UTS UNIVERSITY OF TECHNOLOGY SYDNEY

An examination of the prevalence, impact, experiences and perceptions of learning and health technologies on students, academics and educational leaders in complementary medicine education institutions: A mixed method study of two institutions, one in Australia and one in the US.

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Distinguished Professor Jon Adams and Doctor Amie Steel

University of Technology Sydney
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Certificate of Original Authorship

I, Alastair Gray declare that this thesis, is submitted in fulfilment of the requirements for the award of PhD, in the Faculty of Health at the University of Technology Sydney. This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis. This document has not been submitted for qualifications at any other academic institution. This research is supported by the Australian Government Research Training Program.

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To my friends and colleagues who have supported me during every step of this journey, I am incredibly thankful. Also, to my family who have given and continue to give me so much support - my deepest thanks.

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Format of this thesis

This thesis is structured according to the conventions of a Thesis by Compilation. It presents a single, cohesive body of work comprising a combination of traditional thesis chapters and published/publishable articles. In keeping with the format of Thesis by Compilation, content from articles resulting from the project which have been published or submitted for publication are contained within the relevant chapters of this thesis in their entirety. Where this applies, a chapter preamble and relevant notes are included to indicate publication details. For published articles, journal-formatted copies of each work are included in the Appendices. A list of these articles and details on authorship contributions are provided below.

Published Works by the Author Incorporated into the Thesis

Of the manuscripts contained in this thesis all have been submitted for publication of which 2 are under review, and 3 are published. The list of manuscripts contained in this thesis are as follows:

1. Gray A. C, Steel A, Adams J. (2019). A critical integrative review of complementary medicine education research: Key issues and empirical gaps. *BMC Complementary and Alternative Medicine* 2019 Mar 20;19(1):73. https://doi.org/10.1186/s12906-019-2466-z

2. Gray A. C, Steel A, Adams J. (2021). An examination of technologies in complementary medicine education and clinical practice: The perceptions and experiences of naturopathy students, faculty and educational leaders. *Complementary Therapies in Medicine*, Vol 63, pp102793. https://doi.org/10.1016/j.ctim.2021.102793

3. Gray A. C, Steel A, Adams J. (2020). Attitudes to and Uptake of Learning Technologies in Complementary Medicine Education: Results of an International Faculty Survey. *The Journal of Alternative and Complementary Medicine*, Vol. 26, No. 4 pp. 335–345 DOI: 10.1089/acm.2019.0319

4. Gray, A. C., Steel, A., & Adams, J. (2021). Complementary medicine students' perceptions, perspectives and experiences of learning technologies. A survey conducted in the US and Australia. *European Journal of Integrative Medicine*, Vol. 42 (2021) pp. 101304 https://doi.org/10.1016/j.eujim.2021.101304

5. Gray A. C, Steel A, Adams J. (2021). Student and academic perceptions of the incompatibility of telehealth, learning technologies and practice enhancing technologies in clinical Complementary Medicine work and education; a quantitative study in Australia and the US. *Advances in Integrative Medicine*. https://doi.org/10.1016/j.aimed.2021.10.001

Relevant Published Works by the Author Not Forming Part of the Thesis

This document only includes works relevant to this thesis. However, during candidature, the candidate has published and contributed to 3 peer-reviewed articles, 9 new editions of current textbooks, delivered 13 conference presentations with published abstracts, and presented at 3 invited seminars.

Journal Articles

1. Gray A, Diezel H, Steel A, (2019) The use of learning technologies in complementary medicine education: Results of a student technology survey. Advances in Integrative Medicine Volume 6, Issue 4, December 2019, Pages 174-180 https://doi.org/10.1016/j.aimed.2019.04.001.
2. Steel A, Peng W, Gray A, Adams J, (2019) The role and influence of traditional and scientific knowledge in naturopathic education: a qualitative study: Tradition, science and naturopathic education. The Journal of Alternative and Complementary Medicine 2019 Feb;25(2):196-201. doi: 10.1089/acm.2018.0293.
3. Salatino, S. & Gray, A. (2016). Integrative management of pediatric tonsillopharyngitis: An international survey. Complementary Therapies in Clinical Practice, 22, 29-32. https://doi.org/10.1016/j.ctcp.2015.11.003.

Published Conference Abstracts

2020

- Gray A, (2020) The Future of Homeopathy Education. Online Conference 2020 https://www.naturopathicce.com/homeosummit/

2019

- Gray A, (2019) ICCMR Conference, A critical integrative review of complementary medicine education research: Key issues and empirical gaps. Brisbane 2019

- Gray A, (2019) ICCMR Conference, Luddites and digital natives in Complementary Medicine education: Results of a student technology survey at a Complementary Medicine education institution. Brisbane 2019
- Gray A, (2019) ICCMR Conference, The development and implementation of an integrative medicine diploma – the National Centre for Integrative Medicine (NCIM) UK. Brisbane 2019
- Gray A, (2019) ICCMR Conference, Unsupported in a changing landscape: Learning Technologies in Integrative and Complementary Medicine Education Provision: Results of an International Survey of Faculty. Brisbane 2019

2018

- Gray A, (2018) ICCMR Conference, Unsupported and Marginalised: Attitudes and uptake of learning technologies in Complementary and Integrative Medicine Education at two leading providers - Results of an international faculty survey. Baltimore 2018
- Gray A, (2018) ICCMR Conference, Birthing the elephant. The development and implementation of an integrative medicine diploma the Portland Centre of Integrative Medicine. Baltimore 2018

2017

- Gray A, (2017) JAHC Conference, Autoimmune Disease in Homeopathic Medicine, Atlanta, US

2016

- Gray A, (2016) JAHC Conference, Luddites Evidence and Tradition in Homeopathic Medicine, Denver, US

2015

- Gray A, (2015) Rome HRI Conference Results of a Student Technology Survey, Rome, Italy.
- Gray A, (2015) NHAA Educational Challenges Facing Herbal Medicine, Sydney, Australia
- Gray A, (2015) NHAA Results of a Student Technology Survey, Sydney, Australia

- Gray A, (2015) ICCMR Educational Challenges for Integrative Medicine, Conference Proceedings, Jeju, Korea.

Statement of Contributions to Jointly Authored Works Contained in the Thesis

The results from this thesis have been submitted for publication in peer-reviewed journals through five manuscripts that are presented in Chapters 2, 5, 7, 8 and 9. For each of these papers, I have been primarily and fully responsible for determining the research question, undertaking the analysis and drafting the manuscript. Support in all of these areas has been provided by supervisors Distinguished Professor Jon Adams, and Dr Amie Steel. I take full responsibility in the accuracy of the findings presented in these publications and this thesis.

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List of Tables, Figures and Appendices

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Abbreviations

ACHENA: Accreditation Commission for Homeopathy Education in North America

ACNM: Australian College of Natural Medicine

ACNT: Australasian College of Natural Therapies

APD: Accredited Practicing Dietitian

AHPRA: Australian Health Practitioners Regulation Agency

ANC: Australian Naturopathic Council

AND: Academy of Nutrition and Dietetics

ANTA: Australian Natural Therapies Association

AOM: Acupuncture and Oriental Medicine

ATMS: Australian Traditional Medicine Society

CAA: Computer Aided Assessment

CAI: Computer Aided Instruction

CAL: Computer Aided Learning

CAM: Complementary and Alternative Medicine

CBL: Computer Based Learning

CBT: Computer Based Training

CFO: Chief Financial Officer

CM: Complementary Medicine

CMC, Computer Mediated Communications

CMRB: Chinese Medicine Registration Board

CMS: Content Management System

CNME: Council on Naturopathic Medical Education

CPD: Continuing Professional Development

CPE: Continuing Professional Education

DAA: Dietitians Association of Australia

DI: Diffusion of Innovations theory (of Everett Rogers)

DOHA: Federal Department of Health and Aging

DSHEA: Dietary Supplements Health Education Act

DTR: Dietetic Technician, Registered

EB-IM: Evidence-Based Integrative Medicine

EBM: Evidence-Based Medicine

EBP: Evidence-Based Practice

ET: Educational Technology

FDA: U.S. Food and Drug Administration

FT: Full-Time

FTE: Full-time Equivalent

HREC: Human Research Ethics Committee

HSR: Health Services Research

HTs: Health Care Technologies
IM: Integrative Medicine
IT: Information Technology
LMS: Learning Management System
MMR: Mixed Methods Research
MOOCs: Massive Open Online Courses
NIH: National Center for Complementary and Integrative Health
NSA: Nutrition Society of Australia
NUNM: National University of Natural Medicine
PBRN: Practice Based Research Networks
PH: Public Health
PIS: Participant Information Sheet
PT: Part-Time
RD: Registered Dietitian
SC: Subject Coordinator
SD: Standard deviation
SSNT: Southern School of Natural Therapies
TCIM: Traditional Complementary Integrative Medicine
TCM: Traditional Chinese Medicine
TEQSA: Tertiary Education Quality and Standards Agency
TGA: Therapeutic Goods Administration
TM: Traditional Medicine
US: United States
USED: U.S. Education Department
UTS: University of Technology Sydney
WHO: World Health Organisation
WNF: World Naturopathic Federation

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Abstract

Background: The global healthcare and higher education sectors are experiencing unprecedented changes due, in part, to technology adoption. Meanwhile, complementary medicine (CM) continues to thrive across many countries with increased CM education enrolments. Despite these circumstances, there has been limited and sporadic research examining CM education. In direct response to this important gap, this thesis reports on an examination of the prevalence, experiences and perceptions of learning and health technologies on students, academics and educational leaders in CM education institutions. **Methods**: Following a critical integrative literature review, fieldwork design involved a three-phase approach adopting health services and mixed methods research methodology. Academics, students and educational leaders at two sample institutions in the US and Australia were interviewed, two key institutions were audited, and stakeholders surveyed on their perspectives of practice and learning technologies. **Results**: A literature review of educational research in CM from the last 12 years found an uneven range of empirical research. Initial Phase One fieldwork identified CM students as critical of the deployment of classroom learning technology, possessing lower levels of digital literacy and the existence of a digital divide between subsets of students. Academics were noted to have lower levels of health and learning technology uptake. In Phase Two, the institutional audits identified a difference in the approach, policy and strategic planning for technology use between the two institutions. Subsequent cross-sectional surveys in Phase Three revealed that CM academics perceive technologies as having a detrimental impact on their students' future workplace skills, knowledge and attributes and the learning technology training offered by CM educational institutions to academics is perceived to be ineffectual. CM academics place the responsibility for any personal and professional digital shortcomings with their institution rather than themselves. Students also have technology challenges with evidence of digital literacy divisions within the student body, and a perception that there is a lack of institutional support. Generally, students appear more open than academics to clinical practice enhancing technologies. An urgent need has emerged for educational leaders to address digital literacy inequalities through further training. **Conclusion**: Despite the high levels of CM use in the community, and the thriving nature of CM educational institutions globally, the current evidence evaluating the procedures, effectiveness and safety of CM education remains limited.

There is an urgent need to establish a strategic research agenda around this important aspect of health care education to ensure a safe and effective health care workforce.

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An examination of the prevalence, impact, experiences and perceptions of learning and health technologies on students, academics and educational leaders in complementary medicine education institutions: A mixed method study of two institutions, one in Australia and one in the US.

Chapter 1 - Background

This thesis presents a critical approach to the examination of learning technologies in complementary medicine (CM) education in the US and Australia by applying methods and principles drawn from health services research (HSR). This background chapter explores the insights gained by applying HSR techniques to the evaluation and exploration of contemporary education practices within health educational settings. In doing so this work represents the application of an innovative HSR approach to a topic previously overlooked – the education of future CM practitioners.

1.1 Chapter Introduction

This chapter provides an in-depth background to the thesis topic and examines the current focus of and approach to CM research, as well as the contribution of HSR research to the examination of CM. Initially, the thesis aims, objectives, research questions, research sub-questions, significance, scope and overall thesis structure are outlined. In order to contextualise the thesis, the wider shifting landscape of CM, including the evolving definitions of CM, the contemporary provision of CM in Australia and the US, plus current trends in CM research practice and education are explored. The use of technologies within broader health care provision are identified, including discussion of practice and health care technologies (HTs) as well as telehealth. In addition, current trends in tertiary education such as the use and prevalence of learning technologies are introduced before the current issues faced within contemporary tertiary education are outlined. The chapter concludes by identifying features of the global, Australian and US CM education landscape as well as the challenges and tensions within CM and education as they currently stand. The wider significance of CM and education is outlined and the need to research the education of future practitioners of CM in the context of HSR is identified by way of background to this important unexplored confluence, CM, education and technologies.

1.2 The current focus and approach to Complementary Medicine research

The emphasis on CM research within HSR has evolved both organically and strategically in the last two decades (Andrews and Boon, 2005) from a focus on original randomised-controlled trial research determining the efficacy and effectiveness of CM for a variety of named conditions to allow for a more contextualised understanding and deeper insights into the growing number of populations accessing CM (Broom and Adams, 2007, Walach and Pietikäinen, 2014, Fischer et al., 2014a, Adams, 2007). In that time more qualitative and mixed method research has been published (Bishop and Holmes, 2013) and greater emphasis has turned to policy, and understanding the clinical realities at the frontline in CM consultations and CM practice (Steel et al., 2014, Adams et al., 2015, Wardle and Seely, 2012). Until now there has been no meaningful interest on the topic of education in CM, the education of future CM professionals and consequently, the future of CM itself. This is the novel approach and sole focus of this thesis. CM education is an important emerging sub-theme/focus of the HSR agenda. HSR draws upon many disciplinary perspectives and methods and educational research is one such contribution. As such, a HSR agenda and focus provides the ability and legitimacy to study CM education in a way in which earlier clinical outcomes focused research simply did not address, nor perceived as a topic of much or any interest.

1.3 Aims and scope of this thesis

1.3.1 Research aim

The specific aim of this research is to investigate the prevalence, experiences and perceptions of learning and health technologies on students, academics and educational leaders in CM education institutions.

1.3.2 Research objectives

To achieve this aim, this project addresses five research objectives:

1. Evaluate the role, use and uptake of learning technology in CM education
2. Examine the factors influencing the uptake of learning technologies in CM institutions
3. Examine how stakeholders perceive practice and learning technologies and tools and the impact on institutions, faculty and learners in CM
4. Explore the perceptions of faculty and students of CM education institutions to the challenges and opportunities of a variety of educational delivery methods and technologies with a specific focus upon the needs of CM practitioner training.
5. Investigate the perceptions of educational leaders of CM education institutions to the challenges and opportunities of a variety of educational delivery methods and technologies with a specific focus upon the needs of CM practitioner training.

1.3.3 Thesis structure

This work is a thesis by compilation. While it is a cohesive and consistent body of research, the findings from this thesis have resulted in peer reviewed journal publications which are presented here in the relevant chapters. The overall structure of the thesis is as follows:

Chapter 1 Background: This chapter covers background knowledge which is assumed in subsequent chapters. This chapter explores and the wider significance of CM. The broad trends taking place in healthcare are outlined including the use and uptake of HT's. The broad trends in tertiary education are outlined including the impact of learning technologies. The context for the confluence of these three streams is outlined. A large and important research gap is identified in this chapter as there is currently only sporadic research in the field of CM education.

Chapter 2 Literature Review: This chapter reviews the current international literature relating to CM education. The results from this chapter have been published in BMC Complementary and Alternative Medicine. Gray A, Steel A, Adams J. (2019) A critical integrative review of complementary medicine education research: Key issues and empirical gaps. *BMC Complementary and Alternative Medicine* https://doi.org/10.1186/s12906-019-2466-z

Chapter 3 Theoretical Framework: This chapter describes and outlines some of the concepts, models, theories and frameworks that helped guide the project to completion and that were used to contextualise the research aim and objectives, make meaning from the data and how the results fit within HSR.

Chapter 4 Methodology: This chapter describes the detailed methodology, study design, sample selection, data collection and analysis which were employed for this project.

Chapter 5 Results 1: This chapter presents the results and outlines the initial qualitative study of the perceptions of CM students, academics and leaders from data collected in interviews and focus groups in the two sample education institutions. The results from this chapter have been published in *Complementary Therapies in Medicine*. Gray A. C, Steel A, Adams J. (2021). An examination of technologies in complementary medicine education and clinical practice: The perceptions and experiences of naturopathy students, faculty and educational leaders. *Complementary Therapies in Medicine*, Vol 63, pp102793. https://doi.org/10.1016/j.ctim.2021.102793

Chapter 6 Results 2: This chapter presents the results of an audit from the two sample institutions using a broad asset-mapping-like approach. The focus of the audit identifies infrastructure, hardware, software, mode of delivery, allocation of physical resources and human resources information as well as identifying existing policy, planning and governance gaps.

Chapter 7 Results 3: This chapter describes the quantitative perceptions and experiences of academics in the two sample CM institutions. The results from this chapter have been published in the *Journal of Alternative and Complementary Medicine*. Gray, A. C., Steel, A., & Adams, J. (2020). Attitudes to and Uptake of Learning Technologies in Complementary Medicine Education: Results of an International Faculty Survey. *The*

Journal of Alternative and Complementary Medicine. https://doi.org/10.1089/acm.2019.0319

Chapter 8 Results 4: This chapter describes the quantitative perceptions and experiences of students in the two CM institutions. The results from this chapter have been published in the *European Journal of Integrative Medicine.* Gray, A. C., Steel, A., & Adams, J. (2021). Complementary medicine students' perceptions, perspectives and experiences of learning technologies. A survey conducted in the US and Australia. *European Journal of Integrative Medicine.* https://doi.org/10.1016/j.eujim.2021.101304

Chapter 9 Results 5: This chapter examines the variations and differences of both quantitative and qualitative findings between the perceptions and experiences of students and academics from the focus groups, interviews, audits and surveys that point to digital literacy tensions and highlight a challenge of 'character formation'. The results from this chapter have been published in *Advances in Integrative Medicine*. Gray A. C, Steel A, Adams J. (2021). Student and academic perceptions of the incompatibility of telehealth, learning technologies and practice enhancing technologies in clinical Complementary Medicine work and education; a quantitative study in Australia and the US. *Advances in Integrative Medicine*. https://doi.org/10.1016/j.aimed.2021.10.001

Chapter 10 Discussion: This chapter discusses the implications of the findings of this thesis relevant to the research aim and objectives. The discussion is broader and different to that provided in each manuscript that make up the results chapters and represents an overview highlighting the key take home messages and significant results. Further, the limitations to the study, and areas for future research are also identified and recommendations of policy and research agendas which may be developed from the results of this research project are outlined.

Chapter 11 Conclusion: The final chapter summarizes the core findings and conclusions of the study and builds upon the main findings to explore future research prospects.

1.3.4 De-identification

In this work, the names of the two sample institutions have been de-identified. They are referred to as Institution 1 and Institution 2 throughout the thesis and in all publications arising from this research. The names of the institutions were redacted after consultation with expert supervision and because of potentially sensitive commercial information that emerged from the clinical audit and surveys in Phase Two and Three of the study.

1.3.5 Publications

In line with the compilation format of this thesis, the unabridged manuscripts as submitted or published in the respective journals are embedded within chapters 2, 6, 7, 8 and 9.

1.3.6 The impact of COVID-19 on this work

Data collection and analysis was completed long before the onset of COVID-19 in 2020. As such, the impact of the virus was minimal on the scope, methodology and completion of this work. However, the implications and impact of COVID-19 on the topic of this thesis – learning technologies on educational institutions globally is incalculable, and there are some statements made relating to the adoption of technologies in the Discussion and Conclusion chapters relating to future research directions in post-pandemic settings and contexts.

1.4 The contribution of Health Services Research (HSR) to the examination of Complementary Medicine

CM continues to be a subject of interest amongst health services researchers, notwithstanding the controversy regarding the ultimate validity over a widely held perception of a lack of evidence, efficacy and effectiveness within CM. There are clear trends pointing to a growing engagement with CM by the HSR community. Signs of continued activity and interest include the emergence of peer-reviewed journals in the last decades dedicated to CM and the interrelated field of Integrative medicine (IM). There are many journals listed in the 'complementary therapies' (107) and 'complementary manual therapies' (14) categories on the SCIMAGO ranking site and they are published in US, UK, Australia, Korea etc. The index scores of these journals provide a range from minimum (.101) to maximum (1.585R). Impact factor scores and other journal rank indicators are a measure of a journal's prestige, influence and impact based upon balancing the number of weighted citations with the number of papers published. These increasing number of journals represent both drivers and a reflection of this growth in CM research publication interest.

1.4.1 Health Services Research

As CM maintains both its presence and value for health care consumers around the world in the last decades (Foley and Steel, 2017a, Reid et al., 2016b), in parallel, there have been strong calls to move beyond the limitations of a CM research strategy exclusively bound to the issue of efficacy and clinical effectiveness (World Health, 2019). Researchers are demonstrating a greater willingness to broaden the research approach to include methods and research perspectives from close parallel disciplines and traditions such as public health (PH), HSR and health social science (Adams, 2007, Adams et al., 2019a). Beyond clinical trials and studies that question the efficacy and effectiveness of CM, HSR has the capacity, robustness and elasticity to provide the context and structure for researchers to explore other crucial research gaps in this relevant emerging field (Adams and Steel, 2012). A defining feature of HSR is the broad scope and lens through which the critical and scientific study of health-related issues can be explored. Further, HSR encompasses a framework with which to explore a range of related topics from health care behaviours, clinical decision-making, service delivery and accessibility, to interprofessional and practitioner-patient communication and cost analysis and outcomes of health care delivery and provision. This broad scope also encapsulates the investigation of CM and integrative health services (Adams et al., 2009) to the examination of the health systems within which these services function, from the perspectives and actions of individuals (including community self-care, CM use and health service engagement) through to population level data examining wider health issues (Adams, 2008). The wide research methodologies employed within HSR also allow researchers to identify the prevalence of health services use as well as the evaluation of the services being accessed by these individuals and populations (Bowling, 2014). One of the strengths of HSR is its capacity to enable researchers to examine interactions between health professionals and patients through both direct observation but also through describing patient evaluation of health care. Overall, HSR is a dynamic field of multidisciplinary applied research embracing research methodologies to identify health care needs and health service delivery as well as the examination of most if not all aspects of health care - including how education, technologies and clinical training fits within delivery, practice, and uptake. The flexibility and rigor offered by HSR methods is able to attend to the innumerable nuanced challenges for researchers focused upon aspects of CM (Herman et al., 2006).

1.4.2 New directions in CM research in Health Service Research

The focus of this thesis – an examination of the education of CM practitioners and the influence of technologies upon such education - must be understood and contextualized amongst other streams of current CM research. One important direction in CM research providing an epistemological backdrop to the activity of CM researchers is an ongoing dialogue about the role of science and evidence in CM (Jonas et al., 2013a), the concerns about over-emphasis on the hierarchy of evidence and disregard of the critical importance of traditional evidence in CM medicine (Jagtenberg et al., 2006). The resulting tension has led to preliminary research findings suggesting that CM practitioners may have difficulty balancing between scientific evidence and traditional knowledge when making clinical decisions (Steel and Adams, 2011a, Adams et al., 2012a). This tension is also linked to the perception that while some scientific research supports traditional knowledge, a substantive proportion of relevant scientific research undertaken is disconnected from CM clinical reality and lacks ‘model validity’ (Mathie et al., 2012) and as such of limited meaning and benefit to CM practitioners (Hunter and Grant, 2005). An important direction in CM research also influencing the focus of this project is a move towards clinicians and practitioners developing research capacity (Wardle and Adams, 2013, Adams et al., 2019c) and contributing to and creating rigorous research outputs

(Steel et al., 2021). Practice based research networks (PBRNs) address a wide range of CM research questions and help reframe debate and focus around issues of interest to patients and practitioners in daily routine care (Adams et al., 2019c). CM and its potential for meeting challenges with health disparities and social justice, deeper and more nuanced health economic evaluations, and refining policy, legal and regulatory perspectives are also the focus of recent research initiatives (Adams et al., 2019a). As a consequence of this broadening aperture, more emphasis now is being placed on the degree to which CM practices are being judiciously and effectively integrated into conventional medicine settings (Jonas et al., 2013a, Kreitzer et al., 2014). It has long been identified that HSR has the potential to offer solutions to the growing research needs of CM, provide the strategy and provide the prospecting guide and map to fill in the innumerable research gaps still evident. HSR is not yet close to exhausting it's investigations into the field of CM with so many uncharted areas including the interactions between patient, provider, and the wider health care system as well as patient-centred outcomes studies, research supporting the integration of CM and conventional medicine, insurance coverage for CM therapies, the development of practice guidelines, studies of the effectiveness and cost-effectiveness of CM therapies, and studies focusing on patients' attraction to CM (Herman et al., 2006). The timely and meaningful exploration of CM education also fits into these trends and the broader scope of HSR research. HSR offers a valuable approach to address the research aims and objectives as well as providing the overall theoretical framework for the study – discussed in greater depth in Chapter 3 – at the intersecting focal point of CM, education and technologies.

1.4.3 Health Services Research and Public Health

The interface between PH and HSR in itself is not always clear and there is often to be found significant overlaps in focus and approach (Adams, 2008). In and of themselves PH and HSR represent two large fields of enquiry, but when combined, as they necessarily are at times, their reach is immense (Adams et al., 2019a). This flexibility of framework is critical as the definition of CM is not always clear and the differences and boundaries between CM, IM and traditional, complementary and integrative medicine (TCIM) are also blurred. While this can be inconvenient (as researchers may prefer an uncluttered reductionistic approach in researching healthcare provision) the reality is that CM and its close interwoven counterparts (IM and TCIM) are distinct in some contexts while intersecting in others when exploring their predominant historical and contemporary application in real world settings (Adams et al., 2012a). This complexity highlights how important the political, cultural, social and economic theoretical frameworks are when examining CM and how such acronyms (such as CM and CAM) are themselves open to flux and realignment with respect to time and cultural change. These wider political, cultural, social and economic contexts ultimately justify the need for a PH and HSR agenda focused upon CM (Adams et al., 2019a).

1.5 Background to the broad landscape of Complementary Medicine

Turning to understanding the dynamic changing landscape of CM, this next section focuses on defining CM and identifying the definitions of individual relevant modalities and whole healing systems included in the broad church of CM and relevant to this thesis. In addition, this section seeks to create an understanding of the context of CM provision and the relevant impact of policy, growth, uptake, prevalence, professionalization and evidence of rising standards within CM as it impacts and relates to CM education.

1.5.1 Defining Complementary Medicine

CM is currently defined as relating to those non-conventional practices, technologies, products and approaches to care that are imported (not indigenous to the local culture) and are predominantly provided via the private practice of a vast range of CM practitioners (for example, acupuncture in Europe or North America) (Adams et al., 2019a). There is general agreement that the definitions and descriptions of CM and its previous moniker complementary and alternative medicine (CAM) have been largely inadequate and created a significant amount of confusion and, as a consequence, controversy (Zollman and Vickers, 1999, Wieland et al., 2011, Adams et al., 2019a). CM tends to be defined by exclusion (ie. what it is not) and definitions of CM range from broad, sweeping statements through to detailed lists of medicines and therapies. In the United States (US) for example, the National Institute of Health employs an exclusion based definition and defines CM as "a group of diverse medical and health care systems, practices and products that are not generally considered part of conventional medicine" (NCCIH, 2019a). This definition immediately requires commentary as the concept of what constitutes conventional medicine is socially constructed. As such, what is conventional in the US is not conventional in France, South Africa, Japan or the Marshall Islands. Cultural and local perspectives also influence the way in which CM is described and defined, even given the broad, diverse, and global reach (NHS, 2018, Australian Medical Association, 2018, BMA, 2019). By sometimes naming some but not all CM professions, these definitions actually create further confusion as they can exclude modalities and whole healing systems commonly associated with CM within some national and cultural contexts (NHMRC, 2015, O'Connor et al., 1997, Falkenberg et al., 2012).

Such diversity of definition has created challenges for those attempting to monitor, measure, and evaluate CM as a lack of consistency regarding the therapies and therapists included in the scope of any CM report or study is necessarily discretionary. As a consequence, the ability to compare findings across different research studies has historically been almost impossible. The boundaries within CM, and borders between the CM domain and that of conventional medicine, are cluttered, inconsistent and inconstant. Furthermore, these boundaries and borders change and are shaped over time across a long continuum of gradually increasing acceptance and integration with conventional medicine (in the case of chiropractic as well as the opposite in the case of homeopathy). Some have seen this as evidence of a need for a more specific definition of CM to be uniformly applied to all studies, whereas others have argued that neither complementary, alternative or conventional are static terms and as such attempts at prescriptive definitions are at risk of being outdated as conventional and complementary practices as well as end-user preferences and expectations are fluid and change over time (Oldendick et al., 2000).

1.5.2 Traditional Medicine, Complementary Medicine and Integrative Medicine in healthcare

Within the broad field of CM there is discourse, debate and controversy about the scope and appropriateness of the terms ‘complementary’, ‘alternative’ and ‘medicine’ when referencing CM. Some embrace the concept of ‘complementary’ suggesting that CM practices work alongside of and in support of conventional medicine and perceive any notion of being ‘alternative’ or ‘other’ as simply outdated and incongruent with current prevailing discourse in the sector (O'Connor et al., 1997). Further to this, the term ‘medicine’ has been subject to debate with some conventional biomedical practitioners (e.g. nurses, doctors) arguing that the term medicine should be restricted to those practicing biomedicine (O'Connor et al., 1997) or manufacturing medical products (Therapeutic Goods Australia, 2020a). There have been suggestions that ‘healthcare’ would be a more appropriate term to reflect the diversity of practice and therapies currently encompassed by the broad landscape of CM (Adams et al., 2012a). Despite these continued debates, in recent times there has been a movement toward avoiding the term ‘alternative’ in the descriptor and an evolution from CAM to CM. In addition, there has been an evolution in the parallel field of integrative medicine (IM) (Melchart, 2018). Definitions of IM tend to be somewhat fluid, but generally reflect an attempt to imply the integration some CM therapies into conventional treatment protocols. These definitions sometimes imply that the delivery of the CM is conducted by a licensed physician, or by integrating and sharing clinical details with specialized CM therapists (Gray, 2019a). Currently, a specific WHO project is underway to define and understand “integration as well as integrative medicine” (World Health, 2019). There have been calls that CM also be sub-defined to include those areas of CM that are subject to the same methodological rigors of review and appraisal as any evaluable conventional modality using the protocols and constructs of EBM (evidence-based medicine), so that in some contemporary literature there is sometimes found reference to the term eb-CM (evidence-based CM) (Wells et al., 2019). Further, where CM is integrated with conventional medicine and subject to EBM requirements the term eb-IM (evidence-based Integrative Medicine) is to be found (Kaniklidis, 2013, Cohen et al., 2005, Adams, 2006, Eastwood, 2000, Adams et al., 2019a).

These challenges and problems with existing or outdated definitions, plus the desire to acknowledge the areas of CM where rigor, evidence-informed processes and critical thinking is applied has seen renewed effort to move to a more concrete definition of CM, alongside IM and traditional medicine (TM). There is broad acknowledgement that the breath of definition has caused uncertainty and confusion in research and policy circles. It is to be noted that the World Health Organisation (WHO) describes CM within a much broader context of TM.

> *The terms 'complementary medicine' or 'alternative medicine' refer to a 'broad set of health care practices that are not part of that country's own tradition or conventional medicine and are not fully integrated into the dominant health-care system. They are used interchangeably with traditional medicine in some countries' (World Health Organisation, 2019).*

While intuitively in alignment, this again raises further questions as acupuncture and naturopathy are considered a TM's (originating from specific locations) in some countries, but not in others. Nutritional medicine is considered unremarkable and normalised in some countries while alternative in others. A growing trend is noted in some literature towards the acronym TCIM in recent publications (Adams et al., 2019a).

1.5.3 Specific definitions relevant for the purposes of this study

The definitions of the professions, treatments and practices contained within 'CM healthcare' are very broad. The term CM can be useful, but it is often limited by the diversity of groups in it, and legitimate discussions and arguments ferment within the CM umbrella. There is value in exploring the CM phenomenon in its entirety, but it is also necessary to look at the unique aspects of the individual member professions under the umbrella. For the purposes of this thesis, the use of the term CM does not refer to or imply 'alternative', 'traditional' or 'indigenous' medicine. This decision is in alignment with current discourse at a policy level in Australia and in the US where the National Health and Medical Research Council (NHMRC) and National Center for Complementary and Integrative Health (NCCIH) follow tighter definitions of CM that remove the implication of 'alternative' and refer instead to 'integrative' approaches to healthcare. This is also congruent with the clear research investigating public perceptions of CM; that it is used in addition and alongside of conventional healthcare (Sibbritt et al., 2011b). This study defines TM as those non-conventional practices, technologies, medicines and approaches to care historically associated with the local indigenous culture (for example, 'Rongoa' in New Zealand, 'Jamu' in Malaysia, acupuncture in China, naturopathy in Europe and Indigenous 'bush' medicine in Australia) (Adams et al., 2019a). While similar in many ways and often used interchangeably, the decision was taken to not include the term 'Integrative medicine' in the title or within the articles that make up this thesis, as the students and staff that are engaged in the sample institutions studied in this work are studying complementary therapies. In the US in particular, the term 'integrative medicine' means something very specific and generally does not refer to the very people studying in these institutions.

Integrative medicine in this work is defined as the introduction of non-conventional practices, technologies, products and approaches to care alongside conventional medical care and treatments (incorporating varying degrees of integration and building upon interdisciplinary models of practice led by either a medically qualified practitioner or non-medically qualified practitioner). As a consequence, in this paper, the working definition of CM is defined as healthcare not traditionally included in conventional medical care or medical education settings, a broad and diverse field of individual professions, mind-body practices (yoga, meditation) natural products (vitamins, herbal medicines), therapies and whole medicine systems (naturopathy, homeopathy traditional Chinese medicine) and treatments (e.g. aromatherapy, reflexology) (Adams et al., 2012a). CM is an umbrella term for a collection of diverse approaches outside of the narrower framework of conventional medicine for the maintenance and improvement of health, for disease prevention and treatment, and for various associated supportive functions.

This thesis involved data collection in two very specific tertiary education institutions that provides clinical education for future CM practitioners. Therefore, in this instance, the working definition of CM has been narrowed somewhat and is determined by what it is, rather than what it is not. Data was collected from current students studying, and academics that teach within particular courses in precise locations (Australia and the US). Specifically, those CM professions relevant to this study are Clinical Nutrition, Myotherapy, Naturopathic Medicine, Acupuncture & Oriental Medicine. In addition, reflecting the breath and difference between CM education institutions, data was also collected from academics and students studying or teaching some courses with non-clinical outcomes for the sector, Complementary Medicine, Global Health, and Integrative Medicine Research.

1.5.4 Individual descriptions and definitions of Complementary Medicine professions in this study

The descriptions and definitions of the specific whole healing systems, whole medical systems, clinical modalities, treatments and therapies taught at these leading institutions are as follows:

1.5.4.1 Naturopathy or Naturopathic Medicine

Naturopathic medicine is defined in the US by the American Association of Naturopathic Physicians as, 'a distinct primary health care profession, emphasizing prevention, treatment, and optimal health through the use of therapeutic methods and substances that encourage individuals' inherent self-healing process' (American Association of Naturopathic Physicians, 2011). In Australia, similarly, the practice of naturopathy is a distinct and complete system of health care and naturopaths are prevention medicine specialists and use scientific evidence as well as traditional evidence in practice (Steel et al., 2020). Generally, in both countries the practice of naturopathic medicine includes modern and traditional, scientific, and empirical methods involving the foundation principles of the healing power of nature (*Vis Medicatrix Naturae*), identify and treat the causes (*Tolle Causam*), first do no harm (*Primum Non Nocere*), the doctor as teacher (*Docere*), treat the whole person (*Tolle Totum*) and prevention (*Praevenire*) (World Naturopathic Federation, 2017). Naturopathic medicine recognizes the inherent ordered and intelligent self-healing processes. Naturopathic physicians identify and remove obstacles to healing and recovery, facilitate and augment this inherent self-healing process and seek to identify and remove the underlying causes of illness rather than to merely eliminate or suppress symptoms. Naturopathic practitioners follow guidelines to avoid harming the patient using methods and medicinal substances which minimize the risk of harmful side effects, using the least force necessary to diagnose and treat and avoid where possible the harmful suppression of symptoms. Further, they educate their patients and encourage self-responsibility for health. They also recognize and maximise the therapeutic potential of the therapeutic relationship. Naturopathic physicians treat each patient by taking into account individual physical, mental, emotional, genetic, environmental, social, and other factors such as spiritual health (World Naturopathic Federation, 2019a). Naturopathic case-taking in both acute and chronic conditions for patients of any age often uncovers dis-ease long before it has become a diagnosable pathology. Naturopathic practice includes the use of diagnostic and therapeutic modalities such as clinical and laboratory diagnostic testing, nutritional medicine, homeopathy, dietary and lifestyle advice, massage therapy, botanical medicine, naturopathic physical medicine (including naturopathic manipulative therapy), PH measures, hygiene, counselling, minor surgery, homeopathy, acupuncture, prescription medication, intravenous and injection therapy, and naturopathic obstetrics (natural childbirth) (World Naturopathic Federation, 2017, World Naturopathic Federation, 2019a).

1.5.4.2 Nutrition or Nutrition and Dietetic Medicine

Clinical Nutrition is in the unique position within CM of having no shortage of definitions. These definitions have been aggressively pursued by interests within these nutritional fields eager to identify distinguishing features due to consumer confusion. Clinical nutritionists trained at CM colleges, and recognised by CM associations, are trained in and practice one-on-one clinical care and are generally more holistic in outlook than their Dietetic counterparts. Dietitians are generally more conventional and theoretically reductionistic in their conventional approach to food and nutrition. 'A dietitian is a person with a qualification in nutrition and dietetics recognised by national authority[s]. The dietitian applies the science of nutrition to the feeding and education of groups of people and individuals in health and disease' (Dietitians Association of Australia, 2020). There is an important interpretive distinction between a 'nutritionist' from a dietician's lens (i.e. community-level interventions, not individual care) and 'nutritionist' from a CM lens (i.e.

clinical nutritionist). Dietitians are qualified to provide a range of evidence-based nutrition services, but further, dietitians have the expertise to provide individual dietary counselling, medical nutrition therapy, group dietary therapy and food service management. Dietitians undertake a course of study that includes substantial theory and supervised and assessed professional practice in clinical nutrition, medical nutrition therapy and food service management (Dietitians Association of Australia, 2020). As there is no industry specific assessing authority that assesses the qualifications of nutritionists who are not dietitians, a distinction is made between dietitians and 'other' occupations in the nutrition and food science field, including that of a nutritionist (NSA, 2020c). However, clinical nutritionists trained in CM educational institutions, from a dietician's perspective are only able to provide population level diet advice, not one-on-one individualised clinical advice. From this perspective dietician's use the term 'nutritionist' to refer to health professionals able to provide population level diet advice, not one-on-one individualised clinical advice (Dietitians Association of Australia, 2020). Nutritionists can design, coordinate, implement and evaluate population health interventions that are designed to improve health and wellbeing through food and nutrition (NSA, 2020c).

1.5.4.3 Myotherapy

Myotherapy is defined as the 'evidence-based assessment, treatment and rehabilitation of musculoskeletal pain and associated conditions' (Myotherapy Australia, 2020). Myotherapy includes the comprehensive assessment, treatment and management of neuromusculoskeletal disorders and conditions caused by improper biomechanical functioning. Myotherapists are trained manual therapy professionals in the field of myofascial pain and dysfunction (pain that arises from the muscles and surrounding connective tissue) (Motion Myotherapy, 2020, International Myotherapy Association, 2017). Most myotherapists operate in private practices in stand-alone practices or integrated into multi-disciplinary settings (International Myotherapy Association, 2017). In common with other allied health practices, myotherapists utilise a wide range of evidence-based treatment approaches and skill, which in addition to manual therapy, assists with muscular pain and dysfunction. Myotherapy treatments assist and aid in prevention, assessment, early intervention and treatment of injuries and pain and the ongoing management of chronic musculoskeletal conditions. In practice and in education there is significant overlap with other forms of bodywork, massage therapy and manual therapies (Venes, 2017).

1.5.4.4. Acupuncture and Oriental Medicine, or Acupuncture

Acupuncture, a specific set of practices of traditional Chinese medicine (TCM, Kampo and traditional Korean medicine is defined as a practice that involves the insertion of very thin needles through the skin at strategic points on the body. Most used to treat pain, acupuncture is increasingly employed in the treatment of chronic conditions, overall wellness and stress management. TCM explains acupuncture as a technique for balancing the flow of energy or life force believed to flow through pathways (meridians) in the body. By inserting needles into specific points along these meridians, acupuncture practitioners encourage static energy flow. China has one of the world's oldest medical systems with acupuncture and Chinese herbal remedies dating back more than 2000 years, although the earliest known written record of Chinese medicine is the *Huangdi neijing* (*The Yellow Emperor's Inner Classic*) from the 3rd century BCE. This text provides the theoretical concepts for TCM that remain the basis of its practice today. TCM practitioners seek to restore a dynamic balance between two complementary forces, yin (passive) and yang (active), which interact outside and inside the human body as they do the universe as a whole. According to TCM, a person is healthy when harmony exists between these two forces whereas illness, on the other hand, results from a breakdown in the equilibrium of yin and yang (Tikkanen, 2020). The broad aim of TCM is to prevent or heal disease by maintaining or restoring balance and TCM practitioners employ a large array of traditional remedies, including acupuncture or acupressure, moxibustion (moxa treatment), cupping teas and brews prepared with one (or some combination) of thousands of medicinal plants or dried animal parts (Tikkanen, 2020, Fruehauf, 2019, MayoClinic, 2020). Defining Oriental Medicine (a specific topic of study at Institution 2) is somewhat more difficult. One of the reasons for this is that 'Oriental Medicine' is more usually and globally called TCM. In fact, the institution (Institution 2) that teaches it to professional master's level does not attempt to define nor described it at all. On their institutional website the graduate outcomes are mentioned alongside a discussion of the long historical divide between techniques and approaches of ‘Classical Chinese Medicine’, TCM and more biomedical approaches to TCM (NUNM, 2017).

1.5.5 The context of Complementary Medicine provision in Australia and the US

While the education of future practitioners of CM is the focus of the study, analysis of this topic cannot be separated from the context in which it sits. Therefore, it is important to understand the features and characteristics, tensions and challenges faced by the CM profession in both the US and Australia and identify the interplay between education and policy imperatives, the uptake of CM, the profile of users, and the professionalization taking place within CM. These features directly impact education standards and provision and directly determine the location, size and scope of educational institutions. Further, as CM education students are also CM consumers the features of the wider CM profession are profoundly important in the examination of CM education (Wardle and Sarris, 2014).

1.5.5.1 The law, policy directions and imperatives in Complementary Medicine in the US and Australia

The provision of CM in the Australian and US health systems is characterized by a pattern in which conventional medicine (or biomedicine) exerts hegemony and brings to bear pluralistic dominance over CM medical systems, irrespective of whether or not those systems are legitimised or professionalised (Goldstein, 2004, Pegado, 2019). The US and Australia have among the highest CM utilisation in the developed world (Andrews et al., 2012), and this has gradually been one the drivers that has contributed to the re-emergence of CM as an important subject amongst US and Australian HSR researchers, primary health care professionals, and especially policy makers (Pinder and Ghosh, 2019).

In recognition of the growing prevalence and uptake of CM and weighing the potential associated risks and benefits of this development, regional and national governments worldwide are increasingly required to develop policy, legislative and regulatory initiatives focused upon CM. In the US and Australia for example, the growing prevalence of chronic disease and the associated pressure this places on health spending has been repeatedly highlighted by government departments (NHPAC, 2015) and agencies (Australian Institute of Health and Welfare, 2015b) as well as the need to strengthen primary health care services due to a number of concerns related to accessibility amongst high risk populations (NHPAC, 2006). Another identified challenge for policy makers is the issue of rurality which attracts ongoing attention within Australian health policy due to the large rural and remote areas in Australia and the impact this has on the ability to provide timely and quality health care appropriate to the needs of the population (Australian Institute of Health and Welfare, 2015a). CM is necessarily a part of these policy initiatives as there is a high CM practitioner population which, in Australia, outnumbers conventional medical providers in some non-urban areas (Wardle et al., 2011). In this landscape of diverse provision, there are major structural and political barriers to CM policy development. The many challenges and hurdles for policy makers include the basic problem with defining CM to enable and facilitate inclusion in new policy development, and the challenge to create broader more generic CM legislation with a 'one-size-fits all' approach that do not have the potential consequence of compromising public safety (Wardle et al., 2019a). Above all there is the challenge created due to the competing constitutional provisions, statutory laws, government structures and legislation impacting and affecting CM that are different in all of the states in both the US and Australia (Wardle et al., 2019a).

Policy initiatives and activity directly and indirectly affects CM educational provision, Most recently, the Australian federal Department of Health and Aging (DOHA) in Australia commissioned a review on the government rebate on Private Health Insurance for Natural Therapies (Department of Health and Ageing, 2015, NHMRC, 2015). A subsequent systematic attempt by the Australian government to review CM therapies was established to examine the evidence of clinical efficacy, cost effectiveness, safety and quality of natural therapies with a view to determine which natural therapies should continue to receive the government rebate for private health insurance (Wardle, 2016). However, the practical relevance of the review has been negatively affected by the dearth of 'whole practice' evidence in natural therapies, even in instances where there is significant evidence for individual elements of those therapies. This has resulted in evidence being described as ‘inconclusive’ in situations where there is broad evidence for the intervention of therapies such as herbal medicine but not practicing herbalists, or in situations where sufficient evidence may exist, but the evidence refers to international practice rather than specific Australian evidence (e.g. naturopathy). Some CM practices based on traditions outside the English-speaking world (e.g. Shiatsu) have been disadvantaged in the reviews by the paucity of research in the English language. The process has been fraught with claims of poor methodology, research fraud, recrimination and controversy (NHMRC, 2019, Wardle, 2016, Millar, 2019).

In the US, CM clinical practice and therapies are controlled by state more so than federal law through a variety of policy and legal frameworks. Of these, the several major areas of interest for clinicians include professional licensure, scope of practice, and malpractice. With regards to licensure, each state has enacted medical licensing (eg Pennsylvania Medical Practice Act of 1985) that prohibits the unlicensed practice of medicine and thereby criminalizes activity by unlicensed CM providers who offer health care services to patients. There is a long history of CM practitioners being prosecuted under such legislation in the US even though this enforcement has been uneven across the states. Malpractice is generally defined as unskilful practice which fails to conform to a standard of care in the profession and results in injury making this no different in CM than in conventional medicine. Courts have tended to rely on medical consensus regarding the appropriateness of a given therapy, considering issues such as liability, risk, safety and efficacy. Legal rules governing CM providers and practices are often new, evolving and sometime conflicting. Further, these rules vary by jurisdiction as national and regional legislative developments and judicial opinions make findings from litigation (Cohen, 2003, Lin and Tung, 2017). These various rules have had direct influence on where CM practitioners chose to practise and where CM schools and education institutes chose to place themselves (Eggertson, 2012, Hermes, 2017).

The major exception to this state-led regulatory environment in the US indirectly affecting CM education is the significant federal role in the regulation of dietary supplements. In Australia, medicinal products containing such ingredients as herbs, vitamins, minerals and nutritional supplements are referred to as 'complementary medicines' and are regulated as medicines under the Therapeutic Goods Act 1989 (Therapeutic Goods Australia, 2020b). A complementary medicine is defined in the Therapeutic Goods Regulations 1990 as a therapeutic good consisting principally of one or more designated active ingredients mentioned in Schedule 14 of the Regulations, each of which has a clearly established identity and traditional use. Australia has taken a risk-based approach and adopted a two-tiered system for the regulation of all medicines, including complementary medicines whereby lower risk medicines can be listed, while higher risk medicines must be registered on the Australian Register of Therapeutic Goods (ARTG) (Therapeutic Goods Australia, 2020b, Therapeutic Goods Australia, 2020a). In the U.S. however, the U.S. Food and Drug Administration (FDA) regulates foods, drugs, and cosmetics in interstate commerce. The implications of this system for CM is that no new "drug" may be introduced into interstate commerce unless it is proven "safe" and "effective" for its intended use, as determined by FDA regulations. Traditionally, in the U.S. context "Foods", were not subject to different regulatory requirements, nor need to go through trials proving safety and efficacy. The large uptake of vitamins, minerals, herbs, and other "dietary supplements" in the U.S. challenges the historical divide between drugs and foods. Currently the federal Dietary Supplements Health Education Act (DSHEA) allows manufacturers to distribute dietary supplements without having to prove safety and efficacy, so long as the manufacturers make no claims linking the supplements to a specific disease (Cohen, 2003, Georgetown University Law Library, 2020).

1.5.5.2 Growth, prevalence and uptake of Complementary Medicine

Also impacting the education of future CM practitioners are the patterns of growth taking place. Despite all of the challenges facing CM, its utilization is significant and growing globally (Newhouse et al., 2013). While the research reporting survey data on growth prevalence and uptake of CM is generally sporadic, when examined collectively it confirms an increasing uptake of CM worldwide (Harris et al., 2012, Wardle et al., 2019a, World Health Organisation, 2013, Schloss and Steel, 2019, Fischer et al., 2014b, Clarke et al., 2015). A recent review of national studies of CM use in the prior 12 months (Harris et al., 2012) identified a 12-month CM provider use averaging 21.1% (broadly ranging from 5.8% to 48.7%). In Australia, the prevalence of use was 44.1% in 2005 and in the US 16.2% in 2007 (Harris et al., 2012). A more recent national population survey on overall CM use (including CM provider use, over-the-counter use and self-help) found a 12-month CM use estimate of 33.2% in 2012 in the US (Clarke et al., 2015). CM use in Australia is resoundingly characterised by sustained growth with CM now accounting for up to half the healthcare sector, with both practitioner visits, out-of-pocket and over the counter sales (Reid et al., 2016b, Steel et al., 2018b, Harnett, 2019). In the most recent study of the sample (n=2,019) was broadly representative of the Australian population. Prevalence of any CM use was 63.1%, with 36% consulting a CM practitioner and 52.8% using any CM product or practice. Bodywork therapists were the most commonly consulted CM practitioners (massage therapists 20.7%, chiropractors 12.6%, yoga teachers 8.9%). Almost half of respondents (47.8%) used vitamin/mineral supplements, while relaxation techniques/meditation were the most common practice (15.8%) (Steel et al., 2018b). Research indicates that more than two thirds (68.9%) of Australians have used at least one CM, and a similar number (64.0%) had visited CM practitioners, in the previous 12 months (Steel et al., 2018b). In the US, the data is older with studies published by Eisenberg et al. (1998) Ni et al. (2002), Barnes et al. (2004). The Eisenberg study reported CM use increased by from 33.8% in 1990 to 42.1% in 1997, the prevalence of herbal remedy use increased by 380%, the prevalence of high-dose vitamin use increased by 130%, the total number of visits to CM providers increased by 47% in 1997, the total visits to CM providers (629 million) exceeded the total number of visits to all primary-care physicians (386 million) in 1997. It was estimated that, in 1997, adults made 33 million office visits to professionals for advice regarding the use of herbs and high-dose vitamins (National Academy of Medicine, 2005). The most recent data suggests that in the US, 4 in 10, approximately 38% of adults and approximately about 1 in 9 or 12% of children are using some form of CM (National Center for Complementary and Integrative Health, 2017).

1.5.5.3 Profile of Complementary Medicine users

Determinants of CM use and prevalence (and those potentially drawn to study CM) have been broadly reflective of various sociodemographic, economic and health related factors that include gender, age, education levels, income, urban or rural residence, and the health-related factors that include single or multiple morbidities and perceptions of health care. International data has identified key demographic and health related factors which are now widely recognised as predictors for CM use in the general populations (Peltzer and Pengpid, 2018). Broadly speaking, as compared to non-CM users, CM users are more likely to be female (Bertakis et al., 2000, Redondo-Sendino et al., 2006) and middle-aged (Thomas and Coleman, 2004, Bishop and Lewith, 2010, Laiyemo et al., 2015). In addition, CM users are likely to have higher levels of income and education (Bishop and Lewith, 2010, Chao and Wade, 2008) and have multiple health concerns or diseases (Bishop and Lewith, 2010, Steel et al., 2018b).

Drivers of CM use (and the reasons that future students are drawn to study CM) are often referred to as ‘push and pull’ factors. Push factors towards CM have been shown to include anything which undermines the confidence of users in conventional medicine such as the ability to manage or treat the users’ health condition effectively (particularly for those with chronic conditions), concerns over possible adverse effects of pharmaceuticals and other interventions, dissatisfaction with conventional care and concerns about the safety of pharmaceutical medication, as well as insufficient attention being paid to the social and emotional needs of individual patients (Andrews et al., 2012). In contrast are pull factors, those drivers which attract users towards the use of CM and have been shown to include a desire to engage with the personal and individualised practice approach of individual CM’s, an individual’s need for a greater sense of personal control over their own health, and a preference for more ‘natural’ treatments to avoid perceived adverse effects of conventional treatments. In addition, the perception that CM may hold the answer to managing chronic conditions poorly treated by conventional medicine and alignment with personal beliefs, attraction of the holistic principles of CM or desire for greater personal control of their wellbeing may also draw users to CM (Bishop et al., 2007). Further research into the health-related factors influencing CM prevalence and use have explored users with more than one health condition (Shih et al., 2015), having a chronic disease (Choi et al., 2015, Liu et al., 2015), inconsistent results after receiving conventional medical care and open and positive attitudes toward CM (Kim et al., 2015, Steel et al., 2018b). Other motivational factors explored in the research have included the belief systems of CM users, patient satisfaction (Van Wassenhoven et al., 2014, Woo et al., 2014), the cost of CM, PH savings (Nahin, 2009, Sibbritt et al., 2011a, MacLennan et al., 2006, Bishop et al., 2007, Rayner et al., 2009, Stankiewicz et al., 2007), access to resources (Wilkinson and Simpson, 2001) as well as potential for self-determination and greater disposable income to spend on healthcare. Research findings also show that CM users are potentially conducting their own 'research' to inform self-determined health choices (Broom et al., 2012). These global findings have been shaped by and reflect research into the current position of CM in both US and Australia – the geographical locations of this study.

1.5.5.4 United States

In the US systematic and progressive findings have created solid national estimates of the use of CM among adults in the United States. Trends in the use of selected CM use have been compared across three time points for the years 2002, 2007, and 2012 (Barnes et al., 2004, Clarke et al., 2015, Nahin, 2009, Falci et al., 2016, Barnes et al., 2008) and confirm global findings. They show that CM prevalence is very high in the elderly (87.9%) and that popularity does not differ by gender, ethnicity, income, or educational attainment (Effoe et al., 2017). Similarly, in the US patients suffering with multiple chronic conditions have been found to have a high uptake of CM use (Nahin et al., 2012, Falci et al., 2016, Chalasani et al., 2018, Upchurch, 2018, Shatnawi et al., 2019, Polat et al., 2018). Research into subgroups of the US health care landscape has found that the use of CM among US children is ~12% overall according to the 2012 National Health Interview Study. In line with other research findings only 3% of parents and 2% of children had ever discussed their CM use with a physician (Misra et al., 2017). African American CM users tend to be middle-aged to older, female, educated, and have more medical conditions (especially pain-related) compared to non-CM using African Americans (Wright and Owens, 2016).

1.5.5.5 Australia

In Australia the picture is broadly similar whereby Australian users are significantly more likely to be female (74.4%) and aged between 18-34 years (75.3%). Importantly, the use of CM in Australia has been reported to be concurrent with engagement with general or specialist medical practitioners for a substantial proportion of the population (63.1%, with 36% consulting a CM practitioner and 52.8% using any CM product or practice) (Steel et al., 2018b). CM consumers are higher users of conventional health services than non-users (Sibbritt et al., 2007). It has been conclusively found that CM treatments are most commonly employed by CM users in conjunction with conventional medicine, as an integrative initiative, not as a substitute or an alternative (Andrews et al., 2012). Strikingly, for individuals who both visited medical practitioners and used CM, it is reported that 17.9% never informed their doctors about their CM use (Tracy et al., 2007, Jain and Astin, 2001). It is this complex combination of inconsistent CM policy application in various settings, the dynamic that makes up the demographic, psychographic and sociological profile of CM users, plus the continued growth of the industry that directly impacts CM education, as it is potentially from these populations that future students are drawn (Steel, 2018), and it is against this background that the next generation of CM practitioners are trained and educated.

1.5.6 Maturation, evolution and professionalization of Complementary Medicine modalities leading to rising standards of education

In line with the wider use of CM, the CM sector also appears to be experiencing professionalization as well as growth directly and indirectly affecting CM education. While some CM professions and products are regulated by governing bodies in Australia, often at levels beyond that observed in other countries, most CM provision still remains informal or unregulated, and is generally not integrated into conventional health care frameworks (Wardle et al., 2014). The development of CM regulation in Australia has been uneven across the states and territories but most progressive in the state of Victoria. There, initially, a registration system was established for both chiropractic and osteopathy, with other CMs deemed to be unlikely to cause harm (McCabe, 2005). Following this, further assessment of the regulatory requirements of other CMs was undertaken and resulted in recommendations for the regulation of Chinese medicine, naturopathy and herbal medicine (McCabe, 2005, Wardle, 2008). Currently, the recommendation for the regulation of traditional Chinese medicine, chiropractic and osteopathy has been enacted nationally through the Australian Health Practitioner Regulation Agency (AHPRA) (Australian Health Practitioner Regulation Agency, 2019). The naturopathic profession continues to lobby for inclusion in this scheme. But outside of this therapy, no other CM has been investigated for regulation in Australia. One of the outcomes of the absence of regulation however has been the establishment of multiple and diverse education providers offering training in CM therapies and the results of such diversity have led to an absence of consistency related to the skills, knowledge and attributes of CM practitioners in Australia (McCabe, 2005, Wardle, 2008, Leach and Gillham, 2011).

In the US, the call for regulation of some CM therapies has taken place on a background of concern at the overemphasis and misuse of the 'science' behind by some CM therapies (Murdoch et al., 2018), concerns about the possibility of undesirable interactions with conventional medicines, and concerns that patients are not asked about CM use during conventional patient assessment. A consensus has emerged in some of the research literature that there should be guidelines in place based on CM clinical trial outcomes, and stricter regulations need to be enforced on CM practices to ensure their safety and effectiveness in the same way that conventional clinicians and research are regulated (Kesavadev et al., 2017). On the CM side there are clear signs of maturation and professional evolution (Lin and Tung, 2017, Anheyer et al., 2018, Saizar et al., 2017, Sullivan et al., 2017). Most indicative of these changes is that an integrative clinician now leads the NCCIH (Weeks, 2018). The consequence of this uneven setting - and partly because of this uneven regulatory framework is that each of the whole healing systems, professions and therapies relevant to this study that fall under the CM umbrella, acupuncture, naturopathy, nutritional medicine, myotherapy are at different stages and phases of their professional evolution.

1.5.6.1 Current educational provision, professional directions and intra-professional dialogue in Acupuncture in the US and Australia

In Australia, acupuncture is regulated with approximately 4,800 registered Chinese medicine practitioners registered with the Chinese Medicine Board of Australia (AHPRA, 2016). “Acupuncturist,” “Oriental medicine practitioner,” and “Chinese medicine practitioners” are protected titles for registered acupuncturists (Zheng, 2014). Acupuncture is taught to professional level in a number of institutions at undergraduate level. Currently a bachelor's degree of 4 years is the minimal requirement for registration in Australia. Three public universities offer Master-degree and Doctor of Philosophy programs and three major private colleges offer nine undergraduate and three postgraduate programs that are approved by the Chinese Medicine Board of Australia. Acupuncture is well accepted by Australians, with 10% having received this treatment and 80% general medical practitioners referring their patients to acupuncture service (Zheng, 2014). Current dialogue at the professional level involves formal government regulation and insurance for the most part (Zheng, 2014). All private health insurance schemes provide rebates to patients receiving acupuncture treatment, and third-party payment is also available in six of eight Australian states and territories. Research output in acupuncture has increased greatly since 2000 and mainly investigates their mechanism of action, associated pain, as well as gynaecological and respiratory conditions. Comparatively good education, regulation and research of acupuncture make Australia a leading provider in western countries with respect to acupuncture services (Zheng, 2014) and acupuncture is well into the process of integration into mainstream health care in Australia (Xue et al., 2009).

In the US, acupuncture is more heavily regulated. The research data suggests that the acupuncture profession has steadily grown in the US (Fan and Faggert, 2018). In one recent study it was found that the number of actively licensed acupuncturists as of January 1, 2018 in the U.S. was 37,886 an increase of 257% since 1998. Acupuncture is taught in numerous institutions at mainly masters level. There are 62 active, accredited Acupuncture and Oriental Medicine (McKenzie et al.) (McKenzie et al.) schools which altogether offered approximately 100 programs, 32 master’s degrees in acupuncture, 53 master’s degrees in oriental medicine, 13 postgraduate doctorate degrees and 2 entry-level doctorate degrees. Among these active accredited schools most (77.4%) are in the west and eastern coastal states. There are 48 jurisdictions (47 States and the District of

Columbia) laws governing acupuncture practice (Fan and Faggert, 2018, McKenzie et al., 2017, Fan et al., 2018). Current professional issues cluster around the issues of efficacy (Zhang et al., 2020), sham acupuncture research (Garcia et al., 2019, Bao et al., 2020), and the debate between western and traditional approaches where many more western/biomedical practitioners view acupuncture points as places to stimulate nerves, muscles and connective tissue, as opposed to a more classical holistic philosophical and theoretical approach focusing on the sophisticated application of five-element theory (Roberts et al., 2020, Hughes et al., 2019).

1.5.6.2 Current educational provision, professional directions and intra-professional dialogue in Naturopathy in the US and Australia

Naturopathy is one of the most popular forms of CM in Australia today with 6.2% of the population consulting a naturopath (Steel et al., 2020). Naturopathic consultations are sought for a variety of conditions such as diabetes, mental health disorders or respiratory disease (Steel et al., 2020) and, in some areas, as a form of primary care, especially by middle-aged women with higher levels of tertiary education and higher annual income. The number of Australian naturopaths was estimated to be over 4000 in 2017 and expects to grow to over 4600 by 2022, although this number is likely to be an underestimation (Ooi et al., 2018a, Steel et al., 2020). Consultations tend to be longer than in conventional medicine and patient experiences of naturopathic care are generally reported as empowering and patient-centred (Foley and Steel, 2017a, Foley and Steel, 2017b). In contrast to what is known about the acupuncture profession, Australian naturopaths, are predominantly female, work mainly in private clinical practice with nutritional medicine, herbal medicine, homeopathy, as well as massage therapies being the most common modalities used. There growing signs of greater integration with community pharmacies and IM clinics in major cities (Ooi et al., 2018a). Naturopathy is taught in a diminishing number of educational institutions at undergraduate level. Currently, there are 5 private colleges offering naturopathic education, a significant drop in number which peaked at over 40 in the year 2000 (Wardle et al., 2019b) and the profession has struggled against external interests to establish the Bachelor degree as a minimum education standard, despite it being offered for 20 years (Wardle et al., 2012) and being advocated for by the profession (Breakspear, 2013). Current dialogue at the professional level involves an ongoing discourse on evidence (Myers and Vigar, 2019) and regulation (Wardle, 2014). The profession continues to be self-regulated in Australia with advocates calling for the strongest form of regulation with an enforced national minimum standard of education for the profession, an independent complaints mechanism as well as protection of the title ‘naturopath’ (Wardle et al., 2019b). The challenge of registration of naturopaths currently remains unresolved due to fragmented representation under many different professional associations, clear disunity among the profession, and objections by certain health care lobbyists (Ooi et al., 2018a, Steel et al., 2019b). In response, the Australian members of the World Naturopathic Federation (World Naturopathic Federation) have formed the Australian Naturopathic Council (ANC) (Steel et al., 2019b). The perceived lack of research demonstrating efficacy of the whole practice of naturopathy in Australia has also driven the government's decision to withdraw it from private health insurance coverage from 2019. With increasing scrutiny, the present and future challenge to Australian naturopaths is centered on the integration of both scientific and traditional evidence to form the foundation of a person-centered, evidence-informed practice (Wardle et al., 2019b).

Naturopathy in the US is regulated in some jurisdictions. Currently, 22 states have licensing or registration laws for naturopathic doctors. In these states, naturopaths are required to graduate from accredited four-year residential naturopathic medical programs and pass an extensive postdoctoral board examination through the Naturopathic Physicians Licensing Examinations in order to receive a license or registration. Licensed and registered Naturopathic doctors must fulfil state-mandated continuing education requirements annually and have a specific scope of practice as defined by their state's law (American Association of Naturopathic Physicians, 2019). In addition to a standard medical curriculum, naturopathic physicians also study clinical nutrition, homeopathic medicine, botanical medicine, psychology, and counselling. The Association of Accredited Naturopathic Medical Colleges (Association of Accredited Naturopathic Medical Colleges) was established in February 2001 to propel and foster the naturopathic medical profession by actively supporting the academic efforts of accredited and recognized schools of naturopathic medicine. There are seven accredited naturopathic medical programs and eight campus locations in North America (Association of Accredited Naturopathic Medical Colleges, 2019). However, there is also a complexity to this more usual looking professional environment. The above describes the education and licensure of Naturopathic doctors but there are two further categories of education and licensing that differ. Traditional naturopaths, also known simply as "naturopaths," receive training in a variety of ways and operate more informally in some states. Training programs vary in length and content and are not accredited by organizations recognized for accreditation purposes by the U.S. Education Department (USED). Traditional naturopaths are often not eligible for licensing. Furthermore, other health care providers (such as physicians, osteopathic physicians, chiropractors, dentists, and nurses) sometimes offer naturopathic treatments, functional medicine, and other holistic therapies, having pursued additional training in these areas (NCCIH, 2019b). Consequently, training programs vary and current dialogue at the professional level involves heated debate about the role of traditional evidence and scientific evidence, how to navigate the need for evidence to attract funding and compete for research dollars, all at the same time as holding onto a changing concept of vitalism. In keeping with its history of borrowing from other disciplines, currently in the US Naturopathic practitioners use many different treatment approaches. Examples include dietary and lifestyle changes, stress reduction, herbs and other dietary supplements, homeopathy, manipulative therapies, exercise therapy, detoxification, psychotherapy, and counselling. Conversely many naturopaths choose a narrower clinical focus and work predominantly on the health of the cell and the gut biome with nutritional, vitamin and mineral supplementation.

From a broader international perspective, a recent *Journal of Alternative and Complementary Medicine* edition was especially devoted solely to leadership and mentoring of the naturopathic field (Adams et al., 2019b, Steel et al., 2019a). Regular attempts to separate naturopathy from what are considered fringe therapies and practices sometimes associated with their origins such as homeopathy (Nelson et al., 2019), iridology, water cure, green-care and forest bathing are a feature of the modern international naturopathic landscape (Bradley et al., 2019, Cooley et al., 2019).

1.5.6.3 Current educational provision, professional directions and intra-professional dialogue in Nutrition in the US and Australia

Nutritional medicine in Australia is self-regulated but unregistered affording no protection of title nor legal protection over the terms 'Nutritionist' and 'Dietitian' no matter the level of training. It is a complex environment as the boundaries and differences between the profession of dietetics and nutrition are blurred. A variety of different levels of training and qualification can lead to an individual using a title that references them as a nutrition-based health professional. Credentials are provided and governed by the Nutrition Society of Australia (NSA) (NSA, 2020a, Nutrition Australia, 2015). The key purpose of the NSA register of nutritionists is to protect the public by establishing a list of appropriately qualified persons, and in doing so, to distinguish individuals who have received an approved level of training and experience from others who have not (NSA, 2020b). Those who register with the NSA may have a range of qualifications, including a Bachelor level degree with majors in nutrition or a postgraduate degree such as Graduate Certificate, Graduate Diploma, Master's degree or even a PhD specialising in nutrition. Nutritionists may design, coordinate, implement and evaluate a range of population health interventions to improve the wellbeing of individuals, communities, and populations as a whole, through better food and nutrition although some work in a number of other roles, including research, nutrition consultants and advisors, PH and health promotion officers, community development officers, quality and nutrition coordinators, food technologists, media spokespeople and more. There are currently no Medicare health fund rebates for clients of Nutritionists, and there is only limited private health insurance fund rebates for nutritionists with a small proportion of private health insurers (NSA, 2020a, Nutrition Australia, 2015). The Dietitians Association of Australia (DAA) on the other hand has developed a credentialing system for dietitians which is the only one recognised by the Australian Government, Medicare, the Department of Veterans Affairs and most private health funds. The title 'Accredited Practicing Dietitian' (APD) is protected by law, and only qualified practitioners who have met certain requirements can use this title. In order to become an APD graduates must complete a tertiary level course accredited by the Dietitians Association of Australia. Courses vary depending on the university provider but usually includes a one to two-year post-graduate diploma or master's degree following a Bachelor of Science degree (including physiology and biochemistry), or a four-year integrated undergraduate course. Courses cover food, nutrition, health and diet-related medical conditions, and skills in communication, counselling, education, health promotion, management, research and critical analysis of literature. Dietitians prescribe nutritional advice and dietary treatments for many conditions such as diabetes, food allergies, cancers, gastro-intestinal diseases, and overweight and obesity. APD's work in hospitals and private practice, government, research and teaching, PH and community nutrition, the food and medical nutrition industries, and nutrition marketing and communications. APD is the quality standard for nutrition and dietetics services in Australia (Nutrition Australia, 2015).

