the framework and content they identified where digital literacies were evident and opportunities to build capability levels throughout each subject and at course level.

The mapping tool (Appendix E), and an example of the mapping of a curriculum (Appendix F) are presented in the appendices.

The online module and user guide

The aim of this component was to develop an online Ehealth module and user guide in open access format to embed digital literacies into undergraduate health education to ensure graduate Ehealth capabilities for current and future work.

The underpinning premise for this module was the avoidance of a simplistic step-by-step guide to achieve ICT competence. There is increasing interest in digital content across universities, and the development of a multitude of different digital tools and techniques are embedded in most contemporary curricula. The risk is that university strategic directions create an environment in which there is a proliferation of innovation for innovation's sake. Pressure on educators to be innovative risks an ad hoc approach to curriculum development within a narrow frame of computer skills or information literacies. The approach taken in this project was that the process of mapping curricula and the dialogue this creates prompts educators to think beyond current programs, technologies, skills and competencies. In order to develop graduate capabilities needed for a future that cannot yet be envisaged, the first step is to move academic thinking. The module steps the academic through the contextualised digital literacy framework, provides a mapping tool for their own courses and promotes them to consider the digital literacy capabilities that are already evident within

their curricula, and how these can be made more explicit and expanded across a whole curriculum.

Information on how existing knowledge was used and advanced

In a previous OLT funded study, Gray et al. [5] stated “new initiatives in professional education, training, learning and development are required to build the capabilities that the Australian health workforce needs to work in a national Ehealth system” (p. 4). Continued advances in technology are driving an ever dynamic process of restructuring the health sector, with requirements for interdisciplinary expertise in health care across geographically and organisationally distributed locations. Mobile technologies for home care of people with chronic disease, management of information networks of care across tertiary, secondary, primary health and home environments, and the integration of health information and services across complex hospital and community health organisations are current examples [6].

Whilst previous OLT projects have focused on the use of Information Communication Technology (ICT) in higher education discipline contexts, and embedding digital capabilities in the design of teaching and learning, [8,9], in this project the focus was on the centrality of digital literacies beyond proficiency with ICT.

International commentators on digital literacy emphasise a need for broad skills and competencies and argue that skills-based definitions are inadequate for the complexity of professional settings. The emphasis is on “lifelong digital learners” [10] and digital literacies as complex social and technological engagements [10]. Technological change in disciplines and professions is highlighted in a range of reports on higher education [11,12,13]. All emphasise the effects of new mobility devices and digital practices and “the need for universities to adopt a more strategic and innovative approach to the use of digital technologies in the future” [12]. Gray et al. [5] argues that that the development of Ehealth education cannot be founded on a curriculum built around computer skills or information literacies. In this project, we responded to the call for Ehealth curricula that builds “the more integrated, resilient form of knowledge, skill and attitude expected of a graduate professional” [5] (p. 10).

Disciplinary and interdisciplinary linkages

The strength of this project was the focus on the need to contextualise digital literacies at interdisciplinary level. The project team and people who engaged with developed materials were from multidisciplinary backgrounds, but connected by the context of health care. This enabled discussions and reflection of the applicability of the developed contextualised digital literacy framework to the types of digital literacies that were developed in their own discipline and the opportunity to develop interdisciplinary capability.

Factors critical to the success of the project and factors that impeded its success

The following factors supported or impeded the success of this project:

1. The interdisciplinary project team was a strength, and the link with industry experts central to contextualising the work within the health care context.
2. There were some staff changes, but as the project developed a larger team of people engaged with the project and supported the development of outcomes.
3. A much longer time frame would have enabled scaling of the mapping across a number of disciplines but this was a seed project, with a limited time and budget. Pragmatic decisions needed to be made to maximise the potential for success.
4. Regular project meetings, underpinned by a set of values that encouraged open and honest communication, was a strength.
5. Challenges in connecting to the diverse participants – health professionals, students and academics, to the project as a work in progress through the project blog.

The extent to which the approach/outcomes are amenable to implementation in a variety of institutions or locations

This project was designed to be open access to ensure that the approach and outcomes were amenable across disciplines, organisations and locations. Planning is underway to scale up this project. The next stage of the project is to implement a group of interventions. We envisage that this should include multidisciplinary/multi university engagement with the developed framework. Using the process developed in this project, context specific frameworks and mapping tools could be developed. Across different disciplines, mapping should be conducted to identify the digital capabilities that are evident within the current curricula. The experience in this project was that staff initially focused on ICT skills, but as their confidence and knowledge grew they took a much broader approach to digital literacies: that is, the process of mapping increased their knowledge and skill level, and supported conversations around areas where digital literacy could be strengthened. Focused exploration could occur at the course level, with students supported to take the curriculum maps and identify how each of the identified areas is actually enacted: that is, the staff will have mapped where the digital capabilities have been identified. The students could be asked to summarise their learnings against each of the digital literacy capabilities. Staff, students and health service stakeholders could work together to identify the extent to which digital literacies have been made explicit within each curriculum, highlight opportunities for development of digital literacies at the course level, and develop explicit mechanisms to achieve this. The team who have completed this project are committed to leveraging this seed work into a much larger, cross-university project.

Concluding comments

This purpose of this project was to improve the capacity of Australian higher education institutions to deliver education focused on digital literacies to ensure that graduates have the capabilities to enter a health sector undergoing rapid transformation through developments in Ehealth. The project process and outcomes indicated the potential for

digital literacies to be scaffolded so as to move students from beginning to expert levels, but this potential will not be realised until academics and students develop a broader understanding of digital literacies. Application of the mapping tool to wider higher education contexts and engagement in ongoing discussion will assist in knowing how to best prepare students to not only work in, but also contribute to the transformations occurring in the health care and other sector workforces. We have begun the task of addressing the urgent need to prepare the future health workforce with digital literacy capabilities through outcomes focused on the distinction between information literacy as a set of skills or competencies and the range of practices that apply to complex professional settings. Through this seed project we have confirmed the need for institutions to:

> "place greater value on 'literacies of the digital', and better prepare their students and their own organisational processes to thrive in an age of digital knowledge practices" [8] (p. 547).