The polarized nutritional landscape in Australia is even more sharply delineated in the US (Duggan et al., 2019). 'Nutritional medicine' in the US is regulated and taught in numerous institutions generally at post-graduate level where the focus is on food as medicine and a holistic view of individual and PH problems. Graduate destinations include nutrition consultants, educators, counsellors, therapeutic chefs, food and nutrition authors and writers / bloggers and nutritional medicine consultants can be found in integrative health centres and schools, non-profits, wellness centres, health food and grocery stores (NUNM, 2020d), but notably, not public hospitals. Current dialogue at the professional level involves raising standards, and creating a professional identity separate from the dietetics profession (Bisanz et al., 2018). In the United States, 'nutrition professionals' also include the dietitian or registered dietitian (RD), as well as "dietetic technician" or "dietetic technician, registered" (DTR). These specific terms are legally protected and regulated by the Academy of Nutrition and Dietetics (AND) which registers and confers professional credentials. In addition, many states require specific licensure to work – in medical settings. The AND was founded in 1917 as the American Dietetic Association and is now made up of approximately 72,000 members. The divide in the nutritional medicine field in the US is ideological in origin with nutritionists tending to analyse the nutrient content of dietary patterns and facilitate dietary changes associated with optimizing health, performing effective nutrition counselling resulting in a client's successful implementation of lifestyle behavioural changes, applying skills in cooking, recipe development and meal planning, matching nutritional therapies to medical diagnoses, designing individualized meal plans for clients. AND registrants on the other hand are to be found in more conventional PH settings and institutions, hospitals, aged care facilities and schools. Controversially, AND receives millions of dollars in corporate sponsorships from companies like General Mills, Coca-Cola and PepsiCo via donations, joint initiatives, and programs and is heavily criticized for ties to the mass food industry, consistent messaging that is food industry friendly and board members sharing their duties on other boards such as Monsanto, Bayer and DuPont. AND rebranded to Eat Right / Academy of Nutrition and Dietetics in 2012 (Ellsberg, 2012, Dewey, 2017, Greger, 2015).

1.5.6.4 Current educational provision, professional directions and intra-professional dialogue in Myotherapy in the US and Australia

Myotherapy in Australia is self-regulated but are at the same time unregistered, and may be in stand-alone practices or integrated into multi-disciplinary settings (Myotherapy Australia, 2020). It is taught in numerous institutions Australia-wide at undergraduate level. Current dialogue at the professional level involves questions of clinical effectiveness (Ooi et al., 2018b). The 2015 Australian Government's NHMRC report concluded that myotherapy was one of 17 therapies evaluated for which no clear evidence of effectiveness was found, that no studies were identified that assessed the effect of myotherapy in people with a clinical condition, and the effectiveness of this therapy was therefore unknown (Baggoley, 2015). Myotherapy in the US is taught at masters, and undergraduate levels and in privately certified qualifications. Consistent with other therapies and practices under the broad heading of manual therapies, Myotherapy is trademarked and though the origins of myotherapy lie in trigger point injection therapy in the 1940's and therapeutic exercise and mobilization developed by Hans Kraus (International Myotherapy Association, 2017), the specific method was developed by Bonnie Prudden in 1976 (Venes, 2017). However in Myotherapy there is significant overlap with other forms of bodywork, massage therapy and manual therapies and consequently, just as in Australia (Ooi et al., 2018b), current profession discourse and tensions involve professional identity (Kovesy, 2018). Other techniques employed may include but are not limited to therapeutic massage, muscle energy techniques, neuromuscular techniques, biomechanical retraining, nutrition, injury prevention, and lifestyle education (International Myotherapy Association, 2017).

This interplay between education and policy imperatives, the growth, profile, push and pull factors of CM users, and the professions that make up the student and faculty body, their intra-profession direction, maturity, tensions, and dialogue, reveals a field of CM is in dynamic flux and this interplay has an indirect or direct impact on the education of CM practitioners and stakeholders, and profoundly influence CM educational settings.

1.6 Background to the changing landscape of contemporary healthcare

As this study has a focus on technology in the education of CM practitioners, it is necessary to provide a background to the way in which more broadly, medicine, healthcare and as a consequence CM has been profoundly changed by digital learning technologies. While there are many new initiatives in medicine generally, such as a clear move to integrative (NCIM, 2020b) and 'concierge' approaches in medical provision (NCIM, 2020a), it is the deployment of technologies that is the most important driver of change in medicine and healthcare (Brown and Grossbart, 2019). Technologies are increasingly dominating medical and healthcare provision (Casselman et al., 2017, Marakhimov and Joo, 2017) with a multitude of cutting-edge applications such as, but not limited to robotics, artificial intelligence, the use of nano-technology and health informatics. In a very short time, integrated electronic health records on the one hand and wearable health-related technologies on the other (Cannon, 2018) have transformed the way that health systems manage patient's data and deliver care. In clinical practice however, the three technology developments that are having the most impact are practice management, clinical support, and remote care technologies.

1.6.1 Digital technologies in healthcare provision - clinical care and practice technologies

The internet has placed infinite information at patient's fingertips with personal health devices, technologies and applications changing how individuals perceive, engage, manage and communicate about their health in significant ways (Jetty et al., 2018).

Medical organisations, individual clinics, hospitals, and complete healthcare systems have begun to recognise the value of these options in the delivery of high-quality care (Broman et al., 2016), and the future of healthcare is now inextricably entwined with technologies and telehealth. However, little is known about the use of technologies in CM clinical practice.

1.6.2 Practice management technologies

Clinically, digital technology use can broadly be categorized into three types. Firstly, there are many practice management softwares available in CM clinical settings (such as Clinic Essentials, Clinko, Birdsong, Unified Practice, Compass, Practice Fusion) to assist CM clinicians in the management of the practices, bookings, report writing as well as patient and information management. There are also simply the generic applications used in 'modern life' and information and financial management tools (such as Dropbox, Xero, Email, Excel, Outlook, Word, Online calendars for bookings), and a variety of online databases to assist clinicians of CM in the management of themselves and their work.

1.6.3 Clinic support technologies

Clinical care and practice technologies include (but are not limited to) applications and software specifically orientated to the technical disciplines of acupuncture (eg. point location software such as Points-PC), naturopathy and nutritional medicine software to assist in the prescription of supplements and nutritional advice (eg Nookal, Foodzone, EPIC, FoodWorks), homeopathy (eg. repertory software such as RadarOpus, Synergy, Vision), iridology (eg. EyeRonec), general medical apps and resources (eg. MIMs online, Natural standard), and other software found in the CM marketplace (eg CorePlus, Health Quest, Ginko, nPod).

1.6.4 Remote care technologies in healthcare provision - Telehealth

In parallel, thirdly, telehealth is now being widely employed in conventional health care (du Toit et al., 2019, Myers, 2019) and also appears to be employed in many areas of CM clinical practice (Subbarao and Cooper, 2017). Tele-health is described as, 'a collection of means or methods for enhancing health care, PH, and health education delivery and support using telecommunications technologies. Tele-health encompasses a broad variety of technologies and tactics, Zoom, Skype, Google Hangouts' (Burch et al., 2017, Kruse et al., 2017). Patients and practitioners exhibit increasing willingness to adopt mobile health (M-health) and telehealth applications as part of managing individual health care. The benefits of applying technologies to enhance patient safety and clinical outcomes has been at the forefront of research alongside of cost benefit comparisons and many outcome studies (Turner et al., 2014) in the fields of nursing (Heller et al., 2000, Bartz, 2017) and psychiatry (Fiorini et al., 2015). In medicine, research has examined the role of telehealth in conditions such as cancer (Cannon, 2018), motor neuron disease (Henderson et al., 2014), palliative care (Head et al., 2017), PTSD (Cushing and Braun, 2018), alcohol and drug abuse (Reddy et al., 2014), MS (Tietjen and Breitenstein, 2017), mental health (Kilkku, 2018) and subgroups such as veterans (Schulz-Heik et al., 2017). Research has explored the challenges of integrating telehealth into existing infrastructure and systems (Scotté, 2012). Papers have explored person-centred approaches (Kilkku, 2018) and looked at the benefits and participant satisfaction of support groups developing a sense of community and unconditional acceptance of their condition, in addition to receiving information about their treatment, and self-care (Doorenbos et al., 2010, Dolbeault et al., 2009, Ussher et al., 2006). Studies have confirmed that telehealth interventions can decrease perceptions of stigma (Kiropoulos et al., 2011, Finkelstein et al., 2008), show the transfer of patients between services can be decreased (Buckley and Weisser, 2012) and that staff shortages might be helped when telehealth initiative are implemented in practice (Ellington, 2013). Specialty journals have emerged (Bartz, 2017) and the role of WHO, and individual government policy and strategy has been researched (European Commission, 2012). Some of this research has explored telehealth interventions in Australia (Bursell et al., 2013), Canada (Bhandari et al., 2011) and Italy (Fiorini et al., 2015) as well as targeting service provision to ensure equitable access to care especially in rural areas (Bhandari et al., 2011, Paulson et al., 2015) such as remote rural and regional US (Wilshire, 2012) and Australia (Quilty et al., 2015). Commentary and conclusions have been dominated with the positive results and benefits of telehealth. Some studies into technological health care solutions have connected with ideas of equity, active participation and social inclusivity (Doarn, 2016) and also delved into the issues bought up through the use of telehealth and equitable access (Levy et al., 2002, Wade, 2013) and ethics (Demiris et al., 2009, Ziembroski et al., 2003). Privacy, security, patient safety and uneven distribution of organizational support have been raised as concerns (Tuckson et al., 2017, Borycki and Kushniruk, 2018). In parallel, the training for telehealth provision predominates in the growing body of research (Papanagnou et al., 2015, van Galen et al., 2018). These initiatives have not always been systematic and there has been an unevenness to the spread and depth of telehealth research. At the time of writing, tele-health has now been aggressively forced on the medical and patient community under the dramatic global influence of COVID-19. While there is some research into the role of complementary therapies and the use of telehealth, this has been limited to only some few therapies under the CM umbrella and has been neither strategic nor widespread with sporadic studies into mindfulness (Niles et al., 2013), yoga (Groessl et al., 2008, Schulz-Heik et al., 2017) and music therapy (Lightstone et al., 2015) conducted.

1.6.5 The implications for the Complementary Medicine profession and Complementary Medicine education

Currently there is no research available on the breadth and size of this market in CM for clinical care and practice technologies and little is known how these technologies are applied in CM clinical practice, with what success, how they are perceived by patients or practitioners or how they may be affecting clinical decision-making. Similarly, it is unknown how telehealth is employed in any of the professions under the CM umbrella. Currently there is no research at all exploring the teaching of telehealth skills or the perceptions of telehealth or broader PH implications in CM. There is no ontological exploration (Fiorini et al., 2015), sociological lens, modelling nor strategy behind the use of telehealth in CM health care. Further there is no current understanding or research into the crucial areas of the law and ethics of telehealth in CM, the efficacy of telehealth, the broader implications for the profession, nor the implications for CM education. It appears that there is a curriculum gap as the use of technologies and the replication finds no room in modern CM curricula, and it is possible that the training of practitioners in the use of technologies is left for end-users. The important implication is that with technologies dominating broader healthcare provision and with the education of those future healthcare practitioners embracing and teaching best practices in the use of practice management, clinical support and remote care technologies there is no research at all on this dynamic within CM practice and education. In this regard the 'what' is being taught to CM practitioners and what practitioners do in their practice settings is currently unknown.

1.7 Background to the changing landscape taking place in tertiary education

Just as it is necessary to understand the broad influence of technology use in healthcare to understand what students are taught, it is equally important to grasp the changing face of 'how' future students of CM are taught. Consequently, it is necessary to provide a brief background to the education of CM practitioners by explaining how CM educational institutions have been as profoundly influenced by the significant and transformative changes in tertiary education sector (including but also beyond health care) in response to important and in some ways revolutionary recent developments in the last few decades. These developments have included the adoption of new and radical teaching techniques and theories, new business models to drive and fund tertiary education institutions as well as the adoption of new learning technologies to enhance the experience for students and academics.

1.7.1 Changing andragogy in tertiary education

In the scholarship of education, research has focused upon changing educational approaches as educators attempt to improve the student experience and achieve better outcomes. Research has explored constructivist education theories, flipped classrooms, problem-based learning (Liebenberg et al., 2012, Anderson and Dron, 2012), changing student learning behaviours (Chen, 2014), and non-traditional students (where age, family and work responsibilities, life circumstances, race, gender, non-campus residence and level of employment have been shown to interfere with successful completion of educational objectives) (Dolch and Zawacki-Richter, 2018).

1.7.2 Commercialisation and private equity in tertiary education

In recent decades tertiary education has transformed from traditional models of operations such as government funding or private endowment. Across the landscape of tertiary education provision in the two countries that this study took place in (the US and Australia) there is now an array of licensing agreements between providers as well as strong relationships with the business and industrial sector that are to be found. Research has explored how pressures, tensions and challenges created by the commercialisation of tertiary education impact upon educational outcomes (Wardle et al., 2019c, Narayan et al., 2017). Research has also explored the how educational outcomes are potentially compromised where institutions are privately funded, and where institutions exchange ownership for vast sums of money by private equity interests seeking a return on investment (Di Lorenzo and Wells, 2019, McPherson et al., 1993). CM education institutions have not been exempted from these circumstances but currently there is very little known about the impacts.

1.7.3 Learning technologies in tertiary education

Learning technologies include the use of new tools and applications to teach and assess content, the delivery of content from learning management systems (LMS's), eReaders and eBooks, the storage and collation of data in content management systems, the use of technologies for synchronous and asynchronous delivery such as webinar tutorials, pre-recorded lectures delivered any time, any device, anywhere, and the use of direct face to camera video (Johnson L, 2011). The term 'learning technologies' include the application of technology for the enhancement of teaching, learning and assessment. Learning technologies includes computer-based learning and multimedia materials and the use of networks and communications systems to support learning. Learning technology clearly embraces a wide range of applications, some of which, in the past have been classified under various acronyms such (CAI, Computer Aided Instruction; CAL, Computer Aided Learning; CBL, Computer Based Learning; CBT, Computer Based Training, CAA, Computer Aided Assessment and CMC, Computer Mediated Communications) and include interchangeable terms such as e-learning, Elearning, digital technologies and educational technologies. In this research an attempt has been made to understand all of this activity and focus using the term ‘learning technologies’. An essential component of the study of learning technologies are the ease with which the learner can interact with the content. This is often referred to as the HCI, or Human-Computer Interface and so learning technologies also includes drills and practices, tutorials and simulations as well as communication tools (Childs et al., 2005).

In fast moving times, meaningful questions abound regarding the use of new technologies in the education sector and the possible implications for students, educators and institutions (Gros et al., 2012, Lister, 2014, Liu et al., 2010, Cornelius, 2014). Widespread research has been conducted into the impact on institutions students and academics by learning technologies (Selwyn and Facer, 2014, Johnson L, 2011, Fox-Turnbull and Snape, 2011, Halac and Cabuk, 2013, Rodriguez, 2012, Veletsianos and Kimmons, 2012) and significant research attention has been focused on the sociology, theory, pedagogy and andragogy of online learning (Greenfield et al., 2002, Liebenberg et al., 2012, Anderson and Dron, 2012). In particular, recent research has focused on faculty resistance to change, the digital divide between subsets of students and the digital divide between students and faculty (Parkes et al., 2015, Downing and Dyment, 2013, Ilgaz and Gülbahar, 2015, McKee and Tew, 2013, Black-Fuller et al., 2016). One recurring line of research is to understand how technological changes have ‘diminished and devalued’ the working lives of university faculty (Selwyn, 2016a). So routine are learning technologies in modern tertiary education now that they are often now normalised to educational researchers (Selwyn and Gorard, 2016). This notwithstanding, tertiary educational institutions are still observed to be striving to keep pace with the constant changes wrought by new technologies and the expectations and demands of digitally fluent students who have grown up immersed in digital culture and who are reliant on digital technology in ways that earlier generations were not (Losh, 2014, Selwyn, 2016a, Coelho et al., 2018).

1.8 Educating Complementary Medicine practitioners

These three, separate, dynamic, shifting and sometimes fluctuating streams - CM, technologies in practice and technologies in education interplay in CM educational settings. Even though the focus of the content taught at CM institutions is different in important ways from other fields, these educational settings are not immune from the same pressures, challenges and circumstances from all tertiary education environments. What is known is that there is a continued flux, growth and contraction in the CM education sector (Wardle et al., 2012). However given the size of the billion-dollar CM industry and despite high community use and the increasingly significant role CM practitioners appear to play in the Australian (Wardle et al., 2011) and US healthcare settings (Veziari et al., 2017), when it comes to how those practitioners are educated there is limited empirical research in this area (Gray et al., 2019b).

1.8.1 The Complementary Medicine global landscape: Professionalisation, standards and the breadth and diversity of educational offerings

The transformation of global education driven by learning technologies, and the transformation of health care due to practice technologies are among the various issues that contribute to the complex and environment underpinning contemporary CM practitioner education (Adams et al., 2012b). Upon this background of wider educational change and transformation CM educational provision takes place. The little that is known from the empirical data, grey literature or information found in the public domain paints a complex picture. At one end of the spectrum, the professionalization of the CM education sector appears to be evolving with continuing professional education, education standards, levels of foundational medical science and higher levels of qualifications emerging in recent years (McCabe, 2005, James and Murray, 2011, Wardle and Sarris, 2014, Daniel et al., 2011, Breakspear, 2013). A great deal of the existing grey CM literature has explored the challenges of implementing more formal educational conventions in an arena traditionally associated with a more relaxed approach to the education of future practitioners (Wardle et al., 2013c). But in the same way that individual systems of healing manifest differently in various settings, the education of

CM practitioners is far from homogeneous. In Australia for example, acupuncture is offered at undergraduate bachelor's (Health Science) or at master's level. Naturopathy, on the other hand is offered at diploma level 6 or 7 in New Zealand with government recognition and student funding, while a masters degree is offered in India, and a Naturopathic Doctor (ND) in the US by accredited institutions that are privately funded (The World Naturopathic Federation, 2021). Some educational providers offer TCM, while others offer education and training in just acupuncture – a modality of TCM. In a bewildering landscape of provision there are massage schools, but myotherapy degrees. Then there are unaccredited CM educational offerings to future students in innumerable modalities of CM. Further, there are a myriad of long and short courses for existing health professionals (Gray et al., 2019b). Even in an unregulated environment, as CM modalities mostly are, self-regulated professionals seek continuing professional education (CPE) or continuing professional development (CPD) units, credits or points each year. In the US and Australia these courses are generally taught by approved providers with the relevant professional association responsible for the accreditation or validation of schools providing CPD recognition of these courses (The World Naturopathic Federation, 2021).

1.8.2 Complementary Medicine education: the Australian landscape

In the Australian context there are small and large, both accredited and unaccredited providers of CM education. Institutions of CM continue to see rising student numbers (Wardle et al., 2012, Coulter, 2004, Myers et al., 2012) as demand for courses increase.

1.8.2.1 Different settings, changing programmes, expansion and contraction

Of the large CM institutions Endeavour College of Natural Health (a multi-campus institution formerly Australian College of Natural Medicine, ACNM), Southern School of Natural Therapies (SSNT) in Melbourne and Australasian College of Natural Therapies (ACNT) Sydney predominate. In addition, courses in CM are offered by Torrens University, RMIT University and the University of Western Sydney. These institutions teach an array of the larger and more popular CM therapies such as Naturopathy, Acupuncture and Nutritional Medicine. In recent decades as the broader impacts of educational changes already mentioned have hit home these schools have survived and, in some cases, flourished. Smaller schools have not managed as easily as the pressures of lower student numbers plus a changing and more rigorous tertiary education compliance culture and other pressures have seen diminishing student numbers, acquisitions or closures. Previously popular courses have also disappeared (western herbal medicine, homeopathy) and others emerged (myotherapy).

1.8.2.2 Student body

Very little is able to be asserted about the profiles of the student or academic body in CM education institutions in Australia currently. It is only recently that institutions are required to publish on their websites the basic demographics of their student body. There are now possibly two segments of attending student. Firstly, there are the traditional participants, CM users with pronounced opinions about conventional medicine who are also ‘wounded healers’ (Stockigt et al., 2015, Zerubavel and Wright, 2012). These learners have often had chronic ill-health, negative experiences within the conventional medicine system, have strong opinions about the systemisation of health, the conveyor belt approach in private and PH systems, and they are not strong proponents or advocates of EBM (Mills et al., 2002). But, there is data that possibly points to a younger CM student, with different attitudes, experiences and values (Steel, 2018). These students are possibly more forward-looking and science ready (Steel and Adams, 2011b, Dannenfeldt et al., 2009), identifying a clear gap in the wellness market (workplace wellness, holistic approaches to stress management, fitness, mind and body approaches, beauty and anti-aging) (Smith and Puczkó, 2015) and see a ripe billion-dollar industry ahead of them as the inevitability of an aging population strikes home in ailing PH systems worldwide.

1.8.2.3 Accreditation

Broadly speaking, at the top level, accreditation for institutions and programs is provided by the Tertiary Education Quality and Standards Agency (TEQSA) Australia's independent national quality assurance and regulatory agency for higher education. Content specific validation of institutions and courses is provided by professional associations such as the Chinese Medicine Registration Board (CMRB), Australian Register of Naturopaths and Herbalists (ARONAH) an independent register for naturopaths and herbalists, Australian Traditional Medicine Society (ATMS) or the Australian Natural Therapies Association (ANTA).

1.8.3 Complementary Medicine education: The US landscape

Similarly, in the US, the provision of professional level CM education is massively diverse. It is made more complex by the competing legislative priorities in each state. Medical Practice Acts define the practice of medicine (thus impacting the scope of CM practice) differently in various states and so one state may have innumerable acupuncturists, while the next state there are none. To add another layer of complexity, there is competing Safe Harbour and Freedom of Healthcare Choice legislation in a number of states (eg. MN, AZ, CO) which affects where practitioners work, what they call themselves, what is within their scope and where and how they are trained.

1.8.3.1 Settings, infrastructure, student body and faculty

Leading this varied field is acupuncture with up to 40,000 practitioners, 62 accredited schools which altogether offered 100 programs including 32 masters degrees in acupuncture, 53 master degrees in oriental medicine, 13 postgraduate doctorate degrees and 2 entry-level doctorate degrees (Fan et al., 2018). In some professions there are a surprising small number of schools. Naturopathy currently has 5 accredited naturopathic medical schools. The National University of Natural Medicine (NUNM) for example has undergone a long journey from its beginnings in the 1950's to university status today. It is the oldest accredited naturopathic medical university in North America and a leader in natural medicine education and evidence-based research (NUNM, 2017). Bastyr University similarly has undergone an evolution, formalisation and professionalisation process over the course of 40 years with now more than 20 degree programs and additional campuses and programs in Acupuncture, Exercise Science, Herbal Sciences, Human Biology, Midwifery, Naturopathic Medicine, Nutrition, Psychology and Public Health (Bastyr University, 2020).

Slightly more can be asserted about some programs and institutions in the US as they are required to publish admissions data. For example, NUNM has 153 fulltime, 25 part time and 69 on-call administration staff. When it comes to enrolment – in 2018, NUNM had a total of 564 students. Of these students 32 were undergraduates, 392 were in stand-alone graduate programs and 172 were enrolled concurrently in two graduate programs. Fifty-eight students were enrolled part-time (PT). PT enrolment has been ten percent or less since 2005. In 2018, 77% of students are female identified, 17% male, 6 % other. Student-teacher ratios are low.

Very little can be asserted about CM faculty in US educational institutions. There is some grey literature but only two empirical studies on the demographics or perceptions of academics. One peer-review study of homeopathy teachers in the US (Rowe, 2009) explored demographics and perceptions of their roles, homeopathy as a profession and their students. Another survey was published of acupuncture, chiropractic, and massage faculty and found that they lacked awareness of the capabilities of online education and the elements of good online learning, with firmly held perceptions of what they teach cannot be taught online because of its hands-on requirements. It was found that this faculty did not seem to separate the kinesthetic from the didactic, and held these perceptions in spite of the success of medical science and related health care fields in the online environment (Schwartz, 2010).

1.8.3.2 Accreditation

In North America the accreditation of programmes and institutions is markedly different to Australia with the USED essentially outsourcing accreditation activities to expert bodies. Quality assurance in CM educational settings is provided by industry professionals with educational backgrounds and skills. In turn those accrediting bodies are themselves overseen and accredited by the USED. The accreditation model draws upon experts within the industry, and because these professions are often small, the self-regulation focus means that conflicts of interest are a feature and in fact embedded, expected and managed within the educational accreditation culture. Examples are

Accreditation Commission for Homeopathy Education in North America (ACHENA) or the Council on Naturopathic Medical Education (CNME) and it is bodies such as these that formally accredit CM educational providers and courses.

1.9 Tensions and challenges in contemporary Complementary Medicine education

These education institutions, large and small, formal and informal, face innumerable challenges. At the very least, these include preparing CM graduates to function as health professionals in a variety of health systems sharing clients with conventional practitioners when they apply predominantly traditional principles and concepts (Hollenberg, 2006, Bishop and Lewith, 2010). Equally challenging is training students in inter-professional care when the focus during CM training is often on mastering and applying traditional technique, theory or philosophy (DiMaria-Ghalili et al., 2014). Further challenges involve providing education about evidence-based healthcare (in a field that is often criticized for 'having no evidence' when in fact there are ~700 Cochrane systematic reviews) when the focus during training is often on learning and applying traditional evidence (Greenhalgh et al., 2014, McCabe, 2008, Wardle, 2010a, Wardle et al., 2012, Mills et al., 2002, Wardle, 2010b, Steel et al., 2015, Breakspear, 2013). These tensions exist in the background at the same time as CM institutions are providing education on patient-centred care (Kitson et al., 2013), supporting non-traditional students (Hall et al., 2016, Brändle, 2016) and attempting to gain funding for and providing education related to perceived non-credible CM modalities in conventional tertiary education settings are challenges (Brosnan and Turner, 2009). These challenges only actually represent the immediate demands for education leaders within CM. The new developments in healthcare such as e-health and tele-health (Pathipati et al., 2016) and a growth in interest in the pedagogy and andragogy of online learning (Liebenberg et al., 2012, Anderson and Dron, 2012) in general, present challenges for educational institutions, professional associations, accrediting bodies and regulators as tertiary students are increasingly engaging with technology in both their personal and study lives (Lefoe et al., 2009, Phillips et al., 2013) and technology-based learning and teaching in higher education is now almost an assumed proposition in many undergraduate courses (Gros et al., 2012, Lister, 2014, Ensminger et al., 2004, Adams and Demaiter, 2008, Cornelius, 2014). CM education is not exempt from these circumstances and given that there appear to be significant research gaps there is a necessity for future research on this topic given the size of the billion-dollar CM industry (Smith and Puczkó, 2015).

1.10 The wider significance of the Complementary Medicine education research gap and the wider significance and scope of this thesis

To add to the complex background, currently the research in the CM educations field appears to be dominated by grey literature, with few meagre reviews and empirical data. The public continues to interface with CM practitioners who come from diverse educational backgrounds, but little is known about them. The growing CM workforce requires relevant training appropriate to performing evidence-informed, coordinated and inter-professional care within the broader health system. The development of a robust evidence-base on this subject requires a clear understanding of the current landscape. Current evidence suggests there is continuous development in the provision of education in CM but high-quality data exploring the drivers and impacts of this use appears to be lacking. In particular, little is known about the factors influencing the role of commercial drivers in CM education and how this might relate to the issue of safety associated with CM. There is a case for a deeper and wider strategy, starting with a literature review, to research this field and highlight the need to explore the challenges and tensions for students, academics and leadership. Important gaps remain and possessing broader knowledge on the topic could have an impact in overall institutional strategy, curriculum design, employment status, resource allocation, infrastructure and operational imperatives for CM leaders. Developing the evidence-base on this topic will not only aid the CM field but also provide potential insights for health/medical education more broadly (Baker, 2014). Insights from such an understanding will be able to inform policy development, improve educational outcomes, inform decision makers with hard data, foster the adoption of technologies and have deeply pragmatic application. In doing so educational outcomes for students, academics, school and ultimately health outcomes for the public who chose to be treated by these health care professionals may improve.

1.11 The focus of this study - learning technologies in Complementary Medicine education

The current knowledge gap in relation to CM and education is too wide and the number of questions too broad to answer them all in one contained thesis. At the outset of this study, a decision was taken to focus on one particular important area. Very little is known about technology use in CM and almost nothing in about technology use in CM education. While learning technologies are becoming ubiquitous in education (Johnson et al., 2010, Johnson L, 2011, Johnson L, 2012a, Johnson et al., 2014) currently it is not known how the two worlds of technology and CM, changing learning technologies and student, academic or leadership perceptions intersect in contemporary CM education. It is also unclear what the consequences of new technologies will be for CM students, the CM professions, the CM educators or for PH in general (World Health Organization, 2018). Simply, the growing impact of electronic, online and mobile learning and learning technology in CM is under-researched (Baker, 2014).

1.12 The need to research the education of future practitioners of Complementary Medicine in the context of Health Services Research

The essential tools offered by HSR when investigating CM can assist in addressing research gaps in the evidence for CM education. There is very occasional coverage of research in CM education and interest in the training of future practitioners has not been seen as necessary or beneficial to research in the HSR context until recent times. The substantive area of CM education, and the role of digital technologies be they clinically or educationally applied deserve critical rigorous investigation. Within the context of current peer-reviewed publications which report either peer-reviewed clinical research or grey-literature one-sided viewpoints regarding CM, this thesis responds to this need and provides a systematic approach to exploring the education of future practitioners of CM using well recognised research methods. It therefore, takes a non-partisan HSR approach to specific areas of research education in CM that impacts ultimately on broader issues of health outcomes, health care behaviours and health service utilisation.

1.13 Conclusion

The importance of this investigation into CM education and technologies is clear and the time for it is right. CM is a complex and cluttered field of study. The definitions of the therapies and systems within CM are irregular. What is known is that there is vast economic activity in this field. The global CM sector is expected to generate a revenue of USD 210.81 billion by 2026 (Grand View Research, 2019). In Australia for example, industry revenue generated is already an estimated $4.6 billion in 2017–18 (NICM, 2020). Yet despite this economic activity, high levels of public use by the Australian public, and being acknowledged as a major health issue in successive NHMRC Strategic Plans (NICM, 2020) the Australian Government support for CM research is minimal with NHMRC funding for CM approximately 0.2 per cent of total funding from 2003-2012. Meanwhile, in parallel, the field of healthcare is transforming – driven in part by the presence and implementation of digital technologies. Similarly, the field of education is transforming also partially due to the implementation of learning technologies. This intersection of healthcare, education and technologies is the topic of this research project. When it comes to the education of CM practitioners there is barely any research at even the most basic level. At the minimum, more is needed to be known about the institutions themselves. There is a necessity to explore the values, attitudes, perceptions and experiences of technology by faculty, students and leadership alike. Concomitant to answering these questions, there is an imperative to explore the impacts of learning technologies on individual institutions, and the sector as a whole. This study is a dual international portal into the current use of technology at two important CM education institutions, with a view to begin an important process to understand how the converging flows of technology and education meet in the specific field of CM. This study seeks to gather data and report on findings which are important for CM educational institutions seeking to deliver education which is relevant to individuals practising CM in a modern health system. While the data presented will be preliminary in nature, the absence of any other substantive research in the topic of learning technology within CM practitioner training programs ensures the value of the study for professional leaders and educators.

1.14 Chapter summary

In keeping with the recognition that despite a diversity of approach and methodology, the CM research field has too long focused on designs and models that are removed from the grass-roots reality of health care delivery and consumption. This work on CM education with a particular emphasis on learning technologies is part of a necessary and timely refocus of CM research outputs within an HSR context. This is in order to ensure that research continues to meet the challenges and concerns around CM efficacy but now also supplements and realigns its outputs with a much broader and more nuanced research focus.

Chapter 2 - Literature Review

2.1 Chapter introduction

In order to fully examine the prevalence, impacts, experiences and perceptions of learning and health technologies on students, academics and educational leaders in CM education institutions in the training of health professionals some context and the current evidence describing CM educational research is necessary is required. This research needs to fit within the landscape of existing research and as such a systematic review was conducted to identify all published CM education research.

2.1.2 Publication of results

The results contained within this chapter have been published as follows: *Gray A, Steel A, Adams J. (2019) A critical integrative review of complementary medicine education research: Key issues and empirical gaps.* BMC Complementary and Alternative Medicine https://doi.org/10.1186/s12906-019-2466-z. A copy of the manuscript is attached to this thesis as Appendix I.

2.2 Background

The practice, uptake and economics of Complementary Medicine (CM) - a range of therapies, products and approaches to health and illness not traditionally associated with the medical profession or medical curriculum (Clarke et al., 2015) - continues to thrive in many countries (Nguyen et al., 2011, Barnes et al., 2008, Burke et al., 2013, Harris et al., 2012, Frass et al., 2012, Reid et al., 2016b) and concurrently the enrolments at CM education institutions have steadily increased (Wardle et al., 2012, Myers et al., 2012). CM education institutions providing training and qualifications including naturopathy, nutritional medicine, homeopathy, acupuncture, massage therapy and herbal medicine are located across both the public and private tertiary sector in many regions, Australia (ECNH, 2017), US (NUNM, 2017), UK (CNM, 2017), Asia (SCM-HKU, 2017). The professionalization of the CM education sector appears to be evolving with continuing professional education, education standards, levels of foundational medical science and higher levels of qualifications emerging in recent years (McCabe, 2005, Breakspear, 2013, James and Murray, 2011, Wardle and Sarris, 2014, Daniel et al., 2011).

These education institutions face innumerable challenges. These include preparing CM graduates to function as health professionals in a contemporary health system when they apply predominantly traditional principles and concepts (Hollenberg, 2006, Bishop, 2012,), training students in inter-professional care when the focus during training is often on mastering a traditional technique or philosophy (DiMaria-Ghalili et al., 2014), EBM when the focus during training is often on learning traditional evidence (Greenhalgh et al., 2014) patient-centred care (Kitson et al., 2013) as well as supporting students and especially non-traditional students (Hall et al., 2016, Brändle, 2016). Challenges continue to arise for education leaders both within and beyond CM regarding technological advances and the consequences for students, educators and institutions (Gros et al., 2012, Lister, 2014, Cornelius, 2014). New developments in healthcare such as e-health/tele-health (Pathipati et al., 2016) and a growth in interest in the pedagogy and andragogy of online learning (Liebenberg et al., 2012, Anderson and Dron, 2012) in general, present challenges for educational institutions, professional associations and regulators. Alongside these general educational challenges, faculty resistance to change, the digital divide between students, and between students and faculty, and online readiness for study has been a focus of recent research and discourse in health education (Parkes et al., 2015, Downing and Dyment, 2013, McKee and Tew, 2013, Black-Fuller et al., 2016). More broadly, beyond CM-specific education, tertiary students are increasingly engaging with technology in both their personal and study lives (Lefoe et al., 2009, Phillips et al., 2013) and technology-based learning and teaching in higher education is becoming almost a presumed proposition in many undergraduate courses (Ensminger et al., 2004, Adams and Demaiter, 2008). Moreover, higher education is experiencing major change as a consequence of learning technologies, Massive Open Online Courses (MOOCs), flipped classrooms, constructivist education theories and the implementation of problem-based learning (Rodriguez, 2012, Veletsianos and Kimmons, 2012, Halac and Cabuk, 2013, Johnson and Adams, 2011, Johnson L, 2012b, Jones et al., 2011). CM education is not exempt from such circumstances and there is a necessity for future research on this topic.

In direct contrast to research related to CM practitioner education, there are numerous studies investigating the degree of, and attitudes to CM education in conventional medical training (Loh et al., 2013, Kim do et al., 2012, Sansgiry et al., 2012), in biomedical education (Broom and Adams, 2009), midwifery (Adams, 2006) and in nursing training (Adams and Broom, 2009, Adams and Tovey, 2014, Buchan et al., 2012, Lindquist et al., 2013, Adams and Tovey, 2001). Paradoxically, much of the research into CM education relates to its importance and application in nursing education (Helms, 2006), or the experience of integrating naturopathy into nursing educational programs (McCabe, 2001), the education of physicians about their patients and CM (Templeman et al., 2015), or addressing the obstacles to success in the implementing of change in science delivery in nursing (Dannenfeldt et al., 2009).

The growing CM workforce requires training appropriate to performing evidence-based, co-ordinated and inter-professional care within the broader health system and developing the evidence-base on this topic will not only aid the CM field but also provide potential insights for health/medical education more broadly (Baker, 2014). The development of a robust evidence-base on this topic requires a clear understanding of the current landscape. Unfortunately, there has been no critical review of the peer-reviewed research examining CM education to date. In direct response to this important research gap, this paper reports the first critical review of contemporary literature examining a number of key issues across the CM education field.

2.3 Methodology

A database search was undertaken to identify original peer-reviewed literature published from 2005 to 2017 reporting on issues relating to CM education. This date range was chosen to reflect contemporary issues and ensure findings were as pertinent to current practice and policy as possible.

2.3.1 Search Strategy

The search was conducted in May 2017 and included the systematic search of PubMed and EBSCO (CINAHL, MEDLINE, AMED). The search terms embracing CM included, *Complementary Therapies, Complementary Medicine, Homeopathy, Naturopathy, Herbal Medicine, Acupuncture, Acupuncture Therapy, Medicine, Chinese Traditional, Massage, Therapy, Soft Tissue, Integrative Medicine, Medicine, Traditional, Holistic Health, Osteopathic Medicine, Manipulation, Chiropractic, Musculoskeletal Manipulations, Physical Therapy Modalities.* The search terms embracing education included, *education*, *learning, curriculum, teaching, health occupation students, eLearning, E-Learning, online learning, educational technologies, blended learning.* Manual searching of reference lists of identified papers was also conducted to ensure as full coverage of literature as possible. MESH terms and keywords from related papers were explored to guide the process of selecting search terms, and the process was further refined after referral to a related 2014 review (Milanese et al., 2014). The process is outlined in *Figure* 1.

Figure 1 *Full Search Protocol 2005-2017 Conducted May 2017*

Stage 1 in PubMed

A - The search terms embracing CM included, Complementary Therapies, Complementary Medicine, Homeopathy, Naturopathy, Herbal Medicine, Acupuncture, Acupuncture Therapy, Medicine, Chinese Traditional, Massage, Therapy, Soft Tissue, Integrative Medicine, Medicine, Traditional, Holistic Health, Osteopathic Medicine, Manipulation, Chiropractic, Musculoskeletal Manipulations, Physical Therapy Modalities. Filter 2005-2017. (**n = 258099).**

B - The search terms embracing education included, education, learning, curriculum, teaching, health occupation students, eLearning, E-Learning, online learning, educational technologies, blended learning. Filter 2005-2017. (**n = 906575).**

A+B Combined (*n = 38441).*

Stage 2 in EBSCO

The same search terms used in PubMed when entered into EBSCO provided millions of hits, education (n = 160+M) hits, Complementary Therapies (n= 629674) hits and too many potential papers to work. Including 'eLearning' and 'e-learning' was manageable but these two terms with 'learning technologies' made it impossible to proceed. In the process, a review was located which had used similar terms but a different strategy, Milanes 2014 systematic review, *Is a blended learning approach effective for learning in allied health clinicians?* Because of the enormous number of hits using the EBSCO database, and based on this article a revised search method was undertaken for the EBSCO search.

C - EBSCO Search terms

1. Online learning OR blended learning or web-based learning
2. e-learning OR elearning
3. education* OR curriculum* OR teaching* OR learn*
4. Combine all (1-3) with AND
5. **Complementary Therapies***
6. Search 4 AND 5 (n=637)

7 Limit to articles from 2005 **(n = 567 (with duplicates removed))**

D - This process was completed again searching on the slightly different terminology.

Search terms

1. Online learning OR blended learning or web-based learning
2. e-learning OR elearning
3. education* OR curriculum* OR teaching* OR learn*
4. Combine all (1-3) with AND
5. **Complementary Medicine***

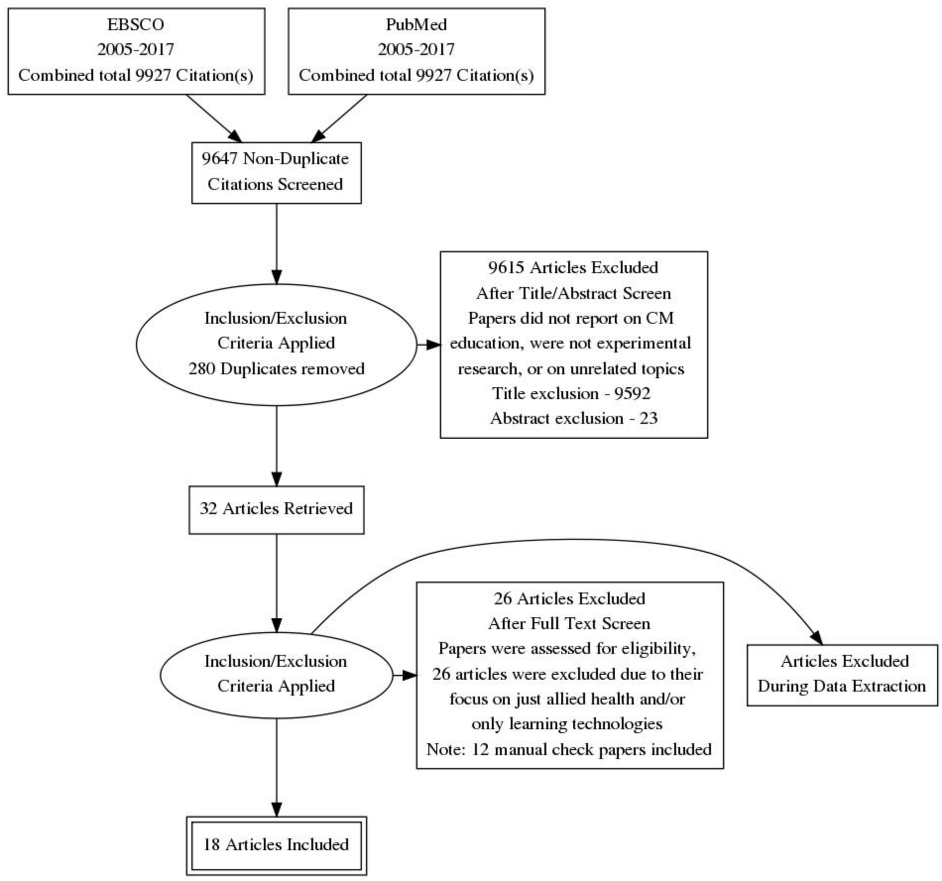
2.3.2 Inclusion and Exclusion Criteria

Papers written in English, presenting original empirical research data, and reporting on the prevalence or nature of the education of CM practitioners in some way were included in the review. Papers reporting conference presentations, or studies on the education of physicians regarding their patients and CM were excluded.

2.3.3 Search outcomes

The combined (Complementary Therapies n=420476 and Education n=102024) search results **(n=9927)** were imported into Endnote. Of these, 9895 papers were excluded via title and abstract due to not meeting the inclusion criteria, and all identified duplicates (n=280) were excluded leaving 32 papers. Upon reviewing full papers an additional 26 articles were excluded due to their focus on just allied health and / or only learning technologies with no CM focus; leaving 6 papers. A total of 12 additional papers were identified for review following manual searches. In total, 18 papers were identified for this review. The process undertaken for this review is presented in *Figure 2*.

Figure 2: *Literature Review Methodology and Selection Process flowchart for articles reporting education and CM (PRISMA Guidelines)*



2.3.4 Critical analysis of included papers

Our critical literature appraisal employed three analytical tools, STROBE, SRQR and MMAT, papers were evaluated for quality and the findings are collated in *Table 1, 2 and 3*.

Table 1: ***Collated Results of Paper Appraisal using STROBE Critical Appraisal Tool for Quantitative Studies***

Study	*Title Abstract and Introduction*			*Methods*								*Results*					*Discussion and other information*					*Score /22*
	Title Abstract	Background	Objectives	Study design	Setting	Participants	Variables	Data sources	Bias	Study size	Quantitative Variables	Statistical Methods	Participants	Descriptive data	Outcome data	Main results	Other analyses	Key results	Limitations	Interpretation	Geralisability	Funding	Score Out of 22
Forman, L., et al. 2006	x	x	x	x	x	x	x	x		x		x	x	x	x	x		x	x	x			17
Grace, S., et al. 2006	x	x	x	x	x	x	x	x		x		x	x	x	x	x		x	x	x			17
McCabe, P., 2008	x	x		x	x	x	x	x		x			x	x	x	x		x		x			15
Rowe T 2009	x	x		x	x	x	x	x	x	x			x	x	x	x	x	x	x	x	x		18
Steel, A., et al. 2015	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			20
Viksveen, P., 2011	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x		x	x	x	x		19

Table 2: ***Collated Results of Paper Appraisal using SRQR Critical Appraisal Tool for Qualitative Studies***

Study	*Title & Abstract*	*Introduction*			*Methods*											*Discussion*				*Other*		*Score /21*
	Title Abstract	Background	Problem Formation	Purpose of the research question	Qualitative approach and research paradigm	Researcher characteristic and reflexivity	Context	Sampling strategy	Ethics pertaining to	Data collection methods	Collection instruments	Units of study	Data processing	Data analysis	Techniques to ensure trustworthiness	Synthesis and interpretation	Links to empirical data	Integration with prior work, transferability	Limitations	Conflict of interest	Funding	Score Out of 21
Chen, Y., et al. 2015	x	x	x	x	x		x	x	x			x	x	x		x	x	x		x		15
Grant, A., et al. 2012	x	x	x	x	x		x	x	x	x		x	x	x		x	x	x				15
Viksveen, P., et al. 2015	x	x	x	x	x		x	x	x	x		x	x	x		x	x	x	x			16
Wardle, J., et al. 2013	x	x	x	x			x	x	x	x		x	x	x		x	x	x	x	x		16
Wardle, J. and Sarris, J., 2014	x	x	x	x			x	x		x		x	x	x		x	x	x	x	x	x	16

Table 3: ***Collated Results of Paper Appraisal using MMAP Critical Appraisal Tool for Mixed Methods Studies***

Study	*1. QUAL study or QUAL component of an MM study*				*2. QUAN randomized controlled trial or component of an MM study*				*3. QUAN nonrandomized study (comparison group) or component of an MM study*				*4. Descriptive QUAN study (no comparison group) or component of an MM study*				*5. MM component of an MM study*			
	Sources of data relevant to answer the research question	Data analysis relevant to answer the question	Context taken into account in data analysis	Reflexivity of researchers (their influence on findings)	Appropriate randomization (or sequence generation)	Concealment allocation (or blinding)	Complete outcome data	Low dropout rate	Recruitment minimizing bias	Appropriate measurement (validated or standard)	Similar participants in groups (or differences analyzed)	Complete data, high response rate, and appropriate follow-up	Sampling appropriate to answer the research question	Sample representative of the population	Appropriate measurement (validated or standard)	Complete data and high response rate	MM design relevant to answer the research questions	Integration of QUAL and QUAN data and/or results	Consideration of limitations associated with this integration	Score out of 19
Frenkel, M., et al. 2007	x		x									x	x	x				x		6
Grace, S., et al. 2007	x		x				x	x		x	x	x	x	x	x			x		11
Joshi, H., et al. 2013	x		x		x				x	x	x		x		x			x		9
Long, C., et al. 2014	x		x		x		x	x	x				x	x	x	x		x		11
Schwartz, J., 2010	x	x	x		x		x		x	x	x	x	x				x	x		12
Toupin April, K., et al. 2013	x		x		x		x		x	x	x	x	x				x	x	x	12
Zwickey H et al. 2014	x	x	x		x		x	x	x	x	x	x	x	x	x	x	x	x	x	17

2.4 Results

Eighteen papers met the review inclusion criteria. An overall synopsis of all papers included in the review incorporated preliminary categorical analysis is outlined in *Table 2*. The identified studies were conducted in Australia (n=7), the US (n=5), Norway (n=2) and one each from Canada, Taiwan, Israel and India. The research designs reported in the reviewed literature varied widely with quantitative, qualitative and mixed methodologies reported. The quantitative studies selected for review utilized a number of survey design approaches and attracted samples of between 10 and 246 individual participants. The qualitative studies identified employed survey methods [1,2,8, 9,10,11,12,13,14,18] as well as interviews [1,6,11,15,15,16], open essays [2] and focus groups [17]. The spread, focus and identification of themes and topics by CM therapy is represented in *Table 2*. The naturopathic profession has received most attention from researchers within the international CM education landscape, followed by acupuncture. There are three studies on homeopathy, two studies of chiropractic, and one each of osteopathy, herbal medicine, ayurveda and massage. Six of the included studies focus on a specific class inside of a CM college [1,2,3,4,7,17], four on academics in CM institutions [6,12,12,16], four studies surveyed members of professional associations [5,10,10,17], and four surveyed College directors [8,9,13,18]. Thematic categorization of the included papers identified four substantive topic areas: CM education provision, the development of educational competencies to develop clinical skills and standards, the application of new educational theory, methods and technology in CM, and future challenges facing CM education.

2.4.1 Complementary Medicine education provision

The review identified three papers that reported a simple description of educational provision in an area of CM. One study compared naturopathy and chiropractic curricula in Australia. Course structures and subject unit descriptions for accredited naturopathic courses were examined from websites where they existed and, in some instances, short follow-up interviews were conducted. This study reported the percentage of curriculum devoted to medical sciences and clinical training whereby it was found that on average, chiropractic courses allocated 45.9% of their curricula to medical sciences, whereas university-based naturopathy courses allocated 26.2% to medical science and nonuniversity naturopathy courses allocated 23.1% (Grace et al., 2007). Another study reported on the scope of education provision in homeopathy and examined the preponderance of accredited FT and PT courses and accredited and non-accredited courses in Europe. This cross-sectional survey of 85 homeopathy education providers found an average of 47 enrolled students and 142 graduates in theses generally small schools. Course duration lasted on average 3.6 years PT, less than half had entry requirements, or provided any medical science education or required students to obtain medical science skills elsewhere. Average teaching hours at surveyed schools were 992 overall, with 555 hours devoted to didactic homeopathy study, the rest on clinical training (Viksveen and Steinsbekk, 2011). A similar 2009 study focused on the demographics, satisfaction, challenges and expectations of homeopathic students, teachers and school administrators in North America. It was found that there were 29 homeopathic schools, 250 homeopathic teachers and 1080 homeopathic students currently enrolled in the United States. Programs varied considerably in length; however, the average program (670 hours) was barely sufficient to meet the minimum standards for homeopathic certification. Homeopathic teachers tend to be older than either homeopathic students or homeopathic practitioners. The average age is 54.3 years old. Although the vast majority of students are female (90%) and practitioners are female, (75%), males are much more common as teachers (43.5%) and school directors (45%). As with homeopathic students, practitioners, and teachers, homeopathic school directors are nearly all Caucasian (85%). Homeopathic education in the US has largely remained stagnant in the last ten years. Although many new schools have been formed, many have closed. The study consisted of three separate surveys targeted at homeopathic students, faculty and school directors consisting of 40 questions with a 91.5% completion rate (Rowe, 2009).

2.4.2 The development of educational competencies to develop clinical skills and standards

Eight papers from the review focused on improving education and clinical skills in CM. One study reporting on findings from 43 education providers of naturopathy and western herbal medicine in Australia found educational standards varied widely, including unsustainable variations in award types, contact hours, clinical education, length of courses and course content with some practitioners unlikely to be trained to professional standards. This study found a need for better integration of complementary care with mainstream healthcare necessitating education to rise to the level of a bachelor degree (McCabe, 2008). The development or application of learning competencies was a focus of these eight papers. Competencies and competency models refer to how the knowledge, skills, and abilities required by these standards are structured. In a study focussing on the skills, knowledge, attributes and competencies of homeopaths and homeopathy education provision, telephone interviews with 17 educators from different schools in 10 European countries were conducted (Viksveen et al., 2012). This qualitative study used constant/simultaneous comparison and analysis to develop categories and properties of educational needs and theoretical constructs and to describe behaviour and social processes and showed educators define a competent homeopath as a professional able to help patients in the best way possible. It was found that course providers and teachers required the competency to be student-centred, and students and homeopaths to be patient-centred (Viksveen et al., 2012). In an Australian study, CM practitioners were reported as having a low level of confidence in identifying clients requiring referral to registered health practitioners, despite the reported high frequency of educational training in, and use of, Western and CM diagnostic techniques (Grace et al., 2006).

Two identified papers focused on teaching aspects of practitioner communication skills and the integration of complementary and conventional medicine in CM schools. Using a pre-course 'semi-structured questionnaire' plus surveys after an educational intervention, 62 students in Israel reported on how the communication gap with conventional physicians and CM practitioners could be improved (Frenkel et al., 2007). This study found that CM practitioners perceived themselves as better equipped to communicate with conventional health care practitioners when critical thinking, patient-centred care, and communicating skills were emphasized in their course of undergraduate study (Frenkel et al., 2007). In addition, a Canadian study published findings derived from 28 directors of colleges of CM. The author reported that student's ability to understand research findings, to rely on high quality research and to engage in continuing education was important in communicating with conventional care providers (Toupin, 2013).

Meanwhile, the need for schools to adopt research literacy and evidence-based practice (Perosky et al.) competencies was the focus of three papers. One study that examined the attitudes towards research and scholarly activity of 202 faculty academics in an Australian

CM college reported low confidence in undertaking research (Steel et al., 2015). Respondents in this Australian study perceived research as important to their personal professional goals (86.0%) although confidence in being able to undertake research was less common (56.5%). The perceived importance of publication of research to the respondents' personal professional goals was also notably high (80.0%) although confidence in their own ability to produce research publications was lower (52.9%) (Steel et al., 2015). Another study conducted in the US examined the approaches of 9 CM colleges to develop evidence-informed skills and knowledge with the aim of developing both students and faculty to critically appraise evidence and then employ that evidence to guide clinical practice (Zwickey et al., 2014). This study found that in developing the framework for their educational programs, educational institutions used strategies that were viewed as critical for success, including making them multifaceted and unique to their specific institutional needs. It was found that these strategies, in conjunction with existing instructional approaches, were of practical use in other CM and non-CM academic environments where administrators were considering the introduction of research literacy and EBP (Perosky et al.) competencies into their curricula. Training programs and workshops were found to be the most useful way to train faculty in EBM and research literacy (Long et al., 2014). Finally, one reviewed paper reported on the educational competencies and institutional teaching strategies that had been developed and implemented to enhance research literacy at all nine R25-funded CM institutions in the US (Zwickey et al., 2014). This study found that while each institution designed approaches suitable for its own research culture, the guiding principles were similar across all, and the need to develop evidence-informed skills and knowledge was important to help students and faculty to critically appraise evidence and then use that evidence to guide their clinical practice. The strategies adopted by these institutions included a need for course content to be conducive to reinforcing EBM competencies using spiral learning strategies, and that faculty were willing to learn and teach EBM skills (Zwickey et al., 2014).

2.4.3 Application of new educational theory, methods and technology in Complementary Medicine

The changing role of the trainer/lecturer in didactic and clinical subjects, as well as the application of new educational theory and problem-based learning within the context of CM curricula in bachelor and medical college programs, and the growing use of learning technologies was highlighted by six papers included in the review. In one study three educational interventions testing new teaching methods were introduced in an ayurveda program (Joshi et al., 2013). The instructional methods that were evaluated were an integrative module on cardiovascular physiology, case-stimulated learning and classroom small group discussion with findings showing the development of testable integrative teaching methods is possible in the context of ayurveda education (Joshi et al., 2013). In contrast, findings from an educational intervention, the implementation of a new objective structured clinical examination model as well as a patient-centred training approach within TCM practitioner education in one Taiwanese medical school, found this new examination approach effective in evaluating, teaching, and certifying TCM clinical competencies to improve the quality of TCM practices. In this study the training program subjects included TCM internal medicine, TCM gynaecology, TCM paediatrics, TCM dietetics, acupuncture, TCM orthopaedics, and traumatology (Chen et al., 2015).

When it comes to resources and the use of technologies, Wardle's 2014 study used focus groups with current and recent students of 4-year naturopathic degree programs in Australia to ascertain how they interact with clinical teaching materials, and their perceptions and attitudes towards teaching materials in naturopathic education. This study described a desire among naturopathy students for existing curriculum to focus on evidence-based approaches and information that both supported and was critical of traditional naturopathic practices. These students remained largely ambivalent about new teaching technologies and preferred that these develop organically as an evolution from printed materials, rather than depart dramatically and radically from these previously established materials (Wardle and Sarris, 2014). CM students' preferred learning methods are often based on levels of computer skills and experience, their current use of computers as an educational tool, and attitudes regarding the role of computers in medical education according to a cross sectional survey study from a 27-item questionnaire distributed to 1-4-year Osteopathic medical students in the US (Forman and Pomerantz, 2006). One ethnographic study based on interviews conducted in the Australian university system with Naturopathic Faculty found an openness to the utilization of a number of technologies for flexible learning, including wikis, podcasts and synchronous audio-based online interactions (Grant and O'Reilly, 2012). In contrast, another study in the US found acupuncture, chiropractic, and massage therapy faculty lacked awareness of the capabilities of online education and the elements of good online learning and described a perception that what they taught could not be taught online because of its hands-on kinaesthetic requirements such as palpation (Schwartz, 2010).

2.4.4 Future challenges facing Complementary Medicine education

Lastly, one paper included in our review identified some of the challenges ahead for the Australian naturopathic profession including naturopathic education, the changing student body in naturopathic education, naturopathic student expectations, and the growing tension between traditional and scientific evidence (Wardle et al., 2013b). This study, involving semi-structured interviews with 20 naturopaths, found that participants articulated a paradox whereby on the one hand, they supported the teaching of increased levels of biomedical sciences in naturopathic education, yet also complained of the trend of contemporary naturopathic education to "become more scientific" – a trend they attributed to their desire for the discipline to be "accepted in the university sector". The participants claimed that such a development would be undertaken at the expense of the philosophical underpinnings of the profession. The authors found the continued development of minimum standards of practice and education that value traditional naturopathic principles and philosophies in tandem with the development of appropriate regulatory regimes, was vital in ensuring continued ethical and effective clinical practice (Wardle et al., 2013b).

Table 4: Study Characteristics of Included Studies and Thematic Categories (1 CM education provision, 2 The development of educational competencies to develop clinical skills and standards, 3 Application of new educational theory, methods and technology in CM, 3 Future Challenges facing CM education)

	Author / Year	Country	Methods	Data source	Participant recruitment	Key Results / Outcomes reported	Group 1 2 3 4
1	Chen, Y., et al. 2015	Taiwan	Qualitative. Cross sectional survey. Free form open answers and interviews	Trainees' survey data were extracted from post-OSCE questionnaires and interviews	Five TCM OSCEs were administered, and the educational backgrounds of the 37 participants were analyzed.	OSCEs can be used in evaluating, teaching, and certifying TCM clinical competencies to improve the quality of TCM practices.	3
2	Forman, L., et al. 2006	USA	Quantitative. Cross sectional survey	A 27-item questionnaire was distributed to first-through fourth-year osteopathic medical students. Preferred learning methods, current use of computers as an educational tool, and attitudes regarding the role of computers in medical education based on their skill level were evaluated.	246 students (80% of enrolled students) responded to the questionnaire.	Participants in the study were full-time students in the first through fourth years of osteopathic medical school. Students' opinions of the importance of computer technology in their education is based mainly on their self-assessed technical competency levels. Understanding this dynamic may aid medical educators in the implementation of computer-assisted instruction.	3
3	Frenkel, M., et al. 2007	Israel	Mixed methods. Observational cross-sectional survey.	Pre-course semi-structured questionnaire and an anonymous open essay about students' experiences with an educational intervention in their final year of study, emphasizing evidence-based learning, patient-centred care, and communication skills with conventional health care providers during 4 academic years, 2001–2005.	62 students were exposed to the educational initiative in integrative medicine to CAM students	CAM practitioners feel better equipped to communicate with conventional health care practitioners after exposure to a structured educational initiative that emphasizes critical thinking, patient-centred care, and communication skills with conventional practitioners.	2

4	Grace, S., et al. 2006	Australia	Quantitative. Observational cross-sectional survey.	45-item questionnaire mailed to members of the Australian Natural Therapists' Association and the Australian Traditional Medicine Society.	617 responses (22%)	A significant relationship exists between the confidence practitioners had in identifying clients requiring referral and their training in Western medical and CM diagnostic techniques. 32% of respondents reported a lack of confidence in identifying patients requiring referral with the potential to compromise the safety of clients and the effectiveness of practice.	2
5	Grace, S., et al. 2007	Australia	Mixed Methods. Survey Analysis and Interview	The aim of this study was to compare two CAM curricula: chiropractic and naturopathy. Accredited naturopathy and chiropractic programs in Australia were located. Key learning areas and approaches to clinical training were identified and compared. Course structures and subject/unit descriptions for accredited naturopathic courses were examined via websites where they existed. In addition, Course Co-ordinators, Directors of Study or other appropriate academics/persons from each naturopathic training institution were invited to take part in a short interview (telephone or email) to clarify subject content and course structure and give details of clinical training.	The study found 30 naturopathy courses that conformed to the requirements of either DEST or professional associations. Detailed curricula were available for 17 programs. Interviews, either by telephone or email, were conducted with representatives of 12 training institutions	Chiropractic registration guarantees a uniform level of training for all practitioners. This training was found to comply with accreditation board requirements. The naturopathy courses in the study had elected to comply with the requirements for state government and professional association accreditation, and a level of uniformity was evident amongst the various courses. It is pertinent to note that although both groups of practitioners are entitled to practise as primary contact practitioners, chiropractors and naturopaths had markedly different focuses on medical science training. A review of naturopathy curricula is warranted in the context of uniformity of training for primary contact practitioners.	1
6	Grant, A., et al. 2012	Australia	Qualitative. Ethno-qualitative research using an ethnographic methodology.	Interviews conducted with ten naturopathy lecturers to investigate reflective approaches to decision making and pedagogy. The scholarly reflections of academic lecturers who taught in the naturopathy program were gathered using interviews and reflective prompts. The approach to the collection and interpretation	Ten individual interviews with key academic lecturers from the disciplinary grouping of Natural and Complementary Medicine (NCM) were undertaken in 2009. Interviews were arranged by email, and semi-structured interviews conducted.	All the naturopathy lecturers interviewed expressed that they had gone through significant changes in their teaching practice as a result of the changes in delivery for the subjects and their exposure to a more involved educational system. This reflective process impacted upon their academic practice as they underwent a process of professional upheaval and reshaping of professional practice.	3

				of data for this investigation was constructivist in epistemology and ethnographic in methodology			
7	Joshi, H., et al. 2013	India	Mixed Methods (?)	Three educational interventions were applied to a specific subject in Bachelor of Ayurvedic Medicine and Surgery (BAMS) program 2011-2012 and 2012-2013.	Three integrative educational interventions were introduced to develop and evaluate the effectiveness of teaching methods in an Ayurveda curriculum.	The test results in the first experiment showed that the integrative method is comparable with the conventional teaching method. In the second experiment, the test results showed that the integrative method is better than the conventional method. The student feedback showed that all the three methods were perceived to be more interesting than the conventional one. The development of testable integrative teaching methods is possible in the context of Ayurveda education. Students find integrative approaches more interesting than the conventional method.	3
8	Long, C., et al. 2014	USA	Mixed methods. Cross sectional survey.	A survey to elicit information on the faculty development initiatives was administered via e-mail to 9 program directors. The survey was designed to elicit information in 6 areas: EBP competencies that were developed and adopted; target audiences; size, formats, and hours of training programs; instructional approaches; evaluation methods; and faculty incentives to participate.	All 9 completed the survey, and 8 grantees provided narrative summaries of faculty training outcomes.	The grantees found the following strategies for implementing their programs most useful: assess needs, develop and adopt research literacy and EBP competencies, target early adopters and change leaders, employ best practices in teaching and education, provide meaningful incentives, capitalize on resources provided by grant partners, provide external training opportunities, and garner support from institutional leadership. Instructional approaches varied considerably across grantees. The most common were workshops, online resources, in-person short courses, and in-depth seminar series developed by the grantees. Training programs and workshops are the most useful way to train faculty in evidence based medicine and research literacy.	2

9	McCabe, P., 2008	Australia	Quantitative. Observational study. Survey	Survey of 43 Australian providers of naturopathy and WHM education. Information sourced from the public record revealed that these providers collectively offered 104 courses in naturopathy and WHM.	Of the 43 providers, 29 valid questionnaires were returned, representing 33 campuses across Australia—a 70.2% response rate by campus.	Educational standards vary widely, with some practitioners not likely to be adequately prepared for practice. There is a need for better integration of complementary care with mainstream healthcare, and education in CM needs to be at least to the level of a bachelor degree.	2
10	Rowe, T. 2009	USA	Quantitative. Observational cross-sectional survey.	Three separate surveys targeted at homeopathic students, homeopathic faculty and homeopathic school directors. It consisted of 40 questions	91.5% of respondents completed the survey. School Director Survey, 20. Teacher Survey, 48. Student Survey, 88.	Homeopathic Schools and Training Programs currently in the United States: 29. Homeopathic Teachers in the United States: 250. Homeopathic Students Currently Enrolled in the United States: 1080.	1
11	Schwartz, J., 2010	USA	Mixed methods. Observational cross-sectional survey and interviews	A survey of faculty teaching at schools in three CM fields and followed up with additional interviews.	NA	Acupuncture, chiropractic, and massage faculty lack awareness of the capabilities of online education and the elements of good online learning, with the perception that what they teach cannot be taught online because of its kinesthetic requirements. The faculty hold this perception in spite of the success of medical science and related health care fields in the online environment, and they do not seem to separate the kinesthetic from the didactic.	3
12	Steel, A., et al. 2015	Australia	Quantitative. Cross-sectional online survey	The survey included items examining respondent attitudes and beliefs about research, personal research experience, and future intended research activity. Statistical analysis determined descriptive frequencies. Backwards stepwise logistic regression was used to identify characteristics of faculty interested in enrolling in a higher degree by research (HDR).	The survey was completed by 202 of 389 academic and operational staff conducted at a dual sector private CM education institution in Australia.	Respondents perceived research as important to their personal professional goals (86.0%) although confidence in being able to undertake research was less common (56.5%). The perceived importance of publication of research to the respondents' personal professional goals was also notably high (80.0%) although confidence in their own ability to produce research publications was lower (52.9%).	2
13	Toupin April, K.,	Canada	Mixed methods. Observational cross-sectional	A two-phase study consisting of an electronic survey and subsequent semi-structured telephone interviews conducted	28 C/P directors replied to the survey and 11 were interviewed, representing chiropractic,	Future CM providers should understand research findings and be able to rely on high quality research and to communicate with conventional care providers	2

	et al. 2013		survey and interviews	with curriculum/program directors in regulated Canadian CAM schools. Questions assessed the extent of the research, evidence-based health care, IPC training and continuing education, as well as the C/P directors' perceptions about the training. Descriptive statistics were used to describe the schools', curricula and the C/P directors' characteristics. Content analysis was conducted on the interview material.	naturopathy, acupuncture and massage therapy schools.	as well as to engage in continuing education. Limited length of the curriculum was one of the barriers to such improvements.	
14	Viksveen, P., 2011	Norway	Quantitative. Cross sectional survey	Cross sectional survey of current homeopathy undergraduate education in Europe in 2008. Data from 145 (94.8%) out of 153 identified courses were collected. Eighty-five (55.6%) responded to a questionnaire survey. For others some data was extracted from their websites. Only data from the questionnaire survey is used for the main analysis.	Data from 145 (94.8%) out of 153 identified courses were collected. Eighty-five (55.6%) responded to a questionnaire survey plus data from websites.	The average course had 47 enrolled students and 142 graduates, lasted 3.6 years part-time. Of 85 courses most had entry requirements and provided medical education (N = 48) or required students to obtain this competence elsewhere (N = 33). Average teaching hours were 992 overall, with 555 for homeopathy. Four of five courses were recognised/accredited. Recognised/accredited part-time courses lasted significantly longer than nonrecognised/non-accredited courses, and offered significantly larger numbers of teaching hours in homeopathy. 6500 students were enrolled. 21,000 had graduated from 153 identified European undergraduate homeopathy courses.	1
15	Viksveen, P., et al. 2012	Norway	Qualitative. Interview	A qualitative study based on grounded theory methodology involving telephone interviews with 17 educators from different schools in 10 European countries. It used constant/simultaneous comparison and analysis to develop categories and properties of educational needs and theoretical constructs and to describe	Telephone interviews with 17 educators from different schools in 10 European countries	The educators defined a competent homeopath as a professional who, through her knowledge and skills together with an awareness of her bounds of competence, is able to help her patients in the best way possible. This is achieved through the processes of study and self-development, and is supported by a set of basic resources. Becoming and being a competent homeopath is underpinned by a set of basic attitudes.	2

				behaviour and social processes. The main questions asked of subjects were “What do you think is necessary in order to educate and train a competent homeopath?” and “How would you define a competent homeopath?”			
16	Wardle, J., et al. 2013	Australia	Qualitative. Interview	Semi-structured interviews were conducted with 20 naturopaths practising in Australia to explore current perceived challenges in the naturopathic profession in Australia.	20 naturopaths practising in Australia	Grassroots naturopaths identify a number of challenges that may have significant impacts on the quality, effectiveness and safety of naturopathic care. Given the increasingly mainstream role that naturopaths are playing in the healthcare system in Australia, it is imperative that some of the issues of concern raised by naturopaths receive appropriate policy focus. This may include the development of appropriate regulatory regimes and the development of minimum standards of practice and education that value traditional naturopathic principles and philosophies, as well as ensuring ethical and effective clinical practice.	4
17	Wardle, J. and Sarris, J., 2014	Australia	Qualitative. Focus groups	Focus groups conducted with current and recent students of 4-year naturopathic degree programs to ascertain how they interact with clinical teaching materials, and their perceptions and attitudes towards teaching materials in naturopathic education.	A total of 24 students and recent graduates participated in the focus groups.	Naturopathic students have a complex and critical relationship with their learning materials. Although naturopathic practice is often defined by traditional evidence, students want information that both supports and is critical of traditional naturopathic practices, and focuses heavily on evidence-based medicine. Students remain largely ambivalent about new teaching technologies and would prefer that these develop organically as an evolution from printed materials, rather than depart from dramatically and radically from these previously established materials.	3

18	Zwickey H et al. 2014	USA	Mixed methods. Survey and interview	An electronic survey was administered to principal investigators of the nine R25 education grants. The survey consisted of 36 closed- and open-ended questions. Follow- up questions were sent via email to clarify responses as needed. Data were compiled for review and content was analyzed for common themes among institutions. A qualitative analysis was performed using three independent reviewers. This team identified the most successful strategies that the individual institutions used, in addition to the most substantial challenges they encountered.	Nine R25-funded CAM colleges	While each institution designed approaches suitable for its own research culture, the guiding principles were similar and the need to develop evidence-informed skills and knowledge was important to help students and faculty to critically appraise evidence and then use that evidence to guide their clinical practice. These nine CAM institutions faced multiple challenges and developed similar and dissimilar strategies for success. An enriched, EBM-infused CAM curriculum can better prepare future CAM practitioners for communicating effectively with their conventional medicine colleagues. Practitioners in the 21st century will need to understand how research and evidence-based practice are related and support one another in order to truly bring about optimal patient care.	2

2.4.5 Quality of papers

Based on the STROBE reporting guidelines the quantitative papers included in this study, while rich in design, descriptive data and discussion of results exhibited a broad weakness in stating clear objectives. In addition, statements and acknowledgement of bias were mostly absent. Other elements commonly missing from these papers were descriptions of statistical methods and generalisability leaving a general impression of low quality among the included papers. Based on the SRQR tool for evaluating qualitative studies, all selected papers omitted a discussion on the qualitative approach and research paradigm used. A description of researcher characteristics and reflexivity, and techniques to enhance trustworthiness and credibility of data analysis were also on the whole missing. In addition, potential sources of influence or perceived influence on study conduct and conclusions and how these were managed were also under-reported across this literature. In addition, a lack of reporting on sources of funding and other support, the role of funders in data collection, interpretation, and write-up were other weaknesses identified. The application of the MMAP critical appraisal tool for the mixed methods studies in this instance found all papers used and reported appropriate sources of data relevant to answer the research question, the context was taken into account in data analysis, sampling appropriate to answer the research question, and the integration of qualitative and quantitative data and/or results were included. On the other hand, only some papers applied features of the tool such as data analysis relevant to answer the research question, and few reported on complete outcome data, or dropout rate, reported on recruitment minimizing bias and appropriate follow-up, used appropriate randomization, appropriate measurement, sample representative of the population, or appropriate measurement. No papers reported on the reflexivity of researchers, nor concealment allocation, and few reported on the MM design relevant to answer the research questions, integrated the mixed qualitative and quantitative data and results nor took into consideration any limitations associated with this integration, leaving an overall impression of poor quality.