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Appendix A

Certification by Deputy Vice-Chancellor (or equivalent)

I certify that all parts of the final report for this OLT grant provide an accurate representation of the implementation, impact and findings of the project, and that the report is of publishable quality.

Name: …Professor Jane Long Senior Deputy Vice Chancellor. Date: April 25 2016

Appendix B: Stakeholder interview schedule

1. Describe the current use of Ehealth in your service: what is the capacity for Ehealth in your service?

2. What do you feel are the skills and attributes required to engage with Ehealth/ utilise Ehealth?

3. How well prepared for Ehealth are new graduate clinicians?

4. How would a health professional who has just graduated be able to demonstrate a capacity for Ehealth in your service?

5. What aspects of Ehealth education would be most useful to your health context?

6. What do you think should be included in a module on Ehealth offered to health sciences undergraduates?

Appendix C: Summary of analysed interview data

Below is a summary of themes and qualitative evidence from interview transcripts.

Theme: BUILDING CONNECTIONS

The theme *building connections* was taking advantage of digital media to enable seamless communication and connectivity between consumers, all of their health care providers, and various sources of information and sharing, including other consumers with similar conditions. Hence, building connections is the aspect of digital literacies in which health care providers communicate and share information through digital technology to as to empower clients to partner in the health care process.

The major knowledge content areas in this theme are:

- Service providers letting go of ownership of clients and their information, and instead entering into a collaborative partnership
- Empowering consumers to manage their health care, and drive activity that will address health problems.
- Enabling care through collaboration

Understanding and responding to client expectation

Digital literacy includes having an understanding of what clients expect, and delivering information to them in a way that can be accessed through digital technology. According to Brooke, this was about "packaging information in ways that can be digitally transmitted" and also knowing that clients are looking to their health care providers to understand and make it easy for them to connect with others around the world with like conditions, for both support and information. She noted:

> *So consumers want it. They crave it. They want to find people like themselves.*

Both Brooke and Kate suggested that this desire by clients for digitally based records of their own information, communication from their health care providers, and access to multiple sources of information was sometimes a surprise to clinicians. Kate, in relating an experience in the Northern Territory, said:

And in actual fact it is the patients who demand it. So in that case it is our Aboriginal patients that are demanding it, so the demand is coming from places you wouldn't expect.

Brooke further suggested that clients, with some digital literacy, can access information when it suited them, making access free of time restrictions and state of wellness (or otherwise):

And so a bit of digital literacy means that that person can connect from their own home and so no matter how they are feeling.

And Eric predicted that sometime in the future boundaries between a service and community would blur, because clients could access services from wherever their location:

…in 50 years time I would hope that the margins between a service like this and the community are quite blurred. I would see, yes we have got services being delivered, but where the person starts interacting with the service can be onsite here or it can be from their own home.

Handing over the Reins to the Consumer

Consumers who are digitally literate have greater means of controlling their health care management, and even can drive it. They need health care providers who not only accept this handing over of control, but also can facilitate it as a result of their own digital literacy, and supporting electronic health information, to the point where person centred care reflects the client in the middle driving management and care. Eric exampled client empowerment:

So if you empower someone to. Say they were able to, from their mobile phone, book an appointment with the doctor, complete a few fields and then give the provider access to their electronic health record, they've planned and managed what they are doing.

Hence, person centred becomes client-driven care, but it requires seamless connections between systems, which, according to Eric, will also be driven by health care service providers looking for "efficiency gains." Kate suggested that handing over control to clients was inevitable, even if health providers have not yet gotten on board. She said

…we are starting to carry around our medical file because the medical industry actually acknowledges that we actually need to connect our care. So they do it in the absence of an Ehealth system, they do it paper based. So as I will probably keep saying it's inevitable because our culture is driving us that way.

Eric was keen that consumers drive their own care as this would give them

> *…a sense of coherence where they become master of their own destiny and health really is about how much control you have over things*

Collaborative Health Care

The result of empowering clients in their own health care did not equate with the health care provider relinquishing responsibility. Rather, a digitally literate client and health care provider could work together in partnership. Kate, in recounting the experience of a man with cancer, talked about how health care empowerment through his own and his GP's digital literacy meant that

> *they would investigate it together and they put the patient in the navigation seat rather than in the back seat, well actually they put him in the driver's seat.*

Kate noted that such partnerships meant recognition that "Patients are untapped resources." For diabetes management, digital technology and basic digital literacy could engage in self monitoring, and in this way

> *actually help to alleviate some of the burden on the medical system but also on our families*

Further, the partnership results in a two-way sharing

> *… [it] does create more of a partnership between the consumer and the health professional. … it is just as much the consumer who might be educating the health professional about what might work best, so it changes that relationship. Which is obviously a benefit to the process. So there is that partnership and the ownership for the consumer, reducing the burden on the health system*

Theme: CREATING UNDERSTANDINGS

The theme *creating understandings* reinforced the importance of context, connections, boundaries and responsibilities when considering what it means to be digitally literate in a health care context.

The major knowledge content areas in this theme are:

- Identifying the best solutions in any given situation based on best evidence and practical wisdom
- Building on foundational knowledge and translating this to different situations
- Understanding professional boundaries and responsibilities.

Understanding the context

Interview participants described the need for graduates to understand the appropriate use of digital tools and why. Being digitally literate is more than just having the skills to work with different software packages; it is about understanding why different situations might require a digital solution or why a digital solution might not be the answer. Brooke explained:

So there's this skill set and then there is this knowledge side of things. This understanding of why. Why would you use this tool here? … knowing which tools to use to get the most out of what you need to do ... knowing its capacity and knowing its limitations (Brooke).

Eric described the current situation in health care:

We tell them they have to use this system and they have to do this this and this. But they don't actually understand why.
Brooke described the important role that students play in creating understandings within health care. By ensuring that students are exposed to different and expanding digital tools and knowledge they can support clinicians with current evidence of what might be used in different situations:

We can use this tool and this tool, and feel like they are useful to the practitioners who are stuck … they have no time to research this. But if we can keep giving them information that is up to date, then they can keep share it and they can feel useful and then they are spreading the word.

Understanding the connection

Central to *creating understandings* is making the connection between skills that you have with one application or within one context and how this knowledge and skill translates to health care. Brooke described how people might have skills in 'using Facebook and Snapchat but don't translate those skills into these [health] settings'.

Brooke highlighted the importance of students understanding that the various digital learning tools that they are exposed to in their education builds their digital literacy. She described how teaching digital literacy as a 'bolt on' rather than embedding in all aspects of education creates a view that digital literacy is an 'isolated skill set' rather than a skill that can translate to all aspects of contemporary life.

Using the example of students uploading a PDF document to an e-portfolio system, she described how students hadn't make the connection between that activity and the experiences that they will have as graduates:

> This is the number of people that attempted the task there and this translates to the number of people who could have applied for a job this way and you can hear the silence. Oh, this is why we need this skill and I noticed in a job ad recently it said no handwritten copies will be accepted and I think I will take that to class and say hey guys, no one will accept your job application by walking in the door or by posting (Brooke).

For Brooke it was important to create understanding and make explicit to students why they are exposed to different digital tools in their education. She described how students perceive that 'we make life so hard for them' through the technologies that they are expected to master, rather than 'you are developing all of these digital literacies as a result'.

Understanding how skills learnt in one context or with one application can be translated was viewed as important to ensure that graduates don't develop a mentality of 'oh well that technology will change anyway .. why bother' (Brooke).

Understanding boundaries and responsibilities

The participants all highlighted boundaries and responsibilities as central understandings when working with digital technologies. They did, however, have different views on this. For Brooke, it was important that graduates understand that professional boundaries extend to the digital space, and that 'the ethics and morals should be all explored'.

Brooke's view was that rather than banning applications like Facebook, it was important to maintain professionalism in every context:

These are the boundaries around using Facebook … you would never criticise another person … never criticise your employer. You are an upstanding professional at all times. You are measured on the ethics of your profession on every forum you are in. So face to face or anywhere someone is potentially snapping, taking screen shots of everything you do.

For Eric, the focus was more on compliance.

You want protection from the usual threats, and then you need good codes of conduct and privacy agreements that your staff member signs up to.

Discussion from Kate challenged the focus on security and threats within health care. Using the example of banking she described how the health care industry has become over concerned about security:

In the health industry, they seem to think that there is no standard, from a security perspective, that has actually met the health's sphere. I think that is garbage. I think there are some very good security standards and privacy standards and if banking is a good parallel.

Eric described the need to ensure that graduates understand the audit trail that is created by technology. He stressed the need for clarity in communication and understanding that digital notes were legal documents but that the audience might not be someone you know; 'you are writing for the next person'.

I think making people aware of that certainly heightens their level of responsibility (Eric).

Kate reinforced the need to ensure that graduates understood their responsibilities in ensuring communication using digital means was understood:

We try to put it in a way we think is clear but it might sound like garbage.

Theme: DEVELOPING THE CULTURE

The theme *developing the culture* highlights the need for health professionals to embrace technology and digital media to enhance their practice and improve service delivery.

The major knowledge content areas in this theme are:

- ICT systems need to be simple to enable uptake and use by health professionals
- Health is lagging behind other industries in the use of digital technologies and consumers may be leading health professionals and requiring them to increase uptake.
- Those teaching health students are not proficient in digital media therefore not teaching students and future graduates adequate digital skills.
- Health professional interactions with clients via digital media will be different to those via face-to-face

Promoting a culture of embracing digital technologies

To encourage health professionals to engage with and use digital technologies, systems and processes need to be simple and barriers such as organisational ICT firewalls need to be reduced. According to Brooke, health professionals find creative ways around organisational barriers such as ICT firewalls, through 'covert information accessing', to utilise information or evidence for their practice. Bringing in their own devices because organisational technology has firewalls is one creative strategy to overcome a culture that does not embrace digital technologies.

> *And that's been the work around the use for everyone working in a firewall situation and in the States, I was talking to one guy and he said "Well I'm not allowed to use my own device but" He said "I feel like a drug dealer" I go into the toilets to read information to apply information in his workplace" (Brooke).*

A supportive culture that encourages health professionals in information technology use is essential in today's health sector. Eric commented that 'health and IT are inseparable' and health services need to be "that supportive environment where no question is wrong".

Health professionals may not spend or invest time in learning how to use new technologies. While the use of videoconferencing technology is more frequently utilised to enhance or delivery specialist services to consumers in rural or remote areas, health professionals will not engage in technologies that are not simple to use. In talking a telEhealth project involving videoconferencing, Kate stressed how important it was to design something simple.

> *Well I can you what they all told me very quickly and that was to go away. So we had to develop an interface that was very simple. So all they have to do is type in telEhealth, brings them up with a map, the clinician clicks where they want to go to, the just click on that clinic and the machine interfaces with the local application for videoconferencing, makes the call and it all just happens magically. Didn't require any training. That service is successful. And at the patient end, all they had to do was to turn on a switch on the wall. So again simple, simple and it is used everyday because it*

was very simple. That is what we have go to do for our clinicians. It has to be relevant, it has to be easy and it has to be simple (Kate).

Catching up with consumer expectations

With use of smart phones, apps and other ICT devices commonly used by everyone, the health sector has traditionally been lagging behind. Kate commented that

> *"there is the aspect of health dragging its feet in that uptake and really embracing it and there is that risk that the consumer will be, and is in many ways, already ahead'.*

Consumer expect that their treating health professionals are 'connected' and have access to the consumer's health information. As a consumer, Kate commented that

> *an informed patient, I now ask all of my specialists to send me a copy of the GP letter. So when I go to the next specialist I have my bundle of papers because I believe in coordinated care and I don't have an Ehealth system, and it's crazy, and I begrudgingly say to them please look at this and find if there is anything relevant. And I also ask them for my path results as well. So I am in essence my own Ehealth record. And so as an informed consumer, I am pretty pissed off about it. Get your acts together health system (Kate).*

Many health services are still using 'old' technology such as pagers with Kate stating that 'health is just so slow to change' and is 'a generation behind'. Health professionals need to be aware of what technologies are available to consumers and for example, 'to be able to prescribe apps' (Kate).