2.5 Discussion

This critical integrative review highlights two key issues and large current empirical gaps. Firstly, given the growing popularity of CM and as a consequence the growth in CM education, there is very sporadic coverage of research in the CM education field. Across the 18 included papers, research from 7 countries is represented with 4 of those countries having only one identified relevant paper. In addition, the quantity and quality of available evidence invariably relates to disparate, random and unrelated parts of CM education philosophy and practice. Our review findings highlight that much of the research is now relatively dated (Mills et al., 2002). In addition, there is extreme diversity in the represented professions and ultimately the quality of papers. Many papers were excluded due to inconsistencies between title, abstract and findings (Zhang and Zheng, 2013). Some papers were relevant but not published in peer reviewed journals and thus excluded; highlighting how in a maturing field there is a need to publish in both professional industry journals and the peer reviewed literature. One such example was the result of a survey of ‘profession-wide’ educational acupuncture institutions in the US as well as an extensive literature review, subject matter expert interviews, community discussions, strategic planning, analysis, and evaluation, that called for the development of educational competencies (Ruhe et al., 2014).

Our review identified that whilst educational standards and practices were considered within original research articles related to CM, this was mostly as part of the contextual discussion of findings of related but not directly relevant CM research. This pattern was observed both in the grey literature (Siegfried and Hughes, 2012, Girard, 2010) and peer-reviewed publications (Sarris and Wardle, 2017, Steel and Adams, 2011b, Breakspear, 2013, Evans, 2000, McCabe, 2001, Melchart et al., 1994, Dobos and Tao, 2011, Wardle and Sarris, 2014, Wardle et al., 2013a, Wardle et al., 2013c, Wardle, 2010a, Wardle et al., 2012, McCabe, 2008). One striking example of research emphasizing information related to CM education but collected in other settings, is by Wardle and colleagues in which practising naturopaths were interviewed regarding multiple issues including the public misconception of the role of naturopathic medicine, the devaluation of naturopathic philosophy as a core component of naturopathic practice, the pressure to move towards an EBM model focused on product prescription, as well as naturopathic education. In this paper, much of the data collected related to CM education but came from a broader research question and sample than research which focuses specifically on education and relevant stakeholders (Wardle et al., 2013b). Similarly, in Steel’s 2011 article, 12 naturopaths in current clinical practice were interviewed on the sources of information used in clinical practice, and the participants’ perceptions of these sources. This elicited comments about naturopathic education as well as concluding comments by the authors in relation to naturopathic education (Steel and Adams, 2011b).

Another major finding from this review is that the robust and mature research exploring educational technology and e-learning that is taking place in medical and or allied health (nursing, midwifery, pharmacy) education research is clearly absent within the CM educational research field. Research within conventional medical and allied health education has explored the value of educational technology in place of traditional face-to-face delivery or within clinical training (Nelson et al., 2009, Adams, 2013). Moreover, there is also now substantial research examining the culture change for stakeholders in medical and allied health education, with qualitative research drawing on the results of surveys reporting of student and staff characteristics for developing faculty, or reporting on digital literacy and other academic processes as a consequence of e-learning (Link and Marz, 2006, Perlman and Stagnaro-Green, 2010). In addition, many case studies of educational interventions have been published using some aspect of e-learning in medical or health services training (Gormley et al., 2009). Finally, there are many original research papers examining the challenges facing medical education due to the clear trends of changing student behaviour, often as a result of the use of learning technologies (Greenfield and Musolino, 2012, Friedl and O'Neil, 2013, Hutchings and Quinney, 2015). Further, there are numerous studies exploring more effective delivery methods, and the development of critical thinking (Serrat et al., 2014, Wheeler and Collins, 2003). None of these areas of research relating to learning technologies have been reported nor evaluated in CM at present. This highlights that there is a significant discourse relating to andragogy and learning technologies taking place in arenas not too distant from CM education but not within CM practitioner education itself. CM education is not immune or separate from the changes taking place in education globally and this points the way forward for CM education research. These findings highlight that most of the research on CM education is in non-CM environments or in arenas possibly similar to CM but not CM.

2.5.1 Consequences

As identified in this review, despite the high levels of use of CM in the community, and the thriving nature of CM educational institutions globally, the current evidence evaluating the procedures, effectiveness and safety of CM education remains limited in many significant areas. As a result, there are a number of challenges previously described by commentators (Wardle et al., 2012). which impact on the growth and sustainability of CM education. In particular, the ongoing absence of strategy in CM education research ensures a gap in the available knowledge and contributes to uncertainty for CM education leaders, policy makers and other health professionals as to the needs of employers and the market (Wardle et al., 2012). Furthermore, our review reveals the current empirical data regarding CM education as affording only a limited, superficial understanding of contemporary CM education highlighting the sporadic spread and apparent scarcity of research in this field. Our research reveals a complex picture, that on the one hand suggests that possibly, in CM, for so long out of mainstream health care activity in Western societies (Adams et al., 2013a, Xue et al., 2007, Barnes et al., 2008), its practitioners and users hold unique values attitudes to health (Schwartz, 2010). In addition, it possibly suggests that there is in general a slower adoption of technology, and a stronger culture of resistance to change (Grant and O'Reilly, 2012). Yet it also points to a selective use of technologies as there is growing evidence of innumerable CM consultations taking place online (Richter et al., 2015, Epstein et al., 2015). This relatively low amount of empirical data pertaining to CM research in general may also be explained by the fact that there are few research active CM academics (Wardle et al., 2012) and this is underpinned by a lack of perceived relevance of research in CM educational entities that are for the most part more technical colleges with academics often focused on technical and clinical expertise rather than empirical research activities (Steel et al., 2015).

2.5.2 Research opportunities and directions

The findings of this review highlight that there are significant gaps in the existing research examining CM education. There is a need to establish a strategic research agenda in this field. To effectively address these gaps, it is important that future research builds on a strong understanding of the unique educational environment of CM courses, colleges and universities. A key foundational step to developing a better understanding of the effectiveness of CM education is to more clearly identify current CM educational provision. Building upon an HSR approach, future research is required which examines the characteristics, attitudes, preferences, experiences and motivations of modern CM students. There is an urgent need to understand CM educational institutions' geographical location, enrolment patterns, andragogy, their size and scope as well as international similarities and differences. This is particularly important given the as yet largely unexplored and potentially unique characteristics of CM educational institutions and their similarities or differences with other health services education, the potential size of the CM education market and the numbers of graduates entering CM professions. Alongside this, a closer examination of the use and reliance on technologies, faculty attitudes to technologies and change, the demographics, psychographics and the values of faculty at CM colleges is needed. Moving forward there is a need to understand how changing educational trends relate to CM, if CM educational settings are distinct because of their unique student body, the difference between training CM practitioners and training people about the use of CM, the broad and differing landscape of CM education provision across the world, to what degree are CM educational institutions influenced by the broader trends taking place in education globally? Such an examination of CM education must also include the cultural diversity of education provision, local regulations and nuances. A broader knowledge of how health services education informs CM education, the degree to which research and evidence in health services education can be scaled to CM education (Verma et al., 2006), and how the foundational sciences are taught in CM institutions is also required. It might be beneficial for Colleges to explore strategies to develop faculty in areas such as e-learning technologies, research literacy and EBP skills. For this, faculty and administrative champions are needed, as are early adopters and change-leaders.

2.5.3 Limitations

These findings can be contextualised within identifiable limitations. Searching literature related to CM can be challenging due to the lack of a consistent international definition. There were 12 papers in this review that were identified through manual searching. This possibly highlights that despite research being conducted in this area, papers may not be published in journals which are indexed in commonly searched research databases. Whether this is due to a perception amongst CM-specific or health professional education journals that research in CM education falls outside of their relative scope and prefer to focus on clinical questions or the researchers are not targeting these other journals is not clear. Moreover, the application of three critical appraisal tools created challenges of inclusion and exclusion related to quality. In the case of the SRQR and MMAT, these guidelines were written for pure qualitative and mixed methods research (MMR), yet the papers in this review were published in PH and education journals. As such, the structure and content of the included qualitative and mixed methods articles may have been modified to suit the journal style guide and intended audience and the reporting guidelines may have been compromised as a result. For this reason, the low score for some of these articles may be due to reporting omissions of necessity rather than true gaps in methodology. Nevertheless, where possible these limitations have been mitigated through attending to systematic review best practice, and as a consequence the relevance and value of the findings presented here for contemporary healthcare education provision should not be minimised.

2.6 Conclusion

Despite the high rates of CM use worldwide and growing interest in CM education, only a sporadic and under-developed body of original research has examined relevant issues to date and there is a need for both a growth in research activity and a clear coordinated research agenda in this important topic area. The significance of growing such a research program around the broad topic of CM education is essential to ensuring an adequately trained and educated CM workforce capable of realising an important role in the broader, coordinated and inter-professional health care system.

2.7 Chapter summary

To date, the primary focal point of HSR in relation to CM use has centred on clinical outcomes, on CM products and CM treatments. This has left a significant macro level gap in the research, namely the education of future practitioners. This integrative critical literature review of CM education found a broad and uneven range of CM education provision. Some studies looked at the development of educational competencies to develop clinical skills and standards while some sparce research was identified that looked into the application of existing and new educational theory, and methods in CM. There were only sporadic papers located exploring technology in CM. One paper explored the future challenges facing CM education. The quality of these research endeavours is somewhat poor overall. While the Chapter One background explored the intersection of

CM education and technologies and pointed to the need possible for further investigation, this literature review has confirmed those impressions and indicate a potentially rich vein of research. This established, it is necessary to now discuss the theoretical framework, and methods to be used in this exploration of CM education.

Chapter 3 - Theoretical Framework

3.1 Chapter introduction

In order to fully meet the aim and objectives of this project, discussion of the theoretical frameworks that were used in the design collection and analysis of data is warranted. This chapter outlines some of the concepts from the *Diffusion of Innovations* (DI) theory of Everett Rogers which were used to help guide some sections of the thesis data collection and interpret some of the thesis data (see Chapters 6, 7, 8, 9, 10). In this thesis, DI theory is not employed to test a specific new innovation in a particular culture but instead constitutes a useful conceptual tool to help understand certain aspects of the study findings.

3.2 Diffusion of Innovation theory

DI theory (Rogers 1962, 1971, 1983, 1995, 2003) is suited to answering the first part of the aim of this project, to investigate the *prevalence, experiences and perceptions of learning and health technologies on students, academics and educational leaders in CM education institutions in the training of health professionals.* DI theory also helps to address aspects of the first and second research objective, *to evaluate the role, use and uptake of learning technology in CM education*, and to *examine the factors influencing the uptake of learning technologies in CM institutions*. DI theory provides a means to provide insights into how change or an adoption of an innovation might flow through a culture, by providing a model that identifies and explains the complex moving components of the spread and adoption of innovations. It does so by examining the innovation itself, understanding the communication channels in that culture, the timeframes and adopter categories of participants in the culture that influence adoption, and the social constructs in the culture.

Rogers, who initially developed DI theory, defined *diffusion* as, ‘the process in which an innovation is communicated through certain channels over time among the members of a social system’ (MacDonald et al., 2003, Surry and Farquhar, 1997, Rogers, 2004, Wonglimpiyarat, 2005b). Diffusion includes both the planned, strategic and spontaneous spread of new ideas. DI theory suggests that there are four main elements that influence the spread of innovations:

Table 3.1 Rogers four main elements that influence the spread of innovations

1. The **innovation**: an innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption.
2. **Communication channels**: the means by which messages get from one individual to another.
3. **Time**: the (time period) rate of adoption or the relative speed with which an innovation is adopted by members of a social system.
4. **Social system**: a set of interrelated units that are engaged in joint problem solving to accomplish a common goal.

From early research focused on the individual who adopted an innovation and on what factors contributed to the adoption of that innovation, today, examples of diffusion research can be found in numerous academic settings (Hayward, 1984, Rogers, 2010, Sahin and Thompson, 2006, Muller, 2016, Aizstrauta, 2015, Rogers and Kim, 1985, Dibra, 2015, McGrath and Zell, 2001). In the health and medical fields DI theory has been applied in medical intervention uptake (Hornik, 2004), nursing (Žvanut, 2011), PH settings (Moseley, 2004, Haider and Kreps, 2004), the adoption of fasting guidelines (Anderson and Comrie, 2009), addiction treatments (Sharma and Kanekar, 2008), and more recently tele-medicine uptake (Peeters et al., 2012).

3.2.1 Diffusion theory and education

DI theory has also been sporadically applied in the field of education particularly in the area of education policy (Alberty, 2014, Wonglimpiyarat, 2005b). Importantly for this research project, it has also been applied to the provision and adoption of teaching online (Chi, 2013), online learning (Mitchell, 2013), staff development in education (Fisher, 2005), faculty attitudes to technology (Tabata and Johnsrud, 2008), faculty resistance to change (Porter and Graham, 2015, Revell, 1999) and adoption of learning technology in general (Lee et al., 2011, Sahin, 2006). The theory has also been applied to the adoption of specific technologies such as podcasts (Merhi, 2015, Sahin and Thompson, 2006), as well as the diffusion of technologies at specific campuses and colleges (Johnson, 2010), in various cultural contexts (Loogma, 2012), in formal learning environments, and informal learning settings (Straub, 2009). Individual aspects of the theory such as the second component, ‘communication channels’, have been robustly ‘road-tested’ in multiple education settings (Zhou, 2008).

3.2.2 The elements influencing the diffusion of an innovation

Rogers describes the adoption of innovations, such as technologies, as a process with specific and identifiable components that require investigation. The reason that these concepts (described in section 3.2.3 - 3.2.8 below) are mentioned are because they assisted in the interpretation of data related to the thesis topic and were useful practical tools to deepen the researcher’s understanding and provide insights into this area of the case studies.

3.2.3 The innovation

Rogers defines an innovation as any ‘idea, practice or object that is perceived as new by an individual or other unit of adoption’ (Kardasz, 2013), and this definition includes the idea that something which is new, leads to a degree of uncertainty for the individuals involved (Rogers, 2003). (Rogers, 2003, Kardasz, 2013). This part of Rogers model was useful in analysing some of the data and understanding the two case study settings.

3.2.4 Communication channels

The second element identified by DI theory as influencing the diffusion of an innovation is the relevant communication channel. This refers to the way in which messages get from one individual to another. In some instances, the use of mass media is a way to rapidly and efficiently spread awareness of an innovation to a large number of people and this may include radio, television, newspapers, magazines, posters, etc. Further, interpersonal channels that involve the face-to-face exchange of information between two or more individuals are generally more effective at persuading an individual to adopt an innovation (Rogers, 2003). Rogers' DI research confirmed that 'most people depend mainly upon a subjective evaluation of an innovation that is conveyed to them from other individuals like themselves who have already adopted the innovation' (Rogers, 2003). Similarly, this part of Rogers model was useful in analysing and understanding data that came from the two case study settings in the second phase of the project.

3.2.5 Time

In the third element of the innovation process, the person or community moves through identifiable steps in the process of determining whether or not the innovation is worthy of adoption. Change is a process and time is involved. While the amount of time is individual and unique to the person, community or organisation all participants in the process of adopting an innovation go through the same process. Rogers defines and describes the process as follows:

1. Knowledge: A person or community first hears about the existence of an innovation and learns the rudiments of what it is, how it could be used, and why they might see value in using it. In this phase, generally mass media is the communication channel that is most effective in delivering general information about the technology or idea.
2. Persuasion: Next, the person or community begins to form a favourable or unfavourable attitude about the innovation. They may begin to seek more evaluative and specific information about the innovation, through individual research in a personal circumstance or through research and reporting at board level in an organisation. The question to be determined is simply to identify the advantages or disadvantages. It is at this time and through this process that the perceived qualities of an innovation will be considered. In addition, at this stage, interpersonal communication with close peers seems to be most effective in persuading a person or organisation to trial a new innovation.
3. Decision: At some point a person or organisation makes a decision to adopt or reject the innovation. It is important to remember that decisions can be un-made and a number of people and communities change their mind in the next two phases. Due to the individualistic nature of this stage, Rogers notes that it is the most difficult stage to acquire empirical evidence.

4. Implementation: If a decision has been made to adopt an innovation, it starts to be used. It is at this stage that the ability to re-invent or re-purpose the innovation may become important.
5. Confirmation: The person or organisation goes through a process to determine if the original decision was sound. Based on experience from using the innovation, or additional information received from others about the innovation, the person or organisation will continue with the original decision, or amend it (Rogers, 2003).

This aspect of Rogers model was useful in analysing some of the data relating to academic and student perceptions of technologies.

3.2.5.1 Adoption categorisation

It is in this context of time - the third distinctive element in the DI theory - that Rogers introduces the idea of 'Adopter Categories'. People with identifiable traits, attributes and behaviours can be clearly categorised to predict (with some certainty) the likelihood to adopt an innovation over a period of time due to their degree of 'innovativeness' (Rogers, 2004). As above, this aspect of Rogers model was useful in analysing some of the data relating to academic and student perceptions of technologies.

Table 3.2 Rogers' Adopter Categories (related the third element of the adoption of an innovation – time)

Innovators	This group include those people who actively seek new ideas. Members generally have high exposure to mass media, wide interpersonal networks of like-minded people, and they cope well with high levels of uncertainty. Innovators are willing to take risks, are youngest in age, have a high socio-economic status, have great financial liquidity, are very social, and have the closest contact to scientific sources and interaction with other innovators. Risk tolerance has individuals in this group adopting technologies which may ultimately fail, though their financial resources help them absorb these failures. Innovators do not depend on subjective evaluations of an innovation before trying it. Innovators are the first individuals to adopt an innovation and can be described as 'Venturesome' and play an important role in the diffusion process of launching the new idea in the system - a gatekeeping role (Rogers, 2004, Kardasz, 2013).
Early adopters	This group involves those people within a system that others look to for their input about a new idea or innovation and they are generally the opinion leaders who will be role models for others. The members of this group are often respected by their peers and trusted to make a good decision when an innovation comes along, will provide subjective evaluations to near peers through their interpersonal channels and these individuals have the highest degree of opinion leadership among the other adopter categories. Early adopters are typically younger in age, have a higher socio-economic status, have more financial liquidity, have attained advanced education, and are more socially forward than later adopters. They are more discrete in adoption choices than innovators, as they realize that judicious choice of adoption will help them maintain a central communication position (Kardasz, 2013).
Early majority	This group have been described as 'Deliberate'. Members are not the first to adopt an innovation, nor are they the last. They want to make sure that an innovation will really be worth the time and effort it may take to adopt it. Individuals in this group don't want to risk an innovation that they will then be disappointed with, often watch and wait for a while until they are convinced and adopt an innovation after a varying degree of time. The time taken to adopt is significantly longer than innovators and early adopters. The early majority tends to be slower in the adoption process, has above average socio-economic status, has contact with early adopters, and seldom holds positions of opinion leadership in a system (Kardasz, 2013).
Late majority	This group is described by Rogers as 'Sceptical'. Members of the late majority have a significantly different risk profile to the above categories. This group is usually pushed into using an innovation due to necessity (the old way is being phased out) or peer pressure. These individuals approach an innovation with a high degree of scepticism. The late majority typically has below average socio-economic status, has very little financial liquidity, shares contact with others in the late majority and the early majority, and has very little opinion leadership (Kardasz, 2013).
Laggards	This group are the last group to adopt any innovation. Members of this group are more traditional, tend to be suspicious of innovations and of those who would encourage them to try one, are more comfortable with the old way of doing things, and often interact with others who agree with them. They may refuse to adopt an innovation. Unlike some of the previous categories, individuals in this category show little to no opinion leadership. Laggards typically tend to be focused on 'traditions', are likely to have the lowest social status, have the lowest financial liquidity, be the oldest of all other adopters, and are in contact with only family and close friends (Kardasz, 2013).

3.2.6 Social system

Equally important in determining the rate of adoption of a new innovation are the nuances, individual characteristics, quirks and culture of the 'social system' within which innovation is taking place. This fourth and final element in the diffusion of an innovation is 'a set of interrelated units that are engaged in joint problem solving to accomplish a common goal' (Rogers, 2003). Every social system has a structure that affects how information is communicated (who talks to whom, when, how, and for what purpose?), its own culture, its own systems and norms or established behaviour patterns. These norms establish the range of acceptable and tolerable behaviours for that system. These can provide barriers to change, especially if they are related to culture or religion (Kardasz, 2013). Rogers identified two crucial features of a system in order to facilitate the ease and rate of change. 'Opinion leaders' and 'change agents' are required in social systems as a requirement. Opinion leaders are often part of the *early adopter* category. These 'champions' of innovation are required, often in leadership positions to pilot a change into a culture (McCorkle, 2001) and they are able to provide information and advice about an innovation to others. Because they are respected by others within the social system, opinion leaders are often able to influence others to try an innovation. They are generally very active in the interpersonal communication networks within the system and usually follow the system norms. In some circumstances, a change agent is a professional from outside of the social system and since they are often seen as being different from those within the system, they may enlist the help of the opinion leaders within the system to influence others about an innovation. This aspect of Rogers model was useful in gaining insights into some of the data that emerged from the audit phase of the study.

3.2.7 Presentation of change to the community in Diffusion of Innovations Theory

In a social system, an organization, a company, a college or a university the decision to adopt an innovation is generally made at the top, at the Director or Board level. In DI theory this change may be presented to the members of a community in a number of ways:

1. *Optional*: This is where there is a choice to adopt or reject the innovation, and this can be made by each individual independent of the decisions of other members of the system
2. *Collective*: This is where the choice to adopt or reject the innovation is made by consensus among the members of the system. Once the decision is made, all members are expected to conform. This type of decision-making process usually leads to the slowest rate of adoption (MacDonald et al., 2003).
3. *Authority*: This is where the choice to adopt or reject the innovation is made by a few individuals in the system who possess power, status, or technical expertise"

Again, once the decision is made, all are expected to implement it. This procedure may lead to the fastest rate of adoption; however, some members of the system may be purposefully resistant and try to undermine the decision.

4. *Contingent*: the choice to adopt or reject the innovation is made only after a prior innovation-decision has been made. The prior decision might have been one or more of the first three types (MacDonald et al., 2003).

This 'presentation of change' aspect of Rogers DI theory was useful in understanding some of the findings from the second and third phases of the study.

3.2.8 The rate of adoption

There may be differences when considering how long it may take for an individual person to adopt an innovation. Importantly the rate of adoption by a group actually tends to create an 'S-shaped curve' (Rogers, 2003). As expected, the *innovators* begin the process slowly but as the *early adopters* and *early majority* get involved, the curve accelerates. Finally, over time it reaches a peak where it begins to taper off as the *late majority* become active. The rate of adoption is defined as the relative speed with which members of a social system adopt an innovation. It is usually measured by the length of time required for a certain percentage of the members of a social system to adopt an innovation. Within the rate of adoption there is a point at which an innovation reaches critical mass. Critical mass is the time in the adoption curve when enough individuals have adopted an innovation so that the continued adoption of the innovation is self-sustaining. Rogers outlines several strategies to help an innovation reach this stage:

1. Have an innovation adopted by a highly respected individual within a social network, creating an instinctive desire for a specific innovation.
2. Inject an innovation into a group of individuals who would readily use an innovation.
3. Provide positive reactions and benefits for early adopters of an innovation.

The adoption process is an individual phenomenon describing the series of stages an individual undergoes from first hearing about a product to finally adopting it. On the other hand, the diffusion process signifies a group of phenomena, which suggests how an innovation spreads among consumers. Overall, the diffusion process essentially encompasses the adoption process of several individuals over time. As above, this aspect of the Rogers DI framework was useful in understanding some of the findings from the second and third phases of the study.

3.3 Limitations of Rogers' theory and other models of technology acceptance

Diffusion research is interdisciplinary and the literature is highly fragmented (Shea et al., 2005, Berryhill and Durrington, 2009). Unsurprisingly, some limitations of DI theory have been identified (Minishi-Majanja and Kiplang'at, 2005, Rogers, 2003). In the arena of education and health care, much of the evidence for DI theory, including the adopter categories, did not originate in PH or education research and it was not developed to explicitly apply to adoption of new behaviours, health or educational innovations. It has been argued by some that the theory does not foster a participatory approach to adoption of PH programs. The theory seems to work better with adoption of behaviours rather than cessation or prevention of behaviours and further, the theory does not take into account an individual's resources or social support to adopt the new behaviour (or innovation). Simply put, research has shown that the process of explaining and predicting change is more nuanced in some settings (Chismar and Wiley-Patton, 2003, Davis et al., 1989, Segars and Grover, 1993, Ward, 2013, Venkatesh et al., 2003, Aizstrauta, 2015, Hall and Loucks, 1978).

3.4 Relevant theoretical frameworks beyond the scope of technology adoption

The lack of nuance in Rogers' framework of explaining technology adoption became relevant in this study due to the breadth and depth of the research objectives. This breadth includes stakeholders' perceptions and individual institutions' experience of the transition to e-learning, the broader implications of that transition for CM education as a whole and importantly the context in which educational institutions manage uncertainty related to technology adoption. As a consequence of the research aim and objectives breadth and depth, deeper investigation was required into the fields where these research objectives and questions interfaced. Literature in these fields assisted in informing some discussion points in the results chapters and understanding the broader undercurrents that effect organisations in a fast-moving digital age and in the field of education (Eason, 1989, Waddell et al., 2019, Stevenson, 2018, Carnall, 2018, Farquharson et al., 2018, Mpofu and Madichie, 2018, Bell and Harrison, 2018, Marshall, 2019, McCaffery, 2018, Nicholls, 2018, Rogers, 2019, Garrick et al., 2017, Vosse and Aliyu, 2018, Ferlie and Trenholm, 2019, de Bruin, 2018, Tarosa et al., 2016, O'Donnell, 2016, Graham, 2013, Selwyn, 2016b, Selwyn et al., 2017, Selwyn et al., 2018, Selwyn, 2012, Dočekal and Tulinská, 2015, Hall, 2011, McCorkle, 2001, Selwyn et al., 2016, Selwyn, 2019, Selwyn and Facer, 2013, Selwyn and Facer, 2014, Kerr, 2004, Broom et al., 2019, Coulter, 2004, Adams, 2000, Willis, 1983, Adams et al., 2017, Broom and Adams, 2007). These papers provided important material but did not present significant overlap with the research topic of this project. The targeted education and technology research objectives and questions in this research were too granular (what is used and by whom) for this wider lens that ultimately explores the broad understanding of why people use what they use and do what they do.

3.5 Testing the models to inform the analysis - shaping fieldwork and design focus

While the work of Rogers is not the only technology adoption frameworks that exist, it was found that in particular, the model of Rogers was a good fit for certain aspects of this study. After considerable exploration, analysis, evaluation and reflection it was determined that insights into the overarching question; to investigate the prevalence, experiences and perceptions of learning and health technologies on students, academics and educational leaders in CM education institutions and some of the objectives could best be answered principally through the lens of DI theory. As Rogers model informs some of the design of and then assisted in the analysis of some of the data there is congruence with the MMR exploratory methodology of the project. Other models of technology adoption were explored and considered (Taherdoost, 2018), but ultimately rejected for application in this study as they did not meet the main purpose (Eason, 1989, Waddell et al., 2019, Stevenson, 2018, Carnall, 2018, Farquharson et al., 2018, Mpofu and Madichie, 2018, Bell and Harrison, 2018, Marshall, 2019, McCaffery, 2018, Nicholls, 2018, Rogers, 2019, Ferlie and Trenholm, 2019, de Bruin, 2018), and did not address pragmatic questions such as, *'what is used, and by whom'*. This HSR study asking a very pragmatic set of questions, the design of the audit was not an exact match to the specific components of Rogers' theory. The audit was conceived as a way to offer practical micro-level insights into structure and specifics (*who does what, what is the prevalence of learning technology, what does it cost*) as well as some wider macro-level insights into the social system, culture and institutional concepts particularly with reference to the existing culture and engagement with technologies. Rogers' DI theory is one of the tools employed to address these questions. The benefits of DI theory lie in its capacity to explore the resistance to innovations, its ability to inform questions about the impacts on students and faculty of the organisational decisions made about technology, the uptake, and the overall satisfaction with new tools and technologies. The value of the model lies in its capacity to take into account personal, organisational or even corporate innovation decision processes. DI theory is robust enough to explore and provide insights into the diffusion of ideas and technologies in individuals and organisations that were stakeholders in this research. Also, it provided the pragmatic framework to identify the non-negotiable ingredients for successful change to be implemented within these organisations. The model can also potentially act as a compass to point to insights into the changes the organisations will be required to make to ensure the successful adoption of a new innovation. For the research objectives for this study the ability to view the data collected through the lens of the innovation (the use of various learning technologies, the existing prevalence, use and culture of technology in these learning environments rather than - say - the introduction or intervention of a new technology), the communication channels, time and the social structures might provide useful insights for leadership and management to amend or draft strategic plans by identifying gaps, needs and opportunities. Further, Rogers model provides insights as to where each organisation finds themselves, potentially highlight likely points of pressure, and provide input to the challenges faced by CM educational leadership.

3.6 Conclusion

It is important to be clear that while Rogers' DI theory informed the formation of some questions and provided a framework for understanding a number of issues, the purpose of this overall study was not to provide a comprehensive case study with which to test the theory. Rather, selected DI theory concepts were employed simply as an aid to better interpret the thesis case study in order to answer the specific questions: where are the different CM institutions in their evolution? And, where are students, faculty and leadership in these institutions in relation to their technology development?

3.7 Chapter summary

This chapter has highlighted how some overarching concepts from DI theory were employed to help contextualise some of the pragmatic questions associated with the study and these insights will be revisited in the Discussion chapter. Further, components of the theory were also important in the design of the tools and instruments that were used in Phase Two and Three of the project relating to digital literacy questions and adopter categories. An explanation of the design of these specific instruments and tools that were adopted and employed is described in more depth in the next chapter focussed on methodology and methods.

Chapter 4 - Methodology

4.1 Chapter introduction

This fourth chapter represents a comprehensive overview of the methodology and methods that were employed in this project. The research design is presented, and the participants, recruitment, tools and instruments used, as well as the procedure, data analysis plan and the sample size justification are described. This study draws primarily upon data from semi-structured interview and focus group data, audit, and cross-sectional surveys specifically developed to address issues related to learning technologies in CM education outlined in the projects' aims and objectives. The specific details of the study design are described in the sections below.

4.2 Research methodology - Multi-phase exploratory mixed methods framework

4.2.1 Mixed Methods Research

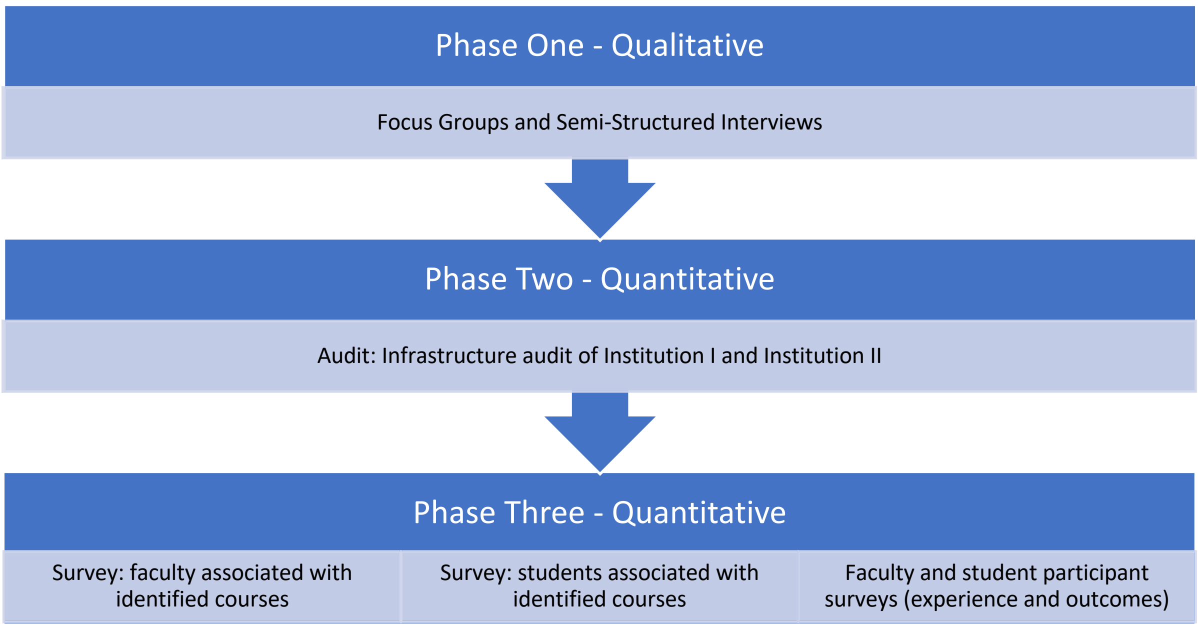
The aim and subsequent objectives of this research are explored through a multi-phase exploratory mixed methods project consisting of three phases. Based on research questions, MMR collects and analyses both qualitative and quantitative data, as well as integrating and linking the data concurrently. MMR design can be convergent, explanatory or exploratory where initial qualitative research is often undertaken first which can inform the quantitative phase subsequently. Multiphase exploratory sequential mixed methods design is characterized by an initial qualitative phase of data collection and analysis, followed by a phase of quantitative data collection and analysis, with a final phase of integration or linking of data from the two separate strands of data. The sequential alignment often occurs with each new approach building on the what was learned previously to address a central program objective (Creswell and Clark, 2017). MMR was chosen as a sound method for this project as it has been tested and widely employed in both education (Creswell and Garrett, 2008), medicine (Wittink et al., 2006) and emerging academic sub-disciplines (van der Roest et al., 2015). The multi-phase exploratory MMR model is often used to support the development, adaption and evaluation of specific programs. Further, it is a sound methodology often applied when mixing the two forms of data concurrently and sequentially such as in a study where it was needed to develop and adapt existing instruments as well as apply the instruments. The purpose is to address a set of incremental research questions that all advance one program objective. MMR provides an overarching methodological framework to a project with multiple phases. In the completion of this project the conventional MMR reporting guidelines have been completed in full (O'cathain et al., 2008, Rodgers et al., 2016).

4.3 Overarching study design

This study was conducted across three-phases:

1. Phase One, the qualitative phase, draws upon data from focus groups and interviews.
2. Phase Two, the quantitative phase, draws upon an educational and information technology infrastructure audit of CM education institutions.
3. Phase Three, which is also quantitative in nature, employs survey data of faculty and staff from the target institutions

Figure 4.1 The three phases of investigation



4.3.1 Phase One – Qualitative: Focus groups and interviews

The first phase of this project was conducted in Australia, the US and Canada in 2015 and aimed to explore the perceptions and experiences among students, faculty and professional leaders (such as representatives of regulators and associations) of the naturopathic profession in Australia, Canada and the US toward technologies in CM education and practice drawing upon focus group and semi structured interview data. This phase was designed to address research objectives 3, 4, and 5. Data analysis was consistent with a multiphase exploratory MMR design with decisions needed on how best to combine the data analyses from the two institutions to address the common research objective.

4.3.2 Phase Two – Quantitative: Audit

The second phase of this project was informed by the findings from Phase One and involved an 'audit' of existing educational and learning technological infrastructure for each sample institution. This included an audit of current practices, the modes of delivery that were currently adopted and why, what tools, technologies and platforms are used, which learner interfaces, content and learning management systems, which software and hardware were used in the various departments, as well as the digital security systems in place, and the educational analytics employed. The audit instrument was developed referencing existing tools. This phase was designed to address research objectives 1 and 2. At the outset of the project, it was anticipated that by the time of the completion of the audit data collection and analysis phase, the questions relating to the technologies employed the infrastructure used, institutional priorities would have been addressed. After the collection of original data, secondary analysis was then undertaken. Data analysis was consistent with a multiphase exploratory MMR design with decisions needed on how best to combine the data analyses from the two institutions to address the common research objective.

4.3.3 Phase Three – Quantitative: Survey

The third phase of this project was informed by the findings from Phase One and Two and employed advanced cross-sectional survey design. Initially, students of both institutions were invited to participate in surveys that explored their attitudes, experiences and perceptions towards learning technologies within the training of CM practitioners. Subsequently faculty were surveyed on their perceptions, experiences and attitudes towards learning technologies within the training of CM practitioners. The survey tools were based upon established surveys and survey tools and were further developed in light of the themes identified through the interviews and focus groups conducted in Phase One, and the audit results from Phase Two. This phase was designed to address research objectives 2, 3, 4, and 5. Data collection was based upon audit with existing institutional stakeholders. Data analysis was consistent with a multiphase exploratory MMR design with decisions needed on how best to combine the data analyses from the two institutions to address the common research objective.

4.4 Phase One – Qualitative: Focus groups and interviews

4.4.1 Aim

This phase of the study aimed to explore the perceptions, experiences, and attitudes among students, faculty, and professional leaders (such as representatives of regulators and associations) of the naturopathic profession toward the role of scientific and traditional knowledge within contemporary naturopathic education.

4.4.2 Setting

The study fieldwork in Phase One was conducted in 2015 in Australia, the US and Canada. These three countries were chosen as they have been identified through the WNF as delivering naturopathic training that are closely aligned in terms of curriculum content and graduate skills, knowledge and attributes (Grant and O'Reilly, 2012). The focus upon naturopathy programs was due to naturopathy being one of the largest CM professions in

Australia and US and the substantial numbers of naturopathy students, faculty and leaders within US and Australian CM educational institutions.

4.4.3 Sample and recruitment

These focus groups and interviews aimed to explore the perceptions, experiences and attitudes of participants among students, faculty and professional leaders (such as representatives of regulators and associations) of the naturopathic profession towards the role of technology within contemporary naturopathic education. Participants and stakeholders in this phase of the study involved students, academics and leaders. Student participants were recruited from Institution 1 in Australia and Institution 2 in the US. Faculty and professional leaders were recruited from Canadian, US and Australian academic organisations and institutions that met the requirements for membership with the WNF (World Naturopathic Federation, 2019b) ensuring the organisations satisfied international recognised standards for professional representation. Students were recruited for focus group participation via email invitation sent via their faculty administration. In the case of two students - where distance was a major barrier to focus group participation – one on one interviews were conducted. Relevant faculty and professional leaders (leaders of an academic department or professional organisation) were identified by senior management from their organisation or institution and invited by the research team to participate in one-on-one interviews.

4.4.4 Instrument

Focus groups and semi-structured interviews were conducted by two researchers (one being the PhD candidate), using a validated semi-structured question/topic facilitation guide (see Appendix C). The same guide was used for both sample groups as the study sought the perceptions and experiences from all parties on similar themes, domains and topics and allowed for exploring related and/or different issues that were introduced by the participants in the fieldwork process.

The interviews and focus groups began with an introductory contextual discussion. All participants were provided with a participant information sheet (PIS) before meeting with the researcher and were given an oral overview of the project summarizing the PIS before being invited to sign an informed consent document. Participants retained the PIS for their records. All interested faculty and leaders were interviewed to ensure any differences in perspectives across organisations and regions were captured.

4.4.5 Data collection

4.4.5.1 Student interviews

A total of seven focus groups, three in Australia and four in North America, were conducted on site at each institution involving a total of 29 naturopathy students. The focus groups were held in convenient central campus-based locations at students' convenience and provided a forum for students to discuss their perceptions and experiences regarding technologies in education and practice through both individual insights and via sharing and reflecting upon the experiences and perceptions of others.

4.4.5.2 Faculty and leadership interviews

Semi-structured interviews were conducted in person with 30 CM faculty and professional leaders in North America (n=19) and Australia (n=11). Interviews were selected as the data collection method for academic and professional leaders to allow open, confidential discussion of personal opinions and experiences. The time and location of the interview was chosen to suit the participant. Wherever possible the researcher attempted to interview a diverse range of participants with respect to location, age, gender and years of educational service. Ultimately this range was balanced by feasibility in recruiting participants.

4.4.5.3 Recording and transcribing

Interviews and focus groups were recorded via a digital recorder and then transcribed. Each interview was between 45 and 60 minutes in duration and focus groups were approximately 90 minutes in duration.

4.4.5.4 Domains: Outlines of issues to cover in fieldwork

As outlined in the facilitation guide, the domains used to pilot the interviews and focus groups were perceptions and experiences of; *educational delivery methods in the education of CM practitioners, learning technologies in the education of CM practitioners, and practice enhancing technologies and software used in clinical practice.*

4.4.5.5 Sample size justification and thematic saturation

Thematic saturation is the key indicator of when to reasonably cease qualitative fieldwork (Marshall et al., 2013, Mason, 2010, Robinson, 2014). In this study, thematic saturation – the point at which repeated investment in further data collection appears to not produce new significant data - was attained after 15 interviews and 4 focus groups (Glaser Barney and Strauss Anselm, 1967). This is in line with current best practice of five to 25 interviews (Creswell and Poth, 2016). In this study, after 20 interviews and 4 focus groups, an exit strategy was developed as it was found that similar issues and perceptions started to be repeated and, as a consequence, after 3 more focus groups and ten more interviews this part of the data collection for this project was completed with thematic saturation attained (Saunders et al., 2018, Guest et al., 2006).

4.4.6 Validity and rigour

The nature of qualitative research data often makes it challenging for the person completing the analysis to separate themselves from the data. The ways in which the researcher of this project managed bias and was able to maintain a level of objectivity in the qualitative data analysis to assure the validity of the analysis produced, was by verifying findings through triangulation - drawing on the strengths of the direct experience of the focus group and semi-structured interview researchers (one being the PhD candidate) and interpretation by an expert supervisor who was not present at interviews. In addition, multiple people were used to code the data to assist in creating consistency of interpretation. The coding was checked by AG who assisted with data collection and JA who did not participate in data collection. This ensured that the coding aligned with direct observations of data collection and distanced observations of the data after collection. Further, other strategies to manage bias included, maintaining meticulous records, demonstrating a clear decision trail by practising reflexivity and reflection, checking for alternative explanations for the findings, reviewing the findings and conclusions with peers, and peer debriefing (Houghton et al., 2013, Noble and Smith, 2015).

4.4.7 Data analysis: Process and approach to analyse the data

Prior to transcript analysis, all interviewees were allocated pseudonyms while focus group participants were only identified by the country where they were located (in North America or Australia). Using a Framework approach (Pope et al., 2000), descriptive data analysis was undertaken from the interview transcripts. The Framework approach was chosen as it provides a structure with which to analyse data within this applied tradition. The analysis followed the established processes of; *familiarisation*, *identifying a thematic framework*, *indexing*, *charting*, and *mapping and interpretation* (Pope and Mays, 2013). Congruent with the Framework approach it was decided to choose to adopt an implicit theoretical approach (in which the theory is not made explicit) as utilised in applied health care research in many fields including general practice, (Benson et al., 2005, Fisher et al., 2009, Burroughs et al., 2006) nursing, (Jansink et al., 2010) and health promotion. (Hesketh et al., 2005). The two researchers (including the PhD candidate) undertook immersion in the raw data by listening to all recorded interviews and focus groups and reading transcripts. Thematic data analysis was subsequently undertaken from the interview and focus group transcripts by Dr Amie Steel after importing the data into the NVIVO qualitative data analysis program. The data was then charted to themes by clustering related data and then reading through each data cluster to identify concepts consistent within clusters. Clusters were then analysed for intersecting concepts and grouped into meta-themes. Quotes were selected based upon the quality of the quote and the representativeness of the theme.

4.5 Phase Two - Quantitative: Audit

4.5.1 Setting, sample and participants

Participants and stakeholders in this phase of the study involved one senior member of staff employed in the management of technology at the two sample educational institutions, Institution 1 and Institution 2. In a field of diverse providers, the two institutions were chosen as they are among leading examples of CM education providers in their jurisdictions, based on their longevity, breadth and range of courses and programs. The individual participants who completed the audit instrument were identified initially through email contact with senior leadership at each institution and then internally assigned.

4.5.1.1 Institution 1 Australia

Institution 1 is a dual sector, multi-modality provider of degrees and certificates in CM based in Australia. It has a nationwide footprint with six campuses in the major state centres. Educational offerings are delivered in the higher education context with ~4500 students enrolled in its five degrees - Bachelor of Health Science (Naturopathy), Bachelor of Health Science (Nutritional and Dietetic Medicine), Bachelor of Health Science (Acupuncture), Bachelor of Health Science (Myotherapy), Bachelor of Complementary Medicine. In June 2016, the time of data collection there were 5,200 students in its undergraduate programs (FT (40%) and PT (60%)). In addition, at the time of the survey there was also bachelor’s degrees of Health Science in Western Herbal Medicine and Homeopathy on scope. A one-year Honours Program has subsequently been added. Institution 1 teaches a degree with a non-clinical outcome in CM for students who are interested in the CM field as a whole and are interested in careers other than as a practitioner. In this degree pathway, students learn a broad range of theoretical topics including biological sciences, social sciences, naturopathy, nutrition, acupuncture, musculoskeletal therapies, homeopathy, public health and health promotion and the degree is described as providing students with a broad perspective on the scope of this dynamic field, within the overall context of public health, ethics, research, health promotion and health behaviour (ECNH, 2020). In the Australian education regulatory framework Institution 1 is technically a non-self-accrediting provider of higher educational degrees, one of only four that sit alongside the 41 public universities. Among its unique characteristics are the size of the student body as (at the time of writing) it is the largest private Higher Education provider of natural medicine courses in the Southern Hemisphere, the student body that ranges from age 18 to 72, the status as a private institution owned by private equity interests and its national campuses (ECNH, 2017).

4.5.1.2 Institution 2 United States

Institution 2 is the oldest accredited naturopathic medical college in North America. A leader in natural medicine education and training, at Institution 2 the Doctor of Naturopathic Medicine is an intensive four - year doctoral program that trains individuals to become primary care physicians with an emphasis on the art and science of natural medicine. Upon graduation, candidates are prepared for and qualified to sit for NPLEX, the North American board examination which confirms licensure eligibility in states and provinces that license naturopathic physicians. The university is accredited by the Northwest Commission on Colleges and Universities and offers Doctor of Naturopathic Medicine, Doctor of Science in Oriental Medicine, Master of Science in Nutrition, Master of Science in Global Health, Master of Science in Integrative Medicine Research, Master of Science in Integrative Mental Health, Master of Science in Integrative Sports Medicine and a Master of Science in Oriental Medicine. In the undergraduate program Institution 2 offers a Bachelor of Science in Nutrition and a Bachelor of Science in Integrative Health Sciences. Global Health is taught at Institution 2. It is described as, 'for students who seek an understanding of the complexity of global health issues and for those that want to contribute meaningful solutions in improving health and health equity for all people' (NUNM, 2020b). Integrative Medicine Research is described as allowing students to, 'study integrative medicine using rigorous research methods' (NUNM, 2020c). Integrative Health Sciences features four core threads, 'integrative health sciences, natural sciences, social sciences and critical thinking. The more general integrative health sciences course focuses on topics such as prevention and wellness, exercise science, mind-body medicine, nutrition and botanical medicine' (NUNM, 2020a). As at mid 2016, the time of data collection, there were 640 students in the graduate programs (NUNM, 2017).

4.5.2 Instruments

4.5.2.1 Audit research design

Within the context of a pragmatic HSR approach, an existing and validated audit approach and tool was sought to guide the data collection and analysis from the sample institutions. As institutional audit (here defined as a wide-ranging methodical examination and review of an organization's infrastructure and activities) tools and approaches already existed, it was assumed that a relevant tool or tools could be applied or could be easily adapted to suit the purposes of this study. Audit tools and strategies are commonly used in both medicine and allied health to understand processes, results and culture (Smith et al., 2012) as well as an established method of understanding quality and processes in education environments (Tierney et al., 2015, Richardson, 2005). Instruments for self-assessment audit commonly assist educational providers in developing long term institutional strategies, develop capacity and leadership and focus on continuous improvement (Jamtvedt et al., 2006). An objective example is 'Audit-based Education', a specific quality improvement intervention that provides feedback, education and guidance, and documents the gap between achievement and guidelines (de Goeij and Rotmans, 2013). However, no existing technology audit tools were found to have been employed in a CM educational setting prior to this thesis study and any such tools currently in use seemed to lack any direct applicability to the type of educational institutions involved in this study. One of the initial challenges for the researcher was that the two institutions, while relatively large in terms of student numbers, are nonetheless specialized in numerous ways, such as the courses taught and the make-up of their IT departments. In public universities in the American and Australian higher education landscape, large IT and ET departments generally interface with individual academics, academic departments or faculties to fulfil all the tasks related to the technological operations in academic delivery. It became apparent that the institutions in this study approached IT and ET delivery in different ways to their tertiary counterparts. Another challenging aspect that emerged during this audit design phase was that the academic activities involving learning technologies in these two institutions spanned many different departments than is generally the case in the broader tertiary educational sector (Academic, IT, Governance, Operations). Moreover, at the outset of this phase of the study the two institutions appeared to be in different phases of their learning technology evolution, were using different technologies and modes of delivery and were employing different terminology to describe basic learning technology functions. All of these factors contributed to challenges for the researcher, and as a consequence of these challenges a more individualized instrument was developed for the audit task as none found were adequate.

4.5.2.2 Audit approach adopted

Some individual relevant questions from 'asset mapping' (University of Kansas, 2018a, University of Kansas, 2018b, Griffin and Farris, 2010, McKnight, 2010), 'technology audits' (Schrimpf and Tower, 2011) 'infrastructure audits' (Morrison, 1993, Alderman et al., 2012), 'Curriculum Management Audits' (Frase et al., 2000), 'Self-assessment audits' (Sperling, 2009) and 'health facility assessment tools' such as the WHO SARA tool (World Health Organisation, 2015) were adopted and integrated into the eventual audit instrument. The finalised audit instrument focused upon gathering data in the categories of Institutional, HR, Financial, Support Services, Content, Academic, Leadership and Organizational Culture and Technical Information. The audit questionnaire was finalised in December 2015.

4.5.3 Administration of the audit instrument

The audit tool was sent in July of 2016, to be completed by two key institutional leaders in both Institutions - the Registrar in Institution 1 and the Dean of Research and Graduate Studies in Institution 2. The process of recruiting the two individuals who filled out the audit instrument involved initially, contacting the CEO/President of each institution to identify and internally select a key senior manager with appropriate internal corporate knowledge relating to technology provision (and other related data) and who could answer the majority of questions in the study.

4.5.4 Data collection

Data collection was via online completion of the audit template. The response to the audit was received in September 2016 from Institution 2 and December 2016 Institution 1.

4.5.5 Validity and rigour

In this phase of the study, bias was minimised by having the final audit document reviewed by peers and supervisors, and through the inclusion of validated sets of questions from other survey instruments (Wieringa et al., 2018). When it came to the interpretation of the data, confirmation bias was minimised by resisting the temptation to immediately generate potential hypotheses and waiting until a more complete information set has been reviewed in Phase Three of the study – triangulation (Klayman, 1995). In addition, the techniques of identifying and considering other hypotheses for key findings, getting expert supervisory input and finding ways to subconsciously ignore contradictory evidence to findings was employed.

4.5.6 Data analysis

Descriptive analysis was completed in January 2017. Consistent with the mixed methods approach of this research this analysis coincided with preparation of Phase Three of the project, a reworking of the cross-sectional surveys. Three versions of analysis of the data were produced; a descriptive narrative of the results and findings of each institution, a comparative narrative of each institution, and an analysis describing the position, evolution and maturity of each institution through the lens of DI theory.

4.6 Phase Three - Quantitative: Surveys of academics and students

The aim of the study was also addressed through an analysis of survey data collected from students and staff during the 2017 academic year. A cross sectional electronic survey was administered to students and staff at the two CM education institutions. Firstly, students within both organisations constituted the target population eligible to participate. The survey was administered to current FT and PT students officially enrolled in degree courses at Institution 1 (n=4227) and FT and PT students officially enrolled in post-graduate courses at Institution 2 (n=624). Students who were listed with their institution as withdrawn, deferred or inactive were excluded, as were alumni. Academic staff within the two institutions were the next target population. The survey was administered to all tenured, contracted and adjunct academics at both institutions at the time of recruitment. It was estimated that Institution 1 administered the survey to ~350 academics. Institution 2 administered the survey to 180 academics. Administrative or research staff were not included in the sample population (Steel et al., 2015).

4.6.1 Setting, sample and participants

Participants and stakeholders in this phase of the study involved students and academics from the sample institutions (Institution 1 in Australia and Institution 2 in the US) described in sections 4.5.1.1 and 4.5.1.2. The courses being studied and taught by these participating students and academics are described in the same sections above.

4.6.2 Instruments

4.6.2.1 Survey research design

Data for this Phase was drawn primarily from cross-sectional surveys - specifically developed to address issues related to CM and education and designed to clarify existing questions and issues that emerged from the findings of the audits. Survey research is an established method in epidemiological research and fits within the broad category of descriptive study designs (Jolley, 2004). The purpose of descriptive epidemiological research is to document prevalence patterns of outcomes of interest as well as to develop hypotheses related to causation where appropriate. The tools used in this survey research are surveys which are 'a systematic method for gathering information from (a sample of) the larger population of which the entities are members' (Groves et al., 2011). The descriptors used to report the results from surveys are most commonly quantitative statistics although these may encompass either descriptive or inferential statistics. The inclusion of both of these methods of data analysis enables surveys to describe the basic characteristics or experiences of populations. Within survey research there are a number of methods which may be employed. One such method is cross-sectional survey design. This method draws on a representative sample of a defined population to determine an accurate picture of the population rather than a perception of those stakeholders in CM education which may be provided by analytical study designs such as case-control or cohort studies (Jolley, 2004). The data produced from cross-sectional studies are useful in evaluating the perceptions, behaviours and attitudes of populations (Bonita et al., 2006). This cross-sectional survey method of data collection is in direct alignment with the research approach to examine prevalence patterns for common behaviours, and the objectives of the study, to examine the factors influencing the uptake of learning technologies in CM institutions, examine how stakeholders perceive practice and learning technologies, explore the perceptions of faculty and students of CM education institutions to the challenges and investigate the perceptions of educational leaders. Furthermore, given the capacity for respondents to retrospectively identify factors which may be considered in the particular context of this research project and in a manner comparable to a cohort study, the applicability and usefulness of the cross-sectional survey design is further strengthened.

4.6.2.1.1 Cross sectional survey review and face-validation

The faculty and student surveys were informed in the initial design phase by an exploration of existing literature (Simpson and Obdalova, 2014, Jones-Kavalier and Flannigan, 2008), and validated surveys and questionnaires such as the Association of Learning Developers in HE, the Heads of e-Learning Forum, the Association of University Administrators, survey and findings on the digital fluency of Staff and Educational Developers Association (SEDA) members, the Heads of Educational Development Group produced the HEDG baseline survey and the Exeter Cascade project. Also reviewed and integrated were digital literacy instruments including commercial instruments such as the iDCA (iDCA Digital Competence Assessment) instrument, the JISC Digital Literacy Services Design Studio, the AUA JISC digital literacy survey, as well as digital competence assessments (Põldoja et al., 2014), digital confidence measures (Arnone, 2010, Tondeur et al., 2017), online instructor satisfaction measures (Bolliger et al., 2014) and other resources (Diogo and António, 2017, Walker et al., 2016).

As a means to validate the surveys, pilot testing was employed in order to examine effectiveness. Qualitative feedback mechanisms were employed for the survey tools to highlight any issues that could confound the data as a way to further enhance the ability to validate the designed tool (Schwarz and Sudman, 1996, Foddy, 1996). Pilot testing provided valuable information on the quality of the respondent's interpretations and formatting issues in the data, revealing any gaps in the survey design. In this instance, the student survey was initially created in July 2015 and the final survey was constructed of a collation of validated questions and blocks of questions from the existing tools and instruments mentioned above. This initial survey was completed, was sent for ethics approval and was obtained (details below). This survey at that stage took over 30 minutes long to complete. Remaining in the surveys were the questions relating to demographics, attitudes to technologies, practice enhancing technologies, and support. In addition, in keeping with the overall project design, mixed methods validation was also applied with some questions adapted after being informed by the results from Phase Two of the overall study – the audit of both institutions exploring vision, strategy, leadership and governance policies, learning technology provision at the two educational providers as well as HR and financial resourcing. The initial findings of the completed audits tentatively suggested two organisations at different points of an adoption of technologies innovations process. Questions were thus included in the survey relating to uptake and attitudes to clinical practice and clinic-based software, telehealth as well and any curriculum time devoted to these trends. The shortened 12-minute survey was then resubmitted for ethics approval and accepted by the UTS and NUNM ethics boards (see below).

4.6.2.1.2 Student survey

Students were questioned relating to four specific domains: *demographics; their perceptions of technologies in general; their perceptions of the transformation taking place in education; and their perceptions of their institution's infrastructure, progress and support regarding learning technologies.* The survey was assessed for face validity prior to study recruitment by testing the instrument. Instrument modifications were undertaken where relevant with regards to language clarity, use of different educational terms (as employed internationally), the time required to complete the survey (12 minutes) and the relevance of questions.

Demographics: Respondents were asked to indicate the institution where they were currently enrolled as a student, the course of study in which they were currently enrolled, how many years they had been studying on their current course, and their gender identity.

Experiences and perceptions of technologies in general: Students were invited to indicate their perceptions and the impact of contemporary digital technologies on their lives through a five-point Likert scale (*Strongly disagree - Strongly agree*).

CM students' perceptions of changes in teaching practice in their institution: Participants were asked to report on their perceptions regarding whether teaching practice is changing due to the availability of learning technologies, and how learning technologies impacted their activities in the classroom and their learning. Using the categories of Rogers' Diffusion of Innovation theory as a model of adoption of technology students were also asked to choose which category best matched the way they adopted technologies using the categories of Rogers (Innovator, Early Adopter, Early Majority, Late Majority, Laggard) (Rogers, 2003, Surry and Farquhar, 1997, Rogers, 2004).

CM students' perceptions of institutional infrastructure, progress and support: Participants were invited to report their experiences and perceptions regarding technology use at their institution. Survey items also asked if the students perceived their institution to be more advanced regarding effective learning technology use as compared to other educational institutions, their awareness of digital technology training opportunities made available by their current institution, and if they considered it necessary that courses that focus on digital literacy be incorporated into their curriculum.

4.6.2.1.3 Staff survey

The staff survey instrument was designed to explore four specific domains: *demographics; attitudes to technologies in general including their self-assessed technology adoption category; perceptions of the changing face of CM education and the role of the CM teacher in general; and perceptions of their institution's infrastructure, progress and support regarding learning technologies*. The survey was assessed for face validity prior to study recruitment by testing the instrument. Instrument modifications were undertaken where relevant with regards to language clarity, use of different educational terms (as employed internationally), the time required to complete the survey (12 minutes) and the relevance of questions.

In relation to the demographic domain, a number of survey items identified the respondent's current institution role or position, how many years they had been teaching at their institution, their gender and current employment status. Related to the attitudes to technologies domain, academics were invited to self-rate their perceptions of contemporary digital technology and the impact of this technology on their CM students. Participants were also asked to choose which category best matched the way they adopted technologies using the DI categories of Rogers (Rogers, 2010, Kardasz, 2013). In questions pertaining to the domain investigating perceptions of change in education, participants were asked to report their perceptions of whether teaching practice is changing and whether this is due to the availability of learning technologies as well as how learning technologies impact both their activities in the classroom and their wider work as academics. A number of survey items captured respondents' perceptions and experiences regarding possible constraints upon the incorporation of digital technologies and digital learning into their own and institution-wide classroom activities, and their own ability to influence and recommend new technologies in their workplace. Lastly, additional survey items explored respondents perceived institutional support for change, challenges and barriers to adopting new digital tools and also questioned if participants viewed their institution as more advanced in the effective use of digital technologies compared to other institutions. Attitudes to training opportunities for academics as well as attitudes to the inclusion of digital literacy content in the institution's curriculum were also explored.

4.6.3 Other study instrument materials

4.6.3.1 Consent form, cover sheet and information for surveys, and participation information sheet (PIS)

A consent form, a cover sheet for the surveys and a participation information sheet were developed and employed for use in the study. These are attached as Appendices A and B.

4.6.4 Administration of the Instruments

4.6.4.1 Academic and student survey administration

A link to the anonymous online survey was distributed via email invitation by a member of the senior leadership team at each institution with two subsequent email reminders. It was made clear to potential participants that completion of the survey was voluntary. Written consent was obtained prior to survey completion. Recruitment was conducted over four weeks in October 2017.

4.6.5 Data collection

4.6.5.1 Surveys

Data collection was administered online via SurveyGizmo. Following completion of data collection period both complete and incomplete data was transferred to spreadsheets for analyses.

4.6.5.2 Sample size justification

In this Phase Three of the project, the study aimed for a sufficiently large sample size to answer the research question. This rate was reached in the faculty survey (15%) but the student survey received a lower response rate (6.4%). In reality it was not expected that responses from more than 10% of students would be received. It has been noted that in educational research that it is somewhat difficult to get large response rates from students given the multiple surveys that are conducted to run the compliance and operational requirements in educational institutions. Survey response rates are notoriously low in these populations (Fan and Yan, 2010, Baruch and Holtom, 2008) and a gradual decrease in survey participation ('survey fatigue') has been noted over time (Nair et al., 2008). There is some literature on the topic of survey responses in educational settings, focussing mostly on ways to incentivise response rates (Dillman, 2011) however, these methods can be costly or require significant time or effort by survey researchers and may be unfeasible for postsecondary institutions due to the increasing fiscal pressures placed upon them. In addition, many survey researchers have begun to question the widely held assumption that low response rates provide biased results (Curtin et al., 2000, Massey and Tourangeau, 2013, Peytchev, 2013). In fact, there is evidence to suggest that small response rates only marginally differ in trivial ways from high response rates (75%) in some educational surveys (Fosnacht et al., 2017).

4.6.6 Validity and rigour

In this phase of the research bias was minimised by using established and validated questionnaires and survey instruments mentioned above. This involved including questions, or clusters of questions on the digital fluency of academics, digital literacy instruments and surveys for students and academics, digital competence assessments, digital confidence and online instructor satisfaction measures. In addition, the surveys were pilot tested by individuals that were representative of the target population.

4.6.7 Data analysis

4.6.7.1 Statistical analysis - Student and academic survey

Descriptive statistical analysis was employed including frequencies and percentages for categorical variables and means and standard deviations for continuous variables. Inferential t-tests were employed to analyse differences in categorical and continuous variables. Pearson chi-square tests were used to test for association between categorical variables. A p-value of <0.05 was applied to determine the level of statistical significance. Analyses were conducted using the statistical software SPSS Statistics.

4.7 Ethical considerations

This project was approved by the Human Research and Ethics (HREC) committees of the University of Technology Sydney Human Research Ethics Committee (ETH16-0477) and NUNM Institutional Review Board (AG05052017) in 2017. The contact details of all participants have been maintained by the principal researcher and all respondents are allocated an ID number ensuring the anonymity of participants is preserved. The voluntary nature of the study was made clear to the participants. They were free to withdraw from the study without penalty. The surveys and audit included contact details for research supervisors should the survey content contribute to emotional distress of participants.

4.8 The candidate's role in this multi-disciplinary team research

The research data for this PhD project was part of a broader study conducted jointly by the University of Technology Sydney (UTS) and Endeavour College of Natural Health. Led by another senior researcher, the PhD candidate was a core team member. The candidate was present at and participated in the data collection focus groups and interviews and evaluated and analysed all the data. The audit was developed by the candidate under supervision, in joint team meetings with all supervisors and the candidate. The surveys were developed by the candidate, adapted and moderated through joint team meetings with all supervisors. The core structure of the survey questions was developed in line with previous educational surveys, but questions and response items were modified in accordance with the overarching project aim and through consensus amongst the research team. The candidate worked with nominated supervisors Distinguished Professor Jon Adams and Dr Amie Steel in all phases. Following data collection, the candidate was solely responsible for analysing the data relevant to this thesis, drafting the manuscript and revising the manuscript based on supervisor feedback. No funding was sought in the completion of this project.

4.9 Chapter summary

This thesis employs a robust MMR exploratory design and a three-phase process to collect data (interview and focus group data, audit and dual cross-sectional survey design) to answer the identified research aim and objectives. It achieves this aim by accessing appropriate representative key stakeholders in the naturopathy profession in North America and Australia in the qualitative interview and focus group phase, two key institutions in the quantitative audit phase, and institutionally representative samples of faculty and students in the quantitative survey phase. The rich data made available from these three sources enabled a refined and detailed qualitative and quantitative statistical analysis, and in doing so provide valuable insights to this important topic area.

Chapter 5 - Results (1): An examination of technologies in complementary medicine education and clinical practice: The perceptions and experiences of naturopathy students, faculty and educational leaders

5.1 Chapter introduction

5.1.1 Rationale for this analysis within the broader research project

The aim and objectives of this project, as outlined in Chapter 1 (Section 1.3.2), require the need to understand using technology is being deployed, adopted and with what perceptions. Determining this baseline information through fieldwork will identify the key perceptions, drivers, and adoption patterns of academics and students alongside of the educational and professional leadership points of pressure. Given the need for a more sophisticated and nuanced approach to HSR related to CM as identified in Chapter 1 (Section 1.4), such an examination needs to be both broad and deep and employ the MMR strategy outlined in the 4th Methods chapter. With this in mind, this chapter reports the findings of the Phase One qualitative interviews and focus group discussions undertaken in order to address research objectives 2-5 of the project. Critically, the results of this phase of the study will inform future phases of the project.