Many of today's health students use a range of ICT technologies. Kate talked about working with

> *Gen Y Den X, this generation is the C Gen, they are connected. They don't understand what it is like to not be connected. Their whole world is connected. So they want, like I keep saying, it is inevitable because to them everything is connected. Social media, they just, the worst thing in the world to them is to not be connected. And if we look at our information and medical, it's not there. So I think this generation has that acceptance, but they are going to have to break away from the way they're taught because the people who are teaching them may, maybe not, but may still be in the old culture (Kate).*

While health professionals may be familiar with devices such as smart phones, tablets, etc, how to fully use that device in a health setting may be a challenge. Using ICT to increase evidence based practice may be acquiring new or different skills.

> *it's one thing to be familiar with a device, but it is how that device, that information then gets used in the whole new context. That is very much part of what might need to be considered. We can all speak, but part of becoming a health professional is learning is how to use a particular language and how to use it. And it is in that same sort of vain I think (Kate).*

Theme: OWNING THE SPACE

The theme *owning the space* relates to health professionals taking control of the clinical space, of which, digital technologies is a fundamental part. This theme encompasses the elements of belonging, taking control and accepting responsibility to be present.

Drawing on knowledge, attitudes and beliefs related to the place of digital technologies within clinical practice, *owning the space* includes:

- Valuing digital technologies as an integral part of clinical care and practice.
- Recognising the need to take control of the clinical space of which digital technologies are a part.
- Accepting responsibility for digital technology in the clinical space and influencing the functionality of digital technologies to enhance clinical practice.

Belonging

To own a space clinicians need to believe that everything within that space has a valid place; that it belongs. Recognising that digital technologies belong to them and to the clinical space is a foundational belief that underpins digital literacy. Without this belief digital technologies become imposters and the other elements under this theme cannot be achieved. Interview participants' identified the importance of clinicians and graduates recognising from the outset that digital technologies have a valid and enduring place within the clinical space.

> *So the use of Ehealth is sort of growing within hospitals. I suppose, it's inevitable is what I am trying to say, it's inevitable. Not everyone is*

at the same point. There are a lot at the basic level and there are some that are quite advanced. So I think we are all at our different point in that journey, but it is a journey that we actually all will be moving towards so it is inevitable. [Kate]

Taking control

Ownership involves the clinicians taking control of the clinical space and the digital technologies functioning within this space, to achieve the best outcomes. Something that Eric highlighted:

If you read the literature the best systems are driven by the clinician users.

To be the drivers, clinicians need to be clear about the purpose and the outcome of using technologies in care:

So basically moving from doing things paper based to doing things electronically but it's not just for the sake of doing things electronically, its actually to get better information flows … Kate

Clinicians need to take the front seat and set the direction:

It is a little bit like saying 'If I [the clinician] have got a much better understanding, I can then tell the IT people what I want them to come up with. Rather than, you come up with an idea and then I will tell you it is any good or not. Kate

Taking control involves recognising the limitations of the technical systems and where they impede best practice rather than supporting it:

It [the program] still doesn't have a recall facility. So if I was looking at best practice guidelines for a diabetic, the best practice says that I need to see that person annually, just for example. There is no mechanism within [the] program for a letter to be spat out in a year's time. Eric

And to be constantly find ways to create a better fit for purpose in a changing landscape:

They could be saying I want to be sure it's going to suit my needs, but needs do change, so my approach is that the system has to be flexible, it has to be configurable by, you know we need to be able to adapt the system to meet our needs. Eric

Without this control, Kate described clinicians becoming disengaged and implementation faltering.

> *Yep, here we go, we have got this great system for you, go and use it'. And they [the clinicians] go, 'This is the biggest piece of garbage I have ever seen in my life, go away'. And it has actually caused hospitals not to open or to close.*

Responsibility to be present

With ownership comes responsibility for all components of the clinical space including digital technologies. Digitally literate clinicians accept responsibility for their role in developing the technologies to improve care and to be present when decisions are being made.

Eric spoke of the need for clinicians to have a positive presence:

> *It is common sense really, they [clinicians] should be the ones influencing the decision making.*

Kate suggestions presence includes having the confidence to speak up and to be understood:

> *They have role in telling the technologist in how they want it, how they need it because they are two different languages.*

Digitally literate clinicians also recognise the need for others to be present and to share expertise:

> '*I'm not a clinician' and they go 'Good there is enough of us around the table'. We need the technician in the room and we need the business person in the room so it's OK. Kate*

Theme: USING THE FULL CAPACITY

The theme *Using The Full Capacity* identifies one aspect of digital literacies in health practice – using the full capacity of digital technologies. It

relates to the extent to which
students and health professionals use this capacity.

Drawing on speakers' accounts of Ehealth practice, the theme *using the full capacity* links digital literacy to the use of digital technologies in health curricula and practice. The theme expresses capacity in the following ways:

- Embedding the capacity of digital technologies
- Capacity in student learning
- Capacity in health systems
- Capacity through connecting communities

Embedding the capacity of digital technologies

Interview participants offered examples of digital literacies in undergraduate students through their use of commonly used software: "things I notice that they don't do well… is being able to use Word and Excel to their full capacity". The concern was that undergraduate curriculum lacked clear expectations of the use of software to even basic capacity. This sense of "full capacity" is expressed in the use of common software:

> *"Outlook has so much capacity in it but people don't know all these other hidden things inside of it such as making groups and all of those things. And then there is excel which is an amazing program and people don't know how to use all the basic functions and stats and things. Some thing I learnt in my Basic skill in pivot tables"*

This includes the use of Word, Excel, Outlook, reference systems, social media software. This capacity in the use of digital reference systems was identified as a foundational skill, currently taught to post-grads, but should be taught to first year:

> *"we are expecting evidence-based practice in every step so I think reference management systems should be part of first year education"*

Capacity in proficiency with digital technologies was linked directly between student learning and becoming a health practitioner. Referring to a 64 per cent success rate in uploading a fieldwork journal as a PDF attachment for an assessment task, one participant alerted students to importance of basic uses to health practice:

This is the number of people that attempted the task there and this translates to the number of people who could have applied for a job this way, and you can hear the silence. This is why we need this skill and I noticed in a job ad recently it said no handwritten copies will be accepted and I think I will take that to class

The capacity of software changes how knowledge is encountered in curriculum, since it requires a student to practise a skill or capability rather than practise knowledge retention:

it doesn't rely solely on a practitioner's capacity to retain knowledge. And you can use them for their skill level in honing in on a problem, moving from the novice to the experts scenario

Digital literacy, then, entails "problem identification and solving rather than [working with an] out of date textbook".