5.1.2 Publication of results

The results contained within this chapter has been published in *Complementary Therapies in Medicine*. Gray A, Steel A, Adams J. (2021) An examination of technologies in complementary medicine education and practice: The perceptions and experiences of naturopathy students, faculty and educational leaders. *Complementary Therapies in Medicine* https://doi.org/10.1016/j.ctim.2021.102793

A copy of the manuscript is attached to this thesis as Appendix J.

5.2 Background

Complementary medicine (CM) - commonly defined as healthcare not traditionally associated with the conventional medical profession or medical curriculum (Adams et al., 2013b) – houses a diverse field of mind-body practices (e.g. yoga, meditation) natural products (e.g. vitamins, herbal medicines), whole healing systems and therapies (e.g. naturopathy, traditional Chinese medicine) and treatments (e.g. aromatherapy, reflexology) (Adams et al., 2012a). There is an increasing uptake of CM worldwide (Harris et al., 2012) and CM accounts for around half the Australian healthcare sector, in terms of practitioner visits (Xue et al., 2007) and over the counter sales (Reid et al., 2016b, Steel et al., 2018b, Harnett, 2019), while in the US the latest available research shows a 12-month CM use estimate of 33.2% (Clarke et al., 2015). The CM education sector appears to also be experiencing growth and professionalisation. Yet, despite the substantial footprint of CM industry and provision within the Australian and US healthcare landscape and clinical settings (Wardle et al., 2011, Jonas et al., 2013a, Adams et al., 2017), CM practitioner education has received little empirical attention to date.

A recent review of CM education research (Gray et al., 2019b) shows the quantity and quality of research regarding learning technologies in education more broadly (Gros et al., 2012, Lister, 2014, Liu et al., 2010, Cornelius, 2014) (and medical and allied health education research more specifically) is notably absent within the field of CM educational research with little research investigating CM academic perspectives to learning and technologies (Steel et al., 2015, Grant and O'Reilly, 2012, Gray et al., 2019a) and there is infrequent and dated empirical research conducted on CM students and their perspectives to learning (Forman and Pomerantz, 2006, Frenkel et al., 2007, Rowe, 2009, Wardle and Sarris, 2014). Much of the existing educational research within CM has focused on naturopathy (Gray et al., 2019b, Steel et al., 2018c) as it is one of the largest and most dynamic of the CM professions in Australia and the US (Sarris and Wardle, 2017, Ooi et al., 2018a, NCCIH, 2019b). Research has yet to explore the identified gaps including faculty resistance to change, student readiness for online study as well as the digital divide between subsets of students and between students and faculty (Parkes et al., 2015, Downing and Dyment, 2013, Ilgaz and Gülbahar, 2015, McKee and Tew, 2013, Black-Fuller et al., 2016).

Meanwhile, the internet has placed unprecedented information at patients' fingertips and personal health devices, technologies and applications are changing how individuals perceive, engage with, manage and communicate their health (Jetty et al., 2018). Medical organisations, individual clinics, hospitals, and broader healthcare systems have acknowledged the significance of these issues in planning high-quality care (Broman et al., 2016) and technologies (especially robotics, nano-technology, health informatics) are increasingly dominating medical and healthcare provision (Wachter, 2015, Casselman et al., 2017, Marakhimov and Joo, 2017) alongside the use of telehealth and practice enhancing software in clinical practice. Patients and practitioners exhibit increasing willingness to adopt applications of telehealth - 'a collection of means or methods for enhancing health care, PH, and health education delivery and support using telecommunications technologies' such as Zoom, Skype and Google hangouts' as part of managing care (Burch et al., 2017, Kruse et al., 2017, Turner et al., 2014, Cannon, 2018, Henderson et al., 2014, Head et al., 2017, Cushing and Braun, 2018, Reddy et al., 2014, Tietjen and Breitenstein, 2017, Kilkku, 2018, Schulz-Heik et al., 2017, Heller et al., 2000, Bartz, 2017, Fiorini et al., 2015). Practice enhancing software – here defined as a technology used to enable efficient, novel application in a clinical setting – are also commonplace and widespread in medicine and CM, see Table One. Significant research has recently focused on the implementation and impact of learning technologies (Demuth III, 2010, Hall, 2011, Stromso et al., Dočekal and Tulinská, 2015) - the study and application of technologies to support and/or enhance teaching, learning and assessment - for students, educators and educational outcomes (Al-Qahtani and Higgins, 2013, Herrington and Herrington, 2006, Liu et al., 2010, Waugh et al., 2013, Cornelius, 2014).

Table One: Examples of Practice Enhancing Software Currently Used in Clinical CM practice

General medical apps and resources	(e.g. MIMs online, Natural standard, NICE Guidelines)
Practice enhancing technologies include (but are not limited) to applications and software specifically orientated to the technical disciplines of	
Acupuncture - point location software	e.g. Points PC

Naturopathy and Nutritional Medicine - prescription of supplements and nutritional advice	e.g. Nookal, Foodzone, EPIC, FoodWorks
Homeopathic Medicine - Repertory software, and databases	e.g. RadarOpus, Synergy
Iridology	e.g. EyeRonec
Numerous other software in the CM marketplace	e.g. CorePlus, Health Quest, Ginko, nPod
Practice management software available in CM clinical settings - management of their practices, bookings, report writing as well as patient and information management	e.g. Clinic Essentials, Clinko, Birdsong, Unified Practice, Compass, Practice Fusion
Generic applications such as information and financial management tools	e.g. Dropbox, Xero, Email, Excel, Outlook, Word

These telehealth technologies are now being widely employed in conventional health care (du Toit et al., 2019, Myers, 2019), and also appear to be employed in some areas of CM clinical practice (Subbarao and Cooper, 2017). Little is known about the use of digital technologies in CM clinical practice. Similarly, only a small amount is currently known about telehealth and CM and is limited to only particular practices such as mindfulness (Niles et al., 2013), yoga (Groessl et al., 2008, Schulz-Heik et al., 2017) and music therapy (Lightstone et al., 2015). In direct response to the circumstances outlined above, the study reported here provides the first examination of the perceptions and experiences of students, faculty and professional leaders toward technologies in CM education and practice.

5.3 Methodology

The study reported in this paper aims to explore the perceptions and experiences among students, faculty and professional leaders (such as representatives of regulators and associations) of the naturopathic profession in Australia, Canada and the US toward technologies in CM education and practice drawing upon focus group and semi-structured interview data. The study fieldwork was conducted in 2015 in Australia, the US and Canada - three countries chosen due to their naturopathic training delivery being relatively aligned in terms of curriculum content and graduate skills, knowledge and attributes. The focus upon naturopathy programs was due to naturopathy being one of the largest CM professions in Australia and US and the substantial numbers of naturopathy students, faculty and leaders within US and Australian CM educational institutions.

Student participants were recruited from Endeavour College of Natural Health in Australia and National University of Natural Medicine in the US. Faculty and professional leaders were recruited from Canadian, US and Australian academic organisations and institutions that met the requirements for membership with the WNF (World Naturopathic Federation, 2019b) ensuring the organisations satisfied international recognised standards for professional representation. Students were recruited for focus group participation via email invitation sent via their faculty administration. In the case of two students - where distance was a major barrier to focus group participation – one on one interviews were conducted. Relevant faculty and professional leaders (leaders of an academic department or professional organisation) were identified by senior management from their organisation or institution and invited by the research team to participate in one-on-one interviews. All study participants received a participant information sheet (PIS) prior to fieldwork before providing informed consent. All interested practitioners were interviewed to ensure any differences in perspectives across organisations and regions were captured.

Focus Groups: A total of seven focus groups, three in Australia and four in North America, were conducted on site at each institution involving a total of 29 naturopathy students. The focus groups provided a forum for students to discuss their perceptions and experiences regarding technologies in education and practice through both individual insights and via sharing and reflecting upon the experiences and perceptions of others.

Interviews: Semi-structured interviews were conducted with 30 CM faculty and professional leaders in North America (n=19) and Australia (n=10). Interviews were selected as the data collection method for academic and professional leaders to allow open, confidential discussion of personal opinions and experiences. The time and location of the interview was chosen to suit the participant.

Guide: Focus groups and semi-structured interviews were conducted by Dr Amie Steel and Alastair Gray using a validated semi-structured question/topic facilitation guide (see Appendix C). The same guide was used for both sample groups as the study sought the perceptions and experiences from all parties on similar themes, domains and topics and allowed for exploring related and/or different issues that were introduced by the participants in the fieldwork process.

Domains: Domains to guide the interview and focus groups (as outlined in the guides) were: perceptions and experiences of educational delivery methods in the education of CM practitioners: learning technologies in the education of CM practitioners; and practice enhancing technologies and software used in clinical practice.

Recording and transcribing: Interviews and focus groups were recorded via a digital recorder and then transcribed. Each interview was between 45 and 60 minutes in duration and focus groups were approximately 90 minutes in duration.

Thematic saturation: Thematic saturation – the point at which repeated investment in further data collection appears not to reap significantly new data - was attained after 15 interviews and 4 focus groups. Prior to transcript analysis, all interviewees were allocated pseudonyms while focus group participants were only identified by the country where they were located (North America or Australia). Using a Framework approach (Pope et al., 2000), we followed the established process of *familiarisation*, *identifying a thematic framework*, *indexing*, *charting*, and *mapping and interpretation* (Pope and Mays, 2013). Congruent with the Framework approach we chose to adopt an implicit theoretical approach (in which the theory is not made explicit), as utilised in applied health care research in many fields including general practice (Benson et al., 2005, Fisher et al., 2009, Burroughs et al., 2006), nursing (Jansink et al., 2010) and health promotion (Hesketh et al., 2005).

5.4 Results

Data analysis identified five explicit issues reported amongst the participants. These related to, *perceptions and experiences of the shortfalls of CM classroom learning technology*, *perceptions of the value of technology within CM clinical practice*, *perceptions of learning technologies in the CM classroom, addressing access and equity concerns for students as a consequence of the use of learning technologies*, *and addressing the need to develop literacy and technology skills amongst students and faculty*.

When asked about the learning technology employed within the classroom, all participants first commented on the use (and perceived misuse) of slide presentation software such as Powerpoint^{TM}. The vast majority of students were critical of the value of delivering content using slide presentations, as seen by the following quotes from two US students (See Table Two: Quote 1.1, Quote 1.2). The lecturers agreed that students tended not to enjoy the Powerpoint presentations, but also felt that many students required and expected them. This dissonance in perspectives was described succinctly by a faculty member from the US (Quote 1.3). The reason that students gave for their dissatisfaction with slide presentations was due to past and in most cases ongoing experience of lecturer(s) simply reading through slides with no embellishment. Students in both the US and Australia describe this linear, restrictive use of the software as impacting on the student's ability to engage fully with the class content (Quote 1.4, Quote 1.5, Quote 1.6). Some faculty also acknowledged the negative impact on student engagement of some lecturers reading through distracting information-dense slide presentations (Quote 1.7). However, it was acknowledged by many participants that slide presentations are not necessarily inherently problematic, emphasising their potential alongside discussion-based classroom delivery (as opposed to didactic reading). As one academic emphasised, this relates to the importance of the lecturer's professional experience and personality to ensure content and delivery is engaging (Quote 1.8). Other learning technologies were discussed by both students and faculty but mostly with regards to their absence - frustrations reported by students that academics were not using the breadth of learning technologies available, and with regards to faculty, the challenges resulting from the institutional leaderships' expectations around accessing and using newer technologies (Quote 1.9, Quote 1.10).

Another topic raised by academic participants was what they perceived to be the relationship between introducing technology within clinical practice – in most cases enthusiastically supported, in some cases with reluctance and in other instances supported as a necessary evil - and technology in naturopathic education. For example, one lecturer outlined how a contemporary clinician should make use of the resources available and how not employing technology in clinical practice was, in some instances, negligent through denying patients best practice. In doing so however, academics also acknowledged that complete reliance on every technology available could be problematic (Quote 2.1). Similarly, two professional leaders presented the view that effective use of electronic medical records and telemedicine were important skills necessary for contemporary naturopathic practice (Quote 2.2, Quote 2.3). In keeping with this perception of the value of technologies, some students also expressed interest in apps and other technological resources for possible future use in practice, but in doing so also clearly indicated concern that their knowledge or training about these technologies were not currently being provided by their lecturers or formal education. Concerns regarding technology use in clinical settings were also raised by students, faculty and professional leaders, particularly as relating to the potentially negative impact on patient experiences of clinical consultations and quality of care delivered. One academic expressed concern that technology may lead to clinical care without direct patient contact resulting in sub-standard care (Quote 2.4). One student similarly described their concern (Quote 2.5). However, this view was not held by all participating students, with others drawing on awareness of research findings suggesting technology has minimal impact and the use of it may not concern patients (Quote 2.6).

The use of learning technology to help facilitate practitioner training was viewed differently between students, academics and professional leaders. There was also a lack of consistency and some complexity within the responses of members of these groups. For example, learning technology was seen by some students as facilitating flexibility in learning (Quote 3.1). Yet, other students were less supportive of technology (Quote 3.2, Quote 3.3). Some participants – students, faculty and professional leaders - also perceived online platforms, particularly if used as a sole delivery method, as creating student isolation and limiting the development of students' communication skills with impact on their wider learning experience and outcome (Quote 3.4, Quote 3.5, Quote 3.6).

Academics acknowledged the potential or realised value of learning technology for education delivery. They also expressed a view that it should be implemented with discernment whereby some content, such as sciences, could be delivered online but others, such as naturopathic clinical skills, required face-to-face delivery (Quote 3.7, Quote 3.8).

Concerns regarding the impact of technology to facilitate or hinder access and equity among students were raised by student and academic study participants. Student participants also described a need, stemming from the technology used in course delivery, to purchase expensive equipment such as a laptop making the course, to their mind, inaccessible to them (Quote 4.1, Quote 4.2). Academics expressed awareness of the importance of supporting their students' ability to use the additional technology required to access their course content. However, this was also experienced by academics as a pressure on faculty to provide additional infrastructure (Quote 4.3 Quote 4.4, Quote 4.5). Some academics also observed students resisting the technology on philosophical grounds that affected both access to learning materials and student learning (Quote 4.6). Another US academic described their own philosophical resistance to technology driving an active choice to avoid much technology in their daily life (beyond computer use) (Quote 4.7).

Interlinked with the issue of equity, participants described the need to develop literacy and technology skills. These skills included the ability to operate technology as well as the ability to manage the format and quantity of information available. Some students experienced the gap as too great between the required digital literary skills and their current skill set to access digital information (Quote 5.1). Highlighting the variety of perceptions and experiences of student participants some described using technology, such as new software, to help manage electronic files, with the goal of improving their curation of information (Quote 5.2). However, some students were also critical of the technological skill level of faculty, (not reflected in faculty accounts) and suggested a need for further technology training of academics (Quote 5.3). Academics recognised the challenges students face in managing and evaluating the quality of the information available (Quote 5.4). Academics also described the ability for technology to help facilitate work-life balance among students through the creative use of technology and emphasised the empowering value for students to cultivate skills to use technology to their advantage (Quote 5.5).

Table Two: Exemplar quotes for identified themes - from CM Students, Faculty and Professional Leaders

Quote #	**Quotes relating to *Perceptions and experiences of the shortfalls of classroom technology***
1.1	*"I am the anti PowerPoint"- student (FGD), United States*
1.2	*"I really hate most of the Powerpoints that I get" – student (FGD), United States*
1.3	*"Students tend to want them but hate them" – academic I, United States*
1.4	*"You can put up a PowerPoint of a 150 slides through 100 slides and a teacher can just flip through them very quickly and you won't be able to engage on that slide for very long and you already past it, and if they don't finish you're still responsible for all the material that just wasn't gone over." – student FGA United States*
1.5	*"So if someone stands up and their reading basically a PowerPoint… my mind's going to wander"- student FGA, United States*
1.6	*"You show up and sit down and somebody will read your PowerPoint for three hours. And every 15 minutes you get up and walk around for 10 minutes. But it's like crazy, I don't know how anyone learns this way. You know… no one learns"- student FGD, Australia*
1.7	*"But I know a lot of instructors just plough a bunch of information out there that they would just read out loud…and I think that students can kind of zone out on them. It makes learning kind of passive and when there's notes in front of the students and the very same stuff is on the slide and then the person is reading them." – Academic Leader I, United States*
1.8	*"I think that there's value in there but it's also data, there's no soul so I think it's kind of contextualized. You can have somebody that has a great PowerPoint but does not have a good personality to deliver it versus a person who has a great personality and a passion to deliver the material and I think people respond more to that rather than respond to other." – Academic/Professional Leader M, Australia*
1.9	*"I think we have a lot of expectation on us to have things readily available and happen on systems that are working, technology that's unique and power points that are put together in their learning style and things like that"- Academic E, United States*
1.10	*"I think those are teaching technologies that I have been requesting in every one of my classes since I started here and it's not used and I don't have any idea why. I don't know if it's that, teachers have been teaching the same way about PowerPoint for so many years that they have refused to switch over but there's so much out there that they can utilize and they're not using it. Yeah they're just not." – Student (FGD), United States*
	Quotes relating to *The value of technology within clinical practice*
2.1	*"If I'm going to be a primary care physician in any industrialized society in the world, it would be negligent and unethical for me not to use ... not necessarily every single piece of technology because I think you can get a technology overload. It would be negligent of me not to use technology on a regular basis."- Academic Leader B, United States*
2.2	*"For telemedicine, for example, you know to be able to train practitioners in school how to make effective use of telemedicine safely and in a way that is super compliant and effective is an enormous advantage that you can give to a student who is graduating today. Seeing with this use of electronic medical records systems and you know how to maximize their potential and use them to really make their life easier and not more difficult."- Professional Leader F, US*

2.3	*"And if we're training naturopathic physicians in the US to be primary care doctors and that's where they intend their careers to go, we've got to encourage them to embrace just to govern pop-cultural landscape, embrace the technology that's available." – Academic Leader B, US*
2.4	*"You can't know what it is like to have that physical contact to know what a real human being sounds like or looks like or smells like. All of those things are part of understanding what is going on with someone"- Academic Leader A, US*
2.5	*"From what I noticed in the clinic is that we're so engrossed in the technology …most people are looking in the screen and are clicking 'do you experience?' versus like being able to have a conversation with them [the patient]and then taking a few seconds to draw things out…" FG C"*
2.6	*"We can borrow studies … that say the computer in the room does not necessarily have to affect the care that's given and patients usually don't notice the computer in the way which is comforting for me" – FG C, US*
	Quotes relating to: Complex approaches of classroom learning technologies
3.1	*"I think it's really good. I think it gives people the chance to experience a lot of things. They might watch a YouTube Video about how to make something or how to do something and it might inspire ideas. They can go back to that video later on" – FG Bris, AUS*
3.2	*"I think it's great that it exists but I wish it wasn't necessary. Like it's good it's there for people who can't come to the lectures in person, but there are some subjects that you have to do online, and a whole lot of stuff that you have to do online."- FG Bris, AUS*
3.3	*"I do worry about how much technology, however necessary it might be, makes the course inaccessible to a lot of people, particularly older people, or people who might for whatever reason can't do all of this stuff online. That makes it difficult that it becomes necessary but yeah, you can't do it with just the library. You can't access." – FG Bris, AUS*
3.4	*"I know personally I don't like the idea of online learning because it's so individualized, I think that people learn so much by being together and talking to each other and debating and discussing, but you need to provide these opportunities within class." – FG D, US*
3.5	*"Online is really hard to do with active learning activities as well although again I've done it, I can make it work. I find that there's a lot less discussion that happens and I don't feel like the richness of the education is the same"- Academic H*
3.6	*"That's another thing about the qualms of doing online is that part of the maturation process of the student is having interaction. Literal human interaction with their classmates, their instructors. The younger generation, how will they feel comfortable interacting with someone and sitting down with someone not just asking questions because you have to but getting to the level of treating the whole person, you get into some pretty deep things. And how someone going to feel comfortable doing that if they don't have any conversations?" – Professional Leader I*
3.7	*"I think that probably most of…the didactic information of the science of medicine could easily be delivered online. Where I would maybe think twice about is any kind of physical, clinical education…things like that which are really, I think, better with a hands-on component." – Academic F, US*
3.8	*"I'll have to say I think they are turning to online education for most didactic courses as the benefit of actually leading to greater standardization of education…When it comes to clinical education I think that that has to be done in the trenches, I think our students need exposure to more real people." – Academic G, US*
	Quotes Relating to: *Addressing access and equity concerns*
4.1	*"You have to pretty much have an internet connection in order to do the course at all. And even in class not having a laptop is sometimes a problem."- FG Bris, AUS*
4.2	*"So making the course inaccessible to a lot of people, particularly older people, or people who might for whatever reason can't do all of this stuff online. That makes it difficult that it becomes necessary but yeah, you can't do it with just the library." – FG Bris, AUS*
4.3	*"Yes, I think we have a lot of expectation on us to have things readily available and happen on systems that are working, technology that's unique and power points that are put together in their learning style and things like that" – Academic E, US*
4.4	*"I don't embrace it [technology]. I'm dragged kicking and screaming because I have to but I also recognize that it is where it is going so I have to." – Academic M, US*

4.5	*"So they [academics] are part of it and they're helping to steer but students are driving some of that and I think some of the research on the millennial generation is that they want to drive their own education, their own knowledge acquisition but they do need someone to help them along that path otherwise they do end up way off or are using things that aren't necessarily the best resources." – Professional Leader R, US*
4.6	*"Then we've had students tell us that the whole reason that they came to naturopathic medicine was that they are not interested in technology, I don't buy it, I mean I don't - that doesn't mean that I don't believe it, I mean like I had a student this fall who told me that he was going to struggle reading any other papers I recommended because I posted them on moodle and he doesn't have a computer at home and I said you're in medical school buy yourself a computer or go to the library and use the computer and I have no problem with you downloading the papers, making a paper copy and reading them on paper but you got to figure out how to use a computer well enough to use the educational technology that we're using for the course, if you're smart enough to go to medical school, you're smart enough to figure that out." – Academic H, US*
4.7	*"I don't embrace it. I'm dragged kicking and screaming because I have to but I also recognize that it is where it is going so I have to. Here's my recent technology... a diary. That's my day planner. My schedule is in there. I have a telephone, I have a fax machine. I have a digital clock. I don't have a computer in my office. I have it somewhere else. One of these things? [points to tablet on table] A tablet. I don't know how to use it." – Academic M, US*
	Quotes relating to: Addressing the need to develop literacy and technology skills of students and faculty
5.1	*"I found that with the internet, there's just so much information to sift through. A lot of it is irrelevant. It felt like I was wasting a lot of time looking for resources and then I can just walk into the library and look in an index and find exactly what I want." – FG Bris, AUS*
5.2	*"Because these computers…hold so much and then it's just, it's a file and…the big thing is being able to search. And so when I'm going to see a patient … I can type in a condition, and it will give me my documents of what has this condition so I can bring out my herbal formulas very quickly that I want to use in this particular case or interactions." – FG A, US*
5.3	*"a lot of professors spend…upward of 10 minutes of class time trying to get the microphones working or trying to turn the fire points on and…it's fiddling with things in the microphone and…it's just like come on and it's very frustrating for us because we know it's taking our class time and so I think maybe some kind of training at the start of the term or something to get them familiar with the technology will be helpful." FG C, US*
5.4	*"I think we need to be more conscious of how we provide information to students, critical information to students that we need them to have and at the same time I think providing them with the skills of where to go looking for quality information and the ability to evaluate that."- Academic ZC, Australia*
5.5	*"And so I do think that there are opportunities that students take to create their own work life balance through their creative use of that technology and that's I think a really empowered stands in a really alliance stands and I think it is important to recognize that the balance between paternalism and cultivating empowerment in students as well."- Academic W, US*

5.5 Discussion

Our study resulted in a number of key findings. The technology issue that students in our study found most challenging was PowerPoint use in the classroom. While previous educational research suggests there can be both positives (Alkash and Al-Dersi, 2017, Sewasew et al., 2015) (Mohsenzadeh et al., 2015) and negatives (Worthington and Levasseur, 2015, Othman et al., 2017) regarding PowerPoint use, our finding appears to move beyond this highlighting a relatively strong negative perception where CM students found it to be linear, restrictive and were critical of the way in which it is being used. It is important that we further examine the use of classroom learning technologies and decipher the extent to which possible challenges are the result of technology design and/or human application. Furthermore, there is a need for further research to also help understand the detailed needs of both CM academics and students regarding this learning technology and related technologies.

The CM students spoken to exhibit complex attitudes and adoption patterns to technology ('*hate it' but then 'demand it'*) (Selwyn, 2012, Alexander et al., 2016). This finding is congruent with broader educational literature. Discerning the acceptance of technology in an educational setting is rarely straightforward and necessitates understanding the complex moving parts that make up digital literacy – often including but not limited to gender, race, social class, identity, power, inequality, age and generation (Van Deursen et al., 2011, Ghobadi and Ghobadi, 2015, Ifinedo, 2016). Similar to other research into institution's or fields where low digital literacy exists within the student and faculty body (Ng, 2012, Bawden, 2008) our study highlights a complex learning environment where it is possible that some digital natives have not developed the digital literacy or critical thinking skills needed for higher education. There is surprisingly little research into institutions or fields where there is evidence, as is the case here in our study, of students being critical of faculty who have perceived low levels of digital literacy or where possibly a subset of the student body is well in advance of other student subsets or their teachers - a digital divide between students and academics (Grant and Eynon, 2017, Robinson et al., 2015, Black-Fuller et al., 2016, Downing and Dyment, 2013, McKee and Tew, 2013). Moreover, research has shown that where academics have been found to be critical of basic academic writing skills as is the case here in our study, further training and resources to develop preparedness for study (Ilgaz and Gülbahar, 2015) and tertiary level academic literacy skills have been needed for students (Parkes et al., 2015), as well as a need for adaption of teaching practices, assessment design and feedback to students by academics, in order to assist improvement of those academic literacy skills (Jefferies et al., 2018).

Another important finding from our study is the perception that the requirements of providing some or all of a course (didactic and/or clinical) online potentially discriminates against older, digitally-challenged, less digitally literate students as is the case in these CM institutions (Gray et al., 2019a). In addition, the range of opinion expressed indicates a wide variety of seemingly conflicting attitudes to technologies which ranged from positive, (*flexibility, adds value, good – when done well*) to ambivalent (*this is a necessary evil, it would be negligent not to use*) to negative (*I don't embrace it. I'm dragged kicking and screaming because I have to*). The main concern expressed was about the negative impact of technologies (*when used in a one-dimensional way that creates isolation and poor clinical outcomes*). This is almost the opposite to findings from previous research and commentary that have predominantly seen learning technologies (such as MOOC's) as vehicles with which to democratise learning (Prior et al., 2016), underpin a more equal global distribution of knowledge (Burbules, 2018, Altbach et al., 2019, Resta and Laferrière, 2015, Becker et al., 2017) and having the capacity to right significant social inequities and power dynamics and bring inexpensive, quality education to students in places remote from bricks and mortar institutions (Fox-Turnbull and Snape, 2011, Halac and Cabuk, 2013, Rodriguez, 2012, Veletsianos and Kimmons, 2012). In subsequent studies this finding of 'inequality' requires clarification. Furthermore, as one of the fundamental principles of naturopathy involves an appreciation of nature, the healing power of nature, and natural approaches to life that may include work / life balance and life / technology balance (digital detox and device vacation) further research into philosophical and ideological perceptions (*there are whole lot of things you cannot do online, physical, clinical education cannot be taught online*) and experiences of CM stakeholders regarding the use of technologies in both practice and education require expansion.

While many learning technology-related issues may be shared across CM and non-CM educational settings, the findings from our study do suggest a further research examination of CM specific use and experience may well be justified and provide benefit in addressing possible challenges and tensions regarding learning technologies. From the broadest perspective, part of a future research agenda could involve the development of a fit-for-purpose theoretical model with which to approach and understand adoption, perceptions and experiences, behaviours and potential change strategies regarding technologies in CM educational environments. More specific future research needs could examine the limitations of what can and cannot be taught online in CM and if and how a more nuanced deployment of technologies may be preferable to relevant stakeholders. Our findings also point to the need to know more about the wider use of clinical and practice enhancing software and technologies available, as well as perceptions and experiences of telehealth by the CM faculty and student body.

Research is needed to explore the perception and experience of faculty and students of CM education institutions as well as professional leaders within CM towards the challenges, opportunities and use of a variety of educational delivery methods and technologies within the specific needs of CM practitioner training and what culture change might be necessary and what skills need to be taught to faculty. Areas requiring further enquiry include the effectiveness of educating CM practitioners as a result of learning technology utilisation and the priorities of educational providers to keep pace with modern learning technology developments. Future research in CM health education settings could involve tools such as asset mapping or infrastructure and technology audits in order to identify the learning technologies used, and the student services, faculty and IT support infrastructure that is currently in place. Possessing broader knowledge on the topic could have an impact in overall institutional strategy, curriculum design, employment status, resource allocation, infrastructure and operational imperatives for CM leaders in these private equity education environments (Gray et al., 2019b). The findings highlighted in this study and the results of further research are important for education leaders, especially if clear trends in education towards the uptake of learning technologies are not being adopted within CM educational institutions.

5.6 Conclusion

This is the first study examining the interface between technologies in learning and clinical practice within the CM education settings. Some students, faculty, and professional leaders of the CM professions in the US and Australia appear conflicted about the use of these widely available educational and clinical tools. More research is necessary to determine CM faculty and student perceptions, experiences and adoption patterns regarding technology, their digital literacy, the divisions and subdivisions within the faculty and student body, the way in which these groups adopt innovations and their identifiable attitudes to technologies and learning. There is an urgent need to establish a strategic research agenda for this important aspect of health care education in order to help ensure a well-educated, effective CM healthcare workforce.

5.7 Chapter summary

As a consequence of the results of this preliminary investigation it is clear that there are strong perceptions, drivers and adoption patterns of academics and students alongside of the educational and professional leadership perspectives on the role of technology in these settings. The implications and consequences of the findings from the Phase One qualitative interviews and focus group discussions are far reaching and create insights into the research objectives of the project. The complexity of the perceptions requires untangling as the groups and subdivisions within the student and academic body come into focus and examination of these perceptions clearly requires deeper research. Importantly, the results of this phase of the study inform the creation of the clinical audit document sent for completion to the sample institutions and the cross-section surveys for the third phase of the project. Consequently, it is to Phase Two that we now turn – to understand the technology deployment, infrastructure, governance, planning and policy inside the CM educational institutions chosen for this project.

Chapter 6 – Results (2): An audit of the learning technology and e-learning capacity, capability and infrastructure of two leading providers of Complementary Education

6.1 Chapter introduction

In order to address the research aim and objectives 1 and 2 of this research project and thesis, it is necessary to understand the educational settings in which the primary empirical data is collected. This chapter presents the results from Phase Two of the study constituting an audit conducted at the two sample institutions initiated in 2016 and completed in 2017. The audit contributes to meeting the overarching research aim (Chapter One Section 1.3.2) by highlighting important aspects of the technology provision and current infrastructure within the two institutions, identifying certain traits and characteristics of technology adoption and providing perspectives on aspects of the organisational culture relating to technology. Further, the audit findings provide insights into other research objectives related to evaluating the role of technology in CM education, (Objective 1), the factors influencing the uptake of learning technologies in CM institutions and (Objective 2) and may even inform the third objective, how changing educational philosophies, technologies, tools and processes may impact the operations of CM institutions (Objective 3). The audit instrument was completed by a key senior staff member of Institution 1 and Institution 2, nominated by the executive manager/director of each institution respectively. The raw data is available upon request.

6.2 Background

In this second phase of the research project, data were collected through an institutional audit aimed at determining the scope of e-learning provision at the sample institutions and provide the necessary foundations for remaining phases of the study. Institutional audits are an important and established way to understand the background to institutional resource provision and culture (Shore et al., 2015, Craig et al., 2014). In addition, audits are often conducted for operational insights (Kezar and Eckel, 2002) and to understand organisational behaviour (Shore and Wright, 2003). Instruments for self-assessment audit commonly assist educational providers in developing long term institutional strategies, develop capacity and leadership and focus on continuous improvement (Jamtvedt et al., 2006). Audit tools, instruments and strategies are an established method for understanding quality and processes in educational environments (Tierney et al., 2015) as well as being commonly used in both medicine and allied health professions to understand processes, results and culture (Smith et al., 2012). In this instance, the audit enabled the researcher to create a more focussed picture of technology prevalence and the culture of technology uptake, and thereby direct the focus of subsequent research questions and activities.

6.3 Methods

The method used in this audit, including full details of the design of the instrument, sample, setting and distribution of the instrument are presented in Chapter Four. Data were collected using questions clustered into the following categories and domains; Institutional, Human Resources, Financial, Support Services, Content Management, Academic, Leadership and Organizational Culture and Technical information.

6.4 Results

The results of the audit are clustered into two categories which are discussed for each individual institution in turn. The first cluster involves findings from the audit elicited from questions in the categories of *Mode of Delivery, Content Management (CMS) and Learning Management System (LMS), Deployment of Software, Hardware and Infrastructure, Facilities and Technical Information, Practice Management and Clinical Software, Educational Technology Organization, Responsibilities, Staffing, and Financing,* and *Support Services for Learning Technology Provision*. The second cluster involves findings from the audit elicited from questions in the categories of *Student Success, Culture of Innovation, Institutional Policies, Priorities* and *Training, ET Governance Processes, Strategy, Investment and Participation.*

6.4.1 Institution 1

6.4.1.1 Course and student characteristics

At the time of data collection in June 2016, Institution 1 had 5,200 FT and PT students in its undergraduate programmes with 60% part time and 40% full time (FT) students. Active course offerings included four Bachelor of Health Science specialisations: *Naturopathy*, *Nutritional and Dietetic Medicine*, *Acupuncture*, *Myotherapy.* A nonclinical Bachelor of Complementary Medicine was also offered by the institution.

6.4.1.2 Educational technology provision at Institution 1

At Institution 1, the educational technology (ET) department had a discrete and separate identity to information technology (IT) and other academic departments although there were many areas of overlap and inter-departmental activities.

6.4.1.2.1 Mode of delivery

At Institution 1, there was a mix of delivery modes available for students to enrol in. There was no blended learning offered at all, as students at Institution 1 chose to take a subject either fully online or face-to-face as, in many cases, both are offered. Within their course of study, students can choose to complete some subjects online or some subjects face-to-face but are unable to move from one mode of delivery to the other once a subject has commenced. The learning resources (study guides, readings, etc.) of all subjects were accessed by students online, irrespective of the delivery mode the student has enrolled in. Online subjects were prepared to be delivered to students asynchronously and these subject materials included recorded lectures enhanced with additional learning resources.

6.4.1.2.2 Content management system and learning management system

At Institution 1, SharePoint was used as the Content Management System (CMS). There were approximately 1.5 million active documents supported by the CMS. The total number of hits to the CMS was reported as not tracked by the institution and therefore was not known. All faculty and students used the LMS - Moodle version 3.1. Learning objects and resources were uploaded to the LMS by trained staff in the ET department rather than by individual academics. An academic subject coordinator (SC) was responsible for the maintenance, quality and improvement processes of academic content, but the technical maintenance, support and quality improvement was the responsibility of the non-academic staff in the ET department. Subjects were updated at least every teaching period and often monthly. There were approximately 200 individual subjects in the five degrees offered, and 66 of those subjects were delivered online. For all students both online and face to face, paper resources were only used in the completion of final examinations held at the nearest local campus. With the exception of these paper-based examinations, all assessment submission and grading were undertaken electronically online. Some LMS analytics were exported and evaluated by academic management, especially overall percentage and pass rates for each subject. The student orientation to study, sometimes referred to as the 'walk-to-class' experience was conducted during the admissions interview and involves an orientation tour navigating students through to the LMS showing the student the virtual resources and training videos. In terms of electronic library resources available for students, the Library resources included e-books, journal access, lib-guides and databases. The total subscriptions in both print and electronic library resources (such as Science Direct) were $A20,189.00 per annum.

6.4.1.2.3 Deployment of software, hardware and infrastructure, facilities and technical Information

Table 1 summarises the deployment of technologies at Institution 1, which shows the organisation as using 16 types of technology institution wide. Of the remaining response options presented in the audit, one technology was deployed to parts of the institution, two were in the planning, piloting, and initial deployment phase, and ten were not deployed at all. Institution-wide deployment of technologies and systems include the LMS, e-learning course analytics for instructors, a plagiarism detection system, remote exam proctoring and the use of e-books and e-textbooks. There was no deployment of live lecture capture, e-publishing platforms for learning, electronic student portfolios, automated lecture capture systems, interactive whiteboards, interactive external monitors or audience response systems. Hardware used to support ET needs at Institution 1 included monitors, audio, lights, cameras, headsets, and computer labs and the software used to record lectures is Camtasia. Data were stored on an off-site data centre and was backed up locally every hour and externally, every evening at midnight.

Table 1: Deployment of Learning Technology at Institution 1

	No deployment.	Tracking	Planning, piloting, and initial deployment.	Deployment to parts of the institution.	Deployment institution-wide.
Podium/lectern computer(s) for instructor					X
Instructor docking station/connections for laptop computer					X
Integrated control and switching system (e.g., Crestron)	X				
Lighting and acoustic control from instructor station					X
Document cameras/projectors					X
Projection systems					X
Flatscreen TVs					X
Wireless projection					X
Automated lecture capture systems (audio only)	X				
Automated lecture capture systems (audio and video)	X				
Interactive whiteboards (e.g., SMART Boards)	X				
Interactive external monitor (e.g., SMART Podiums)	X				
Audience response systems (e.g., clickers)	X				
Accessibility technologies (e.g., JAWS reader, signing support)	X				
Remote monitoring for technical support					X
Full function online learning delivery system					X
Real-time web or video-conferencing online learning environment					X
Lecture capture	X				
E-learning course analytics for instructors					X
Collaboration tools for learning				X	
Multi-media production for online learning					X
E-publishing platform for learning	X				
Student evaluation of teaching effectiveness					X
Electronic student portfolios	X				
Plagiarism detection system					X
Remote exam proctoring					X
Virtual computer lab delivery			X		
Digital asset management system for learning			X		
E-books or e-textbooks					X

6.4.1.2.4 Practice management and clinical software

Some practice management and clinical software - such as Foodworx (nutritional medicine), RadarOpus (homeopathic medicine) and Visible Body (biosciences) - were available for use by academics and students at Institution 1. All software was loaded onto library computers. There were licensing arrangements found to be in place, but no formal class-time was devoted to teaching this software nor was any class or clinic time devoted to telemedicine or distance consultations.

6.4.1.2.5 Learning technology organization, responsibilities, staffing, and financing

At Institution 1, the ET department had overall responsibility for the ET services, maintenance and functions such as online learning technology, classroom technology purchases, classroom technology support for faculty and students, technology-enhanced spaces, online learning technology support for faculty and students, and instructional designers to help faculty develop courses and course materials. The organisational title of the most senior manager of the ET was Director of Student Retention and Systems. Appointed in 2011, the person in this role reported to the Executive Director. The roles that made up the ET department consisted of engagement specialists, learning technologists and a senior information manager. There were seven full-time equivalent (FTE) staff. Some learner support tasks that interfaced with ET were performed external to the ET department by the staff organisationally allocated to the IT department, Student Services or the Library. It was generally the type of support that individual students required that determined the source of the assistance - ET staff generally offered technology support, academics and SC's offer academic support, engagement specialists and the student success team offer student (at risk of academic failure) support. The IT department managed single-sign-on for all sites (including Library, website and LMS), the disaster recovery plan, authentication and identification systems, firewalls, changes in system performance, dropout, bandwidth and the security of student files. Financially, the ET departmental budget for the previous financial year was approximately $A550K. It was reported that $A400K was spent on ET staff, approximately $A100K on Space/facilities, approximately $A15K on Travel, training, and seminars for central ET staff, for a total of approximately $A550K during the previous financial year.

6.4.1.2.6 Support services for learning technology provision

Of the FTE ET staff, two were designated for helpdesk duties during the prior year, ‘depending on traffic’. The type of support the helpdesk provided to faculty, staff, and students was for both institutionally and personally owned devices. Approximately 2600 hours of support was provided by the helpdesk service to students and academics during the academic year between the hours of 8am-6pm, 5 days per week. Services offered by the help desk to students and academic staff included system authentication and passwords, assistance with MS Office suite, assistance with other software applications such as Turnitin, configuration and updates. A digital literacy course was offered as professional development for staff. End-user operating system installation or reinstallation, laptop loan, tablet loan, software virus or malware-related issues are not offered to students. The metrics tracked to assess student support performance included average speed to answer, first contact resolution rate, time to resolve, number of requests (tickets) received, user satisfaction, as well as student engagement and login activity. The number of tickets received by the helpdesk during the prior academic year at Institution 1 totalled 10,000. The helpdesk at Institution 1 also provided wiki’s, ‘frequently asked questions’ and training videos as self-service options.

6.4.1.3 Student success, culture of innovation, institutional policies, priorities and training, learning technology governance processes, strategy, investment and participation at institution 1

The audit also reported on the degree of deployment of features related to e-learning and learning technologies using five-point Likert scales in broad categories related to student success, the culture of innovation, institutional policies, priorities and training and governance processes. These findings are presented in Table 2 below. Detailed audit responses are included in Appendix N.

6.4.1.3.1 Student success

Most of the items related to Student Success were answered using Strongly Agree by the audit respondent (*n=12*). In the sub-categories of Leadership and Governance (e.g. *We have at least one senior position specifically dedicated to student success improvement*), Processes and Policy (e.g. *Our student success efforts are adaptable; we will be able to accommodate new methods or challenges over time*) and Information Systems (e.g. *Our technology systems accurately track student progress and identify potential obstacles to degree or credential completion*) the respondent Strongly Agreed to audit questions. The respondent indicated Agreement with five items examining Collaboration and Involvement (e.g. *Stakeholders throughout the institution (e.g., IT, faculty, institutional research, students, staff, student affairs) use consistent definitions of student success*) and Advising and Student support (e.g. *Our student advising process effectively supports our student success goals*). On the other hand, the respondent Disagreed in two answers in the audit in this category (e.g. *We train users to make effective use of student data*) and Strongly Disagreed with one answer (e.g. *Faculty adopt and use information systems that support student success e.g., early alerts, advising systems, degree progress tracking*).

6.4.1.3.2 Culture of innovation

Important audit questions relating to institutional leadership were asked under the sub-headings of Leadership, Capacity, Resource Allocation and Community. The raw data is to be found in Appendix N. A scale was used to describe the features of the institutional innovation from Entering, Emerging, Adapting, Establishing through to Transforming. Results showed a large proportion of answers in the Adapting and Establishing categories (*n=16*). The respondent placed one item in the Transforming category (e.g. *Innovation is explicitly encouraged, celebrated and studied across the organization. All members of the organization feel empowered to design and try new approaches*). The respondent answered with 12 responses in the Establishing category (e.g. *A focus on innovation drives the vision of the organization which is explicitly linked to students' needs,* and, *Leaders not only explicitly prioritize innovation, but they establish clear expectations and timelines as the basis for making organizational progress*). Another 4 items elicited placement in the Adapting category (e.g. *The support and coaching strategies have been developed and communicated. Budgets exist and innovation has been built into strategic* *documents*). The respondent placed 2 responses in the Emerging category (e.g. *Time for innovation is built explicitly into the schedule through dedicated roles and portions of other team members' time and is consistently honoured by all leaders and staff*), and one response in the Entering category (e.g. *All leaders, teams and individuals refer to shared definitions, objectives and outcomes*).

6.4.1.3.3 Institutional policies, priorities and training

In relation to audit items relating to institutional policies, priorities and training a scale was used to describe the features of the organisation from Strongly Disagree, Disagree, Neutral, Agree to Strongly Agree. The raw data is to be found in Appendix N. The respondent Strongly Agreed with eleven responses (e.g. *We provide training for students to learn new e-learning technology and skills, and, We view e-learning as an investment, rather than as an added cost*), and indicated Agreement with 6 responses (e.g. *We have policies and guidelines in place to verify students' identity to ensure that students submitting course work online are those who have completed the work*). Two Neutral responses were elicited (e.g. *We have appropriate policies outlining the intellectual property of course material*), there was a single Disagree response (e.g. *Our faculty's interest in incorporating technology into teaching is on the rise*), and the respondent Strongly Disagreed with 4 responses (e.g. *Our faculty are rewarded (e.g. extra salary, lower course load, specialized recognition) for designing and delivering online courses*). Other findings from the audit reveal that at Institution 1 there existed formal institutional policies or procedures in place for e-mail use, identity and access management, information security policy, payment card processing and plagiarism. At Institution 1 an academic integrity policy and referencing guidelines addressed the needs and concerns of both online as well as face to face students. All students used *Turn It In* for all of their assignments to mitigate plagiarism. There were numerous documented outcomes and penalties imposed on students found to be in negligent or deliberate breach of this policy. Policies and guidelines existed to verify students' identity to ensure that students submitting course work online were those who had completed the work, there were appropriate policies and guidelines in place to enable effective decision making about e-learning initiatives and there was the appropriate technology in place to ensure the security of e-learning initiatives. It was also reported that there were no policies outlining the intellectual property of course material, nor were there adequate resources and knowledge to effectively provide alternate technologies for students with disabilities to engage in e-learning.

6.4.1.3.4 Learning technology governance processes, strategy, investment and participation

Questions relating to institutional governance related to ET were asked in the audit. The raw data is to be found in Appendix N. A scale was used to describe features of the organisation from Absent/ad hoc, Repeatable, Defined, Managed, through to Optimised. The respondents placed eight responses in the Optimised category, (e.g. *Our ET governance process sets high-level goals for ET outcomes that are aligned with institutional strategic goals*) and five responses in the Managed category (e.g. *Our institution has a clear ET vision, mission, or strategy*). One response is reported in the Defined category (e.g. *Our ET governance process examines full life-cycle costs of projects or initiatives when making investment decisions*). The respondent indicated four responses with a Repeatable answer (e.g. *Our ET governance process prioritizes ET investment in accordance with institutional goals*), and three responses in the Absent category (e.g. *Our ET governance process draws committed participation from academic unit*).

Table 2: Responses to Questions in Categories Relating to Student Success, Culture of Innovation, Institutional Policies, Priorities and Training, and Learning Technology Governance Processes at Institution 1

Category of Question	Sub-Category of Question	Number of items with response options selected				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Student Success	Leadership and Governance		1	1		3
	Collaboration and Involvement			2	4	
	Advising and Student Support		1	1	1	
	Processes and Policy					4
	Information systems		1	1		5
	Total	**1**	**2**	**5**	**5**	**12**
Category of Question	Sub-Category of Question	Number of items with response options selected				
		Entering	Emerging	Adapting	Establishing	Transforming
Culture of Innovation	Leadership				6	1
	Capacity		1	2	1	
	Resource Allocation		1	1	1	
	Community	1		1	4	
	Total	**1**	**2**	**4**	**12**	**1**
Category of Question	Sub-Category of Question	Number of items with response options selected				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Institutional Policies, Priorities and Training	Policies/Governance	1		1	3	1
	Ongoing Evaluation/Training			1	1	2
	Priority					6
	Outcomes Assessment					2
	Readiness	1	1		2	
	Investment In Faculty/Staff	2				
	Total	**4**	**1**	**2**	**6**	**11**
Category of Question	Sub-Category of Question	Number of items with response options selected				
		Absent/ad hoc	Repeatable	Defined	Managed	Optimized
ET Governance Processes, Strategy, Investment and Participation	ET Governance Process	1			3	1
	Strategic Alignment and Influence				1	4
	ET Investment	1	2	1		1
	Communication and Participation	1	2		1	2
	Total	**3**	**4**	**1**	**5**	**8**

6.4.2 Institution 2

6.4.2.1 Course and student characteristics

At the time of data collection in June 2016, there were 640 students at Institution 2 in its graduate programs - two doctorates, five masters and two undergraduate programs offered at Institution 2.

6.4.2.2 Educational technology provision at Institution 2

At Institution 2, it was found that all ET operations were housed within the IT department.

6.4.2.2.1 Mode of delivery

The first finding is that at Institution 2 the vast majority of subjects are only available to students through on campus delivery, with only two subjects available fully online. These fully online subjects are reported in the audit as ‘blended’. This educational model has been adopted citing ‘budget restraints’.

6.4.2.2.2 Content management system and learning management system

A content management system (CMS) was reported as used at Institution 2 and while the actual system and the total number of active documents supported by the CMS is unknown, the total number of hits to the CMS was 636,952 in the audited year. There were two FTE staff responsible for CMS development, clerical, support, and management. Academics used an LMS (Moodle version 2.7.2) for classroom support and the ‘occasional online class’. All subject resources (materials, assignments and quizzes) were accessible via the LMS including for students enrolled for on campus delivery and used by 100% of students. However, it was also reported that paper was still used in the delivery of some subjects and some assessments were not uploaded to the LMS. Most courses have online quizzes and grading of these is undertaken online. ‘Some’ analytics were exported, managed and evaluated, especially overall percentage and pass rates by academics who also updated subject material on a quarterly basis. There was a physical and online library site that linked to several unspecified online databases and medical resources. The other hardware used to support the ET needs of academics in the delivery of courses included document cameras, DVD players, microphones, projectors, and audio equipment. At Institution 2 data was housed on-campus and data was backed up to DVDs.

6.4.2.2.3 Deployment of software, hardware and infrastructure, facilities and technical Information

The next finding of note related to the 29 possible technology and infrastructure deployments at Institution 2. Table 3 below summarises the deployment of technologies at Institution 2. There were 17 instances of No deployment, one example of Tracking, no instances of Planning, piloting, and initial deployment, 11 instances of Deployment to parts of the institution and no examples of Deployment institution-wide. Examples of technologies deployed to parts of the institution included podium computers for the instructor, docking stations, document projectors and projection systems. There is no deployment of lighting and acoustic controls from instructor stations, flatscreen TVs, wireless projection, interactive external monitors, audience response systems, accessibility technologies, or remote monitoring for technical support.

Table 3: Deployment of Learning Technology at Institution 2

	No deployment.	Tracking	Planning, piloting, and initial deployment.	Deployment to parts of the institution.	Deployment institution- .
Podium/lectern computer(s) for instructor				x	
Instructor docking station/connections for laptop computer				x	
Integrated control and switching system (e.g., Crestron)				x	
Lighting and acoustic control from instructor station	x				
Document cameras/projectors				x	
Projection systems				x	
Flatscreen TVs	x				
Wireless projection	x				
Automated lecture capture systems (audio only)				x	
Automated lecture capture systems (audio and video)				x	
Interactive whiteboards (e.g., SMART Boards)				x	
Interactive external monitor (e.g., SMART Podiums)	x				
Audience response systems (e.g., clickers)	x				
Accessibility technologies (e.g., JAWS reader, signing support)	x				
Remote monitoring for technical support	x				

Full function online learning delivery system		x	
Real-time web or video-conferencing online learning environment			x
Lecture capture			x
E-learning course analytics for instructors	x		
Collaboration tools for learning	x		
Multi-media production for online learning	x		
E-publishing platform for learning	x		
Student evaluation of teaching effectiveness			x
Electronic student portfolios	x		
Plagiarism detection system	x		
Remote exam proctoring	x		
Virtual computer lab delivery	x		
Digital asset management system for learning	x		
E-books or e-textbooks	x		

6.4.2.2.4 Practice management and clinical software

RadarOpus, and Food Processor Nutrition Analysis software is taught to students in homeopathy, naturopathy and acupuncture subjects. There were no institutional licensing arrangements for the use of this software but formal class-time was devoted to teaching how to use them. No class time or clinic time was devoted to telemedicine.

6.4.2.2.5 Learning technology organization, responsibilities, staffing, and financing

Reflecting the integration of ET and IT at Institution 2, the position title of the most senior manager responsible for ET was the IT Manager & Webmaster. The person in this role, appointed in 2011 reported to the Associate Vice President of Enrolment Management and the Chief Financial Officer (CFO). The roles that made up the IT department included a Webmaster, Web Developer and IT Manager. There were an additional 5 FTE staff (including clerical, support, and management staff) employed in IT. All tasks relating to ET were performed within the IT department and not outsourced to other administrative or academic units. It was reported that academic input was solicited by IT staff in courseware or instructional design of subjects such as evaluation of potential LMS and learning technology upgrades, but still actioned by the IT department. Overall, ET strategy and policy was developed by the IT Manager and Webmaster and implemented by IT staff. Resource allocation for the IT department was determined on the overall budget for the institution. Content design and web-based publication was determined by the webmaster and web developer and driven by IT imperatives. Information security was managed through ‘secure and competent web development’, firewalls, policies about maintaining strong passwords, ‘careful’ software selection, SSL certificates and other processes. Identity management was arranged through the use of user authentication and roles, firewalls and audit logs. ET services, tasks and functions performed by the IT department included online learning technology management, learning management support and training for faculty, classroom technology maintenance and management, classroom technology support for faculty and students, as well as online learning technology support for faculty and students. IT services were also responsible for maintaining technology-enhanced spaces, providing support for faculty using devices not managed by the institution, such as personally owned computers, tablets and smartphones, support for faculty in their use of technology they choose to implement, and individual training for faculty in the use of ET. Financially, it was reported that ET expenditure at Institution 2 was approximately $US10K (not including hosting cost for Moodle), approximately $US260K on ET staff, approximately $US1.2K on contractors and consultants and approximately $US6K on travel, training and seminars for central ET staff during the previous financial year.

6.4.2.2.6 Support services for learning technology provision

Support service provision for students, faculty and staff at Institution 2 included ET support services, multimedia services, a helpdesk, student technology centres and computing services such as classroom and learning space support. It was reported that there were five FTE ET staff employed during the prior year who provided 200 hours of helpdesk support to academics and students for both institutionally and personally owned devices during the academic year. The helpdesk also offered support to students with system authentication and passwords, access to the LMS, assistance with MS Office suite, virus or malware-related issues etc. but not for other software applications and with mobile apps. The devices supported by the helpdesk for students, faculty and staff alike included Windows-based systems, Macs, iPhones etc, but there was no support to either students, staff or faculty for Linux-or UNIX-based systems, e-book readers, routers, game devices or cameras. No metrics were tracked by the help desk during the prior academic year. Self-service options provided by the help desk included FAQs.

6.4.2.3 Student success, culture of innovation, institutional policies, priorities and training, learning technology governance processes, strategy, investment and participation at Institution 2

The audit also reported on the degree of deployment of features related to e-learning and learning technologies using five-point Likert scales in broad categories related to student success, the culture of innovation, institutional policies, priorities and training and governance processes. Findings are presented in Table 4 below. Detailed audit responses are included in Appendix O.

6.4.2.3.1 Student success

Audit responses show that in the category of student success, there are no instances of Strong Agreement with any of the questions asked. There are eight responses that were in Agreement with questions in the categories of Leadership and Governance (e.g. *We have at least one senior position specifically dedicated to student success improvement*), Advising and Student Support (e.g. *Our student advising process effectively supports our student success goals*) and Process and Policy (e.g. *We have policies that specify privileges and responsibilities regarding access to institutional and individual student success data*). There are seven Neutral responses to questions in the categories Leadership and Governance (e.g. *Our institutional student success efforts are adequately funded*), Collaboration and Involvement (e.g., *Our student success goals are accepted and supported throughout the institution*) and Advising and Support (e.g. *Faculty adopt and use information systems that support student success (e.g., early alerts, advising systems, degree progress tracking*). There is Disagreement reported in ten answers in the audit in the categories of Leadership and Governance (e.g. *Our student success technology initiatives are adequately funded*), Collaboration and Involvement (e.g. *Stakeholders throughout the institution use consistent definitions of student success*), Process and Policy (e.g. *Our information security policies and practices are sufficiently robust to safeguard data used for student success analytics*) and Information Systems (e.g. *Our technology systems accurately track student progress and identify potential obstacles to degree or credential completion*). There are no instances of Strong Disagreement with any of the questions asked. In response to other questions about advising and student support, audit observations reported that there is no plagiarism software used nor is there an academic writing policy at Institution 2. However, (contradicting this finding) it is also reported that the consequence for plagiarism is that the student meets with the Honour Council who review the case and make recommendations.

6.4.2.3.2 Culture of innovation

Important audit questions relating to institutional culture of innovation were asked under sub-headings Leadership, Capacity, Resource Allocation and Community. The raw data is to be found in Appendix O. A scale was used to describe the features of the organisational leadership from Entering, Emerging, Adapting, Establishing through to Transforming. The respondent provides no responses at all in either of the Adapting, Establishing and Transforming categories. There were 4 responses in the Emerging category (e.g. *Senior leaders of the organization have recognized the importance of innovation and relevant individuals receive support and coaching*), and 16 indications in the Entering category (e.g. *Leaders not only explicitly prioritize innovation, but they establish clear expectations and timelines as the basis for making organizational progress*).

6.4.2.3.3 Institutional policies, priorities and training

Audit questions relating to institutional policies, priorities and training were asked. The raw data is to be found in Appendix O. A scale was used to describe the features of the organisation from Strongly Disagree, Disagree, Neutral, Agree to Strongly Agree. The respondent Strongly Agreed with none of the questions in this category, but Agreed with 6 items (e.g. *Our faculty's interest in incorporating technology into teaching is on the rise*). Six Neutral responses were elicited (e.g. *We consider e-learning technology delivery systems to be mission-critical in terms of the support provided*). The respondent Disagreed with eleven questions (e.g. *Our e-learning services, programs, and technologies are scalable; we will be able to handle a growing number of e-learning courses in the coming years* and, *Our faculty are rewarded (e.g., extra salary, lower course load, specialized recognition) for designing and delivering online courses*), and

Strongly Disagree to one item (e.g. *Our e-learning services, programs, and technologies are adaptable; we will be able to accommodate new methods of e-learning delivery in the coming years*).

Table 4: Responses to Questions in Categories Relating to Student Success, Culture of Innovation, Institutional Policies, Priorities and Training, and Learning Technology Governance Processes at Institution 2

Category of Question	Sub-Category of Question	Number of items with response options selected				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Student Success	Leadership and Governance		1	1	3	
	Collaboration and Involvement		3	3		
	Advising and Student Support			1	2	
	Processes and Policy		1		3	
	Information systems		5	2		
	Total	**0**	**10**	**7**	**8**	**0**
Category of Question	Sub-Category of Question	Number of items with response options selected				
		Entering	Emerging	Adapting	Establishing	Transforming
Culture of Innovation	Leadership	5	2			
	Community	5	1			
	Resource Allocation	3				
	Capacity	3	1			
	Total	**16**	**4**	**0**	**0**	**0**
Category of Question	Sub-Category of Question	Number of items with response options selected				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Institutional Policies Priorities and Training	Policies/Governance		4		2	
	Ongoing Evaluation/Training		1	3		
	Priority		1	3	2	
	Outcomes Assessment		2			
	Readiness	1	1		2	
	Investment In Faculty/Staff		2			
	Total	**1**	**11**	**6**	**6**	**0**
Category of Question	Sub-Category of Question	Number of items with response options selected				
		Absent/ad hoc	Repeatable	Defined	Managed	Optimized

ET Governance Processes, Strategy, Investment and Participation	ET Governance Process	5				
	Strategic Alignment and Influence			Unanswered		
	ET Investment	3	2			
	Communication and Participation			Unanswered		
	Total (11 unanswered)	**8**	**2**	**0**	**0**	**0**

6.4.2.3.4 Learning technology governance processes, strategy, investment and participation

In relation to Governance, (the raw data is to be found in Appendix O), a scale was used to describe the features of the organisation from Absent/ad hoc, Repeatable, Defined, Managed, through to Optimised. Results show no responses in the Optimised, Managed or the Defined category at all. The respondent indicated two responses in the Repeatable category (eg *Our ET governance process prioritizes ET investment in accordance with institutional goals*), and eight responses in the Absent category (e.g. *Our institution has a formal ET governance structure in place, Our ET governance process draws committed participation from academic unit*, and *Our ET governance process makes authoritative investment decisions and is not easily circumvented*). Importantly, eleven questions went unanswered in the Governance category of questions (e.g. *Our institution has a formal ET governance structure in place*), and in the Communication and Participation category of questions (e.g. *Our ET governance process makes decisions in a transparent manner*).

6.5 Discussion

The results from this audit identify three overarching findings relevant to this study: *differences in organisational culture*; *differences in planning, policy, strategy and governance*; and *possible faculty disengagement*.

6.5.1 Differences in organisational culture

The first finding of note is the comparative difference in the provision of learning technologies between both institutions. The audit results suggest technology provision is more widespread at Institution 1 compared with Institution 2. There were also differences in the reported use technologies between the institutions (summarised in Table 5), whereby Institution 1 selected affirmative responses with the majority of items relating to *Student Success Initiatives, Strategy, Leadership, Policies, Training and Governance* while Institution 2 did not. The audit also identifies important differences in the modes of delivery and deployment of possible technologies, the self-review capacity through tracking performance and the student orientation to study (and retention).

Table 5: Numeric Differences in the Scoring of Audit Questions between Institution 1 and Institution 2

Questions	Number of items with response options selected				
Categories of Student Success, Culture of Innovation, Institutional Policies, Priorities and Training, ET Governance Processes, Strategy, Investment and Participation	Strongly disagree, Entering, Absent/ad hoc	Disagree, Emerging, Repeatable	Neutral, Adapting, Defined	Agree, Establishing, Managed	Strongly agree, Transforming, Optimized
Totals Institution 1 - 90 questions answered	9	9	12	28	32
Totals Institution 2 - 79 questions answered (11 questions unanswered)	13	39	13	14	0

When considered in concert, the implications of these differences are important for the future of the institutions. Existing commentary and research within educational scholarship suggests that tertiary institutional leadership currently faces the dual challenges of decreased public financial support and increased costs for educational resources, all the while maintaining technological relevance in order to remain institutional competitiveness in the rapidly changing world of global education, the global economy and job market (Wint and Downing, 2017, Richardson et al., 2017). Furthermore, evidence suggests there is little or no deployment of many of the available technologies by many educational institutions (Selwyn, 2007). This previous pattern is also observable our study at Institution 2 (where the operating version of the LMS, was not updated, that basic LMS functions were not used such as electronic marking, that subjects were updated only quarterly, that the student orientation to study was described as haphazard and unstructured, that there were no licensing arrangements with software companies). Such slow adoption of technologies can have institution-wide consequences and implications. In some instances, it has been found that delayed modification and adaptation to technology challenges can become an institutional survival issue (Altbach et al., 2019). Recent research has also shown that traditional educational paradigms are simply becoming more anachronistic and the physical university is now, in most instances, a combination of multi-dimensional blended education models (Richardson et al., 2017). This previous research has also shown that learning technologies have changed teaching and learning and will only continue to do so (de Witt and Gloerfeld, 2018), and sometimes in a disruptive way for all stakeholders (Selwyn, 2016a). Further research has indicated that institutions failing to maintain technology uptake and standards are at risk of potentially impacting student and academic recruitment as well as institutional rankings (Mussard and James, 2018). In other educational research, some basic learning technologies features have been found to be 'unknown' or absent (such as tracking e-learning analytics, the number of tickets received by the helpdesk) (Beer and Lawson, 2017). Such gaps have important implications as they suggest operational data and feedback may be absent, and institutional quality assurance, governance and ultimately accreditation status can be compromised as a result (Macfadyen and Dawson, 2012, Tsai and Gasevic, 2017, Becker et al., 2018b). Further research is necessary in order to verify and clarify the reasons for these technology provision differences; is it a deliberate strategic approach? How does this approach affect compliance and quality assurance at these institutions? Do managers or faculty hold specific attitudes that is influencing the uptake of technology at either institution?

6.5.2 Differences in planning, policy, strategy and governance

The second important finding is the apparent differences between the two institutions with regards to strategic investment, planning, governance, future-focused thinking and risk management. Institution 1 reports having an embedded strategic plan that involves ET. At that institution, many features of strategic planning for the use of ET are fully deployed or optimised at Institution 1 but absent or emerging in Institution 2. Overall, the audit results suggest that Institution 2 has some policies pertaining to the intellectual property of course material and employs technology to ensure the security of e-learning initiatives. However, it also appears that management at Institution 2 does not view learning technology delivery systems as imperative. For example, Institution 2 perceives e-learning as a cost rather than as an investment and does not employ learning analytics to evaluate the efficacy of e-learning courses. In short, Institution 2 self-reported in the audit as 'not being ready for the future', or able to 'accommodate new methods of e-learning delivery in the coming years', and 'not in a position to scale up to be able to handle a growing number of e-learning courses in the coming years'. In contrast, the audit findings show that Institution 1 has senior positions in the organisational structure allocated to e-learning management and the institution views e-learning as an investment rather than as an added cost. Institution 1 also identifies e-learning as a strategic priority, and reports highly reliable learning technology delivery systems that are critical to the institution's ability to evaluate their progress in meeting its strategic goals. It also has a clearly articulated vision, mission or strategy with regards to ET, employs defined standards or frameworks to guide the governance process in relation to ET and allocates clear responsibility and accountability for decision-making about ET strategy and policy to specific staff or departments.

It is broadly acknowledged that planning is a critical part of the sustainability, longevity and health of tertiary institutions (Becker et al., 2018b). All the challenges noted above in relation to technology provision (funding models, technology adoption, spiralling costs) demand strategic planning if higher education institutions are to be competitive and ultimately successful (Richardson et al., 2017). The emergence of strategic planning in higher education coincided with the educational challenges experienced in the 1970s and 1980s, as enrolments began to fluctuate, student demographics started to change, and funding became more inconsistent. At that time, futures research and the rise of technology-enabled data collection and analysis pointed to strategic planning as one solution for developing a proactive stance in the dynamic environment of changing demands and declining resources (Hinton, 2012, Moran, 2020). Put simply, strategic planning in higher education provides insight on the sustainability priorities of educational institutions worldwide (Harris et al., 2017). Specifically, where there is urgency, transparency and evidence of a deliberate culture relating to technologies, as is the case in this study, where at Institution 1, there can be confidence in future proofing, developing future institutional capacity (Dougherty et al., 2016) and institutional resilience (Becker et al., 2018b). This evidence includes, but is not limited to, where innovation is encouraged by senior leaders, budgets exist, coaching is available, leaders are held accountable to develop their teams' capacity to innovate (Gayle et al., 2011) that e-learning services, programs and technologies are scalable and that the institution will be able to handle a growing number of e-learning courses in the coming years – all reported in our audit findings at Institution 1 ('we are usually among the very first to adopt new technologies').

The audit suggests capacity to undertake planning is *ad hoc* or missing at Institution 2. This raises some concerns in an industry where the trends for the short and medium term indicate planning for the future is critical for survival and growth (Brown et al., 2020). This planning foresees online education as a scalable way to provide courses to an increasingly non-traditional student population. A consequence of the changing tertiary delivery models is the need to also plan for well-being and mental health initiatives (including emerging technology and application solutions), as tertiary institutions are required to support the increasing numbers of students who report experiencing depression, anxiety or other mental health concerns. In the short-term future, it is predicted that academics and administrators will both need to engage in more frequent encounters with students seeking well-being and mental health assistance. The link between students who do not have effective intervention services or treatment available to them and the risk of less success in academic and social activities has long been established (Brown et al., 2020). Another consequence of expanded online options point to development of an academic body that is prepared to teach online, and show higher education institutions already moving to engage with online program managers to initiate online programs (Brown et al., 2020), a rethinking of degree pathways to accommodate a changing student demographic and employment landscape and even the employment of artificial intelligence as part of curriculum design (Brown et al., 2020). All of this requires institutional strategic planning. Institution 2's lack of capacity in this regard may well be a concern (Dougherty et al., 2016). In the current broader tertiary educational empirical research literature, there are a few documented examples of institutional failure through poor strategic planning. But where a lack of policy, planning and governance has been identified as has been found in this case at Institution 2, it has been concluded in the NMC (Becker et al., 2018a), and Educause (Brown et al., 2020) educational reports that there is an institutional vulnerability in tough and competitive economic times (Gray, 2019b). At a time when digital literacy - the capacity required to thrive in and beyond education, in an age when digital forms of information and communication predominate - is critical to meet the emerging demands of the workplace, social and political participation in society (European Commission 2010), and to not have these technologies present nor see a need to plan for them seems to be a risky strategy (Littlejohn et al., 2012).

6.5.3 Possible faculty disengagement

Responses to these institutional audits revealed faculty may not be adopting and using information systems that support student success, even when such systems are available. The audit data also suggests faculty have limited interest in incorporating technology into teaching, do not have a large role in determining what technologies are used in their courses, and are not rewarded for designing and delivering online courses. The overall indication from the audit findings was of potential faculty disengagement in *both* institutions. Where similar findings have been reported in the existing research the consequence have included to discuss faculty training (Matthews and Smothers, 2017) and technology adoption models (Wingo et al., 2017). However, Institution 1 only 'sporadically' delivers training to staff to learn and use new learning technologies, and at Institution 2 provides such training 'as needed'. Academics at both institutions were muted about the quality of the training that was offered. This insight highlights that both institutions' academics seem at odds with the taken-for-granted future prediction for the survival and growth of educational institutions there must be an academic body that is willing and enthusiastic to teach online (Brown et al., 2020). As a consequence, further research into the degree of academic dissatisfaction with online teaching and technologies (Clifford, 2018) is warranted. This need is reinforced when considered alongside the findings from the first phase of this research that found students were concerned about faculty digital literacy and use of learning technology (Greener, 2018). As such, this audit suggests that it is possible, that any organisational planning and strategy at either institution may be undermined by academic (and possible student) disengagement from ET uptake and implementation. In light of these findings, the extent of student (Wallace-Spurgin, 2020) and faculty engagement (Altbach et al., 2019) in these institutions needs to be clarified.

6.6 Conclusion

This audit highlights differences in the current deployment of learning technology between the institutions included in this study. Many of these differences arise because of the modes of delivery and all of the infrastructure required to support that mode of delivery. But it seems from the audit that different modes of delivery cannot explain all the differences. The two institutions are different to the other in their current operations in a number of ways, including the mode of delivery of courses, the technologies used to support those modes (CMS, LMS), the institution-wide deployment of learning technologies and institution-wide structures and staffing related to ET. A further critical finding from this audit is that despite these differences in infrastructure, governance and planning, both institutions reported a degree of faculty disengagement with learning technologies which needs to be further examined from the perspective of the faculty and the students.

6.7 Chapter summary

The aim and objectives of this project as outlined in Chapter 1 (Section 1.3.1) require the development of an understanding of the technology provision in the two sample institutions. As a consequence, an audit was undertaken of the two institutions chosen for this study. This chapter provides a descriptive comparison of the findings of the audit. The objective of this chapter was to build on the results presented in the first results chapter from the focus groups and interviews with staff, students and educational leaders. What we now know is the technology provision, educational delivering methods, the faculty support, IT support, infrastructure and student services support in place in these settings. Congruent with the MMR methodology approach of this project the results of this second phase build on the findings of the first phase and in turn, the results of this audit are entwined with and inform data collection in the form of cross-sectional surveys of stakeholders, staff and students at the sample institutions.

Chapter 7 - Results (3): Attitudes and uptake of learning technologies in Complementary and Integrative Medicine Education - Results of an international faculty survey

7.1 Chapter introduction

The aim and objectives of this project as outlined in Chapter 1 (Section 1.3.1) require the development of an understanding of the views and voice of the critical stakeholders. This chapter focusses on academics and contributes to research objectives 2-5. As a consequence of the focus groups and audit conducted previously in the two institutions chosen for this study in Phase One and Two of this project, where the findings pointed to the criticism of the deployment of classroom learning technology and the unique (possibly ideological) attitudes and resistance to clinical and learning technology, a cross-sectional survey was prepared and administered to academic staff in these settings. With this in mind, this chapter reports the demographics of academics, and their attitudes to technologies in general, the ways that technologies impact their students, their perceptions of changes to education and the role of the teacher using technologies. In addition, and following the STROBE guidelines, this chapter report academics' perceptions of institutional infrastructure, progress and support, institutional support for change, the challenges and barriers to adopting new digital tools and also if participants viewed their institution as more advanced in the effective use of learning technologies compared to other institutions. Attitudes to training opportunities for academics as well as attitudes to the inclusion of digital literacy content in the institution's curriculum were also explored.

7.1.1 Publications of results

The results contained within this chapter have been published as follows: Gray AC, Steel A, Adams J. Attitudes to and Uptake of Learning Technologies in Complementary Medicine Education: Results of an International Faculty Survey. *The Journal of Alternative and Complementary Medicine*, Vol. 26, No. 4 pp. 335–345 DOI: 10.1089/acm.2019.0319

A copy of the manuscript is attached to this thesis as Appendix K.

7.2 Background

Complementary medicine (CM) - healthcare not traditionally associated with the conventional medical profession or medical curriculum (Adams et al., 2013b) – houses a diverse field of mind-body practices (e.g. yoga, meditation), natural products (e.g. vitamins, herbal medicines), systems of medicines (e.g. traditional Chinese medicine, naturopathy, homeopathy) and treatments (e.g. aromatherapy, reflexology) (Adams et al., 2012a). The uptake of CM is increasing worldwide (Harris et al., 2012) as evidenced, for example in Australia by practitioner visits (Xue et al., 2007, Reid et al., 2016a, Steel et al., 2018b) and over the counter sales (Harnett, 2019). In Europe and the US, the picture is very similar (Fischer et al., 2014b, Clarke et al., 2015). Yet, despite the size of the CM industry and CM providers occupying a significant role in the Australian and US healthcare settings (Wardle et al., 2011, Jonas et al., 2013a, Adams et al., 2017), the education of CM practitioners has received little empirical attention (Wardle et al., 2012).

Meanwhile the educational sector has seen maturing research exploring changes in tertiary education (including but also beyond a health care focus) in response to developments in learning and digital technologies (Selwyn and Facer, 2014) that include constructivist education theories, changing student learning behaviours (Chen, 2014), non-traditional students and MOOC's (Johnson L, 2011, Fox-Turnbull and Snape, 2011, Halac and Cabuk, 2013, Rodriguez, 2012, Veletsianos and Kimmons, 2012). While significant research attention has been focused on the theory and andragogy of online learning (Greenfield et al., 2002, Liebenberg et al., 2012, Anderson and Dron, 2012), questions remain about the use of new technologies and the possible implications and pressures for students, educators and institutions, as well as conflicting views about the value and importance of technology that impact workforces in general (Gros et al., 2012, Lister, 2014, Liu et al., 2010, Cornelius, 2014). So embedded and normalised are digital technologies in contemporary tertiary education that they are often now considered 'unremarkable' to educational researchers (Selwyn, 2016a). This notwithstanding, tertiary institutions remain challenged in their attempts to engage with the contemporary unsettling and challenging nature of new technologies and the expectations and demands of more recent students who have 'grown up digital' (Losh, 2014, Selwyn, 2016a) and who are reliant on digital technology in ways that earlier generations were not.

A recent critical integrative review of CM education (Gray et al., 2019b) highlighted two key issues of significance for CM educational institutions, regulators and researchers, and pointed to a number of significant gaps in this area of research. Firstly, there is very sporadic coverage of research in CM education. Secondly, the robust and mature research regarding educational technology and e-learning taking place in education more broadly and medical and allied health education research in particular is notably absent within CM educational research. Similarly, completely absent in the CM field is the recent research and discourse in education that has focused the growing casualisation (use of adjunct academics over tenured) of the workforce in academia (Moorehead et al., 2015), in faculty resistance to change, the digital divide between subsets of students and between students and faculty and student readiness for online study (Parkes et al., 2015, Downing and Dyment, 2013, Ilgaz and Gülbahar, 2015, McKee and Tew, 2013, Black-Fuller et al., 2016). Despite the high levels of CM use in the community, and the presence of CM educational institutions globally, the current evidence evaluating the procedures, effectiveness and outcomes of CM education remains limited on a number of fronts. There is an urgent need to establish a strategic research agenda around this important aspect of health care education with the overarching goal of providing important data and support for CM educational leaders as well as ensuring a well-educated, effective CM health care workforce delivering quality clinical care. In response, this paper reports on findings from a study exploring CM academic attitudes to and perceptions of the uptake of learning technologies in the US and Australia in order to address some of the gaps previously identified in relation to CM academics.

7.3 Methods and materials

7.3.1 Aim

The aim of this study is to explore the attitudes and perceptions of CM academics to the use of learning technologies in their work.

7.3.2 Study design

An online survey was administered to academic staff at two CM education provider institutions.

7.3.3 Setting

The sample institutions, an institution in Australia (Institution 1), and an institution in the US (Institution 2) were selected as they represent two leading CM educational providers globally and cover the breadth of CM educational provision (undergraduate, postgraduate, medical and professional CM offerings).

7.3.4 Sample

Academic staff within the two institutions were the target population. The survey was administered to all tenured, contracted and adjunct academics at both institutions at the time of recruitment. It is estimated that Institution 1 administered the survey to ~350 academics (Steel et al., 2015). Institution 2 administered the survey to 180 academics. Administrative or research staff were not included in the sample population.

7.3.5 Ethics approval

Ethics approval for the project was obtained from the University of Technology Sydney (UTS) Human Research Ethics Committee (ETH16-0477) and National University of Natural Medicine (NUNM) Institutional Review Board (#AG05052017).

7.3.6 Survey administration

A link to the anonymous online survey was distributed via email invitation by a member of the senior leadership team at both institutions with two subsequent email reminders. It was made clear to potential participants that completion of the survey was voluntary.

Written consent was obtained prior to survey completion. Recruitment was conducted over four weeks in October 2017.

7.3.7 Instrument

The survey instrument was designed to explore four specific domains: demographics; attitudes to technologies in general including their self-assessed technology adoption category; perceptions of the changing face of CM education and the role of the CM teacher in general; and perceptions of their institution's infrastructure, progress and support regarding learning technologies. The survey was assessed for face validity prior to study recruitment by testing the instrument and receiving expert feedback. Instrument modifications were undertaken where relevant with regards to language clarity, use of different educational terms (as employed internationally), the time required to complete the survey (12 minutes) and the relevance of questions.

7.3.7.1 Demographics

A number of survey items identified the respondent's current institution role or position, how many years they had been teaching at their institution, their gender and current employment status.

7.3.7.2 Attitudes to technologies

Academics were invited to self-rate their perceptions of contemporary digital technology and the impact of this technology on their CM students. Participants were also asked to choose which category best matched the way they adopted technologies using the DI categories of Rogers, (Rogers, 2010), a theoretical model that describes rates of adoption and perceived attributes of adopters (Kardasz, 2013). Examples of where Rogers' DI theory has applied in the field of education include education policy (Alberty, 2014, Wonglimpiyarat, 2005b), the provision and adoption of teaching online (Chi, 2013), online learning (Mitchell, 2013), staff development in education (Fisher, 2005), faculty attitudes to technology (Tabata and Johnsrud, 2008), faculty resistance to change (Porter and Graham, 2015, Revell, 1999) and adoption of educational technology in general (Lee et al., 2011, Sahin, 2006).

7.3.7.3 Perceived changes to education and the role of the teacher

Participants were asked to report their perceptions of whether teaching practice is changing and whether this is due to the availability of learning technologies as well as how learning technologies impact both their activities in the classroom and their wider work as academics.

7.3.7.4 Perceptions of institutional infrastructure, progress and support

A number of survey items captured respondents' perceptions and experiences regarding possible constraints upon the incorporation of digital technologies and digital learning into their own and institution-wide classroom activities, and their own ability to influence and recommend new technologies in their workplace. Additional survey items explored respondents perceived institutional support for change, challenges and barriers to adopting new digital tools and also questioned if participants viewed their institution as more advanced in the effective use of digital technologies compared to other institutions. Attitudes to training opportunities for academics as well as attitudes to the inclusion of digital literacy content in the institution's curriculum were also explored.

7.3.8 Data collection

Data collection was administered online via SurveyGizmo. Following completion of the data collection period both complete and incomplete data was transferred to spreadsheets for analysis. In addition, bias was minimised by using established/pilot tested questions/instruments.

7.3.9 Statistical analysis

Descriptive statistical analysis was employed including frequencies and percentages for categorical variables and means and standard deviations for continuous variables.

Associations between categorical and continuous variables were examined using student t-tests. Pearson chi-square tests were used to test for association between categorical variables. A p-value of <0.05 was applied to determine the level of statistical significance. To correct for multiple statistical testing, a modified Bonferroni correction was used (Keppel, 1991). Analyses were conducted using the statistical software SPSS Statistics.

7.4 Results

7.4.1 Demographics

The survey was completed by 80 respondents providing a response rate of 15%. Table 1 summarises the full details of the demographic features of academics at these educational environments who participated in the research. Respondents reported having taught for a mean of 9.6 years (SD 8.10; Min 1, Max 43) overall and a mean of 5.3 years at their current institution (SD 4.90; Min 0.5, Max 28). More respondents identified as female (n=52, 65.8%) and most participants were contractors (n=57, 72.2%). A majority of permanent employees (71%) reported that they were not in clinical practice. However, 82% of contractors were in clinical practice.

Table 1 Demographics of participants *(n-80).*

Demographics				n	%
Staff member (n=x)	Institution 1			67	83.8
	Institution 2			13	16.3
Gender (n=x)	Female			52	65.8
	Male			23	29.1
	Prefer not to answer			4	5.1
Employment status (n=x)	Permanent full time			16	20.3
	Permanent part time			6	7.6
	Contract/sessional teacher			57	72.2
Years teaching (n=x)	0-5			26	32.5
	5-10			21	26.3
	10-20			25	31.2
	20+			8	10.0
Years teaching at institution?	0-5			50	62.5
	5-10			19	23.7
	10-19			9	11.3
	20+			2	2.5
	n	Mean	Std. Deviation	Min	Max
Years Teaching	79	9.6	8.1	1	43
Years Teaching at Institution	78	5.3	4.9	0.5	28

7.4.2 Attitudes to technologies in general

Many participants reported the digital-specific skills and attributes most important for students to achieve success in life as: judging the quality of information (mean 4.6; SD 0.63); understanding privacy issues (mean 4.6: SD 0.67); and behaving responsibly online (mean 4.5: SD 0.87) (see Table 2). Presenting themselves online (mean 3.5: SD 0.89) and working with video and graphic content (mean 3.2: SD 0.92) were perceived by many academics as less important to students achieving success in life. Most respondents agreed the use of digital technologies led to increased student abilities to share their work with a wider and more varied audience (mean 4.3: SD 0.73). There was strong agreement that, when compared to previous generations, contemporary students were more media literate (mean 4.1: SD 1.12) and have fundamentally different cognitive skills because of the digital technologies with which they have grown up (mean 4.0: SD 0.94). Some academics rated their students' ability to understand how online search results were generated as poor (mean 2.7: SD 1.06), and most considered the amount of information available online today as overwhelming for their students (mean 4.3: SD 1.03). Many participants reported that the internet enabled students to find and use resources that would otherwise not be available to them (mean 4.3: SD 0.81) but perceived search engines as having conditioned students to expect to be able to find information quickly and easily (mean 4.1: SD 0.72). Using Rogers' *Diffusion of Innovation* classification to choose which category best matched the way they adopted technologies the respondents identified themselves as 'early adopters' (n=28, 35%), or 'early majority' (n=30, 38.5%), but not 'laggards' (0%).

Table 2 Academics' observations of students and the impact of the internet in Complementary Medicine education *(n=80).*

How important do you feel each of the following skills is for your students to be successful in life?	Mean	Std. Deviation
Judging the quality of information:	4.6	0.634
Understanding privacy issues surrounding digital and online content:	4.6	0.668
Behaving responsibly online:	4.5	0.874
Writing effectively:	4.3	0.806
Finding information quickly:	4.2	0.792
Communicating their ideas in creative, engaging or interesting ways:	4.0	0.792

Presenting themselves effectively in online social networking sites:	3.5	0.898
Working with audio, video or graphic content:	3.2	0.929
What is the extent that you agree or disagree about impact of contemporary digital technologies on students?		
Contemporary digital technologies allow students to share their work with a wider and more varied audience: *	4.3	0.734
The internet encourages learning by connecting students to resources about topics of interest to them #	4.1	0.608
The availability of digital content has broadened my students' worldviews and perspectives	3.8	1.011
The multimedia content available online immerses students more fully in topics they study	3.8	0.907
Contemporary digital technologies encourage greater collaboration among students	3.8	0.944
Contemporary digital technologies encourage student creativity and personal expression	3.7	0.921
Contemporary digital technologies do more to distract students from schoolwork than to help them academically	3.0	1.031
What is the extent that you agree or disagree with these statements		
Contemporary students are more media literate than previous generations:	4.1	1.120
Compared with previous generations, contemporary students have fundamentally different cognitive skills because of the digital technologies they have grown up with	4.0	0.940
Digital technologies are creating an easily "distracted" generation with short attention spans:	3.9	1.040
Contemporary students are too familiar with digital technologies and need more time away from them:	3.1	0.988
Contemporary students are really no different than previous generations, they just have different tools through which to express themselves:	3.0	1.064
Contemporary students are very skilled at multi- tasking:	2.8	1.001
Contemporary students are more literate than previous generations:	2.2	0.811
Overall, how would you rate your students on each of the following?		
Ability to understand how online search results are generated:	2.7	1.066
Ability to use appropriate and effective search terms and queries:	2.7	1.093
Ability to use multiple sources to effectively support an argument:	2.4	1.166
Ability to assess the quality and accuracy of information they find online:	2.4	1.025
Ability to recognize bias in online content:	2.2	1.099
Patience in looking for information that is hard to find:	2.1	1.096
To what extent do you agree or disagree with the following statements?		
The internet enables students to find and use resources that would otherwise not be available to them:	4.3	0.814
Search engines have conditioned students to expect to be able to find information quickly and easily *	4.1	0.720
The amount of information available online today is overwhelming for most students:	3.8	1.036
The internet makes students more self - sufficient researchers who are less reliant on your help:	3.0	1.104
Today's digital technologies discourage students from finding and using a wide range of sources for their research:	2.8	1.138
Today's digital technologies make it harder for students to find and use credible sources:	2.7	1.184
Self-Reported Technology Adopter Category	*n*	%
Innovator	9	11.5
Early Adopter	28	35.9
Early Majority	30	38.5
Late Majority	11	14.1
Laggard	0	0

Note: All questions received at least one minimum score in the scale 1 (strongly disagree) and one maximum score 5 (strongly agree). The exceptions were # which denotes questions where the response range was from 3 (neutral) to 5 (strongly agree), and * which denotes questions where the response range was from 2 (disagree) to 5 (strongly agree).

7.4.3 Perceptions of the changing face of education and the role of the teacher

Most participating academics disagreed with the statement (see Table 3) that avoiding technology in their CM academic work was to be preferred (mean 2.1: SD 1.03). Participants reported that teaching practice is changing due to the availability of learning technologies (mean 4.2: SD 0.79), and that confidence and capability with digital technologies is essential to be a successful academic (mean 4.2: SD 0.74). Further, respondents reported modifying their teaching and assessment and directed students in class time to specific online resources which are most appropriate for student assignments (mean 4.1: SD 0.84). Many academics devote class time to teaching the critical skills necessary to improve the reliability of information found by students online (mean 3.9), how to conduct research using the internet (mean 3.5: SD 0.97), improve and refine search terms and queries (mean 3.4: SD 1.05), as well as discuss with students how search engines work and how search results are generated and ranked (mean 2.8: SD 1.10). Some CM academics reported developing research questions or assignments that require their students to use a variety of both online and offline sources (mean 3.4: SD 1.18). Academics also report the internet and learning technologies have a negative impact and require more and harder work from them as a teacher (mean 3.7: SD 1.18). These challenges include but are not limited to needing to monitor and manage student behaviours in the classroom, diminishing attention spans, poor academic writing skills and search engine strategies. Overall, with regards to knowledge about how to use digital technologies (such as the internet email, social media and social networking sites, technology devices such as tablets, computers, smartphones or gaming systems) most respondents reported their knowledge level as about equal to that of their students (n=44, 55.7%) while some reported their students as usually knowing more than them (n=22, 27.8%) and only a few academics reported knowing more than their students (n=13, 16.5%).

Table 3 Complementary Medicine academics' perceptions of the changing face of education and the role of the teacher *(n=80).*

What is the extent that you with the following statements?	Mean	Std. Deviation
Teaching practice is changing due to the availability of learning technologies: *	4.2	0.795

I perceive confidence and capability with digital technologies as essential to be a successful academic in my area	4.2	0.749
At work, I'm enthusiastic about using new technologies *	3.7	0.831
Institutional technology projects generally succeed at improving my job	3.3	0.773
I feel that I can influence and recommend new technologies that will be used by my institution	3.1	1.042
Worries about privacy and data protection have restricted the use of digital tools in my area of work	2.5	0.943
I feel that I have a say in choosing which technologies are implemented in my area of work	2.5	1.184
I am concerned that using digital tools will have a negative impact on my work life balance	2.3	1.055
Concerns about my professional image have impacted my use of digital tools at work	2.3	0.989
In the past implementing new technologies has been a negative experience and impacted on my job	2.3	0.996
If there is another way, I would actively prefer to avoid using technology:	2.1	1.039
To what extent do you agree or disagree with the following statements?		
I direct students to specific online resources which you feel are most appropriate for their assignments:	4.1	0.848
I spend class time discussing with students how to assess the reliability of information they find online:	3.9	0.976
I spend class time discussing with students how to generally conduct research using the internet:	3.5	1.025
I spend class time helping students improve their search terms and queries:	3.4	1.055
I develop research questions or assignments that require students to use a variety of sources, both online and offline:	3.4	1.189
I spend class time discussing with students how search engines work and how search results are generated/ranked:	2.8	1.104
I give my students research assignments in which they are not permitted to use online search engines:	1.8	1.040
What impact has the internet and other digital technologies had on your teaching practice?		
Giving you access to more material, content, and resources to use in your teaching:	4.7	0.629
Allowing you to share ideas with other educators: with regards to each of the following *	4.2	0.782
Enabling better interaction with your students: with regards to each of the following	4.2	0.935
Increasing the range of content and skills you need to be knowledgeable about *	4.5	0.669
Generally requiring more work for you as a teacher: with regards to each of the following	3.7	1.189
How is your knowledge of digital technologies compared to your students'	*n*	%
I usually know more than my students	13	16.5
My students usually know more than I do	22	27.8
Our knowledge levels are usually about equal	44	55.7

Note: All questions received at least one minimum score in the scale 1 (strongly disagree) and one maximum score 5 (strongly agree). The exceptions were * which denotes questions where the response range was from 2 (disagree) to 5 (strongly agree).

7.4.4 Perceptions of institutional infrastructure, progress and support

Academics commonly perceived their students as having adequate and sufficient access to the internet and other digital technologies in order to effectively complete college/university assignments (mean 3.9: SD 0.92) (see Table 4). However, many participants reported seeking out opportunities, separate to those provided by the institution to learn more about incorporating digital technologies into their teaching (mean 3.6: SD 0.98). Some CM academics reported using a greater range of technology in their personal life than is available at their institution (mean 3.1: SD 1.10). Some participants reported a lack of technical support to use digital technologies consistently - such as repair, troubleshooting, set-up - provided by their institution (mean 3.0: SD 1.20), while others reported feeling hampered by time constraints in incorporating digital technologies and digital learning into classroom activities (mean 2.9: SD 1.10) and pressured to teach to assessments (mean 2.8: SD 1.22). Academics from both countries perceived their institution as lagging behind in using digital technologies effectively compared with other education institutions more broadly (mean 2.7: SD 1.04). Only a few participants agreed that their institution did a good job providing teachers with the resources and support necessary to effectively incorporate the newest digital technologies into curriculum and andragogy (mean 2.6: SD 1.21) and few agreed there was enough training in how to incorporate digital technologies into the learning process (mean 2.1: SD 1.14). Respondents did not perceive the challenge to incorporating digital technologies in the classroom as being a result of their own lack of comfort, knowledge or training with these technologies (mean 2.3: SD 0.1.19).

Table 4 Complementary Medicine academics' perceptions of institutional infrastructure, progress and support *(n=80)*.

To what extent do you agree or disagree with the following statements?	Mean	Std. Deviation
Courses or content that focus on digital literacy should be incorporated into the College curriculum *	3.9	0.834
Students have sufficient access in College to the internet and other digital technologies they need to effectively complete school assignments *	3.9	0.921
It is necessary to manage students' use of cell phones and other technology in your classroom	3.6	1.243
Have you ever sought out opportunities, separate to those provided by the College, to learn more about incorporating digital technologies into the learning process	3.6	0.984
It is imperative for schools to teach and assess today's students using the digital technologies they are most comfortable with	3.3	0.953
I use a greater range of technology in my personal life than is available at my institution	3.1	1.109
There is a lack of technical support (such as repair, troubleshooting, set-up) to use digital technologies consistently	3.0	1.234
I am hampered in incorporating digital technologies and digital learning into my classroom activities by time constraints	2.9	1.105
I would like to incorporate digital technologies and digital learning into my classroom activities but I am pressured to teach to assessments	2.8	1.221
When it comes to incorporating digital technologies and digital learning into your classroom activities there is general resistance by colleagues and administrators	2.7	1.060
Compared with other colleges, our College is more advanced when it comes to using digital technologies effectively	2.7	1.047
Our College does a good job providing teachers the resources and support needed to effectively incorporate the newest digital technologies into College curriculum and pedagogy	2.6	1.219
My own lack of comfort, knowledge or training with digital technologies is a challenge in incorporating digital technologies in the classroom	2.3	1.196

There is a lack of resources and/or access to digital technologies among my students	2.3	1.095
Our College currently provide teachers with formal training in how to incorporate digital technologies into the learning process	2.1	1.146
To what extent do you agree with these statements related to the challenges and barriers to adopting new digital tools?		
My institution is supportive of new technologies and teaching tools	3.8	1.025
Does your institution support personal digital tools you use in your teaching work	3.2	0.964
Training for new digital technologies is rarely available at my institution	3.1	1.110
I cannot implement change due to budget constraints	3.0	0.864
My institution has formal process for communicating ideas to management for implementing new digital tools	2.9	1.070
Time is made available to explore the use of new digital tools at my institution	2.5	1.091
Highlight the types of assistance you would seek when faced with a new digital technology you must learn	*n*	%
My supervisor, or another knowledgeable lecturer on the topic	45	72.4
Another College resource	30	51.7
A friend, or another research student	23	37.9
A co-worker	35	58.6
A family member	14	24.1
Online an online tutorial, user guides or question forum	46	77.6
I would not look for assistance I would just try to work it out for myself	15	25.9
Which resources of the College have helped you to develop/strengthen your digital technologies skills and capabilities	*n*	%
I do not feel that any resources of the College have helped me to develop or strengthen my digital technologies skills	21	29.3
One-to-one sessions with my supervisor or other:	23	32.8
Lecturers:	14	22.4
Computer software obtained through the College which I use on my personal computer:	11	19
Shared computer labs at the College	3	5.2
IT services:	22	36.2
The Library:	21	34.5
Workshops or other lecture sessions conducted by lecturers or staff in my department:	14	22.4
Workshops or other lecture sessions conducted by someone from outside my department:	13	22.4

Note: All questions received at least one minimum score in the scale 1 (strongly disagree) and one maximum score 5 (strongly agree). The exceptions were * which denotes questions where the response range was from 2 (disagree) to 5 (strongly agree)

7.4.5 The Relationship between academic’s employment status, clinical practice and attitudes to and uptake of learning technologies

Inferential statistical analysis found clear differences between those participants in clinical practice and those not in clinical practice, and between those tenured and contracted, and their attitudes to learning technologies using $\alpha = .05$. It is to be noted that our analysis did not differentiate between private clinical practice and faculty clinical supervision. When compared with tenured academics (i.e. those on permanent contracts), casual contract academics more commonly held the view that their institution is more advanced when it comes to using digital technologies effectively (p=.025). Casual contract academics also agreed more strongly than tenured academics that their institution has a formal process for communicating ideas to management for implementing new digital tools (p=.013), and that their own lack of comfort, knowledge or training with digital technologies is a challenge in incorporating digital technologies in the classroom (p=.047). In contrast, tenured academics had attitudes that were significantly more in agreement than contracted academics regarding if they can influence and recommend new technologies that will be used by their institution (p=.001), if they have a say in choosing which technologies are implemented in their area of work (p<.001), if they currently develop research questions or assignments that require students to use a variety of sources, both online and offline (p=.013) and if there is a lack of technical support at their institution (such as repair, troubleshooting, set-up) to use digital technologies consistently (p=.007). In addition, tenured academics were significantly more in agreement compared to contracted academics about the necessity for the incorporation of courses or content that focus on digital literacy into the College curriculum (p=.045) and that digital technologies allow academics to share ideas with other educators and has had an important impact on their teaching practice (p=.027).

Those respondents that identified as also being in clinical practice were more likely than the academics not in clinical practice to perceive that: the availability of digital content has broadened their students' worldviews and perspectives (p=.030); compared with previous generations contemporary students have fundamentally different cognitive skills because of the digital technologies to which they have been exposed (p=.027); behaving responsibly online is a necessary skill for students to be successful in life (p=.035); contemporary digital technologies encourage student creativity and personal expression (p=.039), and; their institution has a formal process for communicating ideas to management for implementing new digital tools (p=.010). Those academics surveyed that were not in clinical practice were more likely than those in current practice to perceive that: they could influence and recommend new technologies that will be used by their institution (p<.001); they have a say in choosing which technologies are implemented in their area of work (p<.001); training for new digital technologies is rarely available at their institution (p=.047), and they direct students to specific online resources which are most appropriate for their assignments (p=.039).

7.5 Discussion

Our study reveals four key findings that suggest CM education settings are not exempt from the trends found in other educational environments with regards to learning technologies. Existing research previously highlighted the pressures, tensions and impacts of technologies on the working lives of academics in many diverse learning environments from university academics in general (Graham, 2013) to becoming an online academic (Bennett and Lockyer, 2004), and from andragogy (Snyder et al., 2007) to blended learning (McShane, 2006). One core issue identified in our study - faculty resistance as a significant obstacle and challenge to change in the workplace - has been repeatedly identified elsewhere (Schwartz, 2010, Johnson L, 2011). However our findings challenge some commonly held perceptions about academics and change, that differ from previous studies in other educational settings (O'Connell and Dyment, 2016) and suggest CM educational environments may require a more nuanced approach with regards to understanding changing teaching practices, sense of value and support.

Based on our study findings, CM academics perceive themselves to be 'early majority' adopters of innovation and as being proactive in their teaching and assessment delivery, such as devoting class time to discussing the reliability of information found online and how to conduct research using the internet. This finding potentially challenges widespread assertions that academics are simply resistant to change (Buller, 2015, Watty et al., 2016, Ferguson et al., 2014) and instead is more congruent with studies in other educational settings such as science, technology, engineering, and mathematics (Oleson, 2014, Tondeur, 2017) where it has been found that a combination of more digitally literate students plus the introduction of new internet technologies has resulted in development of new assessment approaches such as reflective assignments and e-portfolios (O'Connell and Dyment, 2016). However, as this survey data is self-reported and as academics' perceptions may not fully align with actions in the classroom nor with student perceptions the extent of resistance to change remains unknown.

Despite an apparent readiness to adopt technology, our study findings suggest that CM academics perceive technologies to have a substantial detrimental impact on their students' future workplace skills, knowledge and attributes. This finding emerged from answers to questions exploring perceptions related to the ability of students to understand how online search results are generated, use effective search terms and queries, use multiple sources to effectively support an argument, assess the quality and accuracy of information they find online, recognize bias in online content. Academics generally agreed that digital technologies had created an easily "distracted" student with a short attention span, that was too familiar with digital technologies and needed more time away from them, and that search engines have conditioned students to expect to be able to find information quickly and easily. This finding is similar to that identified in other educational settings such as journalism (Purcell et al., 2012, Tylor, 2014). In the CM settings examined in our study, academics expressed empathy to modern student predicaments given the sheer volume of data available to them, but rated students' ability to understand how online search results are generated in this 'search engine society' as extremely poor (Halavais, 2017). Similar to the findings of our study, existing research has drawn attention to the need for students to develop the ability to discriminate based on the quality and accuracy of available online information (Halavais, 2017). Equally, concerns raised by academics in tertiary education settings have focused on the generational difference in students' expectations and attention spans resulting from high engagement with online content and technology (Arthi and Srinivasan, 2018, Selwyn and Gorard, 2016, Colón-Aguirre and Fleming-May, 2012, Komissarov and Murray, 2016). These concerns were also evident in the responses from participants in our study.

Our research highlights that CM academics (and especially contracted academics) feel strongly that they have limited control over the choice of technologies utilised in their teaching work. The findings point to a possible alignment with existing research describing the perceptions of contracted academics in broader academia (Yu et al., 2009). This previous research points to inequities and inefficiencies compared with tenured staff, and suggests contracted academics feel their talent and ideas are under-utilised and experience marginalisation and disempowerment working within their institution. In broader educational research (Clark, 2017) the trend to 'casualisation' that continues to divide the educational workforce has received attention (Moorehead et al., 2015, Ott and Cisneros, 2015, Levin and Shaker, 2011). This existing research in other academic settings shows casual (contract or adjunct) workers have often been relegated to an 'underclass' that experience more job insecurity, lower wages and poorer working conditions (Kimber, 2003). Further, research in wider education circles has also highlighted that in general there are often fewer processes in place for identifying, documenting, and creating meaningful policies and practices for this contracted faculty population (Kezar and Maxey, 2012). Further research is needed before effective strategies can be established for marshalling institutional resources, appropriate training, more regular allocations, and inclusion in formal academic processes to redress this reported perception among CM academics of marginalisation with regards to learning technologies.

Existing research that provides examples of the successful adoption of technologies in educational settings has found that specific circumstances should be present to ensure such success (Johnson et al., 2011, Ward, 2013). This includes a need for an institutional strategy (Levin et al., 2012), high-level champions supportive of change (McCorkle, 2001), structures and supportive decision making that take into account faculty technology adoption status (Porter and Graham, 2015), faculty willingness for change (Kardasz, 2013), as well as sufficient resources and guidance supported by a varied programme of staff development and opportunities (King and Boyatt, 2015). In other educational settings, when the majority of faculty have articulated similar or the same negative perceptions to those expressed in this study (their institution is less advanced than others, students are given priority and are better resourced than academics, training is ineffectual, there is poor institutional technology supported; and few formal processes for communication upward, restricted by time and budgetary constraints) an urgent need for a strategy of deployment and training has been identified (Hudson et al., 2015, Abrizah, 2017, Buller, 2015, Gutman and Gutman, 2016). A core finding of our study is that most CM academics place the responsibility for any digital shortcomings squarely with their institution, not themselves. They report themselves as early adopters, rank themselves as mostly equal in their technology and knowledge levels to their students and use a greater range of technologies than are available at their institution. This important finding in our study possibly indicates that successful implementation of meaningful digital change may not be fully possible (Al-Senaidi et al., 2009). In broader educational research it is known that part-time employees and adjunct academics typically include a spectrum of faculty associates, lecturers, clinicians and graduate assistants and different types of instructors have different motivations for adopting technology with most faculty adopting a "wait and see" attitude (Yu et al., 2009). For education leaders in these CM settings training should not necessarily be limited to full-time faculty but extended to part-time instructors to set examples to other potential adopters (John, 2015). This acknowledgement of the breadth of digital competence of faculty may hold important strategic significance for CM educators and leaders in planning, training, and resource allocation in CM education settings.

7.5.1 Limitations

The limitations of this study must be acknowledged. Participants self-selected, and as such possibly contributed to the selection bias whereby CM academics that have equally strong or stronger attitudes to learning technologies and practice enhancing technologies chose not to complete the survey. Both CM institutions had students of similar age, subjects offered and gender balance but there are important differences between the institutions, including size, and the mode of study. While teaching similar courses and subjects (eg nutritional medicine), the unique characteristics of Institution 1 (multiple campuses, Australian, undergraduate, non-medical CM courses) and the unique characteristics of Institution 2, (single campus, US, postgraduate, medical courses) limit the transferability of findings to other institutions in both Australia, the US and further afield. In addition, as it was only a small proportion of academics that chose to participate from one institution this meant that there is little value in reporting comparative statistics between the two institutions. The effects of potential random error could be due to the small sample size within the study. Importantly, the small sample size limits the generalisability of findings. Despite these limitations, the results from this research provide valuable insights into CM academic perspectives and experiences regarding learning technologies and highlight the need to further research key aspects of CM education provision. As such, the perceptions of academics regarding technologies and learning at other CM institutions warrants further investigation and comparison with these findings.

7.6 Conclusion

This in-depth empirical study of CM academic perspectives and experiences presents novel but measured preliminary insights into the place and value of learning technologies in CM education. This research is consistent with other educational research suggesting that academics have complex patterns of technology adoption and that over simplified statements by researchers in education about resistance to change require modification and should not be seen as rejection of technologies by academics. The examination of CM student perceptions would serve to create further clarity in this emerging field as would research regarding use of technology as it relates to the methodologies of teaching CM to more deeply understand recruitment, retention and development of faculty teaching within CM to enable graduates to better utilize CM in clinical practice. Moreover, further research is also warranted to explore the perceptions and experiences of broader CM education staff and CM academic researchers at other CM institutions, integrative medicine educational institutions and medical education settings, in order to help identify and ultimately address the challenges, risks and tensions around learning technologies in CM educational settings.

7.7 Chapter summary

The results of this investigation build upon the findings from the first prospecting phase of this research. In the Phase One qualitative investigation reported in Chapter 5 it became clear that there are strong perceptions, drivers and adoption patterns of academics and students alongside of the educational and professional leadership perspectives on the role of technology in these settings. The complexity of the perceptions required nuanced further investigation to uncover the groups and subdivisions within the academic body. This Phase Three research has uncovered that CM education settings are not exempt from the trends found in other educational environments with regards to learning technologies but there are nuances and variations. Additionally, from a granular perspective, it is now known that CM academics perceive themselves to be early majority adopters of innovation and as being proactive in their teaching and assessment delivery, such as devoting class time to discussing the reliability of information found online and how to conduct research using the internet. These findings challenge widespread assertions that all academics are resistant to change. However, despite an apparent readiness to adopt technology, our study findings suggest that CM academics perceive technologies to have a significant detrimental impact on their students' future workplace skills, knowledge and attributes. Furthermore, CM academics feel strongly that they have little control over the choice of technologies utilised in their teaching work. Lastly, academics perceive that their institution is less advanced than others, that students are given priority and better resourced than academics, that offered training is ineffectual, that there is poor institutional technology support, that no formal processes exist for communication upward, and that academics are restricted by time and budgetary constraints. CM academics place the responsibility squarely with their institution, not themselves for any digital shortcomings. However, academics are not the only critical stakeholder, and it is to the investigation of student perspectives and perceptions that we now turn.

Chapter 8 – Results (4): Complementary medicine students' perceptions, perspectives and experiences of learning technologies. A survey conducted in the US and Australia

8.1 Chapter introduction

To meet the aim and objectives of this project as outlined in Chapter 1 (Section 1.3.1) it is necessary to deepen our understanding of the views of the critical stakeholders. This chapter focusses on the student voice and the student lived experience of learning technologies. This focus contributes to research objectives 2-5. As a consequence of the focus groups and audit conducted previously at the two institutions chosen for this study in Phase One and Two of this project, a cross-sectional survey was prepared and administered to students in these settings. The findings in Phase One pointed to student criticism of the deployment of classroom learning technology, gave insights into student digital literacy, digital divides and digital resistance plus the unique (possibly ideological) attitudes and resistance to clinical and learning technology. With this in mind, this chapter reports the specific demographics of students and their experiences and perceptions of technologies in general. In addition, CM students were questioned on their perceptions of changes in teaching practice in their institution and how learning technologies impacted their activities in the classroom and their learning as well as their perceptions of institutional infrastructure, progress and support.

8.1.1 Publications of results

The results from this chapter have been published in the *European Journal of Integrative Medicine.* Gray, A. C., Steel, A., & Adams, J. (2021). Complementary medicine students' perceptions, perspectives and experiences of learning technologies. A survey conducted in the US and Australia. *European Journal of Integrative Medicine.* https://doi.org/10.1016/j.eujim.2021.101304

A copy of the manuscript is attached to this thesis as Appendix L.

8.2 Background

Complementary medicine (CM) - commonly defined as healthcare not traditionally included in conventional medical care or medical education settings (Adams et al., 2013b) - is a broad and diverse field of individual professions, mind-body practices (yoga, meditation) natural products (vitamins, herbal medicines), therapies (naturopathy, traditional Chinese medicine) and treatments (e.g. aromatherapy, reflexology) (Adams et al., 2012a). There is an increasing uptake of CM worldwide (World Health, 2019) and CM use in Australia is characterised by sustained growth with CM now accounting for up to half the healthcare sector, including practitioner visits, out-of-pocket expenses (Xue et al., 2007) and over the counter sales (Reid et al., 2016a, Steel et al., 2018b, Harnett, 2019). In Europe (Harris et al., 2012) and the US (Fischer et al., 2014b, Clarke et al., 2015) CM uptake patterns are very similar. In line with the wider use of CM, the CM education sector also appears to be experiencing professionalization (Wardle et al., 2012). However, despite the size of the CM industry occupying a significant health care role in both Australia and the US (Wardle et al., 2011, Jonas et al., 2013b, Adams et al., 2017), the education of CM practitioners has received relatively little empirical attention to date (Gray et al., 2019b). A recent critical integrative review of CM education examined the quantity and quality of available evidence related to the application of existing and new educational theory, methods and technology in CM education provision and identified many important research gaps (Gray et al., 2019b, Steel et al., 2018c). Amongst more recent research, one Australian paper investigating responses in a student technology survey found drivers and attitudes of students attending one CM institution were mainly in line with the broader tertiary education sector, e.g. in relation to the association between non-traditional students and their use of technology (Gray et al., 2019a). Important knowledge gaps regarding CM education issues remain. There is only sporadic research investigating CM academic perspectives to learning (Steel et al., 2015, Grant and O'Reilly, 2012, Schwartz, 2010) and technologies (Gray et al., 2020). Similarly, there is sparse and dated empirical research conducted on CM students (Rowe, 2009) and their perceptions of learning (Forman and Pomerantz, 2006, Frenkel et al., 2007, Wardle and Sarris, 2014). These research gaps have implications for the CM educational sector regarding overall institutional strategy, curriculum design, resource allocation, infrastructure and operational imperatives for CM leaders.

Meanwhile, moving beyond a focus upon the confines of the CM educational sector, educational research broadly has examined changes in primary, secondary and tertiary education (including but also beyond health care). This research has explored flipped classrooms, constructivist education theories, problem-based learning, the pedagogy and andragogy of online learning (Greenfield et al., 2002, Liebenberg et al., 2012, Anderson and Dron, 2012) and changing student learning behaviours (Chen, 2014). Moreover, non-traditional students (where age, family and work responsibilities, life circumstances, race, gender, non-campus residence and level of employment have been shown to interfere with successful completion of educational objectives) (Dolch and Zawacki-Richter, 2018) has been an area of focus. However, the majority of educational research has been carried out in response to developments in learning and digital technologies (Selwyn and Facer, 2014, Johnson L, 2011, Fox-Turnbull and Snape, 2011, Halac and Cabuk, 2013, Rodriguez, 2012, Veletsianos and Kimmons, 2012), and it is in this area that questions remain regarding the use of new technologies in the education sector and the possible implications for students, educators and institutions (Gros et al., 2012, Lister, 2014, Liu et al., 2010, Cornelius, 2014). Technologies represent the sum of techniques, skills, methods and processes used in the accomplishment of objectives. Learning technologies – here defined as technologies that can be used to support learning, teaching and assessment, often refer to computer technologies, internet technology, web resources, mobile devices, hardware and software for the design, delivery, evaluating, management, facilitating of teaching and learning (Ke and Curtis, 2010, Dziuban et al., 2018). Digital learning technologies are the digital tools that allow for any type of learning. In particular, previous research initiatives have focused on faculty resistance to change in academia, the digital divide between subsets of students and the digital divide between students and faculty (Parkes et al., 2015, Downing and Dyment, 2013, Ilgaz and Gülbahar, 2015, McKee and Tew, 2013, Black-Fuller et al., 2016). So embedded and normalised are digital technologies becoming in modern tertiary education that they are often now considered ‘unremarkable’ to educational researchers (Selwyn, 2016a). Further, tertiary institutions still appear to be reacting to the disorderly impact of new technologies and struggling to stay aligned to the expectations and demands of digitally attuned students who have grown up in the digital age (Losh, 2014, Selwyn, 2016a) and who are observed to be reliant on digital technologies in different ways to earlier generations. As a consequence of these broader trends in the field of tertiary education, the purpose of this research and the focus of the research questions are to fill these empirical gaps in our understanding of CM education that have been identified in the literature review and other commentaries. This objective is undertaken in order to bring together the two aspects of the background material - the contextual information on CM education and learning and the focus on technologies (Fischer et al., 2014a).

8.3 Methods and materials

8.3.1 Aim and objective

The aim of this study is to more deeply understand a current knowledge gap relating to the field of CM education. The objective of this study is to explore CM students' attitudes and perceptions of learning, technologies and associated technologies in CM education. This study was specifically developed to identify and assess the outcomes associated with the exploratory investigation of CM student attitudes and perceptions of learning technologies. To achieve this, the study employed a case study approach focused on Australia and the US – two countries characterized by similar provision of a range of CM (without clear dominance from any one type of CM practice) and with similar CM educational institutions and provision.

8.3.2 Study design

The survey design and field work in this study used the established conventions for applied public health/health services research (Ruel et al., 2015, Creswell and Creswell, 2017). The research aim is addressed through analysis of self-selecting survey data collected from students during the 2017 academic year. A cross sectional electronic survey was administered to students at two CM education institutions. The educational providers were identified according to the size, reputation and existence of research offices, features that differentiated them from the more technical CM institutions (Steel et al., 2015) that predominate in the CM education space.

8.3.3 Sample

Students within both organisations constituted the target population eligible to participate. The survey was administered to current FT and PT students officially enrolled in degree courses at Institution 1 (n=4227) and FT and PT students officially enrolled in post-graduate courses at Institution 2 (n=624). Students who were listed with their institution as withdrawn, deferred or inactive were excluded, as were alumni.

8.3.4 Instrument

The survey instrument (survey) was designed specifically for this study in line with the study objective (to explore wide ranging student perceptions focusing on learning technologies) with a broad number of questions relating to demographics, experiences and perceptions of technologies in general, digital literacy, perceptions of changes in teaching practice in their institution, and perceptions of institutional infrastructure, progress and support. As a consequence, the survey was informed by pre-existing validated student survey instruments (Project SAILS, iDCA Digital Competence Assessment) digital competence (Põldoja et al., 2014) and digital confidence measures (Arnone, 2010, Tondeur et al., 2017) as well as general digital literacy assessments (Diogo and António, 2017, Walker et al., 2016). Further, the survey was also informed by validated surveys and questionnaires drawn from sources such as the Association of Learning Developers in HE, the Heads of e-Learning Forum, the Association of University Administrators, the Heads of Educational Development Group produced the HEDG baseline survey and the Exeter Cascade project. All of these resources combined to create the final survey instrument with its focus on digital technologies. Some questions were included that explored broader contextual questions about perceptions of technologies in life in general as such information can provide an indication of digital literacy. To ensure the final survey questions from these wide-ranging resources were relevant, combined and deemed appropriate to answer the research questions, the survey was reviewed by the authors and assessed for face validity prior to recruitment of students by testing the instrument and receiving expert feedback from four CM students at other non-participating institutions (beyond the study sample). Changes were made with regards to language clarity, use of different educational terms (as employed internationally), the time required to complete the survey (12 minutes) and the relevance of questions. Students were questioned relating to four specific domains. Contextual questions were asked about demographics; perceptions of technologies in general; perceptions of the andragogical and technology driven transformation taking place in tertiary education; before focussing on questions pertaining to their institution's infrastructure, progress and support regarding learning technologies.

8.3.4.1 Demographics

Respondents were asked to indicate the institution where they were currently enrolled as a student, the course of study in which they were currently enrolled, how many years they had been studying on their current course, and their gender identity.

8.3.4.2 Experiences and perceptions of technologies in general

Students were invited to indicate their perceptions and the impact of contemporary digital technologies in their lives through a five-point Likert scale (*Strongly disagree - Strongly agree*).

8.3.4.3 CM students' perceptions of changes in teaching practice in their institution

In this section of the survey, participants were asked to report on their perceptions regarding whether teaching practice is changing due to the availability of learning technologies, and how learning technologies impacted their activities in the classroom and their learning. Students were also asked about their self-perception of their technology adoption. Our study draws upon one specific aspect of Rogers' Diffusion of Innovation (DI) theory - categories of 'innovation adoption' – which serves to help our interpretation of aspects of our data regarding the participants' digital literacy (Alberty, 2014, Wonglimpiyarat, 2005a, Mitchell, 2013, Fisher, 2005, Porter and Graham, 2016, Sahin, 2006). Using these categories of DI theory as a model of adoption of technology, students were also asked to choose which category best matched the way they adopted technologies using the categories of Rogers (Innovator, Early Adopter, Early Majority, Late Majority, Laggard) (Rogers, 2003, Surry and Farquhar, 1997, Rogers, 2004). The components of the theory include the innovation decision process, individual innovativeness, rate of adoption and perceived attributes of adopters (Kardasz, 2013). Innovators are eager to try new ideas, to the point where their venturesomeness almost becomes an obsession. Early adopters tend to be integrated into the local social system more than innovators. Members of the early majority category typically will adopt new ideas slightly before the average member of a social system, interact frequently with peers but rarely will they be found in leadership positions. The late majority are a more sceptical group, cautious about innovations and adopt new ideas just after the average member of a social system. Their adoption is often due to economic necessity and in response to increasing social pressure. Laggards are traditionalists and the last to adopt an innovation (Rogers, 2003). Participants were provided with descriptions of Rogers' categories before being asked to respond to those items.

8.3.4.4 CM students' perceptions of institutional infrastructure, progress and support

Participants were invited to report their experiences and perceptions regarding technology use at their institution. Survey items also asked if the institution provided formal training in how to incorporate digital technologies into the learning process, students' awareness of digital technology training opportunities made available by their current institution, and if students considered it necessary that courses that focus on digital literacy be incorporated into their curriculum.

8.3.5 Setting

The CM education institutions chosen for this study, Institution 1 in Australia and Institution 2 in the US, represent two leading CM educational providers globally and between them offer examples of the breadth of CM educational provision available more generally (undergraduate, postgraduate, medical and professional CM offerings).

8.3.6 Survey administration

A link to the anonymous online survey was distributed via email invitation by a member of the senior leadership team at each institution with two subsequent email reminders. It was made clear to participants that participation in the study was voluntary. Written consent was obtained prior to survey completion. The survey was open at both institutions for four weeks in October 2017 with the aim to recruit as many respondents as possible from all included CM disciplines.

8.3.7 Ethics approval

Ethics approval for the project was obtained from the University of Technology Sydney Human Research Ethics Committee (ETH16-0477) and the NUNM Institutional Review Board (#AG05052017).

8.3.8 Data collection

Data collection was via online survey via SurveyGizmo. Following data collection, both complete and incomplete data were transferred for analysis to spreadsheets.

8.3.9 Statistical analysis

Descriptive statistical analysis was employed including frequencies and percentages for categorical variables and means and standard deviations for continuous variables. Inferential t-tests were employed to analyse differences in categorical and continuous variables. Pearson chi-square tests were used to test for association between categorical variables. A p-value of <0.05 was applied to determine the level of statistical significance. Analyses were conducted using the statistical software SPSS Statistics v24.

8.4 Results

8.4.1 Demographic Data

The survey was completed by 271 respondents in October 2017, a response rate of 6.4%. Table 1 summarises the full details of the demographic features (reported as percentages) of students in these educational environments. The courses being studied included naturopathy (n=126, 46.2%) and nutritional medicine (n=84, 30.8%). Students reported being 40 years old or above (37.4%), 31-40 years (26%), 26-30 years (20.5%) 20-25 years (13.6%) and under 20 years old (2.6%). There were many more female identified students (n=235, 86.1%). In relation to previous tertiary education, respondents reported no previous tertiary study (25.3%), 1 year (16.1%), 2 years (11%), 3 years (12.5%), 4 years (14.7%), 4 years or more (20.5%).

Table One Demographic Data

Degree Enrolment	**Institution 1**		**Institution 2**		**Totals**	
	n	%	n	%	n	%
Naturopathy/ Naturopathic Medicine	98	35.9	28	10.3	126	46.2
Nutrition and Dietetic Medicine/Nutrition	71	26	13	4.8	84	30.8
Acupuncture/ Acupuncture & Oriental Medicine	20	7.3	7	2.6	27	9.9
Complementary Medicine	17	6.2			17	6.2
Myotherapy	6	2.2			6	2.2
Global Health			1	0.4	1	0.4
Integrative Medicine Research			1	0.4	1	0.4
Totals	212	77.6	50	18.5	262	96.1
Age Group					*n*	*%*
< 20 years					7	2.6
20-25 years					37	13.6
26-30 years					56	20.5
31-40 years					71	26
> 40 years					102	37.4
Gender identification					*n*	*%*
Female					235	86.1
Male					35	12.8
Transgender female					1	0.4
Prefer not to answer					1	0.4
Gender variant / non-conforming					1	0.4
Years of tertiary education completed before starting current degree?					*n*	*%*
1 year					44	16.1
2 years					30	11
3 years					34	12.5
4 years					40	14.7
> 4 years					56	20.5
None					69	25.3

8.4.2 Attitudes to technologies in general

A majority of students (see Table 2) reported that the skill and attribute most important to achieve to be successful in their CM career was judging the quality of information (mean 4.8178; SD 0.45) and that contemporary students are more technology literate (mean 4.5498; SD 0.66) and media literate than previous generations (mean 4.3247; SD 0.91). Most students reported using digital technologies to be critical to their study (mean 4.3792; SD 0.75) and a very important part of their future career (mean 4.2097; SD 0.84). Many students reported that they had fundamentally different cognitive skills because of the digital technologies they have grown up with (mean 4.1963; SD 0.87), the amount of information available online today was overwhelming (mean 4.1556; SD 0.94), that search engines had conditioned them to expect to be able to find information quickly and easily (mean 4.0517; SD 0.94), that digital technologies had created an easily "distracted" generation with short attention spans (mean 3.9852; SD 0.98) and that students were too familiar with digital technologies and needed more time away from them (mean 3.8155; SD 0.99).

Table Two Attitudes to Technology in Learning Complementary Medicine

Please rate your agreement with the following statements	N	Min.	Max.	Mean	Std. Dev
The internet enables me to find and use resources that would otherwise not be available to me	270	2	5	4.63	0.66
Today's students are more technology literate than previous generations	271	2	5	4.55	0.66
I feel that using digital technologies has been critical to my study	269	1	5	4.38	0.75
The availability of digital content has broadened my worldviews and perspectives	269	2	5	4.34	0.77
Today's digital technologies allow students to share their work with a wider and more varied audience	270	1	5	4.33	0.82
Today's students are more media savvy than previous generations	271	1	5	4.33	0.91
The internet encourages learning by connecting students to resources about topics of interest to them	271	2	5	4.31	0.74
I feel that using digital technologies will be a very important part of my career	267	1	5	4.21	0.84
Compared with previous generations, Today's students have fundamentally different cognitive skills because of the digital technologies they have grown up with	270	1	5	4.20	0.88
The internet makes me more self- sufficient	269	1	5	4.19	0.85
The amount of information available online today is overwhelming	270	1	5	4.16	0.94
The multimedia content available online today immerses students more fully in topics they study	270	2	5	4.13	0.80
Search engines have conditioned me to expect to be able to find information quickly and easily	271	1	5	4.05	0.94
Confidence and capability with digital technologies are essential to be a successful student in my area of study?	271	1	5	4.05	0.94
Today's digital technologies are creating an easily "distracted" generation with short attention spans	271	1	5	3.99	1.00
Courses or content that focus on how students should behave and treat others online must be incorporated into every school's curriculum	263	1	5	3.91	1.05
It is imperative for Colleges to teach and assess today's students using the digital technologies they are most comfortable with	264	1	5	3.85	0.85
Courses or content that focus on digital literacy must be incorporated into every College curriculum	264	1	5	3.83	0.94
Today's students are too familiar with digital technologies and need more time away from them	271	1	5	3.82	1.00
Today's digital technologies encourage greater collaboration among students	272	1	5	3.64	1.07
Today's digital technologies encourage student creativity and personal expression	269	1	5	3.63	0.98
Today's digital technologies do more to distract students from course work than to help them academically	271	1	5	3.18	1.06
Today's students are very skilled at multi- tasking	268	1	5	3.16	0.96

It is necessary to manage students' use of cell phones and other technology in the classroom	264	1	5	3.16	1.32
Today's students are really no different than previous generations, they just have different tools through which to express themselves	271	1	5	3.08	1.11
Today's digital technologies discourage me from finding and using a wide range of sources for my study	271	1	5	2.78	1.26
Today's digital technologies make it harder for me to find and use credible sources	269	1	5	2.66	1.16
How important do you feel each of the following skills is for you to be successful in your Complementary Medicine career?	N	Min.	Max.	Mean	Std. Dev
Judging the quality of information	269	2	5	4.82	0.45
Understanding privacy issues surrounding digital and online content	267	2	5	4.73	0.58
Behaving responsibly online	270	2	5	4.70	0.62
Writing effectively	271	2	5	4.53	0.73
Finding information quickly	271	2	5	4.51	0.75
Communicating ideas in creative, engaging or interesting ways	269	2	5	4.30	0.79
Presenting yourself effectively in online social networking sites	271	1	5	3.86	1.03
Working with audio, video or graphic content	271	1	5	3.33	1.06
How would you rate yourself with the following?	N	Min.	Max.	Mean	Std. Dev.
Ability to recognize bias in online content	270	1	5	3.72	0.99
Ability to use multiple sources to effectively support an argument	269	1	5	3.68	1.04
Ability to assess the quality and accuracy of information I find online	271	1	5	3.68	0.94
Ability to use appropriate and effective search terms and queries	270	1	5	3.54	1.02
Patience and determination in looking for information that is hard to find	271	1	5	3.49	1.11
Understanding how online search results are generated	270	1	5	3.26	1.06
Based on your experience, which of the following comes closest to your view of the impact of digital technologies on students today				n	%
Today's digital technologies are narrowing the gap between the most and least academically successful students				181	68.6
Today's digital technologies are leading to even greater disparity between the most and least academically successful students				83	31.4

8.4.3 CM students' perception of the changing times in education and their classroom

When using digital technologies, the majority of students felt the knowledge level of teachers and students is usually about equal (52.4%) although a substantial number report knowing more than their teachers (28.0%) (see Table Three). There were many self-declared 'early majority' adopters of technology (34.6%), late majority (26.3%) or early adopters (26.3%) and fewer innovators (9%) or 'laggards' (3.8%). Most participants reported accessing their institutions' learning management system every day (59.7%) or often (36.3%).

Table Three Complementary Medicine student's perception of the changing times in education and their classroom

Overall, when it comes to knowing how to use digital technologies (such as the internet and email, social media or social networking sites, tech devices or gaming systems, apps, etc)	n	%
Our knowledge levels are usually about equal	142	52.4
I usually know more than my teacher	76	28
My teacher usually knows more than I do	53	19.6
I have done assignments in which I am not permitted to use online search engines	n	%
No	183	67.5
Yes	53	19.6
Unsure	35	12.9
I have completed questions or assignments that require me to use a variety of sources, both online and offline	n	%
Yes	250	92.3
No	15	5.5
Unsure	6	2.2
I spend class time discussing how to assess the reliability of information I find online	n	%
Yes	125	46.1
No	121	44.6
Unsure	25	9.2
I spend class time discussing how search engines work and how search results are generated/ranked	n	%
No	193	71.7
Yes	53	19.7
Unsure	23	8.6
I spend class time improving search terms and queries	n	%
No	185	68.3
Yes	63	23.2

Unsure	23	8.5
I spend class time discussing how to generally conduct research using the internet	n	%
No	153	56.7
Yes	100	37
Unsure	17	6.3
Which term describes you best when it comes to adopting new technology?	n	%
Early Majority	92	34.6
Early Adopter	70	26.3
Late Majority	70	26.3
Innovator	24	9
Laggard	10	3.8
How often do you access the College's Learning Management System (LMS, Virtual Learning Environment)	n	%
Every day	163	59.7
Often	98	36.3
Sometimes	6	2.2
Rarely	2	0.7
Never	1	0.4

8.4.4 CM students' perceptions of institutional infrastructure and support

Findings reported in Table Four show that a majority of students had sufficient access at home (mean 4.4656; SD 0.77) and sufficient access in their institution (mean 4.125; SD 0.97) to the internet and other digital technologies they needed to effectively complete assignments. There were mixed responses to how students rated the solving of problems and challenges, the quality of the professionalism of service received from the online help service (mean 3.7984; SD 0.84), the ability of the help desk to solve their problem (mean 3.7628; SD 0.85), the overall quality of the solution (mean 3.7103; SD 0.86), communication and follow-up on problem resolution (mean 3.6166; SD 0.89) and the time required to resolve their problem (mean 3.6111; SD 0.95). Further, many participants reported that the institution had a responsibility to prepare them fully with the digital skills that they needed (mean 3.7138; SD 0.94). Some students disagreed with whether the institution did a good job providing the resources and support they needed to effectively incorporate the newest digital technologies into curriculum and pedagogy (mean 3.3206; SD 1.00). Further, respondents reported they had received ideal support from the institution for learning digital technology skills (mean 3.2602; SD 0.98) and that (from their relative perspectives) compared with other institutions, their institution was ahead when it came to using digital technologies effectively (mean 2.9925; SD 0.89).

Table Four College Resources for Student Technology and Support

Please rate your agreement with the following statements	N	Min.	Max.	Mean	Std. Dev
I have sufficient access in College to the internet and other digital technologies they need to effectively complete College assignments	264	1	5	4.13	0.98
I have sufficient access at home to the internet and other digital technologies they need to effectively complete College assignments	262	1	5	4.47	0.78
My campus has adequate WiFi for my needs	263	1	5	4.00	1.09
How would you rate the quality of the service you received from the online help service					
Professionalism of the help desk support staff?	253	1	5	3.80	0.84
Ability of the help desk to solve your problem?	253	1	5	3.76	0.85
The College has a responsibility to prepare me fully with the digital skills that I need	269	1	5	3.71	0.94
Overall quality of the solution?	252	1	5	3.71	0.87
Communication and follow-up on problem resolution?	253	1	5	3.62	0.90
Time required to resolve your problem?	252	1	5	3.61	0.95
I found the LMS induction and orientation prepared me for online study	264	1	5	3.58	1.02
I entered this degree with a firm grasp of the digital technologies and skills I need	270	1	5	3.53	1.05
My campus has sufficient facilities to recharge my electronic devices (laptop, smart phone, tablet, etc)	262	1	5	3.49	1.22
My College does a good job providing the resources and support I need to effectively incorporate the newest digital technologies into curriculum and pedagogy	262	1	5	3.32	1.00
I have received ideal support from the College for learning digital technology skills	269	1	5	3.26	0.99
Overall, compared with other schools, our school is ahead of the curve when it comes to using digital technologies effectively	265	1	5	3.00	0.90
My College currently provides me with formal training in how to incorporate digital technologies into the learning process	263	1	5	2.94	1.14
Have you ever sought technical support from Library, online help service or technical staff for your own device	266	1	4	1.80	0.77

8.4.5 The relationship between the amount of previous study, identification with adopting technologies and student expectations

Initial analysis of the data revealed potential relationships between data-points. Table 5 presents results of independent t-tests that explored the relationships between participants self-identified category of technology innovation (Rogers, 2003) and the rating of student answers to skills and understanding relating to learning technologies in CM education. It was identified that the more participants identified themselves toward the laggard end of the Rogers' DI spectrum, the lower they ranked themselves when it came to understanding how online search results are generated ($p<.001$), the ability to use appropriate and effective search terms and queries, ($p<.001$), patience and determination in looking for information that is hard to find ($p<.001$), ability to use multiple sources to effectively support an argument ($p<.001$) and knowing how to use digital technologies ($p=0.001$).

Table Five Relationships between Perceptions of Technology and Categorisation of Rogers' Diffusion of Innovations Theory

Which term describes you best when it comes to adopting new technology?	Pearson Correlation	Sig. (2 - tailed) p value
Do you agree or disagree with each of the following statements about the overall impact of today's digital technologies?		
Today's digital technologies encourage student creativity and personal expression	-.133*	0.030
The internet encourages learning by connecting students to resources about topics of interest to them	-.139*	0.024
Today's digital technologies discourage me from finding and using a wide range of sources for my study	.150*	0.015
How important do you feel each of the following skills is for you to be successful in your Complementary Medicine career?		
Presenting yourself effectively in online social networking sites:	-.129*	0.035
Overall, when it comes to knowing how to use digital technologies	-.194**	0.001
How would you rate yourself with the following?		
Understanding how online search results are generated	-.264**	0.001
Ability to use appropriate and effective search terms and queries	-.269**	0.001
Ability to assess the quality and accuracy of information I find online	-.184**	0.003
Ability to recognize bias in online content	-.166**	0.007
Patience and determination in looking for information that is hard to find	-.261**	0.001
Ability to use multiple sources to effectively support an argument	-.248**	0.001
To what extent do you agree or disagree with the following statements		
I have sufficient access at home to the internet and other digital technologies they need to effectively complete College assignments	-.166**	0.008
My campus has adequate WiFi for my needs	-.124*	0.046
I entered this degree with a firm grasp of the digital technologies and skills I need	-.197**	0.001

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

8.5 Discussion

Our findings confirm complexity within the CM student body we examined, exhibiting similar demographic features to what is known about the broader CM practitioner body (Steel et al., 2018a). However, our findings also suggest that the sample CM institutions have an uncommon student demographic compared to the available data published from other worldwide conventional tertiary educational institutions. These characteristics are likely to create specific points of pressure for institution leaders when it comes to resource allocation, planning and compliance due to digital inequalities, uneven power relationships and hierarchies (Selwyn and Facer, 2014). Research exploring the use and uptake of digital technology in education has moved on from simplistic one-dimensional explanations about generational adoption of technology. These have been replaced with less homogeneous and more nuanced discussions related to identifiable divisions and inequalities between students that exist because of socio-economic factors, race, gender, age, prior educational background and geography (rural/regional/urban) (Helsper and Eynon, 2010, White and Selwyn, 2012, Mardis, 2013). In our study there were many more female identified students (86.1%) than the national average for tertiary students in both the US and Australia (57.2%) (Edwards and van der Brugge, 2012). In terms of age, 63.4% of our study respondents are over the age of 30 with more than a third over the age of 40 (37.4%). Only 2.6% of students reported being under 20 years old. This contrasts starkly with the most recent available data that shows the majority of university students in Australia study FT and well over half (58%) are under the age of 25 (Edwards and van der Brugge, 2012). The significance of this level of student diversity also relates to the now considerable body of research in the arena of 'non-traditional' students. It is accepted that the enrolment of larger numbers of non-traditional students - here defined as a student where age, family and work responsibilities as well as other life circumstances, race, gender, non-campus residence or level of employment can interfere with successful completion of educational objectives (Dolch and Zawacki-Richter, 2018, Chung et al., 2017) - require institutions to necessarily invest in and provide more resources for technology support, library services, academic and scientific writing skills and services to support them (Iloh, 2017). Worldwide, non-traditional students' attrition rates tend to be higher and their retention rates trend lower than 'traditional' FT students (Grabowski et al., 2016, Taniguchi and Kaufman, 2005, Ellis, 2019). In addition, and notwithstanding that one institution surveyed was undergraduate and one was postgraduate, the demographic findings indicate a 'two-speed' learning environment. A high proportion of respondents (74.7%) reported previous tertiary study while one quarter of students (25.3%) had no tertiary experience at all. The finding, that the higher number of non-traditional students in the CM classroom, much more divergent than in conventional tertiary educational settings, has important implications for CM institutions. One such implication is perhaps the need to think more broadly about how to provide support for students due to the potential gap in academic writing skills, plagiarism instances, basic science skills. Another implication is provision for allocation of time, energy and bridging that might be required by the CM institution to ensure quality and standards are maintained - all of which require further research.

While exhibiting uncommon demographic features, the CM students in our study nevertheless reported similar paradoxical perceptions about technology. These perceptions are mostly in line with modern tertiary student perceptions reported more broadly - they are well aware of the need to be digitally literate, know they are different in important ways to previous generations of students (and their teachers), and perceive themselves to be under unique modern pressures (Loh et al., 2016). Similar to research in other tertiary environments (Selwyn, 2016a) our findings confirm that these CM students are very aware of the extent to which confidence and capability using digital technologies is an essential part of their future success. Our findings are also congruent with recent scholarship examining the role of digital technologies in broader education settings that reveal a complex and interwoven picture of technology use and adoption where student digital realities are far from straightforward, but are in fact 'entangled, mundane and messy' (Selwyn, 2016a, Hannon, 2013). The seemingly conflicting digital realities reported by these CM students of being concurrently similar *and* different to previous generations - no different than previous generations, but rather simply possess different tools through which to express themselves and fundamentally different cognitive skills because of the digital technologies they have grown up with - is in fact common for this 'always on' learning generation (Selwyn and Facer, 2014). Furthermore, the CM students in our study perceive themselves to be faced with unique modern pressures and stresses in their education and beyond. While digital technologies provide opportunities and new perspectives as well as the capacity for sharing work with a wider and more varied cast of collaborators and audiences, these CM students report perceptions that technologies are not always beneficial nor benign (Selwyn, 2016a). Congruent with existing research on digital technologies in education, our study found that there are perceived drawbacks, distress and dissatisfaction linked to technologies as identified in our study – namely, an overwhelming amount of information online, self-imposed expectations for speed, short attention spans, being too easily distracted, the need to manage cell phone use in the classroom, time away from devices needed, and a proportion of students attesting that they know more than their teacher (Cheong et al., 2016, Briz-Ponce et al., 2016, Crompton and Burke, 2018, Tossell et al., 2015, McCoy, 2016). In these studies there have been few solutions proposed, but an overwhelming conclusion has been drawn that there are no easy answers beyond an institutional need to balance what is possible with what can be achieved through technologies in education with the reality of technology use in contemporary tertiary education settings; a need to realign institutional teaching and learning practices to the skills and expectations of students, and a need to adopt more realistic and grounded understanding and expectations of students (Selwyn, 2016a, Henderson et al., 2015).