Capacity in student learning

This problem solving or enquiry approach in undergraduate health curriculum was conducted in different ways through the use of digital technologies. However, there were contrasting views on capacity in student learning. On the one hand, use of digital technologies was seen as seamless:

Now it is at their finger tips, though I think they are used to, with social media, they are used to finding answers for themselves. I think they are used to that self initiate line of inquiry

They reflected a fluency in their digital practices:

They seems to, well you know, when they have a question they go to the internet, they go to their Latrobe login to find the best practice.

Nevertheless, there was a lack of capacity for critical or reflective practice:

at the basic level we have lots of students here on placement so we do observe them a fair bit and most of them are very good. But they don't have that knowledge of the system itself. They don't know why it's guiding them to do something, why they have to do things a certain way.

A diversity of digital engagement can be confirmed in many studies of students of the “net-generation” or “digital natives”.

Capacity in health systems
There were operational challenges in the use of digital systems, and two types were identified in health practice:
(i) Data sharing: where data in one system is not in a form that can be shared with another system:

> *The big curse of Ehealth over the last 10 -15 years is actually you become captive to a particular system”*

This may not be a technical problem, but one relating to quality and standards of information:

> *there was a lot of garbage going into the system because that is the way that clinicians were recording it. They were recording it poorly, so implementing Ehealth actually changed the quality of their information because their peers could see*

However, there are dangers in requiring health practitioners to acquire expertise and training in digital systems”

> *If it is a GP he wants to see my medications, my pathology, my radiology and he is going to need to get to it quickly and simply. If is his going to be trained on the system, and this is my experience with health, if you have to train the clinicians on the system its probably the wrong system.*

Thus, if a system requires regimes of training, then it is likely to be over complex, an unsustainable in health practice. The ease of use of mobile technologies offers a more adaptable direction.

(ii) Interoperability: where systems do not interconnect, was identified as a limitation on capacity, “I think interoperability is where the market’s just not there yet.”

Despite the increase uses of mobile “apps” in health practice, challenges arise reside in system that do not connect or cannot translate data from one system to another, that is, how health information is shared

> *I don’t think our market is quite there yet around connectiveness of information. So we have lots of pockets of information but we haven’t worked out a way of connecting everything. So for example, on our smart phones there’s the apple health app but you have to*

have apps that plug into that app for it to all interoperate. So I think interoperability is where the market's just not there yet

Capacity through connecting communities

The potential for digital communication systems is shown in Ehealth and TelEhealth, where capacity means extending patient services beyond urban centres to rural communities:

> *If you look at Ehealth records, also telEhealth, around being able to monitor patients in their own home, being able to deliver patient services to patients where they are based on need not location…. So they implemented telEhealth and they now have their consultation and in actual fact, from across that catchment area, now all of those patients go into that small country town to get their services delivered*

This capacity enables a localised, holistic approach by connecting health professionals with schools and parents

> *There is also flow on benefits for pharmacies, for schools. For example providing consultations paediatrician consultations in the school instead of the office*

The system capability exists, since everything is in place – in connected computers, local health information - yet the flow of information through these connections is yet to be made:

> *It just has to be any computer. They are just everywhere it is ubiquitous. But why isn't our health care ubiquitous? Why isn't our information ubiquitous? It's a no brainer*

Theme: TRANSFORMATIVE THINKING

The theme *transformative thinking* refers to the major changes that are occurring in the thinking of health professionals and people who use health services. There are health care leaders who are actively embracing digital technologies, and consumers who are comfortable with technology use to meet their health care needs.

The major knowledge content areas in this theme are:

- The need to think creatively and recognise that problems have multiple solutions
- The future is already happening
- A transformative change in thinking is needed by health professionals and consumers to recognise that using technology does not mean substandard care.

There was agreement from all participants that digital literacy is a central part of the future of health care and that health professionals must be not only prepared for the future, but acknowledge that the 'future is already happening' (Brooke).

The inevitability of a technological future was reinforced:

> *Well again it is inevitable because that is where we are going (Kate).*
>
> *It is a big paradigm shift. If we had of said 20 years we would be on these smart devices doing the things we are doing now, we would be saying "No way". My husband's grandmother sits there on her IPAD all day and like she would have agreed to have done that 10 -15 years ago. Babies pick up IPADS and IPhones and babies can operate them, so it's inevitable (Kate)*

The participants described the potential of technological change as unknown, with no identifiable endpoint. There was acknowledgement that transformative thinking was needed to ensure that health professionals were prepared to embrace an unspecified future:

> *Part of the whole process is to say what does the end point need to look like, but it's not the end point as we know it today, it's the end point of what it might need to be down the track because we are trying to envisage how that's going to be and how that's going to look (Eric).*

There was agreement that the future would require ingenuity and resourcefulness and the ability to apply numerous and varied solutions to problems that were encountered. Brooke explained:

> *They would be thinking of really creative ways to solve things and they would have multiple solutions. They would then have the skillset to do that, put it into place (Brooke).*

Participants explained how there are health professionals who are eagerly embracing the future, but that widespread acceptance is still in its infancy:

> *I was so impressed, I went to a specialist in Melbourne and that specialist prescribed me an app … it's a very small group of people that are evolving and these are leaders I think. But it is getting better. I would say 90 per cent of GPs actually have a clinical information system. Are there leaders? There are a few. (Kate)*

The potential creativity of health professionals was identified as central to widespread acceptance of digital technologies in health care, but the need for individuals to have confidence to take ownership was reinforced:

> *Make them build their own hurdle and they'll create things that are well beyond anything you could imagine. You know what you are like when you take your own projects on (Brooke).*

The need for transformative thinking did not only apply to health professionals. An example was given of a different culture existing in the Northern Territory where technology was embraced to avoid travel. Confidence with technology developed and relationships were built between health professionals and those accessing services:

> *So, in the Northern Territory it's a real different culture to here. In the Territory aboriginal people would accept it because the alternative is I have to get on the plane and go into Darwin and I don't want to do that, I want to stay on Country. So I trust my local aboriginal health worker or I trust my clinical nurse because she has been looking after me. So they have trust relationships.*

There was agreement that people using health care have to embrace a different culture and that transformative thinking was required to recognise that using technology does not equate with substandard care:

> *Whereas here in Victoria we have a different culture. We expect to be face to face. In Victoria we are used to driving 50km down the road and does it mean [if we use telEhealth] we are going to get substandard care [via telEhealth] (Kate).*

Appendix D: Digital Literacies Matrix

Level	Using Full Capacity	Creating Understanding	Developing the culture	Building Connections	Owning the Space	Transformative Thinking
Basic	Uses digital tools and spaces appropriate to the task at hand and activity goals.	Works within boundaries according to the context set by instructors and the learning management system.	Applies digital tools or works in digital spaces to complete shared or collaborative tasks, or to develop a digital profile.	Applies existing skills to new digital tools and spaces.	Demonstrates willingness to have a presence in various digital spaces, and creativity in design or content.	Supports peers in learning and applying digital tools or working in digital spaces. Identifies problems that can be addressed through technology.
Intermediate	Applies various digital tools and in varied digital spaces to solve problems, or find new ways to complete tasks and achieve goals.	Demonstrates appropriate behaviour when using digital tools in varied closed and open access digital spaces for learning and health care.	Demonstrates understanding of the value of working collaboratively using digital tools and in digital spaces to solve problems and share with fellow students,	Selectively chooses digital tools and spaces to communicate or share information with others who have a shared interest in the content.	Identifies own authorship of contributions in varied digital spaces.	Leads peers and those senior to them in using digital tools and working in spaces accessible to health care consumers in specific projects.

			instructors and external audiences (e.g., clinical supervisors)			
Advanced	Identifies the need for and learns skills in using different digital tools or to work in new digital spaces to extend students' own capacity and efficiency.	Establishes and maintains professional boundaries when working in closed and open access digital spaces, and understands the implications when boundaries are exceeded.	Contributes to open access or community of practice digital spaces for connecting with other professionals, and current and future sharing of information and resources with colleagues and health care consumers.	Selectively chooses digital tools and spaces to share content students have created or collated to meet the needs of specific target health care professionals and/or consumers.	Takes control of digital spaces, such as through editing or moderating content, as well as self-censoring contributions.	Initiates changes that require transformative ways of working within health care settings, including through the use of consumer-accessible and friendly digital resources.

Appendix E: Digital Literacies Mapping Tool

Digital literacy Theme: Creating understanding Reinforces the importance of context, connections, boundaries and responsibilities when considering what it means to be digitally literate in a health care context.						
Learner Capability Levels & Subject Codes						
Basic	**Subject Code**	**Intermediate**	**Subject Code**	**Advanced**	**Subject Code**	**Comments**
Works within boundaries according to the context set by instructors and the learning management system.		Demonstrates appropriate behaviour when using digital tools in varied closed and open access digital spaces for learning and health care.		Establishes and maintains professional boundaries when working in closed and open access digital spaces, and understands the implications when boundaries are exceeded.		

Digital literacy Theme: Developing the culture Highlights the need for health professionals to embrace technology and digital media to enhance their professional profile and practice, and improve how they deliver health care services.						
Learner Capability Levels & Subject Codes						
Basic	**Subject Code**	**Intermediate**	**Subject Code**	**Advanced**	**Subject Code**	**Comments**
Applies digital tools or works in digital spaces to complete shared or collaborative tasks, or to develop a digital profile.		Demonstrates understanding of the value of working collaboratively using digital tools and in digital spaces to solve problems and share with fellow students, instructors and external audiences (e.g., clinical supervisors)		Contributes to open access or community of practice digital spaces for connecting with other professionals, and current and future sharing of information and resources with colleagues and health care consumers.		

Digital literacy Theme: Building connections

Taking advantage of digital media to enable seamless communication and connectivity between consumers, all of their health care providers, and various sources of information and sharing, including other consumers with similar conditions to empower them to contribute to or take control of their health care.

Learner Capability Levels & Subject Codes

Basic	Subject Code	Intermediate	Subject Code	Advanced	Subject Code	Comments
Applies existing skills to new digital tools and spaces.		Selectively chooses digital tools and spaces to communicate or share information with others who have a shared interest in the content.		Selectively chooses digital tools and spaces to share content students have created or collated to meet the needs of specific target health care professionals and/or consumers.		

Digital literacy Theme: Using the full capacity The extent to which students and health professionals use the full capacity of digital tools to address their own learning needs, work-based tasks and service provision to and support of health care consumers.						
Learner Capability Levels & Subject Codes						
Basic	**Subject Code**	**Intermediate**	**Subject Code**	**Advanced**	**Subject Code**	**Comments**
Uses digital tools and spaces appropriate to the task at hand and activity goals.		Applies various digital tools and in varied digital spaces to solve problems, or find new ways to complete tasks and achieve goals.		Identifies the need for and learns skills in using different digital tools or to work in new digital spaces to extend students' own capacity and efficiency.		