This survey identified a relationship between student perceptions of technologies and self-reported categories of DI theory (in Table 5) indicating the potential importance of digital literacy in this study. This finding is in alignment with the findings of previous research that has shown that age and gender are less important than digital literacy when it comes to student perspectives and attitudes to technologies (Helsper, 2010, Helsper and Eynon, 2010, White and Selwyn, 2012, Gray et al., 2019b). In this dataset, only a small portion of this student body have grown up in the digital age (Prensky, 2012, Selwyn, 2016a). Instead, in the CM educational settings in our study, a third of all students perceive themselves as 'later majority' or 'laggards' in the Rogers adoption of innovations (in this case digital technology) classification (Rogers, 2003). This disproportionate number of the student body reporting lower levels of digital literacy comes with consequential attitudes and perspectives, (dissatisfaction, un-met expectations of tertiary study, a lack of connection, belonging or creativity) (Selwyn, 2016a) and has the potential to impact the overall academic and operational functions of the institution. This is not the case in other tertiary education institutions that generally have traditional systems to manage fewer older students and/or digitally literate students and/or have larger generational age gaps between students and faculty (sometimes two generations). Similar to recent research into CM academics' perspectives on technologies (Gray et al., 2020), our study found no broad anti-technology sentiment amongst the participants but did identify a clear cluster of dissatisfied CM students. Furthermore, what our study has identified through revealing the uncommon student demographic, digital literacy reporting, and reported perceptions of learning technologies is that a proportion of the CM student body may well have been attracted to studying CM because of their perceptions of technologies (Dutta et al., 2003, Rozin et al., 2004, Rozin et al., 2012, Nedrow et al., 2007). This possible relationship between the drivers to study CM and digital literacy, as well as comparison between student and academic perceptions of technology require further exploration as there are potential consequences for educational leadership due to this relationship between literacy, adoption of technologies and enrolment choices. A number of recent studies show that successful adoption of educational technology involves complex dynamics and patterns that are generally shaped by local context and quickly become normalised and routine (Hannon, 2013, Selwyn and Facer, 2014). The existing modelling of how new technologies eventually become embedded in the broader functioning of an institution need to take into account features such as the number of technological innovations present at any one time, the uncommon student body, the pre-existing influences of the individual academics in the classroom, the actual strategic plan, policies and processes of the institution, the broader local community, as well as state and federal educational policies (Selwyn and Facer, 2013, Selwyn and Facer, 2014).

Our study revealed that for many of these CM students there is a perception of a lack of support. This finding is not just limited to those at the self-reported laggards (the lowest end of the digital literacy spectrum of Rogers). Despite some of the more favourable perceptions and some positive comments about the quality of institutional support reported in the Results Tables 4 and 5, on balance, the majority of perceptions about a lack of support for wifi needs, orientations and inductions, recharge facilities and resourcing suggest that for some students, these institutions could be doing more to prioritize the consistency, efficiency and reliability of the digital systems that their students are required to engage with. This falls in line with results from previous research in contemporary higher education of the need to better support students and maintain an institutional commitment toward developing student and staff digital literacy (Beynon and Mackay, 1992). Our findings show that many students perceived their CM institution as having a responsibility to prepare them fully with digital skills for life in general and CM study in particular. It is possible that decision makers in CM institutions are assuming their students are simply the same as students in other more conventional tertiary educational environments and as a consequence they are not meeting their students' specific needs and expectations (Selwyn and Facer, 2014, Selwyn, 2016a, Losh, 2014). In previous studies in education more broadly, when students have been critical of their institution's capacity in similar ways to these CM students (the adequacy of existing inductions, the lack of resources to help develop or strengthen digital technologies and skills, the lack of formal training in how to incorporate digital technologies into the learning process, content informing them on appropriate behaviour and etiquette regarding on-line activity and engagement) it has been concluded that these perceptions also reflect an inability amongst some CM students to adjust to the need to develop skills in autonomy and independence in their undergraduate studies (Macaskill and Denovan, 2013, Selwyn, 2016a, Lairio et al., 2013). CM institutions could respond to the need to (continue to) support students (as well as academics and tutors) in becoming more proficient in their uses of technology, refresh facilities and infrastructure, as well as provide better technology support services and responses – all of which require financial resources. CM students could be supported in aligning their expectations and developing a more nuanced understanding of learning technologies within their tertiary culture to allow them to develop necessary skills and to not necessarily see the challenges as someone else's problem (Selwyn and Facer, 2014).

8.5.1 Limitations

It is important to acknowledge the limitations of this study. Participants self-selected, and as such possibly contributed to the selection bias. The sample organisations were chosen as they represent the two leading CM providers globally and cover undergraduate, postgraduate, medical and professional CM offerings and while both CM institutions had students of similar age, subjects offered and gender balance there are important differences between the institutions, including size, and the mode of study. The effects of random error could be due to the small sample size within the study and the small sample size limits the generalisability of findings. Further the response rates were Institution 1 - 5.5% and Institution 2 - 8%. Despite these limitations, the results from this research provide valuable insights into CM student perspectives and experiences regarding learning technologies. As such, CM student perceptions of technologies and learning at other CM institutions warrant further investigation and comparison with these findings.

8.6 Conclusion

In this examination of CM student perspectives and experiences some novel preliminary insights into the place and value of learning technologies in CM education emerge. But any specific recommendations that can be made from our study need to be undertaken with caution. What we know now that we did not know before is that given the demographic characteristics of students in CM institutions highlighted in this study, plus the digital inequalities, divisions and subdivisions between academics and students and subsets of students, there are broad challenges for these institutions to improve the educational experience for students. One specific action that could be done differently in practice with regard to the education of future CM practitioners, is to acknowledge the uncommon student demographic highlighted in this study. Further research is necessary to explore the complex and nuanced digital realities in CM institutions as well as the structural and social issues they relate to. Identification and support of student digital literacy, understanding the drivers that lead students to make their study choices and the ways in which they require support is all important future research work that could provide deeper context and support to the CM educational staff and students to enhance the student experience.

8.7 Chapter summary

Congruent with the MMR research design, the results of this investigation explore and build upon the findings from the initial phases of this research. In the Phase One qualitative investigation reported in Chapter 5 strong perceptions, drivers and adoption patterns of students alongside of the educational and professional leadership perspectives on the role of technology were elicited in these settings. The diversity and complexity of these perceptions required nuanced deeper investigation to uncover the groups and subdivisions within the student body. This Phase Three research has uncovered that CM education settings are not exempt from the trends found in other educational environments with regards to learning technologies but there are important variations. The findings confirm an uncommon student body different to most if not all tertiary environments with consequent implications for educational leadership and the institutions they drive forward. The students surveyed in this study have similar technology challenges - awareness of the need to be digitally literate, knowledge that they are different in important ways to previous generations of students (and their teachers), perceptions they are under unique modern pressures – to student perceptions in broader tertiary education. Additionally, the insights from Phase One have been confirmed in this Phase Three study revealing there are clear digital literacy divisions and sub-divisions within the student body. Notably, like academics, there is never enough support from the institution. But, critically, insights into an incongruity or disparity that was found in the responses between students, who seem more liberal and open to both practice enhancing technologies and telehealth and learning technologies, and academic staff who do not share the same perspective was found. It is this disparity between stakeholder perceptions that is the focus of investigation in the next chapter.

Chapter 9 – Results (5) Student and academic perceptions of the incompatibility of telehealth, learning technologies and practice enhancing technologies in clinical Complementary Medicine work and education; a quantitative study in Australia and the US

9.1 Chapter introduction

This chapter focusses on some of the disparities identified in the perceptions relating to learning and clinical technologies between students and academics. In doing so this chapter contributes to the aim and objectives of this project as outlined in Chapter 1 (Section 1.3.2) and specifically contributes to research objectives 2-5. As an implication of the focus groups and audit conducted previously at the two institutions chosen for this study in Phase One and Two of this project, cross-sectional surveys were prepared and administered to academics and students in these educational settings. The focus of this chapter then is to report on the insights gathered from students relating to the use of health technologies (HTs) and telehealth in their future clinical work upon graduation, and report on the academic resistances to the use of HTs and telehealth. These variations in opinion and perception of the use of clinical enhancing technologies and telehealth and their role in clinical education and future practice are evaluated following questions provided to students and academics relating to four specific domains: demographics; attitudes to telehealth and perceptions of HTs; perceptions to teaching aspects of CM via e-learning and learning technologies; and self-assessed categorisation from Rogers' DI theory.

9.1.1 Publications of results

The results contained within this chapter have been published in *Advances in Integrative Medicine*. Gray A, Steel A, Adams J, (2021). Learning technologies and health technologies in complementary medicine clinical work and education: Examination of the perspectives of academics and students in Australia and the US, *Advances in Integrative Medicine*, (2021) https://doi.org/10.1016/j.aimed.2021.10.001

A copy of the manuscript is attached to this thesis as Appendix M. The formatting of this article in Chapter 9 differs to the overall presentation in the thesis in that the publishing journal required an additional abbreviation of Institution 1 to I1 and Institution 2 to I2.

9.2 Background

9.2.1 Technology use in Conventional Medicine and Complementary Medicine practice

In clinical practice there is an array of health technologies (HTs) that significantly impact how patients engage, manage and communicate about their health (Wachter, 2015, Marakhimov and Joo, 2017, Jetty et al., 2018). Stakeholders across health care management now recognise the value of these technology options in the delivery of high-quality care (Broman et al., 2016, Dorsey and Topol, 2016, Nasir et al., 2018, Cannon, 2018). In clinical practice there are three identifiable categories of HTs: those that enhance clinical practice; those that facilitate remote care and support users; and those that provide significant practice management and administrative support (du Toit et al., 2019, Myers, 2019, Kruse et al., 2017). Alongside the development, deployment and normalisation of these technologies, research has generally revealed positive results of telehealth in a number of fields (Henderson et al., 2014, Head et al., 2017, Cushing and Braun, 2018, Reddy et al., 2014, Tietjen and Breitenstein, 2017). Further research also describes the benefits and participant satisfaction for such technologies for self-care and amongst support communities (Doorenbos et al., 2010, Dolbeault et al., 2009, Ussher et al., 2006), and the challenges created by integrating telehealth into existing infrastructure and systems (European Commission, 2012, Bhandari et al., 2011, Paulson et al., 2015, Wade, 2013). Currently, little is known about the use of technologies in CM clinical practice. Existing research into the role of telehealth has been limited to only single studies in specific CM therapies such as osteopathy (Subbarao and Cooper, 2017), mindfulness (Niles et al., 2013), yoga (Groessl et al., 2008, Schulz-Heik et al., 2017), and music therapy (Lightstone et al., 2015).

9.2.2 Health Services Education

Technologies also now dominate healthcare education (Parkes et al., 2015, Downing and Dyment, 2013, Ilgaz and Gülbahar, 2015, McKee and Tew, 2013, Black-Fuller et al., 2016) with implications for students, educators and institutions (Gros et al., 2012, Lister, 2014, Liu et al., 2010, Cornelius, 2014). Educational institutions attempt to keep pace with the constant changes from new technologies and the expectations and demands of digitally-fluent students who have grown up immersed in digital culture and who are reliant on digital technology in ways that earlier generations were not (Losh, 2014, Selwyn, 2016a). This is particularly important in health services education where the focus of study is not always just on the development of technical skills but on the formation of professional character - one of the reasons that qualifications are either degrees or post graduate qualifications in this field (Steel and McEwen, 2014). The breadth and impact of technologies in the education of future practitioners in medical and healthcare education has been widely researched (Papanagnou et al., 2015, van Galen et al., 2018, Hale, 2018, Poole, 2018, Howe et al., 2018), but as yet there has been no research on this topic in relation to CM.

9.2.3 Complementary medicine education

Despite the size of the CM industry in Australia and the US (Wardle et al., 2011, Jonas et al., 2013a, Adams et al., 2017), the education of CM practitioners has received little empirical attention (Gray et al., 2019b). Where research exists, the quantity and quality of available evidence relates to random and unrelated aspects of CM education provision and reveals numerous and important research gaps. There is only sporadic research investigating CM academic perspectives to learning and technologies (Steel et al., 2015, Grant and O'Reilly, 2012) and little research conducted on CM students and their perspectives to learning (Wardle and Sarris, 2014, Gray et al., 2019a, Steel et al., 2018c, Gray et al., 2021a). Broader knowledge on the topic could have an impact on overall institutional strategy, curriculum design, employment status, resource allocation, infrastructure and operational imperatives for CM educators and professional leaders. One such gap was identified in a recent qualitative study exploring experiences and perceptions of technologies in clinical practice and education that found potential ideological opposition to technologies in CM health services provision and education requiring further research (Gray et al., 2021b).

9.2.4 Study Aim and Objective

In direct response to these circumstances, the study reported here analyses survey data exploring the perspectives of students and academics regarding HTs in Australia and the US. The objectives of this study are to explore the experiences and perceptions of CM students and academics related to telehealth, learning and practice enhancing technologies in general, and in their CM work and studies. These objectives are addressed through an analysis of survey data collected from students and academics in the 2017 academic year.

9.3 Methods and Materials

9.3.1 Study Design

The survey design and field work in this study used the established conventions for applied public health/health services research (Ruel et al., 2015, Creswell and Creswell, 2017). The research aim is addressed through analysis of self-selecting survey data collected from students and academics during the 2017 academic year.

9.3.2 Setting and Sample

A cross sectional electronic survey was administered to students and academics at two CM education institutions. The educational providers were identified according to the size, reputation and existence of research offices, features that differentiated them from the more technical CM institutions (Steel et al., 2015) that predominate in the CM education space. The study sample sites - Institution 1 (I1) in Australia and Institution 2 (I2) in the US, represent two leading CM educational providers globally and between them provide examples of the breadth of CM educational provision available (undergraduate, postgraduate, medical and professional CM offerings).

9.3.3 Participants

Students and academic staff within both organisations were the target populations for the survey.

9.3.4 Survey Administration

The first survey was administered to current active and enrolled students at I1 (n=4227) and (n=624) at I2. Excluded were alumni, deferred students or inactive students. In addition, a survey was administered to existing working tenured, contracted and adjunct academics who were primarily or solely undertaking teaching and non-research activities/duties at I1 (n~350) and at I2 (n=180). The two surveys were administered via email invitation by a member of the senior leadership team at both institutions with two subsequent email reminders. It was made clear to participants that participation in the study was completely voluntary and written consent was obtained prior to survey completion. The surveys were available for completion for four weeks in October 2017. Both surveys referenced pre-existing validated survey instruments (Project SAILS, iDCA Digital Competence Assessment), digital competence (Põldoja et al., 2014) and digital confidence measures (Arnone, 2010, Tondeur et al., 2017) as well as general digital literacy assessments (Diogo and António, 2017, Walker et al., 2016).

9.3.5 Validity and Bias

To ensure the final survey questions from these wide-ranging resources were relevant, combined and deemed appropriate to answer the research questions, the survey was reviewed by the authors and assessed for face validity prior to recruitment of students and academics by testing the instrument and receiving expert feedback from four CM students and two academics at other non-participating institutions (beyond the study sample). Changes were made with regards to language clarity, use of different educational terms (as employed internationally), the time required to complete the survey (12 minutes) and the relevance of questions.

9.3.6 Survey Instrument

The surveys administered to academics in both countries and students in both countries were not entirely identical, but questions explored similar themes. Students and academics were questioned relating to four specific domains: *socio-demographics; students' experiences and perceptions of HTs and plans relating to telehealth; academics' perceptions of teaching aspects of CM via e-learning and learning technologies; and academics perceptions of the incompatibility of learning technologies and practice enhancing technologies in clinical CM work and education. Socio-demographics*: The student survey items included place (institution) of study, course of study, years of study undertaken, and gender identity. The academic survey items included the respondents' current role or position at their institution, how many years they had been teaching overall at their institution, their gender identity and current employment status. *Experiences and perceptions of telehealth*: Students and academics were both questioned about their experiences and perceptions of and potential use of telehealth. *Perceptions of HTs:* Academics were questioned if they were in clinical practice and if so, their use of various HT software. Both students and academics were questioned if class-time was devoted to discussion of software use or learning how to use specific software. *Perceptions of teaching aspects of CM via e-learning and learning technologies*: CM academics were questioned about their perspectives relating to teaching CM. A five-point Likert scale ranging from 'strongly disagree' to 'strongly agree' was employed for these specific response options.

9.3.7 Ethical clearance

Ethics approval for the project was obtained from the University of Technology Sydney Human Research Ethics Committee (ETH16-0477) and the NUNM Institutional Review Board (#AG05052017).

9.3.8 Data collection and management

Data collection was via online survey via SurveyGizmo. Following data collection both complete and incomplete data were transferred for analysis to spreadsheets.

9.3.9 Statistical Analysis

Descriptive statistical analysis was employed including frequencies and percentages for categorical variables and means and standard deviations for continuous variables. Pearson chi-square tests were used to test for association between categorical variables. A p-value of <0.05 was applied to determine the level of statistical significance. Analyses were conducted using the statistical software SPSS Statistics v24.

9.4 Results

9.4.1 Socio-demographic Data

Table 1 summarises the full details of the demographic features of the participating academics and students. A total of 80 academics completed the survey, providing a response rate of ~15%. Academic respondents reported having taught for a mean of 9.6 years (SD 8.10; Min 1, Max 43) overall and a mean of 5.3 years at their current institution (SD 4.90; Min 0.5, Max 28). More respondents identified as female (n=52, 65.8%) and most participants were contractors/adjuncts (n=57, 72.2%). A majority of permanent employees (71%) reported that they were not in clinical practice. However, 82% of contractors were in clinical practice. Student respondents (n=271, response rate 6.4%) most commonly reported studying naturopathy (n=126, 46.2%) and nutritional medicine (n=84, 30.8%). The most frequently reported age group was 40 years old or above (37.4%), although many students also indicated they were between 26 and 30 years old (20.5%) or between 31and 40 years old (26%). There were many more female students (n=235, 86.1%).

Table 1: Academic and Student Demographics

Academic Demographic (n=80)					n	%
Academic member	Institution 1				67	83.8
	Institution 2				13	16.3
Gender	Female				52	65.8
	Male				23	29.1
	Prefer not to answer				4	5.1
Employment status?	Permanent full time				16	20.3
	Permanent part time				6	7.6
	Contract/sessional teacher				57	72.2

Years Teaching	n	Min	Max	Mean	Std. Deviation
Years Teaching	79	1	43	9.6	8.1
Years Teaching at Institution	78	0.5	28	5.3	4.9

Student Demographic (n=273)

Degree Enrolment	n	%
Naturopathy Institution 1	98	35.9
Nutrition and Dietetic Medicine Institution 1	71	26
Acupuncture Institution 1	20	7.3
Complementary Medicine Institution 1	17	6.2
Myotherapy Institution 1	6	2.2
Naturopathic Medicine Institution 2	28	10.3
Nutrition Institution 2	13	4.8
Acupuncture & Oriental Medicine Institution 2	7	2.6
Global Health Institution 2	1	0.4

Integrative Medicine Research Institution 2	1	0.4
Age Group	n	%
< 20 years	7	2.6
20-25 years	37	13.6
26-30 years	56	20.5
31-40 years	71	26
> 40 years	102	37.4
Gender identification	n	%
Female	235	86.1
Male	35	12.8
Transgender female	1	0.4
Prefer not to answer	1	0.4
Gender variant / non-conforming	1	0.4

9.4.2 Student plans for use of telehealth, their class-time experience, and their adoption of technologies

Table 2 reports on student perspectives of HT's including telehealth. Many student respondents (49%) reported being unsure if they would use telehealth while 43% responded that they would use it. Of those students who reported they were unsure or would not use telehealth, 77 (51%) reported that 'I have never considered that I will be using some type of tele-health in my clinical work', while 17 (11%) noted that telehealth was 'incompatible' with their values related to health and health care, followed by 13 (8.6%) of respondents that reported 'this will negatively impact on the therapeutic relationship with the practitioner'. When asked about class-time most students were neutral or disagreed that formal class time had been devoted to the study of the legal and ethical consequences of telehealth.

Table 2: Students' plans for use of telehealth, their class-time experience, and their adoption of technologies

Students: Will you employ tele-health (distance or virtual consultations) in your practice? N=270	n	%
Yes	116	43
No	20	7.4
Unsure	134	49.6
You answered 'no' or 'unsure' to the question about using tele-health. Why? N=151		
It is not congruent with my values in natural medicine	17	11.3
I will not be using any tele-health in my work as my modality is hands on	21	13.9
I will not be using any tele-health in my work as I do not agree with it	1	0.7
I have never considered that I will be using some type of tele-health in my clinical work	77	51
Having a consultation by distance will negatively impact on the relationship with the practitioner?	13	8.6
There are more risks using this form of consultation than face to face consultations?	22	14.6
Students: In your College curriculum have you had any formal class time devoted to the use of clinical and practice management software and apps, such as CorePlus, HealthQuestSoftware, Ginko, ClinicEssentials, Clinko, LongGrassSystems, RadarOpus, Synergy, Points-PC n=267	n	%
No	236	88.4
Yes	31	11.6

Please answer these questions about your perception of the time and resources devoted to tele-health, and its place in your College curriculum	n=	min	max	mean	STD
Informal class-time has been used to discuss tele-health:	271	1	5	2.1	0.9
The amount of time devoted to discussing using learning technologies such as skype and face time in my modality has been simply informal conversations with fellow students	271	1	5	3.1	1.1
Formal structured curriculum has been devoted to this subject	270	1	5	1.9	1.0
Legal and ethical issues arising from tele-health implementation have been included in my curriculum time and resources devoted to tele-health, and its place in your College curriculum	268	1	5	2.2	1.1

9.4.3 CM academics' perceptions of practice enhancing technologies in clinical CM work and education

Table 3 presents academic's perspectives regarding HTs in clinical practice and learning technologies in education. Of the academics who identified as being in clinical practice, 51% reported using clinical electronic software(s) and 56.8% reported using practice enhancing software(s) in CM clinical practice. Of those using practice enhancing software, 63% indicated they had received training in how to use that software. Few academic staff who were in clinical practice reported conducting telehealth in their CM clinical work (15.9%), and there were very few responses to questions about the percentage of practice (case taking and case management) that was conducted virtually. When asked why faculty/clinicians did use telehealth to treat their clients they reported a variety of answers including 'ease of use', 'flexibility of location', 'low overheads', 'out of necessity' and 'convenience'.

Table 3: Academic experiences and perceptions of practice enhancing software, telehealth and adoption of technologies

Are you in clinical practice? N=65	n	%
Yes	45	69.20
No	20	30.80
Please respond to these questions about your clinical practice?	N	Y
Do you use any clinical electronic software (s) in your CM clinical practice, (such as point location, repertory, nutritional programme software)?	22	23
Do you use any practice electronic software (s) in your CM clinical practice, (such as patient management software)?	19	25
Have you received training in how to use your practice software? N=22	n	%
Yes	14	63.60
No	8	36.40
What was the formal training you received in how to use your practice or clinical software? N=14	n	%
Structured webinar	4	28.60
Live in person seminar	4	28.60
Series of recordings online	1	7.10
One on one in person session	3	21.40
Other	2	14.30
In the first intake (first consultation), do you consult your clients online or connect by phone in your clinical practice? N=44	n	%
Yes	7	15.90
No	37	84.10

9.4.4 CM academics' perceptions of the incompatibility of learning technologies in clinical CM education and the incompatibility of teaching aspects of CM online.

Table 4 presents academics' experiences and perceptions of online teaching aspects of CM. The majority of academics responded that it is not possible to fully read a patient's body language online (mean 3.9: SD 1.0), it is not possible to conduct good supervision in CM online (mean 3.2: SD 1.3), it is not possible to conduct quality clinical training in CM settings online (mean 3.2: SD 1.3), it is not possible to learn rapport skills online (mean 3.1: SD 1.2), it is not possible to gauge a patient motivation online (mean 3.2: SD 1.1), it is not possible to learn counselling skills online (mean 2.9: SD 1.6), and it is not possible to learn active listening skills online (mean 2.9: SD 1.19). Amongst academics there was less agreement with the following statements, it is not possible to create a healing presence online (mean 2.9: SD 1.16), it is incongruous to use digital tools when studying something natural like CM (mean 2.2: SD 0.9), it is not possible to create a CM learning community online (mean 2.1 SD 0.9).

Table 4: CM academics' perceptions of the incompatibility of learning technologies and practice enhancing technologies in clinical CM work and education

Do you agree or disagree that in a Complementary Medicine education setting	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	Mean	Std. Deviation
It is not possible to fully read a patient's body language online	1	9	9	33	19	3.8	1.0
It is not possible to conduct good supervision in CM online:	7	14	13	22	13	3.3	1.3
It is not possible to conduct quality clinical training in CM settings online:	5	20	14	17	14	3.2	1.3
It is not possible to learn rapport skills online:	6	17	17	22	9	3.2	1.2
It is not possible to gauge a patient motivation online	3	19	21	20	8	3.2	1.1
It is not possible to learn counselling skills online:	7	22	19	16	7	2.9	1.2
It is not possible to learn active listening skills online:	4	30	16	10	11	2.9	1.2
It is not possible to create a healing presence online:	5	26	21	8	10	2.9	1.2
It is incongruous to use digital tools when studying something natural like CM:	15	32	16	5	2	2.2	1.0
It is not possible to create a CM learning community online:	14	39	13	4	1	2.1	0.9

9.5 Discussion

Our study reveals four important findings, each worthy of further examination. Firstly, our results highlight a potential disparity between academics and students regarding their perceptions and plans for using HTs. The surveyed academics in our study are generally in clinical practice but use telehealth or HTs in only a limited way, in comparison to students who in general seem more open to both HTs and using telehealth in their future clinical work. The reasons are unclear for this disparity. Our findings do not suggest the cause of this disparity is a straight rejection of technology in CM by academics as comparisons between results from the academic survey using the same data set (Gray et al., 2020) indicate academics expressed perceptions that embrace some new and relevant learning technologies in their lives and teaching work. The sample academic population used in this study were characterised by being predominantly female. Equally, the student sample was also predominantly female and was not only older than is generally found in tertiary education institutions but also commonly reported previous study (Edwards and van der Brugge, 2012). With this in mind, it seems reasonable to investigate if gender or age play a part in the uptake of technologies in this setting (Gray et al., 2020). However, most existing educational research has found that the variables of generation, gender and age are, in isolation from each other, rarely a feature in the uptake of technology but are rather dynamic elements that inform the larger (and more complex) issue of digital literacy (Goswami and Dutta, 2015, Porter et al., 2016). No evidence of any lower levels of digital literacy among academics emerged from the data in our study (Gray et al., 2020) and as a consequence, digital literacy alone does not seem to be the sole explanation for the disparity found in the responses between academics and students when it comes to their different perspectives on HTs.

Our findings do show a level of resistance to online learning and the use of learning technologies in the classroom amongst CM academics. There is existing research exploring academic resistance to technology uptake in parallel health sciences education professions as programs keep pace with changing clinical practices and technologies. This research into the academic experiences and perceptions of HTs is found in psychology (Reed et al., 2000), counselling (Hale, 2018), clinical training (Grady, 2011) and nursing (Sinacori, 2019, Poole, 2018), including the perceptions, belief and assumptions of nursing educators (Mancuso, 2009, Johnson, 2008, Howe et al., 2018) as nursing faculties transition to online learning (McQuiggan, 2007). In this multi-profession research, strongly negative a priori perceptions have been reported by faculty members who believe that face-to-face instruction in the traditional classroom is the best and only way for students to learn (Meyer, 2004). Some of this earlier research has found that, in such circumstances, the changes faculty experience moving to online educational experiences can make them feel unsettled and threatened (Meyer, 2004), bewildered and overwhelmed (Alley, 1996), or disembodied and disempowered (Cowham and Duggleby, 2005). However, in these fields most of the resistance expressed by participants in the research was usually about the loss of professional identity, rather than the experiences and perceptions to HTs and learning technologies as was expressed in our findings which reveal potential philosophical or ideological opposition or resistance to HTs (Cutri and Mena, 2020). Future CM educational research needs to examine the degree to which these findings from other professions holds true in CM professions and, if so, the reasons for such resistance.

Thirdly, a finding emerges from our study that potentially highlights an ideological or philosophical reason for academics' resistance to online learning and use of HTs in CM. In the field of theology and similar relational professions (such as counselling and nursing) research emphasis has focused on the many challenges educators face in using distance and online education to adequately prepare students for their future relational profession that requires people skills and a maturity of character and where 'formation' or character development is considered an essential element of education and the development of the practitioner (Harkness, 2019, Oliver, 2014, Ferguson, 2016, Hege, 2011). In theology for example, ministerial or spiritual formation is considered to be a critical and measurable educational benchmark and has been described as a multifaceted activity involving critical thinking, the acquisition of knowledge, skills development, religious identity formation as well as the development of moral character, maturity of ministerial discipline and maturing spiritual identity (Naidoo, 2012, Ledbetter, 2018, Hockridge, 2013). Similar to the situation that highlights academics' concerns about the formation of spiritual character of future practitioners due to the perceived inadequacies of online learning in theology (Maddix and Estep, 2010), this finding appears to be in parallel to some of the holistic working paradigms of CM and in part goes to explaining the comparison in experiences and perceptions to technologies in practice and education found in our study. Unlike the fields of theology or nursing however, there is only very early research into the drivers and motivation for students of CM to begin CM study (Steel, 2018). Future research into this finding needs to include the drivers and motivation for students to begin CM study and the extent to which academics and clinicians are drawn to the work of CM because of their health and spiritual values (Foley and Steel, 2017a, Waisse and Bonamin, 2016, Farquhar, 2018), and ultimately how formation plays a role in the clinical work of CM.

Lastly, findings from this study reveal that the support required by academics for the adoption of technologies is mostly absent in these CM educational settings. In healthcare disciplines close to CM, research has been undertaken to understand the successful adoption patterns of HTs (Abbott and Coenen, 2008, de Veer et al., 2011), perceptions of the implementation of telehealth in nursing (Nagel et al., 2013), and the experiences and perceptions preventing the implementation of telehealth (Koivunen et al., 2008). It has been identified that for the seamless adoption of technologies to occur from traditional face-to-face nursing to the use of telehealth, evidence of their effectiveness in meaningful practice (Hebert et al., 2006), specific learning competencies relating to technologies, (van Houwelingen et al., 2016) enough resources and support for telehealth use (Koivunen and Saranto, 2018), workshops (Sevean et al., 2008) and training programs to raise awareness are all necessary to be undertaken (Rutledge et al., 2014). This nursing-focused research on the implementation of technologies may help identify the leadership challenges for CM professions and educational institutions as they work with the complexity that includes on the one hand, clear trends in education towards learning technology use and the trends within CM clinical practice to technology use, and on the other hand, future students being drawn to CM as a future profession with firm beliefs about technology that differ to their teachers', a proportion of students who are digitally challenged and a proportion of academics equally digitally compromised. It is possible that CM educational practice is currently not keeping pace with other similar disciplines regarding HTs and learning technologies, nor are CM educational leaders keeping pace with students' perspectives of technology. With such little formal curriculum time devoted to HTs and telehealth in class-time, it is also possible that existing curricula in these CM institutions does not currently match professional needs or student expectations. It would appear that our study results in this CM educational setting provide further support for the tentative conclusions reached in previous CM education research and parallel findings in Theology, Counselling and Nursing regarding the possible existence of student and faculty ideological or philosophical opposition to HTs.

9.5.1 Limitations

The limitations of this study must be acknowledged. Participants in our study self-selected, and as such possibly contributed to the responder bias. Both CM institutions had students of similar age, subjects offered and gender balance but there are important differences. The institutions are not of similar size, and the mode of study is somewhat different at these institutions. While teaching similar courses and subjects (eg Nutritional Medicine), the unique characteristics of I1 (multiple campuses, Australian, undergraduate, non-medical CM courses) and the unique characteristics of I2, (single campus, US, postgraduate, medical courses) limit the transferability of findings to other institutions in both Australia, the US and further afield. In addition, as it was only a small group that chose to participate from one institution this meant that any statistical comparison between the two institutions was not possible. The effects of random error could be due to the small sample size within the study. The small sample size of academics that were in clinical practice that use technologies also limits the generalisability of findings. However, despite these limitations, the results from this research provide some valuable insights into CM academic and student perspectives and experiences regarding learning technologies and highlight the need to further research into CM education provision.

9.6 Conclusion

The reasons for the contrasts of perceptions between academics and students in these CM educational settings lie in a complex interconnection of circumstances. On the one hand are issues of academic identity, literacy and possibly concern amongst CM academics about the development of professional character in their students. On the other hand, there appears to be more of a willingness by students to engage and creatively apply the technologies and tools that are available to them to enhance their future practice. Our study reveals that the adoption and prevalence of technologies within CM education may be influenced by technology-related tensions, transitions and growing pains similar to those identified as affecting other professions. Further examination of the perspectives and experiences of CM students and CM academics to HTs and learning technologies and their patterns of adoption in CM educational settings warrants further investigation.

9.7 Chapter summary

The results presented in this final results chapter indicate a number of preliminary findings requiring further research. It is evident from these findings that a potential disparity exists in the responses between academics who generally are in clinical practice and who use telehealth or HTs in a very limited way, and students who in general seem more open to both HTs and using telehealth in their future clinical work. The implications are actually profound, as it implies that students are using but not being taught the mechanics, ethics and legalities of telehealth, and are being left to their own devices to find practice enhancing technologies to augment their clinical work. The reasons for the disparity between staff and students' perceptions in relation to the adoption of HTs and telehealth are not so clear, but similar research of academics in parallel fields of clinical education has questioned the suitability of technologies, distance and online education for preparing students for relational professions where 'formation' or 'character development' is considered an essential element of education and the development of the healthcare practitioner. This highlights the critical urgency for CM institutions to be able to understand the push and pull factors that draw students towards them. There is still significant research to be completed to untangle this dynamic, but the new insights offered in this chapter provide strength in the argument that further research is needed, not only from CM and educational researchers but also from within the HSR field itself.

Chapter 10 – Integrated Discussion

10.1 Chapter introduction

This tenth chapter discusses the results of this HSR research. The aim of this chapter is to describe the broader issues that emerge from the findings as well as synthesise, demonstrate higher level abstraction, analysis, interpretations, implications and consequences of those findings (Lewis et al., 2021). There have been a number of key findings identified at each stage of the analysis of this project, some of which have already been discussed within previous chapters. The purpose of the following discussion chapter is to consider the most important previously identified findings through the wider lens of the overall study aims and objectives. This allows for both a deeper discussion and a broader conceptual understanding of the findings in line with the overall study purpose. It is important to note that the novelty of this research, in conjunction with the emergent nature of the TCIM and HSR fields are reflected in the shortage of comparative research to provide context to the findings reported in this thesis. Due to the HSR approach of this thesis (as outlined in section 1.4), this discussion chapter examines the impacts and significance of the findings from the perspective of CM educational institutions and their direct operational needs as well as with a view to broader public healthcare implications. This chapter will also identify limitations to the research reported in this thesis and propose future directions for this important field of enquiry.

10.2 Both institutions show evidence of a disengaged academic body

There is evidence from across all three phases addressing research objectives 2-5 of the project that highlight a low level of academic engagement in relation to practice and learning technology in these sample CM education settings. The consequence of this finding is that academics need training to address digital literacy issues and address their perceptions of marginalisation as existing efforts to integrate learning technologies within CM education delivery has been met with resistance by some academics.

10.2.1 Implications and consequences for academic leadership:

10.2.1.1 Academics require training and digital literacy programs to meet a skills deficit

This study describes the ways in which two institutions teaching courses in the same field show some similarities but mainly differences in the way in which they deploy learning technologies with specific differences in culture, processes, policy, infrastructure, and investment. It was never the intention of this project to compare, contrast, rate, comment or apply a theoretical lens on either institution's features or culture of technology use in relationship to each other. While some theoretical models might have the capacity, from a technological perspective, to place or rank these institutions against each other based on research findings (Graham et al., 2013, Rogers, 2010), any such questions related to the relative positions and evolution of these organisations are beyond the scope of this project. Nevertheless, the degree to which the potential advantages held by Institution 1 in relation to Institution 2 due to their broader ET deployment, strategy and planning become potentially equalised or even negated by the muted presence of this critical stakeholder. It is important to acknowledge that differences in infrastructure, use and adoption of technologies between Institution 1 and Institution 2 are not necessarily mirrored in attitudes, perceptions and perspectives reported by respondents in the academic surveys. Irrespective of whether participants worked in Institution 1 or 2, CM academics *generally* perceive that their institution is less advanced than others, students are given priority and better resourced than academics, the training offered is perceived as ineffectual, there is poor institutional technology support, and there are few if any formal processes for communication upward. Academics across both institutions *generally* report they perceive they are restricted in the delivery of their teaching and learning duties by institutional time and budgetary constraints. Further, CM academics place the burden of responsibility for any digital shortcomings squarely with their institution, not themselves. CM academics also report that they have little control over the choice of technologies utilised in their teaching work. The key finding in this regard is that despite infrastructure, and strategic differences between the institutions, neither institution appears to fully engage their academic teaching staff regarding their institutional technology choices. As in studies that have found similar patterns of academic resistance (Harrison et al., 2017) and disenchantment (Flavell et al., 2019, Liu et al., 2020) this finding may have important implications for these institutions as they adapt to external changes – such as delivering CM education in the time of COVID-19.

These study findings relating to academic perceptions of learning technologies show that despite academics ranking themselves well in terms of technology adoption, students in our study found the most basic classroom deployment of technologies by academics as one of the most challenging aspects of their education. Existing research and modelling (Rogers, 2010) of the successful adoption of technologies in educational settings reveals that a myriad of favourable circumstances need to be present to ensure such success (Johnson et al., 2011, Ward, 2013) including an institutional strategy (Levin et al., 2012), high-level champions that are supportive of change (McCorkle, 2001), supportive decision making and structures that account for faculty technology adoption status (Porter and Graham, 2015), faculty willingness for change (Kardasz, 2013) and sufficient resources and guidance supported by a varied programme of staff development and opportunities (King and Boyatt, 2015). In other educational settings, when the majority of faculty have articulated similar or the same negative perceptions to those expressed in this study (i.e. their institution is less advanced than others, students are given priority and are better resourced than academics, training is ineffectual, there is poor institutional technology supported; and few formal processes for communication upward) an urgent need for strategic deployment of further training has been identified (Hudson et al., 2015, Abrizah, 2017, Buller, 2015, Gutman and Gutman, 2016). This important finding in our study possibly indicates that successful implementation of meaningful digital change may not be fully realised in these settings (Al-Senaidi et al., 2009) as academics in our study mostly self-identify as early adopters, rank themselves as mostly equal in their technology knowledge levels to their students, use a greater range of technologies than are available at their institution and, as mentioned above, place the responsibility for any digital shortcomings squarely with their institution. Research in parallel fields of study suggest possible challenges for CM professional and educational leaders as they work with a complex dynamic that includes, on the one hand, clear trends in education towards learning technology use (and the trends within CM clinical practice to technology use) and, on the other, future students with firm beliefs about technology that differ to their teachers'. This situation may be further complicated by some students and academics being challenged using digital technology.

10.2.1.2 Combatting the academic narrative, 'I have no control, I am unsupported and marginalised'

This thesis also highlights that CM academics (especially non-fixed term contracted/adjunct academics) in two institutions - one in Australia and one in the US - feel marginalised and strongly perceive that they have limited control over the choice of technologies utilised in their teaching work. This finding is in alignment with existing research describing the perceptions of adjunct academics in broader academia (Yu et al., 2009, Ruth, 2018, Andro, 2021). Previous education-wide research points to inequities and inefficiencies compared with tenured staff, and suggests adjunct academics feel their talents are under-utilised and experience marginalisation and disempowerment working within their institution (Reevy and Deason, 2014). In broader educational research (Clark, 2017) the trend to academic 'casualisation' that continues to divide the educational workforce has received attention (Moorehead et al., 2015, Ott and Cisneros, 2015, Levin and Shaker, 2011). This previous research shows casual (contract or adjunct) workers have often been relegated to a perceived 'underclass' that experience more job insecurity, lower wages and poorer working conditions (Kimber, 2003) and poorer health outcomes (Reevy and Deason, 2014). Further, research in wider education circles has also highlighted that, in general, there are often fewer processes in place for identifying, documenting, and creating meaningful policies and practices for this adjunct faculty population (Kezar and Maxey, 2012, Gray et al., 2020).

10.2.2 Presentation of change, the degree of disengagement and the future

With such a large adjunct academic body in these CM settings there are clear challenges for academic leadership to tackle any possible perceptions of disenfranchisement among academics. From data spanning the three phases of this study, it seems the wholesale adoption and application of learning technologies is not a major priority for academics. The policies written and the changes implemented in relation to technologies seem to have been decided by management and experienced as being inflicted or imposed on stakeholders, as opposed to those changes being actualised through a more optional or co-operative adoption process (Rogers, 2010). As a consequence, neither institution seems particularly well placed for the future, despite one being perhaps better positioned with planning, policy and infrastructure. The ability to withstand market changes, and manage risk is managerially important (Leal Filho et al., 2018). Policy, planning, governance is critical to future proofing an institution (Alam et al., 2018, Leal Filho et al., 2018). But it is also crucial to carry a key stakeholder – academics - forward, and there is little evidence from this study of one institution performing better than the other in this regard (Koivunen and Saranto, 2018, Sevean et al., 2008, Rutledge et al., 2014). Institutional policy changes and immediate training for academic use of classroom technology are likely warranted to align the needs of academics to prevent further classroom disconnection. Moreover, further research is needed around these issues such as, 'Why are CM academics not more deeply engaged when the strategic future proofing of the institution seems to exist', and also, 'What are the anxieties and expectations of CM academics that do not seem to be addressed through the existing institutional planning and governance'?

10.3 The tensions in Complementary Medicine education relating to learning technologies are in line with tertiary education in general

The second interesting finding from this study is that CM education is experiencing many similar tensions, transitions and growing pains as the education trajectory of other health services professions such as nursing, midwifery and medicine (and even more broadly in tertiary education). This finding emerged from the surveys, audit, focus groups and interviews from our study and highlights a critical need for educational benchmarking by CM institutional leadership. In particular, the findings of the study confirm that when it comes to the student body's multilayered perceptions and perspectives to learning technologies, there is essentially no substantive difference to the challenges faced by CM educational institutions and other educational tertiary institutions. Students broadly, have a complex relationship with technology, they perceive a lack of support, there is a degree of disengagement with the institution and there is evidence of digital literacy divisions and subdivisions, all of which have important consequences and impacts.

10.3.1 Implications and consequences for institutional leadership

10.3.1.1 Students have a complex relationship with technology

Congruent with existing research on learning technologies in education, our study found that there are perceived unique modern pressures and stresses, drawbacks, distress and dissatisfaction linked to technologies. Consistent to most contemporary tertiary educational settings, CM education students report similar paradoxical perceptions, complex attitudes, adoption patterns and manifest the complicated relationships with technology. Results reported in Chapter 8 are congruent with recent scholarship examining the role of learning technologies in broader education settings that reveal a complex and interwoven picture of technology use and adoption where student digital realities are far from straightforward, but are in fact 'entangled, mundane and messy' (Selwyn, 2016a, Hannon, 2013, Selwyn, 2012, Alexander et al., 2016). The seemingly conflicting digital realities reported by CM students in this study - being concurrently similar and different to previous generations ('no different than previous generations, but rather simply possess different tools through which to express themselves', and, 'fundamentally different cognitive skills because of the digital technologies they have grown up with') - is in fact common for this 'always on' learning generation (Selwyn and Facer, 2014) who are now arriving in CM educational institutions. These new students have been brought up from childhood with a continuous connection to each other and to information, are characterized as nimble, quick-acting multitaskers who count on the internet as an externalised brain and who approach problems in a different way from previous generations. The range of opinion expressed by CM students indicates a wide variety of seemingly conflicting attitudes to technologies which ranged from positive, ('flexibility', 'adds value', 'good – when done well') to ambivalent ('this is a necessary evil', 'it would be negligent not to use') to negative ('I don't embrace it'. 'I'm dragged kicking and screaming because I have to'). Students in this study identified juggling an overwhelming amount of information online, self-imposed expectations for speed, short attention spans, being too easily distracted, a need for time away from devices, and a proportion of students attesting that they know more than their teacher. In existing educational research studies where similar perceptions have been expressed (Cheong et al., 2016, Briz-Ponce et al., 2016, Crompton and Burke, 2018, Tossell et al., 2015, McCoy, 2016) there have been few solutions proposed to meet this complex situation. This research has generally concluded that there are no easy answers beyond an institutional need to balance the sometimes conflicting priorities of, what can be achieved through technologies in education, a need to realign institutional teaching and learning practices, the existing skills and expectations of students and academics, and a need to understanding the expectations of students (Selwyn, 2016a, Henderson et al., 2015).

10.3.1.2 Implications and consequences for leadership: Students are in need of support – 'I am not supported; you need to fix it'.

To deepen matters for leaders in CM education, our research finds that some of the student body perceive that there is not enough support, and further, that the institution is responsible for supporting them. This finding is not just limited to self-reported laggards (the lowest end of the digital literacy spectrum in the DI theory of Rogers). At face value, this perception of a need for support suggests that for most students, these institutions could be doing more to prioritize the consistency, efficiency and reliability of the digital systems that their students are required to engage with. This falls in line with results from previous research in contemporary higher education of the need to better support students and maintain an institutional commitment toward developing student and staff digital literacy (Beynon and Mackay, 1992). The thesis findings reveal that possibly students perceived their CM institution as having a responsibility to prepare them fully with digital skills for life in general and CM study in particular. In previous studies in education more broadly, when students have been critical of their institution's capacity in similar ways to these CM students (the poor effectiveness of existing inductions, the lack of resources to help develop or strengthen digital technologies and skills, and the lack of formal training regarding a number of areas including how to incorporate learning technologies into the learning process, content informing them on appropriate behaviour and etiquette regarding on-line activity and engagement) it has been concluded by investigators that these perceptions reflect an inability amongst some CM students to adjust to the need to develop skills in autonomy and independence in their undergraduate studies (Macaskill and Denovan, 2013, Selwyn, 2016a, Lairio et al., 2013). CM institutions could therefore respond to the need to (continue to) support students and their unmet expectations (Selwyn and Facer, 2014, Selwyn, 2016a, Losh, 2014) in becoming more proficient in their use of technology, refresh facilities and infrastructure, as well as provide better technology support services and responses – all of which require financial resources. CM students could be supported in aligning their expectations and developing a more nuanced understanding of learning technologies within their tertiary culture to allow them to develop necessary skills and to not necessarily see the challenges as someone else in the institution's problem. In other studies where evidence of student disengagement has been found, as is the case in this study, the potential proposed solutions reported have included the need to identify and address and recognise that student engagement is a broad multi-stakeholder challenge within the institution, see solutions to disengagement as a multiple rather than one-size-fits-all approach, and accept that all stakeholders should develop a heightened understanding of the external and internal forces that impact on student engagement sense of belonging (and retention) (Quaye et al., 2019, Greener, 2018, Thomas, 2012).

10.3.1.3 Digital literacy

One of the implications, challenges and potential solutions of this finding for CM leaders relates to the technology challenges, lower levels of digital literacy and possible evidence of student disengagement – all pointing to digital literacy courses and training. The students in our study, *generally* and irrespective of their place of study, have technology challenges (aware of the need to be digitally literate, different in important ways to previous generations of students (and their teachers), and under unique modern pressures) and exhibit clear digital literacy divisions and sub-divisions. Similar to other research into institutions or fields where low digital literacy has been found within the student and some of the academic body (Ng, 2012, Bawden, 2008) our study highlights a complex learning environment where it is possible that some students have not yet developed the digital literacy or critical thinking skills needed for higher education. For CM leaders this potential skills deficit challenges existing admission procedures and criteria. Further, research where academics have been found to be critical of the basic academic writing skills of students as is the case here in our study, further training and resources to develop preparedness for study (Ilgaz and Gülbahar, 2015) and tertiary level academic literacy skills have been required for students (Parkes et al., 2015). In addition, a need for the adaption of teaching practices, assessment design and feedback to students by academics, in order to assist improvement of those student academic literacy skills have been shown to be necessary (Jefferies et al., 2018).

10.3.1.4 Benchmarking

The implications of this finding for faculty and students are somewhat important, but are critical for institution leadership. As these broad issues (student digital literacy, student criticism of the digital skills of faculty, academic criticism of student's reliance on technology, students expecting the institution to provide services) are affecting all tertiary education providers, there is much that can be done in CM institutions to address them (Hebert et al., 2006, van Houwelingen et al., 2016). In addition to further research to investigate the impact of these broad issues in more detail, it is also appropriate that benchmarking be undertaken to identify best practice from the findings of other research in close professions and generalise to make necessary changes in CM institutions. In the existing modelling of how new technologies and culture related to the use of those technologies eventually become embedded in the broader functioning of an institution, successful strategy and planning needs to take into account features such as the number of technological innovations present at any one time, the unique features of the student body (Abbott and Coenen, 2008, de Veer et al., 2011, Li et al., 2005), the pre-existing influences of the individual academics in the classroom (Nagel et al., 2013, Koivunen et al., 2008), the institutional strategic plan, policies and processes of the institution, the broader local community, as well as jurisdictional educational policies (Selwyn and Facer, 2013, Selwyn and Facer, 2014). The implication here is that educational leaders can learn from the experiences and studies more broadly to implement necessary changes to reduce attrition and allay the concerns of students – who feel unsupported (and academics – who also express a lack of support and exhibit evidence of marginalisation). This point is a critical take-home message from our study. The seamless transition to the use and uptake of technologies in education and clinical practice has been completed in numerous settings, not too far from CM. But this study finds that the perceptions and perspectives of students and academics are often currently working against the institutions they find themselves in, and that the likely transition to a more mature uptake of technologies in those settings is unlikely to occur until more is known about the perceptions of students and academics, and those institutions through action policy governance and infrastructure move closer to those students and academics in clear and meaningful dialogue.

10.4 Tensions and challenges facing future Complementary Medicine education

The third finding from this study reveals that for all the similarities with other tertiary settings there are specific key differences between CM institutions and other tertiary education providers with regard to the uncommon characteristics of the student body, their perceptions of technologies and the interplay between perceptions to technologies of the academic body. Our study findings from the fourth results publication (Chapter 8) suggest that these CM institutions have some uncommon student demographic features compared to other tertiary educational institutions and these characteristics are likely to create specific points of pressure for institutional leaders when it comes to resource allocation, planning and compliance. Further, there is evidence from the first and fifth results publication of unique (possibly ideological) academic concerns, attitudes and resistance to HTs, including telehealth, and learning technology at play in these settings. Ultimately, evidence of a challenge relating to '*formation', 'character formation', 'professional character',* or '*professional formation'* has been identified in the field of CM education for the first time, that raise further questions. The presence of the formation issue in CM education takes the challenge for educational leadership beyond the need for benchmarking to an urgent need for further research.

10.4.1 The uncommon characteristics of the student body

This study shows aspects of a complex, unique and uncommon student body different to most if not all tertiary environments; they are mostly female, digitally divided and subdivided, older and non-traditional creating a two-speed learning classroom due to their previous tertiary study – or absence of previous study. It is accepted that digital literacy is one of the important factors influencing tertiary (and CM) student perspectives and attitudes to technologies (Helsper, 2010, Helsper and Eynon, 2010, White and Selwyn, 2012, Gray et al., 2019b). It is also accepted that the enrolment of larger numbers of non-traditional students require institutions to necessarily invest in and provide more resources for technology support, library services, academic and scientific writing skills and services to support them (Iloh, 2017). Non-traditional students' attrition rates are higher and their retention rates trend lower than 'traditional' FT students (Grabowski et al., 2016, Taniguchi and Kaufman, 2005). The implication of this finding is that there is a broad diversity in the CM classroom, much more divergent than in conventional tertiary educational settings, with the potential for a wide gap in academic writing skills, plagiarism instances, basic science skills, and ultimately the need for student support allocation in time, energy and bridging that is required by the institution to ensure quality and standards are maintained. In this dataset, surprisingly, only a small portion of this student body are of an age to have grown up in the digital age (Prensky, 2012, Selwyn, 2016a). Instead, in the CM educational settings in our study, a third of all students perceive themselves as 'later majority' or 'laggards' in the Rogers' classification (Rogers, 2003). This disproportionate number of the student body reporting lower levels of digital literacy comes with consequential attitudes and perspectives, (dissatisfaction, unmet expectations of tertiary study, a lack of connection, belonging or creativity) has the potential to impact the overall academic and operational functions of the institution. This is somewhat different in other tertiary education institutions that generally have traditional systems to manage fewer older students and/or digitally literate students and/or have larger generational age gaps between students and faculty (sometimes two generations). Importantly our study found no broad anti-technology sentiment amongst the student participants but did identify a clear cluster of dissatisfied CM students.

10.4.2 Student Outlook and Principles

What our study has also identified is that a proportion of the CM student body may well have been attracted to studying CM due to an array of causes that also include their perceptions of technologies (Dutta et al., 2003, Rozin et al., 2004, Rozin et al., 2012, Nedrow et al., 2007, Gray et al., 2021b). There are as yet unmapped push and pull factors, perceptions and experiences that drive CM student behaviour and activity. CM students have a very different perception to the findings from previous research and commentary in relation to technology and equity. Existing research has predominantly seen learning technologies (such as MOOC's) as vehicles with which to democratise learning (Prior et al., 2016), underpin a more equal global distribution of knowledge (Burbules, 2018, Altbach et al., 2019, Resta and Laferrière, 2015, Becker et al., 2017) and as righting significant social inequities and power dynamics and bring inexpensive, quality education to students in places remote to bricks and mortar institutions (Fox-Turnbull and Snape, 2011, Halac and Cabuk, 2013, Rodriguez, 2012, Veletsianos and Kimmons, 2012). In our study, some students perceived that the requirements of providing some or all of a course online (didactic and/or clinical) actually discriminates against older, digitally-challenged, less digitally literate students as is the case in these CM institutions (Gray et al., 2019a). The main concern expressed was about the negative impact of technologies (when used in a one-dimensional way that creates isolation and poor clinical outcomes).

10.4.3 Uncommon academic resistance to change, learning and practice enhancing technologies

To compound matters for CM educational leaders, our findings also reveal particular experiences and perceptions of technologies from within the academic body, with some important features that are different to their colleagues in other educational settings and in other educational research (Holmes and Prieto-Rodriguez, 2018, Alhabeeb and Rowley, 2018). As mentioned in discussion point one, they are not found to be resistant to change simply because it involves change. In this study, in general we have found that CM academics have a good opinion of themselves when it comes to technology. Our findings do not show that academics see the issue with themselves. CM academics in this research study place the responsibility with their institution for their digital shortcomings. This finding is for educational leadership somewhat more of a complex issue than just expecting or only hiring academics that feel more comfortable with digital technologies or get them to engage in more training in the use of learning technologies in order to solve the problem.

10.4.4 Implications and consequences for Complementary Medicine leaders and managers

Despite an apparent readiness to adopt technology, our study findings suggest that CM academics perceive technologies to have a significant detrimental impact on their students' future workplace skills, knowledge and attributes. This finding challenges the initial analysis which pointed to digital literacy as being the likely reason for the academic hesitancy expressed towards technologies. There is existing research exploring resistance to technology uptake in parallel transitioning health sciences education professions as programs keep pace with changing clinical practices and technologies and with so much medical education (including clinical training) now offered online. Abundant research into the role of and attitudes to technologies is found in educational psychology (Reed et al., 2000), counselling (Hale, 2018), clinical training (Grady, 2011), and nursing (Sinacori, 2019, Poole, 2018), including the perceptions, belief and assumptions of nursing educators (Mancuso, 2009, Johnson, 2008, Howe et al., 2018) as more faculties transition to online learning (McQuiggan, 2007). In these studies, strongly negative *a priori* perceptions have been reported by faculty members who believe that face-to-face instruction in the traditional classroom is the best and only way for students to learn (Meyer, 2004). Some of that research has found that in such circumstances the changes faculty experience moving to online educational experiences make them feel unsettled, bewildered, overwhelmed (Alley, 1996), disembodied, disempowered (Cowham and Duggleby, 2005), and threatened (Meyer, 2004). However, in these fields of research most of the resistance expressed by participants was usually about literacy or loss of professional identity, rather than the attitudes and perceptions towards HTs, telehealth and learning technologies as was expressed in our findings. In fact, digital literacy issues alone cannot fully explain the divergence of perceptions and beliefs. Our study highlights a disparity found in the responses between academics who are in clinical practice and do not use virtual consultations in the first clinical intake and where the use of HTs is very limited, and students who in general seem more open to both HTs and using telehealth technologies in their future clinical work. The reasons for the disparity between staff and students' perceptions in relation to the adoption of HTs and telehealth are not so clear. One possibility to emerge from this study is potential philosophical or ideological opposition or resistance to HTs and telehealth (Gray et al., 2020, Gray et al., 2021a).

10.4.5 Formation

One of the key findings of this study, is that CM academics express convictions that include that an over-reliance on learning and practice technologies will have a detrimental professional outcome – poorly trained students - as there seem to be core aspects of the training of a CM practitioner that they perceive cannot be studied online. In addition, a disparity is found in the responses between students who seem more liberal and open to both practice enhancing technologies and telehealth and academic staff who do not share the same perspective. After the results of these surveys were analysed, it was anticipated that insights into the disparity between academics and students' perceptions might come from close disciplines to CM such as other health services, but in fact it is in the field of theology and similar relational professions (such as counselling) where perhaps the most meaningful comparisons lie and potentially point towards a path forward for CM education. In theology education research emphasis has focused on the many challenges educators face in using distance and online education to adequately prepare students for their future profession that requires people skills and a maturity of character. Similar to our findings, faculty participants in theological education research have questioned the suitability of technologies, distance and online education for preparing students for relational professions where 'formation' or character development is considered an essential element of theological education and the development of the practitioner (Harkness, 2019, Oliver, 2014, Ferguson, 2016, Hege, 2011). In the field of theology, ministerial or spiritual formation has been described as a multifaceted activity involving critical thinking, the acquisition of knowledge, skills development, religious identity formation as well as the development of moral character, maturity of ministerial discipline and maturing spiritual identity (Naidoo, 2012). 'Formation' is considered an essential component of theological education and is an educational benchmark. It is also a core feature of non-theological education settings such as nursing, counselling social work and medicine (Yazdani et al., 2016). In the theological research, there is as yet no consensus regarding best practices of developing online undergraduate formation, but there is an agreement that it has a communal aspect, that collaborative online learning environments are crucial, 'the role of the teacher in online formation is critical, the transformation of the learner and application to the world is paramount' (Ledbetter, 2018), and more research exploring these concerns about formation and strategies for addressing them is recommended. This body of work in theology education that highlights academics' concerns about the formation of spiritual character of future practitioners due to the perceived inadequacies of online learning online (Maddix and Estep, 2010) is in parallel to the holistic working paradigms of CM. There is a possibility that such generalisation of findings in theology research, in part may begin to explain the disparity in attitudes to technologies in practice and education found in our study. Currently, there is only very sparse research into the drivers and motivation for students of CM to begin study (Steel, 2018). It has been tentatively shown that some of the push and pull factors go well beyond the ‘desire to help’. Possible push factors include philosophical/ideological disagreement with current emphasis in health care on pharmaceuticals, the drivers of the ‘wounded healer’ and ‘wounded healer by proxy’, as well as ‘unexpected encounter’ and ‘accidental tourist’ motivations for study. Similar to theology, the pull factors also include complex convictions that include a love of nature (Dutta et al., 2003, Rozin et al., 2004, Rozin et al., 2012, Nedrow et al., 2007) and spiritual concepts of health such as ‘vis medicatrix naturae’ (Foley and Steel, 2017a), ‘spiritual vital force’ (Waisse and Bonamin, 2016), and the flow of energy (Farquhar, 2018), all of which combine to a ‘calling’ or ‘mission;’ that draws future students to CM health care (Hahnemann, 1996). These as yet un-researched convictions perhaps highlight that experienced CM academics perceive that they know something their students currently do not, and they are concerned that some important part of the educational process is likely to be lost in fully relying on technologies to develop aspects of a practitioner in a field where formation is considered so important. Future research into this finding needs to include the drivers and motivation for students to begin study and the extent to which academics and clinicians are drawn to the work of CM because of their health/spiritual values and how ultimately how formation plays a role in the clinical work of CM.

10.5 Limitations

The limitations of this study cluster around methodological, theoretical, design and implementation issues and span all three phases of the research.

10.5.1 Grey literature, indexing and quality

The literature review findings from this thesis can be contextualised within identifiable limitations of definition, scope, indexing and quality. Searching literature related to CM can be challenging because of the lack of a consistent international definition. Further, there are many relevant studies, papers and commentaries that are not peer-reviewed and therefore fell outside the scope of this review in line with conventional academic practice in line with conventional academic practice, and the advice of expert supervision and an academic librarian with expertise in public health, medical and health science. There were also 12 papers in this review that were identified through manual searching. This possibly highlights that despite some research being conducted in this area, that papers may not be published in journals which are indexed in commonly searched research databases. Whether this is due to a perception amongst CM-specific or health professional education journals that research in CM education falls outside of their relative scope and prefer to focus on clinical questions or the researchers are not targeting these other journals is not clear. Moreover, the application of three critical appraisal tools created challenges of inclusion and exclusion related to quality. In the case of the SRQR and MMAT, these guidelines were written for pure qualitative research and MMR, yet the papers in this review were published in PH and education journals. As such, the structure and content of the included qualitative and mixed methods articles may have been modified to suit the journal style guide and intended audience and the reporting guidelines may have been compromised as a result. For this reason, the low-quality score for some of these articles may be due to reporting omissions of necessity rather than true gaps in methodology. Another limitation identified is that conducting research that crosses national borders, comparisons become challenging. There are quite different standards for entry level and practice even between the various professions from country to country. Nevertheless, where possible these limitations have been mitigated through attending to critical integrative review best practices, and as a consequence the relevance and value of the findings presented in Chapter 2 for contemporary healthcare education provision should not be minimised.

10.5.2 Limitations of the focus groups and interviews, the audit tool and instrument, and the survey data from Phases One, Two and Three

One immediate limitation to the study is that only two institutions were included in the audit (and later the survey) sample. This makes the generalizability of findings limited in a number of ways. The sample represents key institutions in their respective countries and as such they might be dealing with somewhat different issues to other smaller, single modality, regional, CM institutions elsewhere. Both sample CM institutions in this study had students of similar age, subjects offered and gender balance but there are important differences. The institutions are not of similar size, and the mode of study is somewhat different at these institutions. While teaching similar courses and subjects (eg nutritional medicine), the unique characteristics of Institution 1 (multiple campuses, Australian, undergraduate, non-medical CM courses) and the unique characteristics of Institution 2, (single campus, US, postgraduate, medical courses) limit the transferability of findings to other institutions in both Australia, the US and further afield. In addition, in Phase Two of the study, the lack of an applicable and relevant existing audit tool proved a limitation. So many instruments existed, but none were found to cover the breadth and depth of all of the research questions of this study in a complete way. The 'audit' in our study was certainly not a formal educational audit of the institutions. For that, similar to educational accreditation audits, an audit, then a self-study, plus a site visit (in order to triangulate answers to the data that had been gathered) would have been necessary. The audit in this study was also not designed to be a single, discreet and definitive study in and of itself. The research objectives were broad, and in order to have provided more concrete conclusions to these questions, exhaustive participation and observational research would have needed to be completed for up to a year, on site in these settings, in order to augment and triangulate the findings of the audit. This was deemed impractical and ultimately not necessary for this HSR research project. Further, the audit was completed by one senior member of staff at each institution (in consultation with other relevant staff members if information was not available or known). This reliance on information coming from an internally self-selected single source means that perhaps some positive or negative perceptions relating to Institution 1 and 2 needs to be tempered somewhat and triangulated with other Phase Three information to ensure the accuracy of the interpretation of the data. In this regard, further research could include comparative studies of findings in this study with other institutions in both the US and Australia to explore differences in attitudes and opinions to technology adoption in health and education when individuals are polled who live in areas dominated by different political leanings.

In the third survey phase, participants in our study surveys self-selected, and as such possibly contributed to the selection bias. CM academics and students that have equally strong or stronger attitudes to learning technologies and practice enhancing technologies perhaps chose not to complete the survey. In addition, as it was only a small proportion of academics that chose to participate from one institution this meant that there is little value in reporting comparative statistics between the two institutions. The effects of random error could be due to the small sample size within the study. In both the student and academic surveys, the small sample size of academics that were in clinical practice that use technologies limits the generalisability of findings.

However, despite these identifiable limitations, the results from this MMR research provide some valuable insights into CM academic and student perspectives and experiences regarding HTs and learning technologies and highlight the need to further research into CM education provision. Whilst there are elements of chance, bias and confounding within the study, these have all been considered throughout the analysis and reporting of results and accommodated where possible. It is suggested that this study is internally valid. Likewise, there is considerable external validity and generalisability for other CM educational settings in Australia, the US and beyond.

10.6 Future directions in research

By adding to the value of current knowledge in the field of CM and education, it has been possible in this thesis to also identify and highlight the significant deficits in the available research. Gaps in the areas of education research and HSR have been identified and which require urgent attention. The most obvious gap is that the specific topic of learning technologies is under researched in a broader field of CM education where there is such little research, nor even grey literature commentary. As well as knowledge gaps, and as expected, these new insights discussed above have given rise to a multitude of further questions requiring investigation.

10.6.1 Health Services Research agenda

Firstly, one important area requiring urgent attention is the need for an overarching CM educational research strategy. PH and HSR researchers have a pivotal role to play in this regard. Working closely with educational leaders, developing and tightening the research strategy and beginning to actualise individual items on the priority list of research projects is warranted. To effectively address knowledge gaps there is a need to establish a strategic research agenda in this field and it is important that future research builds upon a strong understanding of the uncommon educational environment of CM institutions. This strategic agenda also needs to plan for building capacity in this field. CM education stakeholders, researchers as well as practitioners need to be encouraged to produce research outputs to ensure engagement in the future as this topic is critical for the future of CM. The additional level of sophistication in the analysis provided in this thesis emphasises the need to continue examining CM future practitioners, and academics as important, separate and discrete fields. A broader knowledge of how health services education informs CM education, and the degree to which research and evidence in health services education can be scaled to CM education is critical (Verma et al., 2006). Development and implementation of this agenda will solve the challenge of disparate unrelated research in separate areas of the CM professions.

10.6.2 CM education modelling and sociological research

It would appear that relevant research into the CM education field using theoretical frameworks with which to view the complex dynamic of technology attitude and adoption in CM educational settings and apply the results of that research is required. This future work could well seed the development of a specific CM orientated technology acceptance model through which to analyse findings, as well as provide deeper context and support to CM academics and students to enhance the student experience - a theoretical model with which to approach and understand adoption, perceptions and experiences, behaviours and potential change strategies regarding technologies in CM educational environments. Moving forward there is a need to understand how changing educational trends relate to CM, how CM educational settings are distinct because of their unique and uncommon student body, the difference between training CM practitioners and training people about the use of CM, and the degree to which CM educational institutions are influenced by the broader trends taking place in education globally. In alignment with the HSR initiatives outlined above, this thesis also identifies new topic areas which may be best addressed through research using qualitative research methods and MMR as further research is necessary to explore the complex and nuanced digital realities inside CM institutions as well as the structural and social issues they relate to. Questions starting with, ‘Why is CM a phenomenon’, and, ‘What are the drivers of students to study CM’, are deserving of robustly researched answers. The experiences, perceptions and practice behaviours described above needing research attention could best be explored and understood through the judicious and appropriate application of organisational change and sociological research frameworks as well as PH and HSR perspectives.

10.6.3 Prospecting: Global mapping of Complementary Medicine educational provision

A critical next step is to conduct a global mapping exercise related to CM education. A key foundational step to developing a better understanding of the effectiveness of CM education is to more clearly identify current CM educational provision. There is an urgent need to understand the geographical locations of CM educational institutions, the modes of delivery, level of education, enrolment patterns, andragogy, their size and scope as well as international similarities and differences. This is particularly important given the as yet largely unexplored and potentially unique characteristics of CM educational institutions and their similarities or differences with other health services education (nursing, pharmacy), the potential size of the CM education market and the numbers of graduates entering CM professions. More needs to be known about the sheer breadth of educational provision in CM internationally, the range of award options with courses currently available at undergraduate and postgraduate level, the relationship between prerequisites and the content of the program and the graduate outcome. Currently there is no map nor broad holistic grasp of the location, provision, scope, and to what educational level CM education is delivered. Critically, the information from this research needs to include the legal and governance structures, and the financial and funding models from these institutions in order to understand more deeply how operational decisions are influenced by the financial drivers in these not-for-profit and for-profit private equity educational institutions in the CM field.

10.6.4 Strategic stakeholder research - Workforce surveys of academics, students and educational leadership

Future research also needs to include workforce surveys across the stakeholder groups from a wider sample that involved data collection from one institution in Australia and one institution in the US. Student and academic perspectives on learning and clinical technologies is one feature of this broader work. Data collection can take the form of learning technology surveys and readiness for online study surveys. There are a number of findings presented in this thesis requiring deeper research to clearly understand the implications of the results. Research is needed to explore the perception and experience of faculty and students of CM education institutions towards the challenges, opportunities and use of a variety of educational delivery methods and technologies within the specific needs of CM practitioner training and what culture changes might be necessary. Given the percolation of technologies into all corners of modern life, magnified dramatically with the global pandemic of Covid-19, the trends and the pragmatic reality that technologies are now dominating all similar professions, the beliefs and expectations of faculty and students need to be more deeply explored in the area of CM education.