Digital literacy Theme: Owning the space Taking control of the clinical space, of which, digital technologies are a fundamental part. It encompasses the elements of belonging, taking control and accepting responsibility to be present.						
Learner Capability Levels & Subject Codes						
Basic	**Subject Code**	**Intermediate**	**Subject Code**	**Advanced**	**Subject Code**	**Comments**
Demonstrates willingness to have a presence in various digital spaces, and creativity in design or content.		Identifies own authorship of contributions in varied digital spaces.		Takes control of digital spaces, such as through editing or moderating content, as well as self-censoring contributions.		

Digital literacy Theme: Transformative thinking **Actively embraces changes in the health care context arising from technology,** and leads and supports these changes to empower consumers who are comfortable with technology use to meet their health care needs.						
Learner Capability Levels & Subject Codes						
Basic	**Subject Code**	**Intermediate**	**Subject Code**	**Advanced**	**Subject Code**	**Comments**
Supports peers in learning and applying digital tools or working in digital spaces. Identifies problems that can be addressed through technology.		Leads peers and those senior to them in using digital tools and working in spaces accessible to health care consumers in specific projects.		Initiates changes that require transformative ways of working within health care settings, including through the use of consumer-accessible and friendly digital resources.		

Digital Literacies Mapping of Occupational Therapy Curriculum

Digital literacy Theme: Creating understanding Reinforces the importance of context, connections, boundaries and responsibilities when considering what it means to be digitally literate in a health care context.						
Learner Capability Levels & Subject Codes						
Basic	**Subject Code**	**Intermediate**	**Subject Code**	**Advanced**	**Subject Code**	**Comments**
Works within boundaries according to the context set by instructors and the learning management system.		Demonstrates appropriate behaviour when using digital tools in varied closed and open access digital spaces for learning and health care.	OCT3PDC OCT5MSP	Establishes and maintains professional boundaries when working in closed and open access digital spaces, and understands the implications when boundaries are exceeded.		

Digital literacy Theme: Developing the culture Highlights the need for health professionals to embrace technology and digital media to enhance their professional profile and practice, and improve how they deliver health care services.						
Learner Capability Levels & Subject Codes						
Basic	**Subject Code**	**Intermediate**	**Subject Code**	**Advanced**	**Subject Code**	**Comments**
Applies digital tools or works in digital spaces to complete shared or collaborative tasks, or to develop a digital profile.	HLT1RAE OCT4HOB OCT4ECA OCT5ECB OCT5ECC OCT5ECD	Demonstrates understanding of the value of working collaboratively using digital tools and in digital spaces to solve problems and share with fellow students, instructors and external audiences (e.g., clinical supervisors)		Contributes to open access or community of practice digital spaces for connecting with other professionals, and current and future sharing of information and resources with colleagues and health care consumers.	OCT5MSP	

Digital literacy Theme: Building connections

Taking advantage of digital media to enable seamless communication and connectivity between consumers, all of their health care providers, and various sources of information and sharing, including other consumers with similar conditions to empower them to contribute to or take control of their health care.

Learner Capability Levels & Subject Codes						
Basic	**Subject Code**	**Intermediate**	**Subject Code**	**Advanced**	**Subject Code**	**Comments**
Applies existing skills to new digital tools and spaces.	OCT4ECA OCT5PPA OCT5PPB OCT5PPC	Selectively chooses digital tools and spaces to communicate or share information with others who have a shared interest in the content.	HLT1RAE OCT5PPA OCT5PPB OCT5PPC	Selectively chooses digital tools and spaces to share content students have created or collated to meet the needs of specific target health care professionals and/or consumers.		

Digital literacy Theme: Using the full capacity

The extent to which students and health professionals use the full capacity of digital tools to address their own learning needs, work-based tasks and service provision to and support of health care consumers.

Learner Capability Levels & Subject Codes

Basic	Subject Code	Intermediate	Subject Code	Advanced	Subject Code	Comments
Uses digital tools and spaces appropriate to the task at hand and activity goals.	OCT3PDC OCT4HOB OCT5ECB OCT5ECC OCT5ECD	Applies various digital tools and in varied digital spaces to solve problems, or find new ways to complete tasks and achieve goals.	OCT5MSP OCT5PPA OCT5PPB OCT5PPC	Identifies the need for and learns skills in using different digital tools or to work in new digital spaces to extend students' own capacity and efficiency.		

Digital literacy Theme: Owning the space Taking control of the clinical space, of which, digital technologies are a fundamental part. It encompasses the elements of belonging, taking control and accepting responsibility to be present.						
Learner Capability Levels & Subject Codes						
Basic	**Subject Code**	**Intermediate**	**Subject Code**	**Advanced**	**Subject Code**	**Comments**
Demonstrates willingness to have a presence in various digital spaces, and creativity in design or content.	OCT4HOB OCT5PPA OCT5PPB OCT5PPC	Identifies own authorship of contributions in varied digital spaces.		Takes control of digital spaces, such as through editing or moderating content, as well as self-censoring contributions.		

Digital literacy Theme: Transformative thinking **Actively embraces changes in the health care context arising from technology,** and leads and supports these changes to empower consumers who are comfortable with technology use to meet their health care needs.						
Learner Capability Levels & Subject Codes						
Basic	**Subject Code**	**Intermediate**	**Subject Code**	**Advanced**	**Subject Code**	**Comments**
Supports peers in learning and applying digital tools or working in digital spaces. Identifies problems that can be addressed through technology.		Leads peers and those senior to them in using digital tools and working in spaces accessible to health care consumers in specific projects.	OCT5PPA OCT5PPB OCT5PPC	Initiates changes that require transformative ways of working within health care settings, including through the use of consumer-accessible and friendly digital resources.		

Appendix F: Mapping of Occupational Therapy Curriculum: Matching subject content to digital literacies and developmental levels.