10.6.4.1 Student research

Building upon an HSR approach, future research is required which examines the characteristics, attitudes, preferences, experiences and motivations of modern CM students. The questions start with understanding the students, what drives them, why have they chosen CM, what do they think about their education, what are their plans for the future. Questions also include the push and pull factors that drive students to study CM, the identifiable differences between the professions - naturopathy, homeopathy, acupuncture and more about technology adoption in these groups. The examination of CM student perceptions and research regarding the use of technology as it relates to the methodologies of teaching CM, would serve to create further clarity in this emerging field and more deeply understand recruitment, retention and development of faculty teaching within CM to enable graduates to better utilize CM in clinical practice. Furthermore, as one of the fundamental principles of CM generally involves an appreciation of nature, the healing power of nature, and natural approaches to life that may include work / life balance and life / technology balance (digital detox and device vacation) further research into philosophical and ideological perceptions of what and what cannot be taught online from the student perspective require expansion. In addition, subsequent studies into the finding from this research exploring perceptions of 'digital inequalities' requires clarification and comparison.

10.6.4.2 Academic research

A closer examination of the demographics, psychographics and the values of faculty at CM institutions is needed including the perceptions and experiences of telehealth by the CM faculty. Specific future research could examine academic perceptions of the use and reliance on technologies, the limitations of what can and cannot be taught online in CM and if and how a more nuanced deployment of technologies may be preferable to relevant stakeholders. Alongside this, it might be beneficial for CM educational institutions to explore strategies to develop faculty further in areas such as learning technologies, research literacy and EBP skills. Simply, more is needed to be known about technology adoption in this important stakeholder group. In particular, the ideological and philosophical underpinnings related to faculty attitudes to the 'formation of character' in CM highlighted in our study are needed. Results of this research can assist educational leaders in identifying what skills need to be taught to faculty, with a view to engaging them better and more fully. Further research findings will also assist in identifying and cultivating the faculty and administrative champions, as well as the early adopters and change-leaders that are needed.

10.6.4.3 Educational leadership research

Given that so many of the findings from this research have broad implications for academic and educational leadership and that the discussion points from this research point to significant challenges ahead for educational leaders juggling private equity pressures with the nuances of the student body and the perceptions and experiences of the academic body, further research into this critical stakeholder is required. It is necessary to identify, in much greater depth, the challenges that those leaders perceive and swiftly arm them with research data and solutions to be able to meet these challenges.

10.6.5 Individual institutional research and replication studies

Future research in other individual CM educational settings could involve tools such as asset mapping or infrastructure and technology audits in order to identify the learning technologies used, and the student services, faculty and IT support infrastructure that is currently in place. Possessing broader knowledge on all of these topics could have an impact in overall institutional strategy, curriculum design, employment status, resource allocation, infrastructure and operational imperatives for CM leaders in these mostly private equity education environments (Gray et al., 2019b). Specific research inside individual institutions is also needed to fully apply theories of technology adoption (such as Rogers or Graham) in CM educational settings. From the application of new devices, to the broad adoption of new modes of delivery, specific and discrete research that looks at the actual innovation, in a way that was not possible in this study is necessary. It has also been identified that replication studies of this project in other large and small institutions CM institutions in Australia, the US and further afield, as well as comparison to IM institutions that are teaching similar topics, subjects and courses would be of value. Lastly, further research is also warranted to explore the perceptions and experiences of broader CM education staff and CM academic researchers at other CM institutions, integrative medicine educational institutions and medical education settings, in order to help identify and ultimately address the challenges, risks and tensions relating to learning technologies in CM educational settings.

10.7 Chapter summary

Broadly speaking, the field of CM education is under immense pressure with significant tensions and challenges. As demonstrated by our study, there is little research or knowledge that informs the infrastructure and planning for CM institutions in the future and so in the interim, benchmarking to other tertiary practices is critical. With the maintained emphasis on external pharmaceutical solutions in conventional medicine, CM education will likely continue to be an attractive option to thousands of students world-wide. But these environments have been shown from this study to be settings of fermenting differences and paradoxes. Given the uncommon demographic characteristics in CM institutions, the digital inequalities, divisions and subdivisions between academics and students and subsets of students provide broad challenges for these institutions to improve the educational experience for students and academics. After hearing the call, making the decision to begin to study and investing in substantial course fees, students in CM education struggle with a number of issues. The classroom is a place of knowledge but also tension as students have strong values about health and technology - and they know they ‘should’ be digitally literate. But as users of technology, they are at the end of the chain and they mostly rank themselves poorly, feel unsupported and are critical of their academics' skills. Their teachers, experienced practitioners and academics who love teaching have their own struggles as they rank themselves highly but also feel unsupported and marginalised by their institution. Educational leaders need to have very special qualities and access to data to manage and lead these groups in these times in these settings. In addition, they have their Boards to report to and attain specific enrolment targets. Research and benchmarking can only go so far. What is also required is vision, planning and leadership. What is clear is that external factors will impact on the internal resilience of these institutions. Leadership that invests in the future trends in education, but tailors these to the specific needs of CM education, and the specific culture of the institution is the only way forward. Strategic shortfalls and gaps create tensions and challenges for educational leadership in individual institutions. As the two institutions are in different places in their development and evolution to deal with these challenges additional questions emerge; How can leaders minimise staff turnover, manage academic disengagement when most academics are contractors, manage student disappointment, maintain quality, drive growth for the private equity owners? How can they acknowledge their academics' perceptions yet at the same time make lean commercial decisions? For good decision making, further research into the drivers, the push and pull factors of students to CM study and attitudes to formation by CM academics is crucial to assist in the innumerable points of tension that exist for CM educational leadership.

Chapter 11 – Conclusion

This thesis presents a summary of findings aligned with the overarching research aim, to examine the prevalence, experiences and perceptions of learning and health technologies on students, academics and educational leaders in CM education institutions in the training of health professionals. The limitations of this study preclude sweeping generalised and definitive statements, but the findings do speak to novel and measured preliminary insights, identifiable trends and discussion points into the place and value of learning technologies in CM education.

In order to achieve this above aim, applying an HSR approach, this project addressed five objectives. The first objective was examined during the Phase Two – the audit. The exploration of the second objective was spread across Phase Two and Three of the study – the surveys. The remaining three objectives were investigated in the Phase Three surveys.

Initially, a critical integrative literature review found that there was only very sporadic research conducted and an uneven range of CM education provision, and virtually no research on the role of technologies in CM settings. It was found that the mature conversation taking place in close disciplines relating to perceptions of technologies and the uptake of technologies completely absent, creating a knowledge gap for educational leaders given the challenges facing CM education.

Secondly, as a consequence of these literature review findings, Phase One of this project gathered preliminary data that addressed in part the research objectives 3-5. During fieldwork in the first phase of the study, the data collected from semi-structured interviews and focus groups were analysed. What is now known is a broad range of stakeholder perceptions to technologies, that that there is evidence of student criticism of the deployment of classroom learning technology in CM education by academics, a potential digital divide between those stakeholders and variations in digital literacy in CM educational institutions, digital resistance from some subgroups of academics and students, and unique (possibly ideological) attitudes and resistance to practice and learning technology. These early insights are confirmed by findings from Phase Three of our study where we now know the perceptions to many challenges and opportunities. Many CM academics feel strongly that they have little control over the choice of technologies utilised in their teaching work. Many perceive their institution is less advanced than others, that students are given priority and better resourced than academics, offered training is ineffectual, they have poor institutional technology support, no formal processes for communication upward, and are restricted by time and budgetary constraints. CM academics place the responsibility squarely with their institution, not themselves for any digital shortcomings. As a consequence of these findings, and in answer to the three study objectives it is apparent that one of the CM educational providers seems to be keeping pace with the fast-changing learning technologies in and meeting the needs of modern learners more than the other. Moving forward however, it is equally apparent that educational leadership need stay abreast of technology developments, yet also prioritise the vigorous training of academics to manage their disenchantment, address any digital disharmonies and gaps, and manage student disengagement. Our study confirms that with an eye to the future, ET skills and a cultural change are necessary in these settings but any cultural and technology initiatives cannot be ‘imposed’ on academics as such impositions have been demonstrated to be a failure previously.

Thirdly, as a consequence of both the literature review findings and the Phase One findings, an audit tool was developed alongside of cross-sectional surveys of academics and students and applied in the sample institutions chosen for our study. The specific research questions relating to this aspect of the study included Objective 1 and 2. Addressing these objectives, this research project has identified that one institution reported being better resourced and having a more robust infrastructure than the other. One institution was ranked very poorly by the representative that filled out questions related to leadership, governance, planning, strategy, policy, resource allocation, investment, training events for academics and students, the commitment of senior leadership and the existence of metrics for measuring success. Feedback from students and academics supported the view that more reliance of ET might actually discriminate against students studying CM. In general, it has been shown that the utilisation of learning technology to be in some instances effective, appropriate and but not universally acceptable to all stakeholders – academics or students. The depth and levels of criticism of ET deployment across the stakeholders was striking and evidence was found of important discord and disharmony in the academic and student body. Furthermore, this study has found that faculty support, IT support, infrastructure, student services support in place in order to facilitate e-learning in the CM education environment exists in Institution 1 and are to an extent emerging in Institution 2. This investigation has identified the types and scope of educational delivery methods and technologies used in contemporary CM practitioner training. Comparisons as to whether the type of technology uptake and culture are in alignment with best practice standards in education more broadly are left for other research projects.

Fourthly, research objectives 2-5 were addressed in the third phase of the study - surveys. The results of the academic survey confirmed that CM education settings are not exempt from challenges and tensions found in other educational environments with regards to learning technologies. In a complex pattern of technology adoption, it was found that CM academics perceive themselves to be 'early majority' adopters of innovation and as being proactive in their teaching and assessment delivery that challenge widespread assertions that all academics are simply resistant to change. However, it was also found that contracted academics feel unsupported and marginalised, and for educational leaders there is an urgency to act to provide more regular allocations and include adjunct faculty in formal academic processes to redress this reported perception among CM academics. Equally, the students also have technology challenges; they are well aware of the need to be digitally literate; they also know they are different in important ways to previous generations of students (and their teachers), and they perceive they are under unique modern pressures. There is evidence of digital literacy inequalities, divisions and sub-divisions within the student body. Students perceive that there is never enough support and the institution is responsible. From these findings what is now able to be asserted is that leadership has the opportunity to learn from the experiences and studies more broadly to implement necessary changes to reduce attrition and allay the concerns of students – who feel un-supported, and academics – who feel un-supported and marginalised. What we now know is that these perceptions are factors that influence the uptake of learning technologies in CM institutions. Benchmarking to best educational practice and generalizing from other educational research in close professions is warranted in order to inform decision makers to introduce necessary and swift changes, develop effective strategies and plans to marshal institutional resources and implement appropriate training with regards to learning technologies. It is now known that student and academic experiences and perceptions with technologies are complex. From analysis in this third phase of the project, academic and student survey data were compared, and it was found that a disparity existed in the responses between students who seem more liberal and open to both practice enhancing technologies and telehealth and academic staff who do not share the same perspective. What we now know is that the reasons for the diversity of perceptions between academics and students in these CM educational settings lie in an entangled web of academic identity, literacy and a deep concern about the development of formation in their students, while on the student side is a willingness to engage and apply creatively all that is available to them to enhance their future practice. It is possible that CM educational practice is currently not keeping pace with other similar disciplines, nor are CM educational leaders keeping pace with students' perspectives. The results of the student surveys found that the CM education institutions showed an uncommon student body different to most tertiary environments. It seems that in these CM institutions, current curriculum does not match current professional trends nor student expectations with little formal curriculum time devoted to HTs and telehealth in class-time. This study has shown – in answer to the research objectives, that there are digital literacy lines and divides visible in both the CM academic and student body. Some positive responses to LTs were elicited. But the makeup of the uncommon student body made up of a significant proportion of non-traditional students with their specific needs, coupled with the challenge created by academic concern about the formation of character creates a unique challenge for leadership. The existence of, or lack of leadership, champions, policy and strategy in these sample institutions effects the perspectives of staff, to an extent, but the final conclusion in this regard is that much more research is necessary to understand more about specific dynamic between the trinity of stakeholders, students, academics and educational leaders.

This is the first study examining the interface between technologies in learning and clinical practice within the CM education settings. Some students, faculty, and professional leaders of the CM professions in the US and Australia appear conflicted about the use of these widely available educational and clinical tools. We now know the answers to the research aim and objectives. CM faculty and student perceptions, experiences, adoption patterns regarding technology, their digital literacy, the divisions and subdivisions within the faculty and student body, and even to an extent the way in which these groups adopt innovations and their identifiable attitudes to technologies and learning are now better understood. But there is still a need to establish a strategic research agenda for this important aspect of health care education in order to help ensure a well-educated, effective CM healthcare workforce. This study has limitations and any specific recommendations that can be made from our study need to be undertaken with caution. However, this thesis not only reported the above key significant findings, it also progressed the field of HSR on the topic of CM by taking the novel approach of a three-phase study to understand the challenges and tension in CM education with a focus on technologies. The importance of this approach has been validated by a number of findings within the study, which highlight the discrete differences in drivers and outcomes across the range of stakeholder groups examined. As such, the need for future HSR to apply more sophisticated approaches to the study of CM and education must not be disregarded, as CM education is the cradle of the future of CM. This will ensure any insights and conclusions which are developed from additional research are relevant. The thesis also clearly identifies a number of future areas of research necessary to verify and contextualise the study findings. The novelty of the research topic examined in this thesis has resulted in the identification of many previously unreported and unexamined relationships and associations from the approach of both HSR and educational research. Further development of our understanding of CM, learning technologies and education therefore necessitates that attention be given to all research areas. The study presented in this thesis contributes new insights to an emerging research topic. The strengths of the sample, design and methodology provides a strong foundation for additional research to be built upon in the future.

Coda

There is an important closing statement to be made about rigorous yet slow moving research in fast moving times – the time of COVID-19.

Private equity in educational settings

Information from this study shows that Institution 1, from 2015-17 at the time of data collection, reveals evidence of a more mature infrastructure capacity in planning and strategy in relation to learning technologies than Institution 2. It cannot be assumed that that remains the position today. Information available and accessible in the public domain reveals the influence of private equity ownership in these educational settings. Institution I (a for profit corporation is owned by a private investment company, members of whom dominate the Board) has been bought and sold five times in the last 12 years and twice in the last five years for hundreds of millions of dollars. Information from available public data also reveals stressed services through asset-stripping, institutional knowledge potentially lost through high turnover of staff, and reviews of the institution by students and academics on social media platforms that are freely available speak to dissatisfaction with the current direction. It is possible that the strategic direction and technology champions evident at the time of data collection are no longer employed there. By contrast, Institution 2 (a non-profit 501(c)(3) corporation) gained university status at the time of data collection for this research project (2016) and while at the time showed emerging capacity and signs of an immature process around learning technologies now shows steady signs of stability and growth. There is perhaps an important lesson to be learned about hares and tortoises.

COVID-19

At the time of writing all educational institutions globally have dramatically and emphatically needed to embrace learning technologies in the wake of COVID-19. The haphazard way in which this has been adopted globally, from media reports and industry insights could well be paralleled in these institutions teaching CM. In this regard COVID-19 has speeded a process taking place in education that was already well underway. The digital age, the tidal wave of changes from the use of technologies in education and technologies in healthcare has broken on the CM shore and irrevocably swept away many of the old ways of doing business and the old institutions. The daily realities of the revolution of the digital age are only just emerging in a field that has been shown from this study to be a late adopter when it comes to learning technologies. While the implications are only just emerging, the imperative for further research has never been more urgent.

Chapter 12 References

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Chapter 13 Appendices

Appendix A Participant Information Sheet

Title

An examination of the readiness and capacity of Colleges of Complementary Medicine to deliver quality educational outcomes in the training of health professionals using learning technologies and e-learning: A mixed method study in Australia and the US

Invitation paragraph

Before you decide to take part in this study it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. A member of the team can be contacted if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

Purpose of the study

Complementary Medicine (CM) - a range of therapies, products and approaches to health and illness not traditionally associated with the medical profession or medical curriculum continues to thrive across many countries (Nguyen, 2011, Barnes, 2008, Burke, 2013, Frass, 2012, Harris, 2012). Alongside, and closely related to the continuing popularity of CM have been rising enrolments at CM education institutions (Wardle, 2012, Willis, 2007, Myers, 2012) which are located across the public and private tertiary sector in many countries (Australia Endeavour College of Natural Health (http://www.endeavour.edu.au/), USA National Centre of Naturopathic Medicine (http://ncnm.edu/), UK College of Naturopathic Medicine (http://www.naturopathy-uk.com/), Asia School of Chinese Medicine, The University of Hong Kong (http://www.scm.hku.hk/english-school_intro_page_1.html). The professionalization of the CM education sector appears to be evolving with continuing professional education, education standards, levels of foundational medical science and higher levels of qualifications emerging and/or developing of late (McCabe, 2005, Breakspear, 2013, Wardle, 2014).

More broadly beyond CM-specific education, tertiary students are increasingly engaging with technology in both their personal and study lives (Lefoe, 2009, Phillips, 2013) and technology-based learning and teaching in higher education is becoming almost a taken for-granted proposition in many undergraduate courses (Ensminger et al., 2004). Moreover, wider higher education is experiencing major change as a consequence of learning technologies, Massive Open Online Courses (MOOCs), flipped classrooms, constructivist education theories, the implementation of problem based learning (Rodriguez, 2012, Veletsianos, 2012, Halac, 2013, dramatically changing student attitudes and behaviours (Johnson, 2011, Johnson L, 2012, Jones, 2011) and CM education is not exempt from such circumstances. However, despite the growth in CM education and the many current challenges and changes facing higher education more generally, there has been no critical review of the contemporary peer-reviewed research examining CM education. In direct response to this gap in our understanding, this paper reports the first critical review of recent literature examining a number of key issues across the CM education field, and outlines a research proposal to address these gaps. The study will be completed in 2019

Why have I been chosen?

You have been approached as you are a crucial stakeholder in the research. As a student, an academic or a key administrator, you are a part of one of the largest colleges of CM in the world and are therefore at the cutting edge of changes in education and learning technologies in the CM space.

Do I have to take part?

Taking part is entirely voluntary and refusal or withdrawal will involve no penalty or loss, now or in the future.

What will happen to me if I take part?

The audit is a desk audit and takes place at a a time and place of your choosing. There is a time by which the audit must be completed however 1 August 2016.

The surveys involve your participation from a computer terminal near you. It is expected that you complete the audit or survey in its entirety.

What do I have to do?

The only expectation of your participation is to complete the audit or survey you begin.

Audit – upon completion of the audit an in person or phone conversation will be scheduled and recorded to verify and clarify any answers. Tapes will be identified only by a code, and will not be used or made available for any purposes other than the research project. These tapes will be destroyed and deleted at the end of the study.

Are there possible disadvantages and/or risks in taking part?

There are no discomforts, disadvantages or risks in taking part.

What are the possible benefits of taking part?

The predominant benefit in taking part in the research is to broaden our understanding and fill an important gap in knowledge of the uptake, usage, readiness and trends in education in CM Colleges

Will my taking part in this project be kept confidential?

All information collected about participants will be kept strictly confidential. All data will be identified only by a code, with personal details kept in a locked file or secure computer with access only by the immediate research team. As principle investigator my permission will be needed to allow restricted access to information collected about participants in the course of the project.

What will happen to the results of the research project?

Results will be presented at conferences and written up in journals. Results are normally presented in terms of groups of individuals. If any individual data are presented, the data will be totally anonymous, without any means of identifying the individuals involved. Data collected during the course of the project might be used for additional or subsequent research.

Who is organising and funding the research?

This research is part of a Phd project exploring the staff and student body at Endeavour College of Natural health and National College of Natural Medicine

Ethical review of the study

This project has received ethical approval from University of Technology Research Ethics Committee UTS HREC ETH16-0477

Contact for further information

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Appendix B Consent Form

An examination of the readiness and capacity of Colleges of Complementary Medicine to deliver quality educational outcomes in the training of health professionals using learning technologies and e-learning: A mixed method study in Australia and the US

I have been approached as a crucial stakeholder in this research project. As a student, an academic or a key administrator, I am a part of one of the largest colleges of CM in the world and are therefore at the cutting edge of changes in education and learning technologies in the CM space.

☐ I confirm that I have read and understand the Participant Information Sheet

☐ I have had the opportunity to ask questions and had them answered

☐ I understand that all personal information will remain confidential and that all efforts will be made to ensure I cannot be identified (except as might be required by law)

☐ I agree that data gathered in this study may be stored anonymously and securely, and may be used for future research

☐ I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason.

☐ I agree to take part in this study

Participant's signature

Print name and date

Investigator Signature

Print their name and date

Ethics Approval UTS HREC ETH16-0477

Appendix C Focus Group and IV Guide

Focus Groups

1. Background and beliefs about complementary medicine and its role
    1. Tell me what attracted you to study complementary medicine?
    2. What is your academic background?
    3. How has your involvement in complementary medicine impacted on your life outside of study?
    4. The influence of their biography of their experience (age, ethnicity)
2. Traditional knowledge and scientific research
    1. What do you understand the term 'traditional knowledge' to mean?
    2. How important is traditional knowledge to your personal experience of complementary medicine? To your future role as a practitioner?
    3. What about scientific research? What role do you expect science to play in your study and your future practice?
    4. How would you describe the balance between science and tradition in your studies at the moment?
    5. How does this balance compare to what you expected when you started studying?
    6. Would you like to see a change to this balance?
    7. What are the strengths and weaknesses of both science and tradition in complementary medicine?

3. Education delivery methods in the training of complementary medicine practitioners

    1. What types of learning environments have you experienced at this institution and elsewhere? What are your thoughts on these different environments?
    2. Tell me about your personal use of technology
    3. What are your views about the use of technology in society?
    4. How would you describe your personal relationship with technology?
    5. What is your experience of using technology for learning?
    6. How do you feel about technology being used as part of complementary medicine practitioner education?
    7. Are there any areas of practitioner education that you feel technology is better or worse suited?
    8. What has been your personal experience of using technology as part of your learning?

Appendix D Surveys

Learning Technologies in Complementary Medicine Education: Student Survey

Information Sheet and Consent

An examination of the readiness and capacity of Complementary Medicine Colleges to deliver quality educational outcomes in the training of health professionals using learning technologies and e-learning: A mixed method study in Australia and the US

Information about this research

Who Is Doing The Research?

My name is Alastair Gray and I am a researcher engaged in a PhD at the University of Technology Sydney

What Is This Research About?

Complementary Medicine (CM) continues to thrive across many countries. Alongside, and closely related to the continuing popularity of CM have been rising enrolments at CM education institutions. The professionalization of the CM education sector appears to be evolving with continuing professional education, education standards, levels of foundational medical science and higher levels of qualifications emerging and/or developing of late. More broadly beyond CM-specific education, tertiary students are increasingly engaging with technology in both their personal and study lives and technology-based learning and teaching in higher education is becoming almost a taken for-granted proposition in many undergraduate courses. However, despite the growth in CM education and the many current challenges and changes facing higher education more generally, there has been little research examining CM education. In direct response to this gap in our understanding, this research examines a number of key issues across the CM education field. The study will be completed in 2019.

Why have I been chosen?

You have been approached as you are a crucial stakeholder in the research. As a student, an academic or a key administrator, you are a part of one of the largest colleges of CM in the world and are therefore at the cutting edge of changes in education and learning technologies in the CM space.

If I Say Yes, What Will It Involve?

We will ask you to complete an online questionnaire that may take up to 10 minutes to complete. Your completion of this survey will be taken as your consent to participate.

Are There Any Risks/Inconvenience?

Yes, there is some inconvenience. This survey will take up to 10 minutes to complete.

What are the possible benefits of taking part?

The predominant benefit in taking part in the research is to broaden our understanding and fill an important gap in knowledge of the uptake, usage, readiness and trends in education in CM Colleges.

Will my taking part in this project be kept confidential?

All information collected about participants will be kept strictly confidential. All data will be identified only by a code, with personal details kept in a locked file or secure computer with access only by the immediate research team. As principle investigator my permission will be needed to allow restricted access to information collected about participants in the course of the project.

Do I Have To Say Yes?

You do not have to say yes. Your participation is completely voluntary.

What Will Happen If I Say No?

Nothing. We will thank you for your time so far and will not contact you about this research again.

If I Say Yes, Can I Change My Mind Later?

You can change your mind at any time and you do not have to say why. We will thank you for your time so far and won't contact you about this research again.

What If I Have Concerns Or A Complaint?

If you have concerns about the research that you think I or my colleagues can help you with, please feel free to contact me on emcintyre@csu.edu.au.

Ethical review of the study

This project has received ethical approval from University of Technology Research Ethics Committee UTS HREC ETH16-0477

Contact for further information

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Australia +61[redacted]

Student Survey

Who are you? Learner Demographics

ID: 38

1) Which of the following best describes the degree you are enrolled in?

Nutrition and Dietetic Medicine (ECNH)

Naturopathy (ECNH)

Myotherapy

Acupuncture

Complementary Medicine

Naturopathic Medicine (NUNM)

Nutrition (NUNM)

Acupuncture & Oriental Medicine

Global Health

Integrative Medicine Research

Integrative Mental Health

ID: 151

2) How many years of tertiary education have you completed before starting your current degree?

None

1 year

2 years

3 years

4 years

> 4 years

ID: 153

3) Which age group best describes you?

< 20 years

20-25 years

26-30 years

31-40 years

> 40 years

ID: 152

4) To which gender identity do you most identify?

Female

Male

Transgender male

Transgender female

Gender variant / non-conforming

Not listed

Prefer not to answer

Logic: Show/hide trigger exists.

ID: 330

5) Confidence and capability with digital technologies are essential to be a successful student in my area of study?

Strongly disagree

Disagree

Neutral

Agree

Strongly agree

Logic: Hidden unless: Question "Confidence and capability with digital technologies are essential to be a successful student in my area of study?" #5 is one of the following answers ("Strongly agree","Agree")

ID: 331

6) Which digital capabilities do you see as specifically as essential to be a successful student in your area?

ID: 332

7) Where is the first place you would think to go for assistance when faced with a new digital technology you must learn? (select all that apply)

My supervisor, or another knowledgeable lecturer on the topic.

Another College resource.

A friend, or another research student.

A coworker.

A family member.

Online; an online tutorial, user guides or question forum.

I would not look for assistance; I would just try to work it out for myself.

Other:

ID: 335

8) Please rate your agreement with the following statements

	Strongly disagree	**Disagree**	**Neither agree or disagree**	**Agree**	**Strongly agree**
I feel that using digital technologies has been critical to my study.					
I feel that using digital technologies will be a very important part of my career.					
The College has a responsibility to prepare me fully with the digital skills that I need.					
I entered this degree with a firm grasp of the digital technologies and skills I need.					
I have received ideal support from the College for learning digital technology skills.					

ID: 410

9) Do you agree or disagree with each of the following statements about the overall impact of today's digital technologies?

	Strongly Disagree	**Somewhat Disagree**	**Neutral**	**Somewhat Agree**	**Strongly Agree**
Today's digital technologies encourage greater collaboration among students					
Today's digital technologies allow students to share their work with a wider and more varied audience					

Today’s digital technologies encourage student creativity and personal expression					
Today’s digital technologies do more to distract students from course work than to help them academically					
The internet encourages learning by connecting students to resources about topics of interest to them					
The multimedia content available online today immerses students more fully in topics they study					
The availability of digital content has broadened my worldviews and perspectives					
Compared with previous generations, today’s students have fundamentally different cognitive skills because of the digital technologies they have grown up with					
Today’s digital technologies are creating an easily “distracted” generation with short attention spans					
Today’s students are really no different than previous generations, they just have different tools through which to express themselves					

Today's students are more media savvy than previous generations					
Today's students are more technology literate than previous generations					
Today's students are very skilled at multi- tasking					
Today's students are too familiar with digital technologies and need more time away from them					

ID: 420

10) How important do you feel each of the following skills is for you to be successful in your Complementary Medicine career?

	Not Important	**Somewhat Important**	**Neutral**	**Very Important**	**Essential**
Writing effectively					
Finding information quickly					
Judging the quality of information					
Communicating ideas in creative, engaging or interesting ways					
Presenting yourself effectively in online social networking sites					

Working with audio, video or graphic content					
Behaving responsibly online					
Understanding privacy issues surrounding digital and online content					

ID: 369

11) Overall, when it comes to knowing how to use digital technologies (such as the internet and email, social media or social networking sites, tech devices such as tablet computers, smartphones or gaming systems, apps, etc.) which of the following statements best describes you?

I usually know more than my teacher

My teacher usually knows more than I do

Our knowledge levels are usually about equal

ID: 437

12) How would you rate yourself with the following?

	Poor	**Fair**	**Good**	**Very Good**	**Excellent**
Understanding how online search results are generated					
Ability to use appropriate and effective search terms and queries					
Ability to assess the quality and accuracy of information I find online					
Ability to recognize bias in online content					
Patience and determination in looking for information that is hard to find					

Ability to use multiple sources to effectively support an argument					

ID: 446

13) Please answer the following questions about learning technologies in your course of study.

	Yes	No	Unsure
I have done assignments in which I am not permitted to use online search engines			
I have completed questions or assignments that require me to use a variety of sources, both online and offline			
I spend class time discussing how to assess the reliability of information I find online			
I spend class time discussing how search engines work and how search results are generated/ranked			
I spend class time improving search terms and queries			
I spend class time discussing how to generally conduct research using the internet			

ID: 455

14) Do you agree or disagree with each of the following statements?

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
The amount of information available online today is overwhelming					

Search engines have conditioned me to expect to be able to find information quickly and easily					
The internet enables me to find and use resources that would otherwise not be available to me					
The internet makes me more self-sufficient					
Today's digital technologies discourage me from finding and using a wide range of sources for my study					
Today's digital technologies make it harder for me to find and use credible sources					

ID: 472

15) Based on your experience, which of the following comes closest to your view of the impact of digital technologies on students today...

Today's digital technologies are narrowing the gap between the most and least academically successful students

Today's digital technologies are leading to even greater disparity between the most and least academically successful students

ID: 532

16) Which term describes you best when it comes to adopting new technology? Please note the broad definitions used in Diffusion of Innovation Theory.

Adopter Categories

Innovators *are eager to try new ideas, to the point where their venturesomeness almost becomes an obsession.*

Early adopters *tend to be integrated into the local social system more than innovators. The early adopters are considered to be localites, versus the cosmopolite innovators.*

Members of the ***early majority*** *category will adopt new ideas just before the average member of a social system. They interact frequently with peers, but are not often found holding leadership positions.*

The ***late majority*** *are a skeptical group, adopting new ideas just after the average member of a social system. Their adoption may be borne out of economic necessity and in response to increasing social pressure. They are cautious about innovations.*

Laggards *are traditionalists and the last to adopt an innovation (Rogers, 1971).*

Innovator

Early Adopter

Early Majority

Late Majority

Laggard

The role of practice enhancing technologies?

Looking forward, what are your perceptions and plans for applying practice enhancing technologies?

Logic: Show/hide trigger exists.

ID: 530

17) Tele-health is described as, '*a collection of means or methods for enhancing health care, public health, and health education delivery and support using telecommunications technologies. Tele-health encompasses a broad variety of technologies and tactics to deliver virtual medical, health, and education services.*'

Will you employ tele-health (distance or virtual consultations) in your practice?

Yes

No

Unsure

Logic: Hidden unless: Question "Tele-health is described as, '*a collection of means or methods for enhancing health care, public health, and health education delivery and support using telecommunications technologies. Tele-health encompasses a broad variety of technologies and tactics to deliver virtual medical, health, and education services.*'

Will you employ tele-health (distance or virtual consultations) in your practice?" #17 is one of the following answers ("No","Unsure")

ID: 492

18) You answered 'no' or 'unsure' to the question about using tele-health. Why?

It is not congruent with my values in natural medicine

I will not be using any tele-health in my work as my modality is hands on

I will not be using any tele-health in my work as I do not agree with it

I have never considered that I will be using some type of tele-health in my clinical work

Having a consultation by distance will negatively impact on the relationship with the practitioner?

There are more risks using this form of consultation than face to face consultations?

ID: 493

19) Please answer these questions about the time and resources devoted to tele-health, and its place in your College curriculum.

	Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Informal class-time has been used to discuss tele-health					
The amount of time devoted to discussing using learning technologies such as skype and face time in my modality has been simply informal conversations with fellow students					
Formal structured curriculum has been devoted to this subject					
Legal and ethical issues arising from tele-health implementation have been included in my curriculum					

Logic: Hidden unless: Question "Tele-health is described as, '*a collection of means or methods for enhancing health care, public health, and health education delivery and support using telecommunications technologies. Tele-health encompasses a broad variety of technologies and tactics to deliver virtual medical, health, and education services.*'

Will you employ tele-health (distance or virtual consultations) in your practice?" #17 is one of the following answers ("Yes")

ID: 500

20)

What are the reasons that clients might choose to have a distance consultation?

Logic: Hidden unless: Question "Tele-health is described as, '*a collection of means or methods for enhancing health care, public health, and health education delivery and support using telecommunications technologies. Tele-health encompasses a broad variety of technologies and tactics to deliver virtual medical, health, and education services.*'

Will you employ tele-health (distance or virtual consultations) in your practice?" #17 is one of the following answers ("Yes")

ID: 501

21)

Which method(s) do you potentially envisage using for your distance consultations?

ID: 528

22) In your College curriculum have you had any formal class time devoted to the use of clinical and practice management software and apps, such as CorePlus, HealthQuestSoftware, Ginko, ClinicEssentials, Clinko, LongGrassSystems, RadarOpus, Synergy, Points-PC etc?

No

Yes

Are you supported? - College Resources for Technology and Support

ID: 352

23) How often do you access the College's Learning Management System (LMS, Virtual Learning Environment, Moodle, BlackBoard)?

Every day

Often

Sometimes

Rarely

Never

ID: 354

24) Have you ever sought technical support from Library, online help service or technical staff for your own device eg laptop, tablet etc?

Never

Occasionally, perhaps once a semester or less

Very often, at least twice a semester

Other (please specify):

ID: 355

25) How would you rate the quality of the service you received from the online help service\

	Very dissatisfied	**Dissatisfied**	**Neutral**	**Satisfied**	**Very satisfied**
Professionalism of the help desk support staff?					
Communication and follow-up on problem resolution?					
Ability of the help desk to solve your problem?					
Time required to resolve your problem?					

Overall quality of the solution?					

ID: 333

26) Which of the following resources of the College have helped you to develop/strengthen your digital technologies skills and capabilities during your time as a student? (select all that apply)

I do not feel that any resources of the College have helped me to develop or strengthen my digital technologies skills.

One-to-one sessions with my supervisor or lecturers

Computer software obtained through the College which I use on my personal computer

IT services or Library staff

Workshops or other lecture sessions conducted by someone from outside my department

Other:

ID: 464

27) To what extent do you agree or disagree with the following statements

	Strongly Disagree	**Somewhat Disagree**	**Neutral**	**Somewhat Agree**	**Strongly Agree**
Overall, compared with other schools, our school is ahead of the curve when it comes to using digital technologies effectively					
My College does a good job providing the resources and support I need to effectively incorporate the newest digital technologies into curriculum and pedagogy					
My College currently provides me with formal training in how to incorporate					

digital technologies into the learning process					
I have sufficient access in College to the internet and other digital technologies they need to effectively complete College assignments					
I have sufficient access at home to the internet and other digital technologies they need to effectively complete College assignments					
It is imperative for Colleges to teach and assess today's students using the digital technologies they are most comfortable with					
Courses or content that focus on digital literacy must be incorporated into every College curriculum					
Courses or content that focus on how students should behave and treat others online must be incorporated into every school's curriculum					
It is necessary to manage students' use of cell phones and other technology in the classroom					
My campus has adequate WiFi for my needs					

My campus has sufficient facilities to recharge my electronic devices (laptop, smart phone, tablet, etc)?					
I found the LMS induction and orientation prepared me for online study					

Thank You!

ID: 1

Thank you for taking our survey. Your response is very important to us.

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Contact for further information

Alastair Gray
@gmail.com
USA +1
Australia +61

Academic Survey

Demographics

ID: 387

1) I am currently a staff member at ...

( ) Endeavour College of Natural Health

( ) National University of Natural Medicine

( ) Other: ____

ID: 465

2) How many years have you been teaching?

____

ID: 466

3) How many years have you been teaching at this institution?

____

ID: 469

4) To which gender identity do you most identify?

( ) Female

( ) Male

( ) Other

( ) Prefer not to answer

ID: 470

5) What is your current employment status?

( ) Permanent full time

( ) Permanent part time

( ) Contract/sessional teacher

Attitudes towards technology

ID: 269

6) How important do you feel each of the following skills is for your students to be successful in life?

	Not Important	**Somewhat Important**	**Neutral**	**Very Important**	**Essential**
Writing effectively	( )	( )	( )	( )	( )
Finding information quickly	( )	( )	( )	( )	( )
Judging the quality of information	( )	( )	( )	( )	( )
Communicating their ideas in creative, engaging or interesting ways	( )	( )	( )	( )	( )

Presenting themselves effectively in online social networking sites	( )	( )	( )	( )	( )
Working with audio, video or graphic content	( )	( )	( )	( )	( )
Behaving responsibly online	( )	( )	( )	( )	( )
Understanding privacy issues surrounding digital and online content	( )	( )	( )	( )	( )

ID: 259

7) To what extent do you agree or disagree with each of the following statements about the overall impact of contemporary digital technologies on students?

	Strongly Disagree	**Somewhat Disagree**	**Neutral**	**Somewhat Agree**	**Strongly Agree**
Contemporary digital technologies encourage greater collaboration among students	( )	( )	( )	( )	( )
Contemporary digital technologies allow students to share their work with a wider and more varied audience	( )	( )	( )	( )	( )
Contemporary digital technologies encourage student creativity and personal expression	( )	( )	( )	( )	( )
Contemporary digital technologies do more to distract students from schoolwork than to help them academically	( )	( )	( )	( )	( )

The internet encourages learning by connecting students to resources about topics of interest to them	( )	( )	( )	( )	( )
The multimedia content available online immerses students more fully in topics they study	( )	( )	( )	( )	( )
The availability of digital content has broadened my students' worldviews and perspectives	( )	( )	( )	( )	( )

ID: 247

8) Do you agree or disagree with each of the following statements about the students you teach at the College?

	Strongly disagree	**Somewhat disagree**	**Neutral**	**Somewhat Agree**	**Strongly Agree**
Compared with previous generations, contemporary students have fundamentally different cognitive skills because of the digital technologies they have grown up with	( )	( )	( )	( )	( )
Digital technologies are creating an easily "distracted" generation with short attention spans	( )	( )	( )	( )	( )
Contemporary students are really no different than previous generations, they just have different tools through which to express themselves	( )	( )	( )	( )	( )

Contemporary students are more media savvy than previous generations	( )	( )	( )	( )	( )
Contemporary students are more literate than previous generations	( )	( )	( )	( )	( )
Contemporary students are very skilled at multi- tasking	( )	( )	( )	( )	( )
Contemporary students are too familiar with digital technologies and need more time away from them	( )	( )	( )	( )	( )
Teaching practice is changing due to the availability of learning technologies	( )	( )	( )	( )	( )
I perceive confidence and capability with digital technologies as essential to be a successful academic in my area	( )	( )	( )	( )	( )
If there is another way, I would actively prefer to avoid using technology.	( )	( )	( )	( )	( )

ID: 361

9) Which term describes you best when it comes to adopting new technology? Please note the broad definitions used in Diffusion of Innovation Theory.

Adopter Categories

***Innovators** are eager to try new ideas, to the point where their venturesomeness almost becomes an obsession.*

***Early adopters** tend to be integrated into the local social system more than innovators. The early adopters are considered to be localites, versus the cosmopolite innovators.*

*Members of the **early majority** category will adopt new ideas just before the average member of a social system. They interact frequently with peers, but are not often found holding leadership positions.*

*The **late majority** are a skeptical group, adopting new ideas just after the average member of a social system. Their adoption may be borne out of economic necessity and in response to increasing social pressure. They are cautious about innovations.*

***Laggards** are traditionalists and the last to adopt an innovation (Rogers, 1971).*

( ) Innovator

( ) Early Adopter
( ) Early Majority
( ) Late Majority
( ) Laggard

ID: 368

10) What is the extent that you agree or disagree with the following statements?

	Strongly disagree	**Disagree**	**Neither agree or disagree**	**Agree**	**Strongly agree**
I feel that I can influence and recommend new technologies that will be used by my institution	( )	( )	( )	( )	( )
At work I'm enthusiastic about using new technologies	( )	( )	( )	( )	( )
In the past implementing new technologies has been a negative experience and impacted on my job	( )	( )	( )	( )	( )
Institutional technology projects generally succeed at improving my job	( )	( )	( )	( )	( )
I feel that I have a say in choosing which technologies are implemented in my area of work	( )	( )	( )	( )	( )
Worries about privacy and data protection have restricted the use of digital tools in my area of work	( )	( )	( )	( )	( )
Concerns about my professional image have impacted my use of digital tools at work	( )	( )	( )	( )	( )

I am concerned that using digital tools will have a negative impact on my work life balance	( )	( )	( )	( )	( )

ID: 246

11) Overall, when it comes to knowing how to use digital technologies (such as the internet and email, social media or social networking sites, tech devices such as tablet computers, smartphones or gaming systems, apps, etc.) which of the following statements best describes you?

( ) I usually know more than my students

( ) My students usually know more than I do

( ) Our knowledge levels are usually about equal

The impact of digital technology

ID: 297

12) Overall, how would you rate your students on each of the following?

	Poor	**Fair**	**Good**	**Very Good**	**Excellent**
Ability to understand how online search results are generated	( )	( )	( )	( )	( )
Ability to use appropriate and effective search terms and queries	( )	( )	( )	( )	( )
Ability to assess the quality and accuracy of information they find online	( )	( )	( )	( )	( )
Ability to recognize bias in online content	( )	( )	( )	( )	( )
Patience in looking for information that is hard to find	( )	( )	( )	( )	( )

Ability to use multiple sources to effectively support an argument	( )	( )	( )	( )	( )

ID: 306

13) To what extent do you agree or disagree with the following statements?

	Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
I give my students research assignments in which they are not permitted to use online search engines	( )	( )	( )	( )	( )
I develop research questions or assignments that require students to use a variety of sources, both online and offline	( )	( )	( )	( )	( )
I spend class time discussing with students how to assess the reliability of information they find online	( )	( )	( )	( )	( )
I spend class time discussing with students how search engines work and how search results are generated/ranked	( )	( )	( )	( )	( )
I spend class time helping students improve their search terms and queries	( )	( )	( )	( )	( )
I spend class time discussing with students how to generally conduct research using the internet	( )	( )	( )	( )	( )
I direct students to specific online resources which you feel are most appropriate for their assignments	( )	( )	( )	( )	( )

ID: 316

14) To what extent do you agree or disagree with the following statements?

	Strongly Disagree	**Somewhat Disagree**	**Neutral**	**Somewhat Agree**	**Strongly Agree**
The amount of information available online today is overwhelming for most students	( )	( )	( )	( )	( )
Search engines have conditioned students to expect to be able to find information quickly and easily	( )	( )	( )	( )	( )
The internet enables students to find and use resources that would otherwise not be available to them	( )	( )	( )	( )	( )
The internet makes students more self - sufficient researchers who are less reliant on your help	( )	( )	( )	( )	( )
Today's digital technologies discourage students from finding and using a wide range of sources for their research	( )	( )	( )	( )	( )
Today's digital technologies make it harder for students to find and use credible sources	( )	( )	( )	( )	( )

ID: 326

15) What impact has the internet and other digital technologies had on your teaching practice with regards to each of the following?

	Not At All	No Impact	Neutral	Minor Impact	Major Impact
Giving you access to more material, content, and resources to use in your teaching	( )	( )	( )	( )	( )
Allowing you to share ideas with other educators	( )	( )	( )	( )	( )
Enabling better interaction with your students	( )	( )	( )	( )	( )
Increasing the range of content and skills you need to be knowledgeable about	( )	( )	( )	( )	( )
Generally requiring more work for you as a teacher	( )	( )	( )	( )	( )

ID: 335

16) Do you agree or disagree with the following statements about incorporating digital technologies and digital learning into your classroom activities?

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
When it comes to incorporating digital technologies and digital learning into your classroom activities there is general resistance by colleagues and administrators	( )	( )	( )	( )	( )
I am hampered in incorporating digital technologies and digital learning into my classroom activities by time constraints	( )	( )	( )	( )	( )

I would like to incorporate digital technologies and digital learning into my classroom activities but I am pressured to teach to assessments	( )	( )	( )	( )	( )
There is a lack of resources and/or access to digital technologies among my students	( )	( )	( )	( )	( )
My own lack of comfort, knowledge or training with digital technologies is a challenge in incorporating digital technologies in the classroom	( )	( )	( )	( )	( )
There is a lack of technical support (such as repair, troubleshooting, set-up) to use digital technologies consistently	( )	( )	( )	( )	( )
Compared with other colleges, our College is more advanced when it comes to using digital technologies effectively	( )	( )	( )	( )	( )
Our College does a good job providing teachers the resources and support needed to effectively incorporate the newest digital technologies into College curriculum and pedagogy	( )	( )	( )	( )	( )
Our College currently provide teachers with formal training in how to incorporate digital technologies into the learning process	( )	( )	( )	( )	( )

Have you ever sought out opportunities, separate to those provided by the College, to learn more about incorporating digital technologies into the learning process	( )	( )	( )	( )	( )
Students have sufficient access in College to the internet and other digital technologies they need to effectively complete school assignments	( )	( )	( )	( )	( )
Today's digital technologies are narrowing the gap between the most and least academically successful students	( )	( )	( )	( )	( )
Today's digital technologies are leading to even greater disparity between the most and least academically successful students	( )	( )	( )	( )	( )
It is imperative for schools to teach and assess today's students using the digital technologies they are most comfortable with	( )	( )	( )	( )	( )
Courses or content that focus on digital literacy should be incorporated into the College curriculum	( )	( )	( )	( )	( )
It is necessary to manage students' use of cell phones and other technology in your classroom	( )	( )	( )	( )	( )

I use a greater range of technology in my personal life than is available at my institution	( )	( )	( )	( )	( )
Personal worries about privacy have restricted my use of digital tools	( )	( )	( )	( )	( )
I'm concerned that using digital tools will have a negative impact on my work life balance	( )	( )	( )	( )	( )

Complementary Medicine Specific Questions

Logic: Show/hide trigger exists.

ID: 443

17) Are you in clinical practice?

( ) Yes

( ) No

Logic: Hidden unless: Question "Are you in clinical practice?" #17 is one of the following answers ("Yes")

ID: 129

18) Please respond to these questions about your clinical practice?

	Yes	**No**
Do you use any clinical electronic software (s) in your CM clinical practice, (such as point location, repertory, nutritional programme software)?	( )	( )
Do you use any practice electronic software (s) in your CM clinical practice, (such as patient management software)?	( )	( )

Logic: Hidden unless: Question "Do you use any clinical electronic software (s) in your CM clinical practice, (such as point location, repertory, nutritional programme software)?" is one of the following answers ("Yes")

ID: 130

19) Which software (s) do you use?

____
____
____
____

Logic: Show/hide trigger exists. Hidden unless: Question "Do you use any clinical electronic software (s) in your CM clinical practice, (such as point location, repertory, nutritional programme software)?" is one of the following answers ("Yes")

ID: 440

20) Have you received training in how to use your practice software?

( ) Yes

( ) No

Logic: Hidden unless: Question "Have you received training in how to use your practice software?" #20 is one of the following answers ("Yes")

ID: 464

21) What was the formal training you received in how to use your practice or clinical software?

( ) Structured webinar

( ) Live in person seminar

( ) Series of recordings on line

( ) One on one session with remote coach

( ) One on one in person session

( ) Other: ____

Logic: Show/hide trigger exists. Hidden unless: Question "Are you in clinical practice?" #17 is one of the following answers ("Yes")

ID: 383

22) In the first intake (first consultation), do you consult your clients online or connect by phone in your clinical practice?

( ) Yes

( ) No

Logic: Hidden unless: Question "In the first intake (first consultation), do you consult your clients online or connect by phone in your clinical practice?" #22 is one of the following answers ("Yes")

ID: 441

23) What percentage of your practice (case taking) is conducted virtually (phone, face-time, text, skype, whats app etc).

( ) 75% >

( ) 50% - 75%

( ) 25% - 50%

( ) < 25%

( ) 0

Logic: Hidden unless: Question "In the first intake (first consultation), do you consult your clients online or connect by phone in your clinical practice?" #22 is one of the following answers ("Yes")

ID: 442

24) What percentage of your practice (case management) is conducted virtually (phone, face-time, text, skype, whats app etc).

( ) 75% >

( ) 50% - 75%

( ) 25% - 50%

( ) <25%

( ) 0

Logic: Hidden unless: Question "In the first intake (first consultation), do you consult your clients online or connect by phone in your clinical practice?" #22 is one of the following answers ("Yes")

ID: 416

25) Describe some of the major reasons that have made you make yourself available for virtual consultations?

____
____
____
____

ID: 116

26) To what extent do you agree or disagree with the following statements about the use of learning technologies in a Complementary Medicine education setting.

	Strongly Disagree	**Disagree**	**Neither Agree nor Disagree**	**Agree**	**Strongly Agree**
It is not possible to conduct quality clinical training in CM settings online	( )	( )	( )	( )	( )
It is not possible to conduct good supervision in CM online	( )	( )	( )	( )	( )
It is not possible to create a CM learning community online	( )	( )	( )	( )	( )
It is not possible to create a healing presence online	( )	( )	( )	( )	( )
It is not possible to learn counselling skills online	( )	( )	( )	( )	( )

It is not possible to learn rapport skills online	( )	( )	( )	( )	( )
It is not possible to fully read a patient's body language online	( )	( )	( )	( )	( )
It is not possible to gauge a patient's motivation online	( )	( )	( )	( )	( )
It is not possible to learn active listening skills online	( )	( )	( )	( )	( )
It is incongruous to use digital tools when studying something natural like CM	( )	( )	( )	( )	( )

Support for change, challenges and barriers to adopting new digital tools

ID: 223

27)

To what extent do you agree with these statement related to the challenges and barriers to adopting new digital tools?

	Strongly Agree	**Somewhat Agree**	**Neutral**	**Somewhat Disagree**	**Strongly Disagree**
My institution is supportive of new technologies and teaching tools.	( )	( )	( )	( )	( )
My institution has formal process for communicating ideas to management for implementing new digital tools.	( )	( )	( )	( )	( )
Does your institution support personal digital	( )	( )	( )	( )	( )

tools you use in your teaching work					
I cannot implement change due to budget constraints.	( )	( )	( )	( )	( )
Training for new digital technologies is rarely available at my institution.	( )	( )	( )	( )	( )
Time is made available to explore the use of new digital tools at my institution.	( )	( )	( )	( )	( )

ID: 235

28) Highlight the types of assistance you would seek when faced with a new digital technology you must learn (select all that apply)

( ) My supervisor, or another knowledgeable lecturer on the topic.

( ) Another College resource.

( ) A friend, or another research student.

( ) A coworker.

( ) A family member.

( ) Online; an online tutorial, user guides or question forum.

( ) I would not look for assistance; I would just try to work it out for myself.

( ) Other: ____

ID: 236

29) Which of the following resources of the College have helped you to develop/strengthen your digital technologies skills and capabilities during your time as an academic (answer all that apply)?

( ) I do not feel that any resources of the College have helped me to develop or strengthen my digital technologies skills.

( ) One-to-one sessions with my supervisor or other

( ) Lecturers

( ) Computer software obtained through the College which I use on my personal computer
( ) Shared computer labs at the College
( ) IT services
( ) The Library
( ) Workshops or other lecture sessions conducted by lecturers or staff in my department
( ) Workshops or other lecture sessions conducted by someone from outside my department

Thank You!

Appendix E Ethics Approval Letters UTS

Dear Applicant,

The Faculty has considered your Nil/Negligible Risk Declaration Form for your project titled, "An examination of the readiness and capacity of Colleges of Complementary Medicine to deliver quality educational outcomes in the training of health professionals using learning technologies and e-learning: A mixed method study in Australia and the US", and agree your research does not require review from the UTS Human Research Ethics Committee. Please keep a copy of your Declaration form on file to show you have considered risk.

For tracking purposes, you have been provided with an ethics application number, which is UTS HREC ETH16-0477.

I also refer you to the AVCC guidelines relating to the storage of data, which require that data be kept for a minimum of 5 years after publication of research. However, in NSW, longer retention requirements are required for research on human subjects with potential long-term effects, research with long-term environmental effects, or research considered of national or international significance, importance, or controversy. If the data from this research project falls into one of these categories, contact University Records for advice on long-term retention.

You should consider this your official letter of noting.

Instructions for saving the declaration form can be downloaded from: https://staff.uts.edu.au/howdoi/Pages/Researching/Research%20ethics/Human%20research%20ethics/submit-my-human-research-ethics-application.aspx

To access this application, please follow the URLs below:
* if accessing within the UTS network: https://rm.uts.edu.au
* if accessing outside of UTS network: https://remote.uts.edu.au, and click on "RM6 - Research Master Enterprise" after logging in.

If you or anyone connected with this research have any queries please do not hesitate to contact Research.Ethics@uts.edu.au

Yours sincerely,

Professor Marion Haas
Chairperson
UTS Human Research Ethics Committee
C/- Research & Innovation Office
University of Technology, Sydney
E: Research.Ethics@uts.edu.au

https://staff.uts.edu.au/topichub/Pages/Researching/Research%20ethics/Human%20research%20ethics/human-research-ethics.aspx

PO Box 123, BROADWAY NSW 2007

[Level 14, Building 1, Broadway Campus]

REF: E28

Appendix F Ethics Approvals UTS and Letter of Support

University Technology Sydney

FWA FWA00004785

IRB Registration IRB00002821

(ETH16-0477 - 12220214, Alastair Gray - Nil/Negligible Risk Amendment to Survey)

Ethics Secretariat
Important 24 May 2016 at 10:14 pm

UTS HREC Letter of Noting - ETH16-0477

To: Alastair Gray, Jon Adams, Amie Steel, Ethics Secretariat

Dear Applicant,

The Faculty has considered your Nil/Negligible Risk Declaration Form for your project titled, "An examination of the readiness and capacity of Colleges of Complementary Medicine to deliver quality educational outcomes in the training of health professionals using learning technologies and e-learning: A mixed method study in Australia and the US", and agree your research does not require review from the UTS Human Research Ethics Committee. Please keep a copy of your Declaration form on file to show you have considered risk.

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You should consider this your official letter of noting.

Instructions for saving the declaration form can be downloaded from: https://staff.uts.edu.au/howdoi/Pages/Researching/Research%20ethics/Human%20research%20ethics/submit-my-human-research-ethics-application.aspx

To access this application, please follow the URLs below:
* if accessing within the UTS network: https://rm.uts.edu.au
* if accessing outside of UTS network: https://remote.uts.edu.au, and click on "RM6 - Research Master Enterprise" after logging in.

If you or anyone connected with this research have any queries please do not hesitate to contact Research.Ethics@uts.edu.au

Yours sincerely,

Professor Marion Haas
Chairperson
UTS Human Research Ethics Committee

Priya Nair
5 April 2017 at 2:20 am
Details
PN

Ethics ETH16-0477 - 12220214, Alastair Gray - Nil/Negligible Risk Amendment to Survey - Approved by ADR

To: Alastair Gray, Cc: Chris Fernandes, Priya Nair

Dear Alastair

Your request has been approved today, 5 April 2017 by the Associate Dean Research Prof Fiona Brooks.

If you need any further clarification, please contact me at priya.nair@uts.edu.au

Best regards
Priya Nair
Research Projects Administrator
Faculty of Health | **University of Technology Sydney**
UTS Building 10, Level 7, Rm 280
235 Jones St, Ultimo NSW 2007 (PO Box 123)
T +61 2 9514 4834 **E** priya.nair@uts.edu.au **W** health.uts.edu.au

ENDEAVOUR
COLLEGE OF NATURAL HEALTH

13 February 2015

TO WHOM IT MAY CONCERN

Re: Research Project – Training Complementary Medicine Practitioners in the New Millennium

Endeavour College of Natural Health agrees to provide logistical support to recruitment of participants for the proposed research project "Training Complementary Medicine Practitioners in the New Millennium".

I am aware that this project is led by Dr Amie Steel (University of Technology Sydney/Endeavour College of Natural Health) in collaboration with Professor Jon Adams (University of Technology Sydney) and Dr Heather Zwickey (National College of Natural Medicine).

The support offered by Endeavour College for this project includes undertaking email invitations to our current student base to assist with recruitment.

We are also happy to provide any other support as appropriate to assist with the successful completion of the project.

Regards

Production Note:
Signature removed
prior to publication.

Carolyn Barker AM
CEO
Endeavour College of Natural Health
Australian College of Natural Medicine Pty Ltd

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ABN 57 061 868 264

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F: +617 3257 1889

Gold Coast
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F: +617 5503 0988

Melbourne
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F: +613 9662 9414

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F: +618 9225 2999

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F: +612 8204 7799

endeavour.edu.au

Appendix G Ethics Approvals NUNM and Letter of Support National University of Natural Medicine

FWA00003419

IRB Registration 00002896

(NUNM IRB# AG05052017).

Kendal Kubitz 5 May 2017 at 2:07 pm KK

RE: IRB Chair Response Details

To: Alastair Gray, Cc: Heather Zwickey

Dear Mr. Alastair Gray,

Attached, please find your approval letter for your exempt status of study "An examination of the readiness and capacity of Complementary Medicine Colleges to deliver quality educational outcomes in the training of health professionals using learning technologies and e-learning: A mixed method study in Australia and the US" (NUNM IRB# AG05052017).

Please let me know if I can be of any further assistance.

Celebratory Regards,

Kendal Kubitz

Institutional Review Board Liaison

Study Coordinator

503.552.1749 | nunm.edu

NATIONAL UNIVERSITY OF Natural Medicine

facebook | twitter | instagram

From: Al Gray [mailto:[redacted]@gmail.com]
Sent: Thursday, May 04, 2017 7:59 AM
To: Kendal Kubitz <kkubitz@nunm.edu>
Cc: Heather Zwickey <hzwickey@nunm.edu>
Subject: Re: IRB Chair Response

nunm NATIONAL UNIVERSITY OF Natural Medicine | Helfgott RESEARCH INSTITUTE

Rev 07/19/16 kbk

EXEMPTION AND EXPEDITED REVIEW FORM for NUNM's Institutional Review Board (IRB)

Exempt Status Research

Research is eligible to be reviewed for exempt status by an IRB committee member if it involves very minimal or no risk to participants. In general, research that does not propose to disrupt or manipulate the normal life experiences of participants, incorporate any form of intrusive procedures, or involve intentional deception will be exempt from full committee review.

Please note that **all of the rights and protection afforded to human subjects in research are required in exempt status cases.** In short, research with exempt status **is exempt only from full committee review.** Investigators engaged in human subject research that qualifies for exempt status **must still complete a full application and prepare an informed consent statement.**

Research that involves protected classes or vulnerable populations (such as prisoners, pregnant women, mentally disabled persons, research by a faculty member on his/her own students) is never exempt.

Expedited Status Research

Expedited review is a procedure through which certain kinds of research may be reviewed and approved without convening a meeting of the entire IRB. The term "expedited" does **not** mean a review is quicker or conducted with less rigor. It means fewer reviewers are required for approval.

In general, research may be considered for expedited review if it involves no more than minimal risk, does not include intentional deception, does not employ vulnerable populations or sensitive topics, and includes appropriate consent procedures. Please note that **all of the rights and protection afforded to human subjects in research are required in expedited status cases.** Investigators engaged in human subject research that qualifies for expedited status **must still complete a full application and prepare an informed consent statement.**

To be considered for exempt or expedited status, research must fall into one of the categories listed below. However, the IRB may determine that a full committee review is necessary if the research poses risks or ethical concerns.

Please complete this form and submit it to the IRB Liaison with all required documents for initial IRB review.

Study Title: An examination of the readiness and capacity of Complementary Medicin

Principal Investigator (PI): Alastair Gray (Prof Jon Adams, Dr

PI Telephone Number: [redacted] **PI Email:** [redacted]@gmail.co

Submission with petition for EXEMPTION - this project is:

- ☒ Research conducted in established or commonly accepted educational settings, involving normal educational practices.
- ☒ Research involving the use of educational tests, survey procedures, interview procedures, or observation of public behavior.
- ☐ Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens.
- ☐ Research and demonstration projects which are designed to study, evaluate, or otherwise examine public benefit or service programs.
- ☐ Taste and food quality evaluation and consumer acceptance study.

Please Note: Survey/interview procedures are 'Non-Exempt' under any of the following conditions:

a. Responses are recorded in such a manner that the participant can be identified, either directly or through linked identifiers.
b. Responses, if they become known outside the research setting, could reasonably place the participant at risk of criminal or civil liability or be damaging to the participant's financial standing, employability, or reputation within the community.
c. Research deals with sensitive aspects of participant's own behavior, such as illegal conduct, use of alcohol, drugs or other addictive substances.
d. Questions ask about sexual attitudes, preferences, or practices.
e. Questions request information pertaining to a participant's psychological well-being or mental health.
f. Research involves HIV status information.

Submission with petition for EXPEDITED review - this project is:

- ☐ A clinical study of drugs for which an investigational new drug application is not required.
- ☐ Research on medical devices for which an investigational device exemption application is not required; or the medical device is cleared/approved for marketing and the medical device is being used in accordance with its cleared/approved labeling.
- ☐ Research involving collection of blood samples by finger stick, heel stick, ear stick, or venipuncture per the Office for Human Research Protections expedited review guidelines.
- ☐ Research involving prospective collection of biological specimens for research purposes by noninvasive means.
- ☐ Research involving collection of data on subjects 18 years of age or older through noninvasive procedures routinely employed in clinical practice.
- ☐ Research involving materials that have been collected, or will be collected solely for non-research purposes.
- ☐ Research involving collection of data from voice, video, digital, or image recordings made for research purposes.
- ■ Research on individual or group characteristics or behavior; or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Additional Notes:

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PI Signature

5/4/17
Date

Institutional Review Board Decision:

Review Date: May 5, 2017 **IRB Number:** AG5052017

■ IRB Exemption Approved

If an exemption is approved, file this form along with all proposal documents where they can be easily accessed and identified.

☐ IRB Exemption Not Approved (Please see comments on original documents.)

If the exemption is not approved, the IRB Liaison will contact the PI to inform them that the study has not been exempted and will be reviewed by the IRB.

☐ IRB Expedited Review Approved (Please see comments on original documents.)

If an expedited review is approved, file this form along with all proposal documents where they can be easily accessed and identified.

☐ IRB Expedited Review Not Approved (Please see comments on original documents.)

If the expedited review is not approved, the IRB Liaison will contact the PI to inform them that the study has not been approved for expedited review and will be reviewed by the full IRB.

Production Note:

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IRB Chairperson Signature

5/05/2017

Date

February 19, 2015

Amie Steel
Associate Director of Research
Endeavour College of Natural Health

Dear Dr. Steel,

I am writing to express NCNM's full support of the research project "Training complementary medicine practitioners for the new millennium". We are willing and able to assist with local logistical coordination of the project, data interpretation and manuscript preparation.

NCNM will also help to facilitate recruitment of students for the focus group component of the project, including emailing students to invite them contact the research team if interested.

With our best wishes for a successful project,

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prior to publication.

Heather Zwickey, PhD
Dean of Research and Graduate Studies
Director of Helfgott Research Institute
Professor of Immunology
National College of Natural Medicine

Appendix H Institutional Research Approval Letters

Endeavour College

ENDEAVOUR
COLLEGE OF NATURAL HEALTH

13 February 2015

TO WHOM IT MAY CONCERN

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The support offered by Endeavour College for this project includes undertaking email invitations to our current student base to assist with recruitment.

We are also happy to provide any other support as appropriate to assist with the successful completion of the project.

Regards

Production Note:

Signature removed
prior to publication.

Carolyn Barker AM
CEO
Endeavour College of Natural Health
Australian College of Natural Medicine Pty Ltd

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endeavour.edu.au

Australian College of Natural Medicine Pty Ltd (ACNM) trading as Endeavour College of Natural Health, College of Natural Beauty, FIAFitnation, Wellnation
National CRICOS Provider Number 00231G

February 19, 2015

Amie Steel
Associate Director of Research
Endeavour College of Natural Health

Dear Dr. Steel,

I am writing to express NCNM's full support of the research project "Training complementary medicine practitioners for the new millennium". We are willing and able to assist with local logistical coordination of the project, data interpretation and manuscript preparation.

NCNM will also help to facilitate recruitment of students for the focus group component of the project, including emailing students to invite them contact the research team if interested.

With our best wishes for a successful project,

Production Note:
Signature removed prior to publication.

Heather Zwickey, PhD
Dean of Research and Graduate Studies
Director of Helfgott Research Institute
Professor of Immunology
National College of Natural Medicine

Appendix I Articles and Manuscripts and Tables – Chapter 2

Manuscript associated with results reported in chapter 2. Gray AC, Steel A, Adams J. Gray (2020) Critical integrative review of complementary medicine education research: key issues and empirical gaps.

Gray *et al. BMC Complementary and Alternative Medicine* _###################_
https://doi.org/10.1186/s12906-019-2466-z

BMC Complementary and Alternative Medicine

RESEARCH ARTICLE

Open Access

A critical integrative review of complementary medicine education research: key issues and empirical gaps

Alastair C. Gray[1,2,3,6*], Amie Steel[4] and Jon Adams[5]

Abstract

Background: Complementary Medicine (CM) continues to thrive across many countries. Closely related to the continuing popularity of CM has been an increased number of enrolments at CM education institutions across the public and private tertiary sectors. Despite the popularity of CM across the globe and growth in CM education/education providers, to date, there has been no critical review of peer-reviewed research examining CM education undertaken. In direct response to this important gap, this paper reports the first critical review of contemporary literature examining CM education research.

Methods: A review was undertaken of research to identify empirical research papers reporting on CM education published between 2005 and 17. The search was conducted in May 2017 and included the search of PubMed and EBSCO (CINAHL, MEDLINE, AMED) for search terms embracing CM and education. Identified studies were evaluated using the STROBE, SRQP and MMAT appraisal tools.

Results: From 9496 identified papers, 18 met the review inclusion criteria (English language, original empirical research data, reporting on the prevalence or nature of the education of CM practitioners), and highlighted four broad issues: CM education provision; the development of educational competencies to develop clinical skills and standards; the application of new educational theory, methods and technology in CM; and future challenges facing CM education. This critical integrative review highlights two key issues of interest and significance for CM educational institutions, CM regulators and researchers, and points to number of significant gaps in this area of research. There is very sporadic coverage of research in CM education. The clear absence of the robust and mature research regarding educational technology and e-learning taking place in medical and or allied health education research is notably absent within CM educational research.

Conclusion: Despite the high levels of CM use in the community, and the thriving nature of CM educational institutions globally, the current evidence evaluating the procedures, effectiveness and outcomes of CM education remains limited on a number of fronts. There is an urgent need to establish a strategic research agenda around this important aspect of health care education with the overarching goal to ensure a well-educated and effective health care workforce.

Keywords: Complementary medicine, Education, Andragogy, Challenges, Learning technologies, E-learning, Naturopathy, Education research

* Correspondence: Alastair.Gray@endeavour.edu.au
[1]PhD Candidate Australian Research Centre in Complementary and Integrative Medicine (ARCCIM), Faculty of Health, University of Technology Ultimo, Sydney, NSW, Australia
[2]Director New Zealand Operations and Academic Lead, College of Natural Health and Homeopathy, Auckland, New Zealand
Full list of author information is available at the end of the article

Background

The practice, uptake and economics of Complementary Medicine (CM) - a range of therapies, products and approaches to health and illness not traditionally associated with the medical profession or medical curriculum [1] - continues to thrive in many countries [2–7] and concurrently the enrolments at CM education institutions have steadily increased [8, 9]. CM education institutions providing training and qualifications including naturopathy, nutritional medicine, homeopathy, acupuncture, massage therapy and herbal medicine are located across both the public and private tertiary sector in many regions, Australia [10], USA [11], UK [12], Asia [13]. The professionalization of the CM education sector appears to be evolving with continuing professional education, education standards, levels of foundational medical science and higher levels of qualifications emerging in recent years [14–18].

These education institutions face innumerable challenges. These include preparing CM graduates to function as health professionals in a contemporary health system when they apply predominantly traditional principles and concepts [19, 20]. Another challenge is training students in inter-professional care when the focus during training is often on mastering a traditional technique or philosophy [21]. Further challenges involve providing education about evidence-based healthcare when the focus during training is often on learning and applying traditional evidence - defined here as evidence with a long and coherent history of use, well documented in monographs such as materia medica and other texts, mainly inductive in nature, and passed on orally over many generations [22]. This is pertinent in a field that has 700 Cochrane systematic reviews yet one where traditional evidence and knowledge is also highly regarded. Further, providing education on patient-centred care [23], supporting non-traditional students [24, 25] and also gaining funding for and providing education related to perceived non-credible CM modalities in conventional tertiary education settings are challenges [26]. In addition, challenges continue to arise for education leaders both within and beyond CM regarding technological advances and the consequences for students, educators and institutions [27–29]. New developments in healthcare such as e-health/tele-health [30] and a growth in interest in the pedagogy and andragogy of online learning [31, 32] in general, present challenges for educational institutions, professional associations and regulators. Alongside these general educational challenges, faculty resistance to change, the digital divide between students, and between students and faculty, and online readiness for study has been a focus of recent research and discourse in health education [33–36]. More broadly, beyond CM-specific education, tertiary students are increasingly engaging with technology in both their personal and study lives [37, 38] and technology-based learning and teaching in higher education is becoming almost a presumed proposition in many undergraduate courses [39, 40]. CM education is not exempt from such circumstances and there is a necessity for future research on this topic.