Subject Code	Digital Literacy	Developmental Level	Explanatory Notes
HLTRAE	Developing the culture	Basic	Students complete enquiries to address the ILO "Demonstrate verbal, writing and digital media skills that effectively communicate research-based guidance." To achieve this ILO, students "develop verbal and digital communication skills through workshop presentations, team discussions, web searching and web-based discussions."
OCT3PDC	Creating understandings	Intermediate	Students learn about the boundaries in terms of on-line friendships and what is appropriate to put on social media. This is their first experience of having to be professional and there are explicit lessons about generalising this to digital spaces. This lesson comes from both the University and the Secondary School, where they are completing a service learning project, therefore conveying a shared belief about use of digital spaces in the form of social media. In particular, the School must respond to their students' push to be friends with the OT students.
	Using the full capacity	Basic	Students must use Pebblepad for reflections, so that they are encouraged to own the digital space and be creative with it, but this objective is not made explicit. They know that they will build on their Pebblepad as an eportfolio and are encouraged to use it as they move through 3rd year.
OCT4HOB	Owning the	Basic	Students' Pebblepad work provides the opportunity to take control of their digital space and be creative in it, but it is unclear the extent to

Subject Code	Digital Literacy	Developmental Level	Explanatory Notes
	space		which this happens in practice.
	Using the full capacity	Basic	Here students begin scenario-based learning. Students must design a web-based portfolio page on Pebblepad about their own occupations.
OCT4ECA	Developing the culture	Basic	Students must go on-line to obtain Australian Standards for design for access. In this way they are made cognisant of the need to be able to use an on-line source in order to comply with legal requirements, which is core to their professional practice.
	Building connections	Basic	Students are required to download pictures of home environment and email to a builder to provide information needed for modifications to be made. Students are also introduced to Google Sketch prior to beginning their clinical placement subjects.
OCT5PPA OCT5PPB OCT5PPC	Building connections	Basic	In these clinical placement subjects, students may use photos they have taken and email to builders and others who will follow specifications for adaptations in the home. They may also continue to use Google Sketch for this purpose.
		Intermediate	Students source evidence and consumer information sheets from websites, requiring that they make clinical judgements about the credibility of the information and fit with client needs. They are on placement at Netschool[a], which provides the chance to use technology to support school student needs and involve them in the use of technology.
	Using the full capacity	Intermediate	The placement at Netschool affords the opportunity to work with adolescents. Students are engaged with varied technologies to support

Subject Code	Digital Literacy	Developmental Level	Explanatory Notes
			adolescents to address or prevent mental health concerns. Students work with clients to develop life skills, such as through use of technology (e.g., Headspace[b] website, shopping on-line).
	Owning the space	Basic	Students' Pebblepad eportfolio work provides the opportunity to take control of their digital space and be creative in it, but it is unclear the extent to which this happens in practice.
	Transformative thinking	Intermediate	Students in this course have driven a change whereby Google Sketch is used for home modification plans.
OCT4ECA OCT5ECB OCT5ECC OCT5ECD	Developing the culture	Basic	Students develop wikis for the purpose of collaborative work.
OCT5ECD	Using the full capacity		Students are encouraged to participate in *webinars with other students/ professionals, and connect with the organisation delivering it, which is responsible for providing Continuing Professional Development to health professionals working in youth mental health.*
OCT5MSP	Creating understandings	Intermediate	Students are thinking about what their social media profiles look like and the message it could send to prospective employers who may use this to get information about them.

Subject Code	Digital Literacy	Developmental Level	Explanatory Notes
	Developing the culture	Advanced	Students are introduced to LinkedIn®, SEEK and other professional networking tools and create profiles. Their LinkedIn account, set up in ECT4HOB, is revisited, and they learn to create and develop their job profiles.
	Using the full capacity	Intermediate	Increasingly students find digital solutions to their project challenges. These projects include developing resources, conducting needs analyses, and making recommendations for changes and improvements to practice.

ILO = Intended Learning Outcomes

a = Netschool is an alternative schooling program of Bendigo Senior Secondary College

b = headspace is a national youth early intervention mental health service

Bachelor of Health Sciences and Master of Occupational Therapy Practice Subject Outline

First year

Teaching period	Subject code	Subject title
TE-SEM-1	HLT1AIM*	Academic Integrity Module
TE-SEM-1	HBS1HBA	Human Biosciences A
TE-SEM-1	HLT1IPP	Introduction to Professional Practice
TE-SEM-1	Elective	Subject may be taken from anywhere in the University.
TE-SEM-1	PHE1IDH	Individual Determinants of Health
TE-SEM-2	HBS1HBB	Human Biosciences B
TE-SEM-2	HLT1RAE	Research and Evidence in Practice
TE-SEM-2	PHE1SDH	Social Determinants of Health
TE-SEM-2	Elective	Subject may be taken from anywhere in the University.

Second year

Teaching period	Subject code	Subject title
TE-SEM-1	PSY1EFP	Experimental Foundations of Psychological Science
TE-SEM-1	HBS2ALU	Anatomy: Vertebral Column, Lower and Upper Limb
TE-SEM-1	HLT2IEP	Integrating Evidence into Practice
TE-SEM-1	Elective	Subject may be taken from anywhere in the University. Any prerequisites must be met.
TE-SEM-2	PSY1CFP	Clinical Foundations of Psychological Science
TE-SEM-2	HBS3PAN	Pathophysiology, Anatomy and Neurosciences
TE-SEM-2	OCT3PDC[1]	Participation in Diverse Communities through Service Learning
TE-SEM-2	SOC2SHI	Sociology of Health and Illness

Third year

Teaching period	Subject code	Subject title
TE-W06-13	OCT4HOB	Humans as Occupational Beings
TE-W15-26	OCT4ECA	Occupational Therapy: Enabling Change A (Adult)
TE-W29-32	OCT5PPA	Professional Practice A
TE-W33-45	OCT5ECB	Occupational Therapy: Enabling Change B (Adult)

Fourth year

Teaching period	Subject code	Subject title
TE-W06-09	OCT5ECC	Occupational Therapy: Enabling Change C (Children)
TE-W18-25	OCT5PPB	Professional Practice B
TE-W10-14	OCT5ECD	Occupational Therapy: Enabling Change D (Youth)
TE-W10-14	OCT5ERA	Evidence Review
TE-W28-37	OCT5MSP	Macro Strategies for Advanced Professional Practice
TE-W39-46	OCT5PPC	Professional Practice C