In direct contrast to research related to CM practitioner education, there are numerous studies investigating the degree of, and attitudes to CM in conventional medical training [41–43], in biomedical education [44], midwifery [45], pharmacy [46–48] and in nursing training [44, 49–52]. Paradoxically, much of the research regarding CM education relates to its importance and application in nursing education [53], or the experience of integrating naturopathy into nursing educational programs [54], the education of physicians about their patients and CM [55], or addressing the obstacles to success in the implementing of change in science delivery in nursing [56].

The growing CM workforce requires training appropriate to performing evidence-informed, co-ordinated and inter-professional care within the broader health system and developing the evidence-base on this topic will not only aid the CM field but also provide potential insights for health/medical education more broadly [57]. The development of a robust evidence-base on this topic requires a clear understanding of the current landscape. Unfortunately, there has been no critical review of the peer-reviewed research examining CM education to date. In direct response to this important research gap, this paper reports the first critical review of contemporary literature examining a number of key issues across the CM education field.

Methods

Aim

The aim of this critical integrative review [58] was to review all published original research found in peer-reviewed literature examining education within higher educational institutions that provide training for CM professionals.

Method

A database search was undertaken to identify original peer-reviewed literature published from 2005 to 2017 reporting on issues relating to CM education. This date range was chosen to reflect contemporary issues and ensure findings were as pertinent to current practice and policy as possible.

Search strategy

The search was conducted in May 2017 and included the systematic search of PubMed and EBSCO (CINAHL, MEDLINE, AMED). MESH terms and keywords from related papers were explored to guide the process of selecting search terms, and the process was further refined after referral to a related 2014 review [59]. The first stage was conducted in PubMed. Search A - The search terms embracing CM included, Complementary Therapies, Complementary Medicine, Homeopathy, Naturopathy, Herbal Medicine, Acupuncture, Acupuncture Therapy, Medicine, Chinese Traditional, Massage, Therapy, Soft Tissue, Integrative Medicine, Medicine, Traditional, Holistic Health, Osteopathic Medicine, Manipulation, Chiropractic, Musculoskeletal Manipulations, Physical Therapy Modalities. Filter 2005–2017. ($n = 258{,}099$). Search B - The search terms embracing education included, education, learning, curriculum, teaching, health occupation students, eLearning, E-Learning, online learning, educational technologies, blended learning. Filter 2005–2017. ($n = 906{,}575$). A + B Combined (*n = 38,441)*. Stage 2 was conducted in EBSCO. The same search terms used in PubMed when entered into EBSCO provided millions of hits, education ($n = 160 + M$) hits, Complementary Therapies ($n = 629{,}674$) hits and too many potential papers to work. Including 'eLearning' and 'e-learning' was manageable but these two terms with 'learning technologies' made it impossible to proceed. In the process, a review was located which had used similar terms but a different strategy, Milanes 2014 systematic review, *Is a blended learning approach effective for learning in allied health clinicians?* Because of the enormous number of hits using the EBSCO database, and based on this article a revised search method was undertaken for the EBSCO search. Search C - EBSCO Search terms, 1. Online learning OR blended learning or web-based learning, 2. e-learning OR elearning, 3. education* OR curriculum* OR teaching* OR learn*, 4. Combine all (1–3) with AND 5. Complementary Therapies*, 6. Search 4 AND 5 ($n = 637$), 7 Limit to articles from 2005 ($n = 567$ (with duplicates removed)). Search D - This process was completed again searching on the slightly different terminology. Search terms, 1. Online learning OR blended learning or web-based learning, 2. e-learning OR elearning, 3. education* OR curriculum* OR teaching* OR learn*, 4. Combine all (1–3) with AND, 5. Complementary Medicine*, 6. Search 4 AND 5 = 1203, 7. Limit to articles from 2005 = ($n = 1013$ (with duplicates removed)). Stage 3 (Milanes Refined) PubMed. Search E - The search terms Health occupation students OR educational technologies OR teaching OR curriculum AND complementary therapies, filter to last 10 years. Search results = ($n = 8439$). Totals: Search C – $n = 567$, Search D – $n = 1013$, Search E – $n = 8439$. Total Papers $n = 10{,}019$. Duplicates removed $n = 523$. Grand Total 9496. Manual searching of reference lists of identified papers was also conducted to ensure as full coverage of literature as possible.

Inclusion and exclusion criteria

Papers written in English, presenting original empirical research data, related to courses where graduates receive a qualification in a CM to a standard accepted by those professions and reporting on the prevalence or nature of the education of CM practitioners in some way were included in the review. Papers reporting conference presentations, or studies relating to how pharmacy, nursing or registered medical professionals are educated regarding their patient behaviours or looking to how they accumulate CPD points in short term CM topics were excluded.

Search outcomes

The combined (Complementary Therapies $n = 420{,}476$ and Education $n = 102{,}024$) search results ($n = 9927$) were imported into Endnote. Of these, 9895 papers were excluded via title and abstract due to not meeting the inclusion criteria, and all identified duplicates ($n = 280$) were excluded leaving 32 papers. Upon reviewing full papers an additional 26 articles were excluded due to their focus on just allied health and / or only learning technologies with no CM focus; leaving 6 papers. A total of 12 additional papers were identified for review following manual searches. In total, 18 papers were identified for this review. The process undertaken for this review is presented in Fig. 1.

Critical analysis of included papers

Our critical literature appraisal employed three analytical tools, STROBE [60, 61], SRQR [62] and MMAT [63]. Papers were evaluated for quality and the findings are collated in Table 1.

Results

Of 9927 identified papers, 18 papers met the review inclusion criteria. An overall synopsis of all papers included in the review incorporated preliminary categorical analysis is outlined in Table 2. The identified studies were conducted in Australia ($n = 7$), the US ($n = 5$), Norway ($n = 2$) and one each from Canada, Taiwan, Israel and India. The research designs reported in the reviewed literature varied widely with quantitative, qualitative and mixed methodologies reported. The quantitative studies selected for review utilized a number of survey design approaches and attracted samples of between 10 and 246 individual participants. The qualitative studies identified employed survey methods [1, 2, 8–14, 18] as well as interviews [1, 6, 11, 15, 16], open essays [2] and focus groups [17]. The spread, focus and identification of themes and topics by CM therapy is represented in Table 2. The naturopathic profession has received most attention from researchers within the international CM education landscape, followed by acupuncture. There are

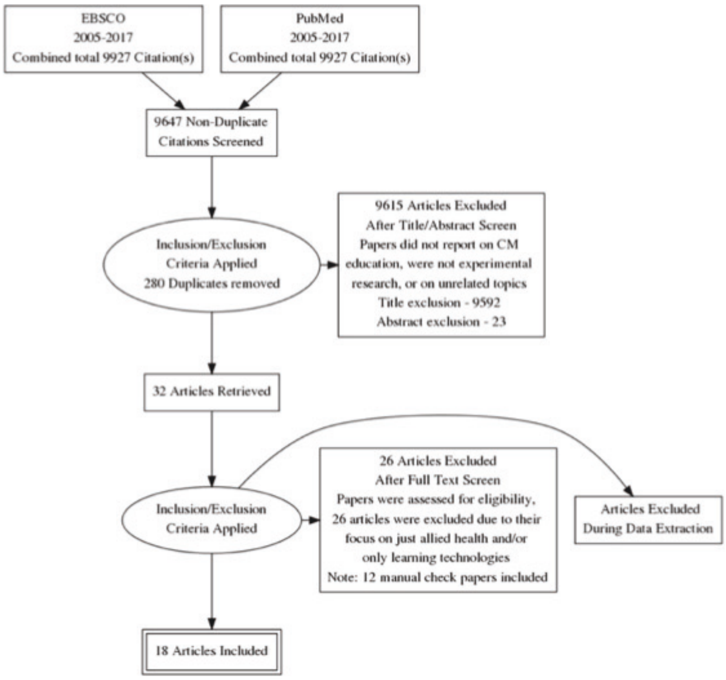

Fig. 1 Literature Review Methodology and Selection Process flowchart for articles reporting education and CM (PRISMA Guidelines)

three studies on homeopathy, two studies of chiropractic, and one each of osteopathy, herbal medicine, ayurveda and massage. Six of the included studies focus on a specific class inside of a CM college [1–4, 7, 17], four on academics in CM institutions [6, 12, 16], four studies surveyed members of professional associations [5, 10, 17], and four surveyed College directors [8, 9, 13, 18]. Thematic categorization of the included papers identified four substantive topic areas: (1) CM education provision, (2) the development of educational competencies to develop clinical skills and standards, (3) the application of existing and new educational theory, methods and technology in CM, and (4) future challenges facing CM education.

CM education provision

The review identified three papers that reported a simple description of educational provision in an area of CM. One study compared naturopathy and chiropractic curricular in Australia. Course structures and subject unit descriptions for accredited naturopathic courses were examined from websites where they existed and in some instances short follow-up interviews were conducted. This study reported the percentage of curriculum devoted to medical sciences and clinical training whereby it was found that on average, chiropractic courses allocated 45.9% of their curricula to medical sciences, whereas university-based naturopathy courses allocated 26.2% to medical science and non-university naturopathy courses allocated 23.1% [64]. Another study reported on the scope of education provision in homeopathy and examined the preponderance of accredited full-time and part-time courses and accredited and non-accredited courses in Europe. This cross-sectional survey of 85 homeopathy education providers found an average of 47 enrolled students and 142 graduates in these generally small schools. Course duration lasted on average 3.6 years part-time, less than half had entry requirements, provided any medical science education or required students to obtain medical science tuition elsewhere. Average teaching hours at surveyed schools were 992 overall, with 555 h devoted to didactic homeopathy study, while the rest focused on clinical training [65]. A similar 2009 study focused on the demographics, satisfaction, challenges and expectations of homeopathy students, teachers and school administrators in North America. The study consisted of three separate surveys targeted at homeopathy students, faculty and school directors consisting of 40 questions with a 91.5%

Table 1 STROBE Critical Appraisal Tool for Quantitative Studies

Study	Title Abstract and Introduction			Methods								
	Title Abstract	Background	Objectives	Study design	Setting	Participants	Variables	Data sources	Bias	Study size	Quantitative Variables	Statistical Methods
Forman, L., et al. 2006	x	x	x	x	x	x	x	x		x		x
Grace, S., et al. 2006	x	x	x	x	x	x	x	x		x		x
McCabe, P., 2008	x	x		x	x	x	x	x		x		
Rowe T 2009	x	x		x	x	x	x	x	x	x		
Steel, A., et al. 2015	x	x	x	x	x	x	x	x	x	x	x	x
Viksveen, P., 2011	x	x	x	x	x	x	x	x		x	x	x
SRQR Critical Appraisal Tool for Qualitative Studies												
Study	Title & Abstract		Introduction		Methods							
	Title Abstract	Background	Problem Formation	Purpose of the research question	Qualitative approach and research paradigm	Researcher characteristic and reflexivity	Context	Sampling strategy	Ethics pertaining to human subjects	Data collection methods	Collection instruments and tech	Units of study
Chen, Y., et al. 2015	x	x	x	x	x		x	x	x			x
Grant, A., et al. 2012	x	x	x	x	x		x	x	x	x		x
Viksveen, P., et al. 2015	x	x	x	x	x		x	x	x	x		x
Wardle, J., et al. 2013	x	x	x	x			x	x	x	x		x
Wardle, J. and Sarris, J., 2014	x	x	x	x			x	x		x		x
MMAT Critical Appraisal Tool for Mixed Methods Studies												
Study	1. QUAL study or QUAL component of an MM study				2. QUAN randomized controlled trial or component of an MM study				3. QUAN nonrandomized study (comparison group) or component of an MM study			
	Sources of data relevant to answer the research question	Data analysis relevant to answer the question	Context taken into account in data analysis	Reflexivity of researchers (their influence on findings)	Appropriate randomization (or sequence generation)	Concealment allocation (or blinding)	Complete outcome data	Low dropout rate	Recruitment minimizing bias	Appropriate measurement (validated or standard)	Similar participants in groups (or differences analyzed)	Complete data, high response rate, and appropriate follow-up
Frenkel, M., et al. 2007	x		x									x
Grace, S., et al. 2007	x		x				x	x		x	x	x
Joshi, H., et al. 2013	x		x		x				x	x	x	
Long, C., et al. 2014	x		x		x		x	x	x			
Schwartz, J., 2010	x	x	x		x		x		x	x	x	x
Toupin April, K., et al. 2013	x		x		x		x		x	x	x	x
Zwickey H et al. 2014	x	x	x		x		x	x	x	x	x	x

Table 1 STROBE Critical Appraisal Tool for Quantitative Studies *(Continued)*

Study	Results					Discussion and other information					Score/22
	Participants	Descriptive data	Outcome data	Main results	Other analyses	Key results	Limitations	Interpretation	Geralisability	Funding	Score Out of 22
Forman, L., et al. 2006	x	x	x	x		x	x	x			17
Grace, S., et al. 2006	x	x	x	x		x	x	x			17
McCabe, P., 2008	x	x	x	x		x		x			15
Rowe T 2009	x	x	x	x	x	x	x	x	x		18
Steel, A., et al. 2015	x	x	x	x	x	x	x	x			20
Viksveen, P., 2011	x	x	x	x		x	x	x	x		19
SRQR Critical Appraisal Tool for Qualitative Studies											
Study	Methods			Discussion				Other		Score/21	
	Data processing	Data analysis	Techniques to ensure trustworthiness	Synthesis and interpretation	Links to empirical data	Integration with prior work, transferability	Limitations	Conflict of interest	Funding	Score Out of 21	
Chen, Y., et al. 2015	x	x		x	x	x		x		15	
Grant, A., et al. 2012	x	x		x	x	x				15	
Viksveen, P., et al. 2015	x	x		x	x	x	x			16	
Wardle, J., et al. 2013	x	x		x	x	x	x	x		16	
Wardle, J. and Sarris, J., 2014	x	x		x	x	x	x	x	x	16	
MMAT Critical Appraisal Tool for Mixed Methods Studies											
Study	4. Descriptive QUAN study (no comparison group) or component of an MM study				5. MM component of an MM study						
	Sampling appropriate to answer the research question	Sample representative of the population	Appropriate measurement (validated or standard)	Complete data and high response rate	MM design relevant to answer the research questions	Integration of QUAL and QUAN data and/or results	Consideration of limitations associated with this integration	Score out of 19			
Frenkel, M., et al. 2007	x	x				x		6			
Grace, S., et al. 2007	x	x	x			x		11			
Joshi, H., et al. 2013	x		x			x		9			
Long, C., et al. 2014	x	x	x	x		x		11			
Schwartz, J., 2010	x				x	x		12			
Toupin April, K., et al. 2013	x				x	x	x	12			
Zwickey H et al. 2014	x	x	x	x	x	x	x	17			

completion rate [66]. It was found that there were 29 homeopathy schools, with 250 teachers and 1080 students currently enrolled in the United States. Programs varied considerably in length; however the average program (670 h) was barely sufficient to meet the minimum standards for homeopathic certification. Homeopathy teachers tend to be older than both homeopathy students or practitioners. The average age of students is 54.3 years old. Although the vast majority of students are female (90%) and practitioners are female (75%), males are much more common as teachers (43.5%) and school directors (45%). As with homeopathy students, practitioners, and teachers, homeopathy school directors are nearly all Caucasian (85%). An important conclusion was that education in homeopathy in the United States has largely remained stagnant in the last 10 years. Although many new schools have been formed, many have closed. It was not speculated as to the cause.

The development of educational competencies to develop clinical skills and standards

Eight papers from the review focused on improving education and clinical skills in CM. One study reporting findings from 43 education providers of naturopathy and western herbal medicine in Australia found educational standards varied widely, including unsustainable variations in award types, contact hours, clinical education, length of courses and course content with some practitioners unlikely to be trained to professional standards. This study found a need for better integration of complementary care with mainstream healthcare necessitating education to rise to the level of a bachelor degree [67]. The development or application of learning competencies was a focus of these eight papers. Competencies and competency models refer to how the knowledge, skills, and abilities required by these standards are structured. In a study focussing on the skills, knowledge, attributes and competencies of homeopaths and homeopathy education provision, telephone interviews with 17 educators from different schools in 10 European countries were conducted [68]. This qualitative study used constant/simultaneous comparison and analysis to develop categories and properties of educational needs and theoretical constructs and to describe behaviour and social processes and showed educators define a competent homeopath as a professional able to help patients in the best way possible. It was found that course providers and teachers required the competency to be student-centred, and students and homeopaths to be patient-centred [68]. In an Australian study, CM practitioners were reported as having a low level of confidence in identifying clients requiring referral to registered health practitioners, despite the reported high frequency of educational training in, and use of, Western and CM diagnostic techniques [69].

Two identified papers focused on teaching aspects of practitioner communication skills and the integration of complementary and conventional medicine in CM schools. Using a pre-course 'semi-structured questionnaire' plus surveys after an educational intervention, 62 students in Israel reported on how the communication gap with conventional physicians and CM practitioners could be improved [70]. This study found that CM practitioners perceived themselves as better equipped to communicate with conventional health care practitioners when critical thinking, patient-centered care, and communicating skills were emphasized in their course of undergraduate study [70]. In addition, a Canadian study published findings derived from 28 directors of colleges of CM. The author reported that student's ability to understand research findings, to rely on high quality research and to engage in continuing education was important in communicating with conventional care providers [71].

Meanwhile, the need for schools to adopt research literacy and evidence based practice competencies was the focus of three papers. One study that examined the attitudes towards research and scholarly activity of 202 faculty academics in an Australian CM college reported low confidence in undertaking research [72]. Respondents in this Australian study perceived research as important to their personal professional goals (86.0%) although confidence in being able to undertake research was less common (56.5%). The perceived importance of publication of research to the respondents' personal professional goals was also notably high (80.0%) although confidence in their own ability to produce research publications was lower (52.9%) [72]. Another study conducted in the US examined the approaches of 9 CM colleges to develop evidence-informed skills and knowledge with the aim of developing both students and faculty to critically appraise evidence and then employ that evidence to guide clinical practice [73]. This study found that in developing the framework for their educational programs, educational institutions used strategies that were viewed critical for success, including making them multifaceted and unique to their specific institutional needs. It was found that these strategies, in conjunction with existing instructional approaches, were of practical use in other CM and non-CM academic environments where administrators were considering the introduction of research literacy and EBP competencies into their curricula. Training programs and workshops were found to be the most useful way to train faculty in evidence based medicine and research literacy [74]. Finally, one reviewed paper reported on the educational competencies and institutional teaching strategies that had been developed and implemented to enhance research literacy at all nine R25-funded CM institutions

Table 2 Study Characteristics of Included Studies and Thematic Categories (1 CM education provision, 2 The development of educational competencies to develop clinical skills and standards, 3 Application of new educational theory, methods and technology in CM, 3 Future Challenges facing CM education)

	Author/ Year	Country	Methods	Data source	Participant recruitment	Key Results/ Outcomes reported	Group 1 2 3 4
1	Chen, Y., et al. 2015 [76]	Taiwan	Qualitative. Cross sectional survey. Free form open answers and interviews	Trainees' survey data were extracted from post-OSCE questionnaires and interviews	Five TCM OSCEs were administered, and the educational backgrounds of the 37 participants were analyzed.	OSCEs can be used in evaluating, teaching, and certifying TCM clinical competencies to improve the quality of TCM practices.	3
2	Forman, L., et al. 2006 [77]	USA	Quantitative. Cross sectional survey	A 27-item questionnaire was distributed to first- through fourth-year osteopathic medical students. Preferred learning methods, current use of computers as an educational tool, and attitudes regarding the role of computers in medical education based on their skill level were evaluated.	246 students (80% of enrolled students) responded to the questionnaire.	Participants in the study were full-time students in the first through fourth years of osteopathic medical school. Students' opinions of the importance of computer technology in their education is based mainly on their self-assessed technical competency levels. Understanding this dynamic may aid medical educators in the implementation of computer-assisted instruction.	3
3	Frenkel, M., et al. 2007 [70]	Israel	Mixed methods. Observational cross sectional survey.	Pre-course semi-structured questionnaire and an anonymous open essay about students' experiences with an educational intervention in their final year of study, emphasizing evidence-based learning, patient-centered care, and communication skills with conventional health care providers during 4 academic years, 2001–2005.	62 students were exposed to the educational initiative in integrative medicine to CAM students	CAM practitioners feel better equipped to communicate with conventional health care practitioners after exposure to a structured educational initiative that emphasizes critical thinking, patient-centered care, and communication skills with conventional practitioners.	2
4	Grace, S., et al. 2006 [67]	Australia	Quantitative. Observational cross sectional survey.	45-item questionnaire mailed to members of the Australian Natural Therapists' Association and the Australian Traditional Medicine Society.	617 responses (22%)	A significant relationship exists between the confidence practitioners had in identifying clients requiring referral and their training in Western medical and CM diagnostic techniques. 32% of respondents reported a lack of confidence in identifying patients requiring referral with the potential to compromise the safety of clients and the effectiveness of practice.	2
5	Grace, S., et al. 2007 [64]	Australia	Mixed Methods. Survey Analysis and Interview	The aim of this study was to compare two CAM curricula: chiropractic and naturopathy. Accredited naturopathy and chiropractic programs in Australia were located. Key learning areas and approaches to clinical training were identified and compared. Course structures and subject/unit descriptions for accredited naturopathic courses were examined via websites where they existed. In addition, Course Co-ordinators, Directors of Study or other appropriate academics/persons from each naturopathic training institution were invited to	The study found 30 naturopathy courses that conformed to the requirements of either DEST or professional associations. Detailed curricula were available for 17 programs. Interviews, either by telephone or email, were conducted with representatives of 12 training institutions	Chiropractic registration guarantees a uniform level of training for all practitioners. This training was found to comply with accreditation board requirements. The naturopathy courses in the study had elected to comply with the requirements for state government and professional association accreditation, and a level of uniformity was evident amongst the various courses. It is pertinent to note that although both groups of practitioners are entitled to practise as primary contact practitioners, chiropractors and naturopaths had markedly different focuses on medical science	1

Table 2 Study Characteristics of Included Studies and Thematic Categories (1 CM education provision, 2 The development of educational competencies to develop clinical skills and standards, 3 Application of new educational theory, methods and technology in CM, 3 Future Challenges facing CM education) *(Continued)*

	Author/ Year	Country	Methods	Data source	Participant recruitment	Key Results/ Outcomes reported	Group 1 2 3 4
				take part in a short interview (telephone or email) to clarify subject content and course structure and give details of clinical training.		training. A review of naturopathy curricula is warranted in the context of uniformity of training for primary contact practitioners.	
6	Grant, A., et al. 2012 [78]	Australia	Qualitative. Ethno-qualitative research using an ethnographic methodology.	Interviews conducted with ten naturopathy lecturers to investigate reflective approaches to decision making and pedagogy. The scholarly reflections of academic lecturers who taught in the naturopathy program were gathered using interviews and reflective prompts. The approach to the collection and interpretation of data for this investigation was constructivist in epistemology and ethnographic in methodology	Ten individual interviews with key academic lecturers from the disciplinary grouping of Natural and Complementary Medicine (NCM) were undertaken in 2009. Interviews were arranged by email, and semi-structured interviews conducted.	All the naturopathy lecturers interviewed expressed that they had gone through significant changes in their teaching practice as a result of the changes in delivery for the subjects and their exposure to a more involved educational system. This reflective process impacted upon their academic practice as they underwent a process of professional upheaval and reshaping of professional practice.	3
7	Joshi, H., et al. 2013 [75]	India	Mixed Methods (?)	Three educational interventions were applied to a specific subject in Bachelor of Ayurvedic Medicine and Surgery (BAMS) program 2011–2012 and 2012–2013.	Three integrative educational interventions were introduced to develop and evaluate the effectiveness of teaching methods in an Ayurveda curriculum.	The test results in the first experiment showed that the integrative method is comparable with the conventional teaching method. In the second experiment, the test results showed that the integrative method is better than the conventional method. The student feedback showed that all the three methods were perceived to be more interesting than the conventional one. The development of testable integrative teaching methods is possible in the context of Ayurveda education. Students find integrative approaches more interesting than the conventional method.	3
8	Long, C., et al. 2014 [74]	USA	Mixed methods. Cross sectional survey.	A survey to elicit information on the faculty development initiatives was administered via e-mail to 9 program directors. The survey was designed to elicit information in 6 areas: EBP competencies that were developed and adopted; target audiences; size, formats, and hours of training programs; instructional approaches; evaluation methods; and faculty incentives to participate.	All 9 completed the survey, and 8 grantees provided narrative summaries of faculty training outcomes.	The grantees found the following strategies for implementing their programs most useful: assess needs, develop and adopt research literacy and EBP competencies, target early adopters and change leaders, employ best practices in teaching and education, provide meaningful incentives, capitalize on resources provided by grant partners, provide external training opportunities, and garner support from institutional leadership.	2

Table 2 Study Characteristics of Included Studies and Thematic Categories (1 CM education provision, 2 The development of educational competencies to develop clinical skills and standards, 3 Application of new educational theory, methods and technology in CM, 3 Future Challenges facing CM education) *(Continued)*

	Author/ Year	Country	Methods	Data source	Participant recruitment	Key Results/ Outcomes reported	Group 1 2 3 4
						Instructional approaches varied considerably across grantees. The most common were workshops, online resources, in-person short courses, and in-depth seminar series developed by the grantees. Training programs and workshops are the most useful way to train faculty in evidence based medicine and research literacy.	
9	McCabe, P., 2008 [67]	Australia	Quantitative. Observational study. Survey	Survey of 43 Australian providers of naturopathy and WHM education. Information sourced from the public record revealed that these providers collectively offered 104 courses in naturopathy and WHM.	Of the 43 providers, 29 valid questionnaires were returned, representing 33 campuses across Australia—a 70.2% response rate by campus.	Educational standards vary widely, with some practitioners not likely to be adequately prepared for practice. There is a need for better integration of complementary care with mainstream healthcare, and education in CM needs to be at least to the level of a bachelor degree.	2
10	Rowe, T. 2009 [66]	USA	Quantitative. Observational cross sectional survey.	Three separate surveys targeted at homeopathic students, homeopathic faculty and homeopathic school directors. It consisted of 40 questions	91.5% of respondents completed the survey. School Director Survey, 20. Teacher Survey, 48. Student Survey, 88.	Homeopathic Schools and Training Programs currently in the United States: 29. Homeopathic Teachers in the United States: 250. Homeopathic Students Currently Enrolled in the United States: 1080.	1
11	Schwartz, J., 2010 [79]	USA	Mixed methods. Observational cross sectional survey and interviews	A survey of faculty teaching at schools in three CM fields and followed up with additional interviews.	NA	Acupuncture, chiropractic, and massage faculty lack awareness of the capabilities of online education and the elements of good online learning, with the perception that what they teach cannot be taught online because of its kinesthetic requirements. The faculty hold this perception in spite of the success of medical science and related health care fields in the online environment, and they do not seem to separate the kinesthetic from the didactic.	3
12	Steel, A., et al. 2015 [72]	Australia	Quantitative. Cross-sectional online survey	The survey included items examining respondent attitudes and beliefs about research, personal research experience, and future intended research activity. Statistical analysis determined descriptive frequencies.	The survey was completed by 202 of 389 academic and operational staff conducted at a dual sector private CM education institution in Australia.	Respondents perceived research as important to their personal professional goals (86.0%) although confidence in being able to undertake research was less	2

Table 2 Study Characteristics of Included Studies and Thematic Categories (1 CM education provision, 2 The development of educational competencies to develop clinical skills and standards, 3 Application of new educational theory, methods and technology in CM, 3 Future Challenges facing CM education) *(Continued)*

	Author/ Year	Country	Methods	Data source	Participant recruitment	Key Results/ Outcomes reported	Group 1 2 3 4
				Backwards stepwise logistic regression was used to identify characteristics of faculty interested in enrolling in a higher degree by research (HDR).		common (56.5%). The perceived importance of publication of research to the respondents' personal professional goals was also notably high (80.0%) although confidence in their own ability to produce research publications was lower (52.9%).	
13	Toupin April, K., et al. 2013 [71]	Canada	Mixed methods. Observational cross sectional survey and interviews	A two-phase study consisting of an electronic survey and subsequent semi-structured telephone interviews conducted with curriculum/program directors in regulated Canadian CAM schools. Questions assessed the extent of the research, evidence-based health care, IPC training and continuing education, as well as the C/P directors' perceptions about the training. Descriptive statistics were used to describe the schools', curriculum's and the C/P directors' characteristics. Content analysis was conducted on the interview material.	28 C/P directors replied to the survey and 11 were interviewed, representing chiropractic, naturopathy, acupuncture and massage therapy schools.	Future CM providers should understand research findings and be able to rely on high quality research and to communicate with conventional care providers as well as to engage in continuing education. Limited length of the curriculum was one of the barriers to such improvements.	2
14	Viksveen, P., 2011 [65]	Norway	Quantitative. Cross sectional survey	Cross sectional survey of current homeopathy undergraduate education in Europe in 2008. Data from 145 (94.8%) out of 153 identified courses were collected. Eighty-five (55.6%) responded to a questionnaire survey. For others some data was extracted from their websites. Only data from the questionnaire survey is used for the main analysis.	Data from 145 (94.8%) out of 153 identified courses were collected. Eighty-five (55.6%) responded to a questionnaire survey plus data from websites.	The average course had 47 enrolled students and 142 graduates, lasted 3.6 years part-time. Of 85 courses most had entry requirements and provided medical education ($N = 48$) or required students to obtain this competence elsewhere ($N = 33$). Average teaching hours were 992 overall, with 555 for homeopathy. Four of five courses were recognised/accredited. Recognised/accredited part-time courses lasted significantly longer than nonrecognised/non-accredited courses, and offered significantly larger numbers of teaching hours in homeopathy. 6500 students were enrolled. 21,000 had graduated from 153 identified European undergraduate homeopathy courses.	1
15	Viksveen, P., et al. 2012 [68]	Norway	Qualitative. Interview	A qualitative study based on grounded theory methodology involving telephone interviews with 17 educators from different schools in 10 European countries. It used	Telephone interviews with 17 educators from different schools in 10 European countries	The educators defined a competent homeopath as a professional who, through her knowledge and skills together with an awareness of her bounds of competence,	2

Table 2 Study Characteristics of Included Studies and Thematic Categories (1 CM education provision, 2 The development of educational competencies to develop clinical skills and standards, 3 Application of new educational theory, methods and technology in CM, 3 Future Challenges facing CM education) *(Continued)*

	Author/ Year	Country	Methods	Data source	Participant recruitment	Key Results/ Outcomes reported	Group 1 2 3 4
				constant/simultaneous comparison and analysis to develop categories and properties of educational needs and theoretical constructs and to describe behaviour and social processes. The main questions asked of subjects were "What do you think is necessary in order to educate and train a competent homeopath?" and "How would you define a competent homeopath?"		is able to help her patients in the best way possible. This is achieved through the processes of study and self-development, and is supported by a set of basic resources. Becoming and being a competent homeopath is underpinned by a set of basic attitudes.	
16	Wardle, J., et al. 2013 [80]	Australia	Qualitative. Interview	Semi-structured interviews were conducted with 20 naturopaths practising in Australia to explore current perceived challenges in the naturopathic profession in Australia.	20 naturopaths practicing in Australia	Grassroots naturopaths identify a number of challenges that may have significant impacts on the quality, effectiveness and safety of naturopathic care. Given the increasingly mainstream role that naturopaths are playing in the healthcare system in Australia, it is imperative that some of the issues of concern raised by naturopaths receive appropriate policy focus. This may include the development of appropriate regulatory regimes and the development of minimum standards of practice and education that value traditional naturopathic principles and philosophies, as well as ensuring ethical and effective clinical practice.	4
17	Wardle, J. and Sarris, J., 2014 [17]	Australia	Qualitative. Focus groups	Focus groups conducted with current and recent students of 4-year naturopathic degree programs to ascertain how they interact with clinical teaching materials, and their perceptions and attitudes towards teaching materials in naturopathic education.	A total of 24 students and recent graduates participated in the focus groups.	Naturopathic students have a complex and critical relationship with their learning materials. Although naturopathic practice is often defined by traditional evidence, students want information that both supports and is critical of traditional naturopathic practices, and focuses heavily on evidence-based medicine. Students remain largely ambivalent about new teaching technologies and would prefer that these develop organically as an evolution from printed materials, rather than depart from dramatically and radically from these previously established materials.	3
18	Zwickey H et al. 2014	USA	Mixed methods. Survey and	An electronic survey was administered to principal	Nine R25-funded CAM colleges	While each institution designed approaches	2

Table 2 Study Characteristics of Included Studies and Thematic Categories (1 CM education provision, 2 The development of educational competencies to develop clinical skills and standards, 3 Application of new educational theory, methods and technology in CM, 3 Future Challenges facing CM education) *(Continued)*

Author/ Year	Country	Methods	Data source	Participant recruitment	Key Results/ Outcomes reported	Group 1 2 3 4
[73]		interview	investigators of the nine R25 education grants. The survey consisted of 36 closed- and open-ended questions. Follow- up questions were sent via email to clarify responses as needed. Data were compiled for review and content was analyzed for common themes among institutions. A qualitative analysis was performed using three independent reviewers. This team identified the most successful strategies that the individual institutions used, in addition to the most substantial challenges they encountered.		suitable for its own research culture, the guiding principles were similar and the need to develop evidence-informed skills and knowledge was important to help students and faculty to critically appraise evidence and then use that evidence to guide their clinical practice. These nine CAM institutions faced multiple challenges and developed similar and dissimilar strategies for success. An enriched, EBM-infused CAM curriculum can better prepare future CAM practitioners for communicating effectively with their conventional medicine colleagues. Practitioners in the twenty-first century will need to understand how research and evidence-based practice are related and support one another in order to truly bring about optimal patient care.	

in the US [73]. This study found that while each institution designed approaches suitable for its own research culture, the guiding principles were similar across all, and the need to develop evidence-informed skills and knowledge was important to help students and faculty to critically appraise evidence and then use that evidence to guide their clinical practice. The strategies adopted by these institutions included a need for course content to be conducive to reinforcing EBM competencies using spiral learning strategies, and that faculty were willing to learn and teach EBM skills [73].

Application of existing and new educational theory, methods and technology in CM

The changing role of the trainer/lecturer in didactic and clinical subjects, the application of existing and new educational theory and problem-based learning within the context of CM curricula in bachelor and medical college programs, as well as the growing use of learning technologies was highlighted by six papers included in the review. In one study three educational interventions testing new teaching methods were introduced in an ayurveda program [75]. The instructional methods that were evaluated were an integrative module on cardiovascular physiology, case-stimulated learning and classroom small group discussion with findings showing the development of testable integrative teaching methods is possible in the context of Ayurveda education [75]. In contrast, findings from an educational intervention, the implementation of an objective structured clinical examination (OSCE) model as well as a patient-centered training approach within traditional Chinese medicine (TCM) practitioner education in one Taiwanese medical school, found this examination approach effective in evaluating, teaching, and certifying TCM clinical competencies to improve the quality of TCM practices. In this study the training program subjects included TCM internal medicine, TCM genecology, TCM paediatrics, TCM dietetics, acupuncture, TCM orthopaedics, and traumatology [76].

When it comes to resources and the use of technologies, Wardle's 2014 study used focus groups with current and recent students of 4-year naturopathic degree programs in Australia to ascertain how they interact with clinical teaching materials, and their perceptions and attitudes towards teaching materials in naturopathic education. This study described a desire among naturopathy students for existing curriculum to focus on evidence-based approaches and information that both supported and was critical of traditional naturopathic practices. These students remained largely ambivalent about new teaching technologies and preferred that these develop organically as an evolution from printed materials, rather than depart dramatically and radically from these previously established materials [17]. CM student's preferred learning methods are often based on levels of computer skills and experience, their current use of computers as an educational tool, and attitudes regarding the role of computers in medical education according to a cross sectional survey study from a 27-item questionnaire distributed to 1–4-year Osteopathic medical students in the US [77]. One ethnographic study based on interviews conducted in the Australian university system with Naturopathic Faculty found an openness to the utilization of a number of technologies for flexible learning, including wikis, podcasts and synchronous audio-based online interactions [78]. In contrast, another study in the US found acupuncture, chiropractic, and massage therapy faculty lacked awareness of the capabilities of online education and the elements of good online learning and described a perception that what they taught could not be taught online because of its hands-on kinaesthetic requirements such as palpation [79].

Future challenges facing CM education

Lastly, one paper included in our review identified some of the challenges ahead for the Australian naturopathic profession including naturopathic education, the changing student body in naturopathic education, naturopathic student expectations, and the growing tension between traditional and scientific evidence [80]. This study, involving semi-structured interviews with 20 naturopaths, found that participants articulated a paradox whereby on the one hand, they supported the teaching of increased levels of biomedical sciences in naturopathic education, yet also complained of the trend of contemporary naturopathic education to "become more scientific" – a trend they attributed to their desire for the discipline to be "accepted in the university sector". The participants claimed that such a development would be undertaken at the expense of the philosophical underpinnings of the profession. The authors found the continued development of minimum standards of practice and education that value traditional naturopathic principles and philosophies in tandem with the development of appropriate regulatory regimes, was vital in ensuring continued ethical and effective clinical practice.

Quality of papers

Based on the STROBE reporting guidelines [60] the quantitative papers included in this study, while rich in design, descriptive data and discussion of results exhibited a broad weakness in stating clear objectives. In addition, statements and acknowledgement of bias were mostly absent. Other elements commonly missing from these papers were descriptions of statistical methods and generalisability leaving a general impression of low quality among the included papers. Based on the SRQR [62] tool for evaluating qualitative studies, all selected papers omitted a discussion on the qualitative approach and research paradigm used. A description of researcher characteristics and reflexivity, and techniques to enhance trustworthiness and credibility of data analysis were mostly missing. In addition, potential sources of influence or perceived influence on study conduct and conclusions and how these were managed were also under-reported across this collected literature. In addition, a lack of reporting on sources of funding and other support, the role of funders in data collection, interpretation, and write-up were other weaknesses identified. The application of the MMAT critical appraisal tool for the mixed methods studies [63] in this instance found all papers used, included and reported appropriate sources of data relevant to answer the research question, took into account the context in data analysis, used appropriate sampling to answer the research question, and integrated qualitative and quantitative data and/or results. On the other hand, only some papers applied features of the tool such as data analysis relevant to answer the research question, and only a few reported on complete outcome data, or dropout rate, reported on recruitment minimizing bias and appropriate follow-up, used appropriate randomization, appropriate measurement, sample representative of the population, or appropriate measurement. No papers reported on the reflexivity of researchers, nor concealment allocation, and only a few reported on the mixed method design relevant to answer the research questions, integrated the mixed qualitative and quantitative data and results nor took into consideration any limitations associated with this integration, leaving an overall impression of poor quality.

Discussion

This critical integrative review highlights two key issues and large current empirical gaps. Firstly, given the growing popularity of CM and as a consequence the growth in CM education, there is very sporadic coverage of research in the CM education field. Across the 18 included papers, research from 7 countries is represented with 4 of those countries having only one identified relevant paper. In addition, the quantity and quality of available evidence invariably relates to disparate, random and unrelated parts of CM education philosophy and practice. Our review findings highlight that much of the research is now relatively dated [81]. In addition, there is extreme diversity in the represented professions and ultimately the quality of papers. Many papers were excluded due to inconsistencies between title, abstract and findings [82]. Some papers were relevant but not published in peer reviewed journals and thus excluded; highlighting how in a maturing field there is a need to publish in both professional industry journals and the peer reviewed literature. One such example was the result of a survey of 'profession-wide' educational acupuncture institutions in the US as well as an extensive literature review, subject matter expert interviews, community discussions, strategic planning, analysis, and evaluation, that called for the development of educational competencies [83]. Others examples were the Survey on Inter-institutional and Interprofessional Relationships of Accredited Complementary and Alternative Medicine Schools and Consortium of Academic Health Centers for Integrative Medicine Programs [84], the National Education Dialogue to Advance Integrated Health Care: Creating Common Ground [84], the Project for Inter- Institutional Education Relationships [85]: Examples of Real Life Inter-Institutional Collaborations [84], and the Credentialing Licensed Acupuncture and Oriental Medicine Professionals for Practice in Healthcare Organizations: An Overview and Guidance for Hospital Administrators, Acupuncturists and Educators [84].

Our review identified that whilst educational standards and practices were considered within original research articles related to CM, this was mostly as part of the contextual discussion of findings of related but not directly relevant CM research. This pattern was observed both in the grey literature [86, 87] and peer-reviewed publications [8, 15, 54, 67, 88–99]. One striking example of research emphasizing information related to CM education but collected in other settings, is by Wardle and colleagues in which practicing naturopaths were interviewed regarding multiple issues including the public misconception of the role of naturopathic medicine, the devaluation of naturopathic philosophy as a core component of naturopathic practice, the pressure to move towards an evidence-based medicine model focused on product prescription, as well as naturopathic education. In this paper, much of the data collected related to CM education but came from a broader research question and sample than research which focuses specifically on education and relevant stakeholders. Similarly, in Steel's 2011 article, 12 naturopaths in current clinical practice were interviewed on the sources of information used in clinical practice, and the participants' perceptions of these sources. This elicited comments about naturopathic education as well as concluding comments by the authors in relation to naturopathic education [89].

Another major finding from this review is that the robust and mature research exploring educational technology and e-learning that is taking place in medical and or allied health (nursing, midwifery, pharmacy) education research is clearly absent within the CM educational research field. Research within conventional medical and allied health education has explored the value of educational technology in place of traditional face-to-face delivery or within clinical training [100, 101]. Moreover, there is also now substantial research examining the culture change for stakeholders in medical and allied health education, with qualitative research drawing on the results of surveys reporting of student and staff characteristics for developing faculty, or reporting on digital literacy and other academic processes as a consequence of e-learning [102, 103]. In addition, many case studies of educational interventions have been published using some aspect of e-learning in medical or health services training [104]. Finally there are many original research papers examining the challenges facing medical education due to the clear trends of changing student behaviour, often as a result of the use of learning technologies [105–107]. Further, there are numerous studies exploring more effective delivery methods, and the development of critical thinking [108, 109]. None of these areas of research relating to learning technologies have being reported nor evaluated in CM at present. This highlights that there is a significant discourse relating to andragogy and learning technologies taking place in arenas not too distant from CM education but not within CM practitioner education itself. These findings also highlight that most of the research on CM education is in non-CM environments or in arenas possibly similar to CM, such as nursing or Integrative Medicine but not CM.

Consequences

As identified in this review, the current evidence evaluating the procedures, effectiveness and outcomes of CM education remains limited in many significant areas despite the high levels of use of CM in the community and the thriving nature of CM educational institutions globally. As a result, there are a number of challenges previously described by commentators [8] which impact on the growth and sustainability of CM education. In particular, the ongoing absence of strategy in CM education research ensures a gap in the available knowledge and contributes to uncertainty for CM education leaders, policy makers and other health professionals as to the needs of employers and the market [8]. Furthermore, our review reveals the current empirical data regarding CM education as affording only a limited, superficial understanding of contemporary CM education highlighting the sporadic spread and apparent scarcity of research in this field. Our research suggests that possibly practitioners and users of CM for so long out of mainstream health care activity in Western societies [3, 110, 111] hold unique values attitudes to health [79]. In addition, it possibly suggests that there is in general a slower adoption of technology, and a stronger culture of resistance to change [78]. Yet it also points to a selective use of technologies as there is growing evidence of innumerable CM consultations taking place online [112, 113]. This relatively low amount of empirical data pertaining to CM research in general may also be explained by the fact that there are few research active CM academics [8] and this is underpinned by a lack of perceived relevance of research in CM educational entities that are for the most part more technical colleges with academics often focused on technical and clinical expertise rather than empirical research activities [72].

Research opportunities and directions

The findings of this review highlight that there are significant gaps in the existing research examining CM education. There is a need to establish a strategic research agenda in this field. To effectively address these gaps it is important that future research build on a strong understanding of the unique educational environment of CM courses, colleges and universities. A key foundational step to developing a better understanding of the effectiveness of CM education is to more clearly identify current CM educational provision. Building upon a health services research approach, future research is required which examines the characteristics, attitudes, preferences, experiences and motivations of modern CM students. There is an urgent need to understand CM educational institutions geographical location, enrolment patterns, andragogy, their size and scope as well as international similarities and differences. This is particularly important given the as yet largely unexplored and potentially unique characteristics of CM educational institutions and their similarities or differences with other health services education (nursing, pharmacy), the potential size of the CM education market and the numbers of graduates entering CM professions. Alongside this, a closer examination of the use and reliance on technologies, faculty attitudes to technologies and change, the demographics, psychographics and the values of faculty at CM colleges is needed. Moving forward there is a need to understand how changing educational trends relate to CM, if CM educational settings are distinct because of their unique student body, the difference between training CM practitioners and training people about the use of CM, the broad and differing landscape of CM education provision across the world, to what degree are CM educational institutions influenced by the broader trends taking place in education globally? CM education is not immune or separate from the changes taking place in education globally (Massive Open Online Courses (MOOCs), flipped classrooms, constructivist education theories and the implementation of problem based learning [114–119] and this points the way forward for CM education research. Such an examination of CM education must also include the cultural diversity of education provision, local regulations and nuances. A broader knowledge of how health services education informs CM education, the degree to which research and evidence in health services education can be scaled to CM education [120], and how the foundational sciences are taught in CM institutions is also required. It might be beneficial for Colleges to explore strategies to develop faculty in areas such as e-learning technologies, research literacy and evidence-based practice skills, and students in health literacy and information literacy. For this, faculty and administrative champions are needed, as are early adopters and change-leaders. More needs to be known about the sheer breadth of educational provision in CM internationally, the range of award options with courses currently available at undergraduate, and postgraduate level, the relationship between prerequisites, the content of the program and the graduate outcome, as well as pathways include promoting CM-related courses in higher education generally, such as meditation, or somatics. General education courses to benefit all students and entry requirements and education prior to CM training, which may improve science literacy, publication productivity, professional standards. In addition more needs to be known about the financial drivers of for profit private equity educational institutions in the CM field.

Limitations

These findings can be contextualised within identifiable limitations. Searching literature related to CM can be challenging due to the lack of a consistent international definition. Further, there are many relevant studies, papers and commentaries that are not peer-reviewed and fell outside the scope of this review. There were 12 papers in this review that were identified through manual searching. This possibly highlights that despite research being conducted in this area, papers may not be published in journals which are indexed in commonly searched research databases. Whether this is due to a perception amongst CM-specific or health professional education journals that research in CM education falls outside of their relative scope and prefer to focus on clinical questions or the researchers are not targeting these other journals is not clear. Moreover, the application of three critical appraisal tools created challenges of inclusion and exclusion related to quality. In the case of the SRQR and MMAT, these guidelines were written for pure qualitative and mixed methods research, yet the papers in this review were published in public health and education journals. As such, the structure and content of the included qualitative and mixed methods articles may have been modified to suit the journal style guide and intended audience and the reporting guidelines may have been compromised as a result. For this reason, the low score for some of these articles may be due to reporting omissions of necessity rather than true gaps in methodology. Another limitation identified is that conducting research that crosses national borders comparisons become challenging. There are quite different standards for entry level and practice even between the various professions from country to country. The findings of the article reflect a symptom of wider issues and general statements are necessarily hesitant in this context. Nevertheless, where possible these limitations have been mitigated through attending to systematic review best practice, and as a consequence the relevance and value of the findings presented here for contemporary healthcare education provision should not be minimised.

Conclusion

Despite the high rates of CM use worldwide and growing interest in CM education, only a sporadic and under-developed body of original research has examined relevant issues to date and there is a need for both a growth in research activity and a clear coordinated research agenda in this important topic area. The significance of growing such a research program around the broad topic of CM education is essential to ensuring an adequately trained and educated CM workforce capable of realising an important role in the broader, coordinated and inter-professional health care system.

Abbreviations

CM: Complementary Medicine; EBM: Evidence Based Medicine; HREC: Human Research Ethics Committee; MMAT: Mixed Methods Appraisal Tool; MOOC: Massive Open Online Course; OSCE: Objective Structured Clinical Examination; PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses; SRQR: Standards for Reporting Qualitative Research; STROBE: Strengthening the Reporting of Observational Studies in Epidemiology; TCM: Traditional Chinese Medicine; US: United States

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Authors' contributions

AG conceptualised the analysis and the paper, undertook the analysis. JA and AS assisted with interpretation of the findings of the analysis. All authors contributed to drafting and finalising the manuscript.

Ethics approval and consent to participate

Ethics approval was granted from the Human Research Ethics Committees of the University of Technology Sydney (ETH16–0477 – 12,220,214) and the IRB of the National University of Natural Medicine (NUNM IRB# AG05052017).

Consent for publication

No consent for publication was required for this analysis.

Competing interests

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Appendix J Articles and Manuscripts and Tables – Chapter 5

Manuscript associated with results reported in chapter 5. Gray A, Steel A, Adams J. (2021) An examination of technologies in complementary medicine education and practice: The perceptions and experiences of naturopathy students, faculty and educational leaders.

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An examination of technologies in complementary medicine education and practice: The perceptions and experiences of naturopathy students, faculty and educational leaders

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A R T I C L E I N F O

Keywords:
Complementary medicine
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Equity
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A B S T R A C T

Objectives: Little is known about the education of future CM practitioners. The objective is to explore the perceptions and experiences of students, faculty and professional leaders toward technologies in complementary medicine education and practice.

Design and setting: Qualitative focus groups and one-on-one semi-structured interviews were conducted in CM educational organizations and institutions in North America (United States / Canada) and Australia involving seven focus groups (29 naturopathic students), and 30 one-on-one interviews (faculty, educational and professional leaders of the naturopathic profession).

Results: Data analysis identified five issues reported. These related to perceptions of; *the shortfalls of CM classroom technology, the value of technology within CM clinical practice, learning technologies in the classroom, addressing equity concerns as a consequence of learning technology use, and the need to develop technology literacy skills amongst students and faculty.*

Conclusion: This is the first study to examine the perceptions of students, faculty and professional leaders toward technologies in CM education and practice within an education setting. CM students exhibited complex attitudes and adoption patterns to technology. CM students were critical of faculty who have perceived low levels of digital literacy. The technology issue that students in our study found most challenging was PowerPoint use in the classroom. There is an urgent need to establish a strategic research agenda and modelling around this important area of health care education in order to ensure a well-educated, effective workforce able to deliver the best outcomes for the patients and communities they serve.

1. Introduction

Complementary medicine (CM) - commonly defined as healthcare not traditionally associated with the conventional medical profession or medical curriculum [1] – houses a diverse field of mind-body practices (e.g. yoga, meditation) natural products (e.g. vitamins, herbal medicines), whole healing systems and therapies (e.g. naturopathy, traditional Chinese medicine) and treatments (e.g. aromatherapy, reflexology) [2]. There is an increasing uptake of CM worldwide [3] and CM accounts for around half the Australian healthcare sector, in terms of practitioner visits [4] and over the counter sales [5–7], while in the US the latest available research shows a 12-month CM use estimate of 33.2% [8]. The CM education sector appears to also be experiencing growth and professionalisation. Yet, despite the substantial footprint of CM industry and provision within the Australian and US healthcare landscape and clinical settings [9–11], CM practitioner education has received little empirical attention to date.

A recent review of CM education research [12] shows the quantity and quality of research regarding learning technologies in education more broadly [13–16] (and medical and allied health education research more specifically) is notably absent within the field of CM educational research with little research investigating CM academic perspectives to learning and technologies [17–19] and there is infrequent and dated empirical research conducted on CM students and their

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perspectives to learning [20–23]. Much of the existing educational research within CM has focused on naturopathy [12,24] as it is one of the largest and most dynamic of the CM professions in Australia and the US [25–27]. Research has yet to explore the identified gaps including faculty resistance to change, student readiness for online study as well as the digital divide between subsets of students and between students and faculty [28–32].

Meanwhile, the internet has placed unprecedented information at patient's fingertips and personal health devices, technologies and applications are changing how individuals perceive, engage with, manage and communicate their health [33]. Medical organisations, individual clinics, hospitals, and broader healthcare systems have acknowledged the significance of these issues in planning high-quality care [34] and technologies (especially robotics, nanotechnology, health informatics) are increasingly dominating medical and healthcare provision [35–37] alongside the use of telehealth and practice enhancing software in clinical practice. Patients and practitioners exhibit increasing willingness to adopt applications of telehealth - 'a collection of means or methods for enhancing health care, public health, and health education delivery and support using telecommunications technologies' such as Zoom, Skype and Google hangouts' as part of managing care [38–51]. Practice enhancing software – here defined as a technology used to enable efficient, novel application in a clinical setting – are also commonplace and widespread in medicine and complementary medicine, see Table 1. Significant research has recently focused on the implementation and impact of learning technologies [52–55] - the study and application of technologies to support and/or enhance teaching, learning and assessment - for students, educators and educational outcomes [14,16,56–58].

These telehealth technologies are now being widely employed in conventional health care [59,60], and also appear to be employed in some areas of CM clinical practice [61]. Little is known about the use of digital technologies in CM clinical practice. Similarly, only a small amount is currently known about telehealth and CM and is limited to only particular practices such as mindfulness [62], yoga [48,63], and music therapy [64]. In direct response to the circumstances outlined above, the study reported here provides the first examination of the perceptions and experiences of students, faculty and professional leaders toward technologies in complementary medicine education and practice.

2. Methods and materials

The study reported in this paper aims to explore the perceptions and experiences among students, faculty and professional leaders (such as representatives of regulators and associations) of the naturopathic profession in Australia, Canada and the US toward technologies in complementary medicine education and practice drawing upon focus group and semi-structured interview data.

2.1. Setting

The study fieldwork was conducted in 2015 in Australia, the US and Canada - three countries chosen due to their naturopathic training delivery being relatively aligned in terms of curriculum content and graduate skills, knowledge and attributes. The focus upon naturopathy programs was due to naturopathy being one of the largest CM professions in Australia and US and the substantial numbers of naturopathy students, faculty and leaders within US and Australian CM educational institutions.

2.2. Sample and recruitment

Student participants were recruited from [Redacted for Blinded Review] in Australia and [Redacted for Blinded Review] in the US. Faculty and professional leaders were recruited from Canadian, US and Australian academic organisations and institutions that met the requirements for membership with the World Naturopathic Federation [65] ensuring the organisations satisfied international recognised standards for professional representation. Students were recruited for focus group participation via email invitation sent via their faculty administration. In the case of two students - where distance was a major barrier to focus group participation – one on one interviews were conducted. Relevant faculty and professional leaders (leaders of an academic department or professional organisation) were identified by senior management from their organisation or institution, and invited by the research team to participate in one-on-one interviews. All study participants received a participant information sheet (PIS) prior to fieldwork before providing informed consent. Consent was gained verbally and in writing from all participants. All interested practitioners were interviewed to ensure any differences in perspectives across organisations and regions were captured.

2.3. Data collection

Focus Groups. A total of seven focus groups, three in Australia and four in North America, were conducted on site at each institution involving a total of 29 naturopathy students. The focus groups provided a forum for students to discuss their perceptions and experiences regarding technologies in education and practice through both individual insights and via sharing and reflecting upon the experiences and perceptions of others.

Interviews. Semi-structured interviews were conducted with 30 CM faculty and professional leaders in North America (n = 19) and Australia (n = 10). Interviews were selected as the data collection method for academic and professional leaders to allow open, confidential discussion of personal opinions and experiences. The time and location of the interview was chosen to suit the participant.

Guide. Focus groups and semi-structured interviews were conducted by [redacted for blinded review] using a validated semi-structured question/topic facilitation guide (see Appendix One). The same guide was used for both sample groups as the study sought the perceptions and experiences from all parties on similar themes, domains and topics and allowed for exploring related and/or different issues that were introduced by the participants in the fieldwork process.

Domains. The domains to guide the interview and focus groups (as outlined in the guides) were: perceptions and experiences of educational delivery methods in the education of CM practitioners; learning technologies in the education of CM practitioners; and practice enhancing

Table 1
One: Examples of Practice Enhancing Software Currently Used in Clinical CM practice.

General medical apps and resources	(e.g. MIMs online, Natural standard, NICE Guidelines),
Practice enhancing technologies include (but are not limited) to applications and software specifically orientated to the technical disciplines of	
Acupuncture - point location software	eg Points PC
Naturopathy and Nutritional Medicine - prescription of supplements and nutritional advice	e.g. Nookal, Foodzone, EPIC, FoodWorks
Homeopathic Medicine - Repertory software, and databases	eg RadarOpus, Synergy
Iridology	eg EyeRonec
Numerous other software in the CM marketplace	e.g. CorePlus, Health Quest, Ginko, nPod
Practice management software available in CM clinical settings - management of their practices, bookings, report writing as well as patient and information management	eg Clinic Essentials, Clinko, Birdsong, Unified Practice, Compass, Practice Fusion
Generic applications such as information ... anagement tools	eg Dropbox, Xero, Email, Excel, Outlook, Word

Recording and transcribing. Interviews and focus groups were recorded via a digital recorder and then transcribed. Each interview was between 45 and 60 min in duration and focus groups were approximately 90 min in duration.

Thematic saturation. Thematic saturation – the point at which repeated investment in further data collection appears to not reap significantly new data - was attained after 15 interviews and 4 focus groups.

2.4. Data analysis

Prior to transcript analysis, all interviewees were allocated pseudonyms while focus group participants were only identified by the country where they were located (North America or Australia). Using a Framework approach [66], we followed the established process of *familiarisation, identifying a thematic framework, indexing, charting,* and *mapping and interpretation* [67]. Congruent with the Framework approach we chose to adopt an implicit theoretical approach (in which the theory is not made explicit), as utilised in applied health care research in many fields including general practice [68–70], nursing [71] and health promotion [72].

3. Results

Data analysis identified five explicit issues reported amongst the participants. These related to *perceptions and experiences of the shortfalls of CM classroom technology, perceptions of the value of technology within CM clinical practice, perceptions of learning technologies in the CM classroom, addressing access and equity concerns for students as a consequence of the use of learning technologies, and addressing the need to develop literacy and technology skills amongst students and faculty*.

When asked about the learning technology employed within the classroom, all participants first commented on the use (and perceived misuse) of slide presentation software such as Powerpoint™. The vast majority of students were critical of the value of delivering content using slide presentations, as seen by the following quotes from two US students (See Table 2: Quote 1.1, Quote 1.2). The lecturers agreed that students tended not to enjoy the Powerpoint presentations, but also felt that many students required and expected them. This dissonance in perspectives was described succinctly by a faculty member from the US (Quote 1.3). The reason that students gave for their dissatisfaction with slide presentations was due to past and in most cases ongoing experience of lecturer(s) simply reading through slides with no embellishment. Students in both the US and Australia describe this linear, restrictive use of the software as impacting on the student's ability to engage fully with the class content (Quote 1.4, Quote 1.5, Quote 1.6). Some faculty also acknowledged the negative impact on student engagement of some lecturers reading through distracting information-dense slide presentations (Quote 1.7). However, it was acknowledged by many participants that slide presentations are not necessarily inherently problematic, emphasising their potential alongside discussion-based classroom delivery (as opposed to didactic reading). As one academic emphasised, this relates to the importance of the lecturer's professional experience and personality to ensure content and delivery is engaging (Quote 1.8). Other teaching technologies were discussed by both students and faculty but mostly with regards to their absence - frustrations reported by students that academics were not using the breadth of learning technologies available, and with regards to faculty, the challenges resulting from the institutional leaderships' expectations around accessing and using newer technologies (Quote 1.9, Quote 1.10).

Another topic raised by academic participants was what they perceived to be the relationship between introducing technology within clinical practice – in most cases enthusiastically supported, in some cases with reluctance and in other instances supported as a necessary evil - in naturopathic education. For example, one lecturer ontemporary clinician should make use of the resources

Table 2
Exemplar quotes for identified themes - from CM Students, Faculty and Professional Leaders.

Quote #	**Quotes relating to *Perceptions and experiences of the shortfalls of classroom technology***
1.1	*"I am the anti PowerPoint"- student (FGD), United States*
1.2	*"I really hate most of the Powerpoints that I get" – student (FGD), United States*
1.3	*"Students tend to want them but hate them" – academic I, United States*
1.4	*"You can put up a PowerPoint of a 150 slides through 100 slides and a teacher can just flip through them very quickly and you won't be able to engage on that slide for very long and you already past it, and if they don't finish you're still responsible for all the material that just wasn't gone over." – student FGA United States*
1.5	*"So if someone stands up and their reading basically a PowerPoint… my mind's going to wander"- student FGA, United States*
1.6	*"You show up and sit down and somebody will read your PowerPoint for three hours. And every 15 min you get up and walk around for 10 min. But it's like crazy, I don't know how anyone learns this way. You know… no one learns"- student FGD, Australia*
1.7	*"But I know a lot of instructors just plough a bunch of information out there that they would just read out loud…and I think that students can kind of zone out on them. It makes learning kind of passive and when there's notes in front of the students and the very same stuff is on the slide and then the person is reading them." – Academic Leader I, United States*
1.8	*"I think that there's value in there but it's also data, there's no soul so I think it's kind of contextualized. You can have somebody that has a great PowerPoint but does not have a good personality to deliver it versus a person who has a great personality and a passion to deliver the material and I think people respond more to that rather than respond to other." – Academic/Professional Leader M, Australia*
1.9	*"I think we have a lot of expectation on us to have things readily available and happen on systems that are working, technology that's unique and power points that are put together in their learning style and things like that"- Academic E, United States*
1.10	*"I think those are teaching technologies that I have been requesting in every one of my classes since I started here and it's not used and I don't have any idea why. I don't know if it's that, teachers have been teaching the same way about PowerPoint for so many years that they have refused to switch over but there's so much out there that they can utilize and they're not using it. Yeah they're just not." – Student (FGD), United States*
	Quotes relating to T*he value of technology within clinical practice*
2.1	*"If I'm going to be a primary care physician in any industrialized society in the world, it would be negligent and unethical for me not to use. not necessarily every single piece of technology because I think you can get a technology overload. It would be negligent of me not to use technology on a regular basis."- Academic Leader B, United States*
2.2	*"For telemedicine, for example, you know to be able to train practitioners in school how to make effective use of telemedicine safely and in a way that is super compliant and effective is an enormous advantage that you can give to a student who is graduating today. Seeing with this use of electronic medical records systems and you know how to maximize their potential and use them to really make their life easier and not more difficult."- Professional Leader F, US*
2.3	*"And if we're training naturopathic physicians in the US to be primary care doctors and that's where they intend their careers to go, we've got to encourage them to embrace just to govern pop-cultural landscape, embrace the technology that's available." – Academic Leader B, US*
2.4	*"You can't know what it is like to have that physical contact to know what a real human being sounds like or looks like or smells like. All of those things are part of understanding what is going on with someone"- Academic Leader A, US*
2.5	*"From what I noticed in the clinic is that we're so engrossed in the technology … most people are looking in the screen and are clicking 'do you experience.?' versus like being able to have a conversation with them [the patient]and then taking a few seconds to draw things out…" FG C"*
2.6	*"We can borrow studies … that say the computer in the room does not necessarily have to affect the care that's given and patients usually don't notice the computer in the way which is comforting for me" – FG C, US*
	Quotes relating to Complex approaches of classroom learning technologies
3.1	*"I think it's really good. I think it gives people the chance to experience a lot of things. They might watch a YouTube Video about how to make something or how to do something and it might inspire ideas. They can go back to that video later on" – FG Bris, AUS*
3.2	*"I think it's great that it exists but I wish it wasn't necessary. Like it's good it's there for people who can't come to the lectures in person, but there are some subjects that you have to do online, and a whole lot of stuff that you have to do online."- FG Bris, AUS*
3.3	*"I do worry about how much technology, however necessary it might be, makes the course inaccessible to a lot of people, particularly older people, or people*

(continued on next page)

Table 2 (*continued*)

	who might for whatever reason can't do all of this stuff online. That makes it difficult that it becomes necessary but yeah, you can't do it with just the library. You can't access." – FG Bris, AUS
3.4	*"I know personally I don't like the idea of online learning because it's so individualized, I think that people learn so much by being together and talking to each other and debating and discussing, but you need to provide these opportunities within class." – FG D, US*
3.5	*"Online is really hard to do with active learning activities as well although again I've done it, I can make it work. I find that there's a lot less discussion that happens and I don't feel like the richness of the education is the same"- Academic H*
3.6	*"That's another thing about the qualms of doing online is that part of the maturation process of the student is having interaction. Literal human interaction with their classmates, their instructors. The younger generation, how will they feel comfortable interacting with someone and sitting down with someone not just asking questions because you have to but getting to the level of treating the whole person, you get into some pretty deep things. And how someone going to feel comfortable doing that if they don't have any conversations?" – Professional Leader I*
3.7	*"I think that probably most of…the didactic information of the science of medicine could easily be delivered online. Where I would maybe think twice about is any kind of physical, clinical education…things like that which are really, I think, better with a hands-on component." – Academic F, US*
3.8	*"I'll have to say I think they are turning to online education for most didactic courses as the benefit of actually leading to greater standardization of education…When it comes to clinical education I think that has to be done in the trenches, I think our students need exposure to more real people." – Academic G, US*
	Quotes Relating to Addressing access and equity concerns
4.1	*"You have to pretty much have an internet connection in order to do the course at all. And even in class not having a laptop is sometimes a problem."- FG Bris, AUS*
4.2	*"So making the course inaccessible to a lot of people, particularly older people, or people who might for whatever reason can't do all of this stuff online. That makes it difficult that it becomes necessary but yeah, you can't do it with just the library." – FG Bris, AUS*
4.3	*"Yes, I think we have a lot of expectation on us to have things readily available and happen on systems that are working, technology that's unique and power points that are put together in their learning style and things like that" – Academic E, US*
4.4	*"I don't embrace it [technology]. I'm dragged kicking and screaming because I have to but I also recognize that it is where it is going so I have to." – Academic M, US*
4.5	*"So they [academics] are part of it and they're helping to steer but students are driving some of that and I think some of the research on the millennial generation is that they want to drive their own education, their own knowledge acquisition but they do need someone to help them along that path otherwise they do end up way off or are using things that aren't necessarily the best resources." – Professional Leader R, US*
4.6	*"Then we've had students tell us that the whole reason that they came to naturopathic medicine was that they are not interested in technology, I don't buy it, I mean I don't - that doesn't mean that I don't believe it, I mean like I had a student this fall who told me that he was going to struggle reading any other papers I recommended because I posted them on moodle and he doesn't have a computer at home and I said you're in medical school buy yourself a computer or go to the library and use the computer and I have no problem with you downloading the papers, making a paper copy and reading them on paper but you got to figure out how to use a computer well enough to use the educational technology that we're using for the course, if you're smart enough to go to medical school, you're smart enough to figure that out." – Academic H, US*
4.7	*"I don't embrace it. I'm dragged kicking and screaming because I have to but I also recognize that it is where it is going so I have to. Here's my recent technology. a diary. That's my day planner. My schedule is in there. I have a telephone, I have a fax machine. I have a digital clock. I don't have a computer in my office. I have it somewhere else. One of these things? [points to tablet on table] A tablet. I don't know how to use it." – Academic M, US*
	Quotes relating to Addressing the need to develop literacy and technology skills of students and faculty
5.1	*"I found that with the internet, there's just so much information to sift through. A lot of it is irrelevant. It felt like I was wasting a lot of time looking for resources and then I can just walk into the library and look in an index and find exactly what I want." – FG Bris, AUS*
5.2	*"Because these computers…hold so much and then it's just, it's a file and…the big thing is being able to search. And so when I'm going to see a patient … I can type in a condition, and it will give me my documents of what has this condition so I can bring out my herbal formulas very quickly that I want to use in this particular case or interactions." – FG A, US*
5.3	*"a lot of professors spend…upward of 10 min of class time trying to get the microphones working or trying to turn the fire points on and…it's fiddling with things in the microphone and…it's just like come on and it's very frustrating for us because we know it's taking our class time and so I think maybe some kind of training at the start of the term or something to get them familiar with the technology will be helpful." FG C, US*
5.4	*"I think we need to be more conscious of how we provide information to students, critical information to students that we need them to have and at the same time I think providing them with the skills of where to go looking for quality information and the ability to evaluate that."- Academic ZC, Australia*
5.5	*"And so I do think that there are opportunities that students take to create their own work life balance through their creative use of that technology and that's I think a really empowered stands in a really alliance stands and I think it is important to recognize that the balance between paternalism and cultivating empowerment in students as well."- Academic W, US*

available and how not employing technology in clinical practice was, in some instances, negligent through denying patients' best practice. In doing so however, academics also acknowledged that complete reliance on every technology available could be problematic (Quote 2.1). Similarly, two professional leaders presented the view that effective use of electronic medical records (EMR) and telemedicine were important skills necessary for contemporary naturopathic practice (Quote 2.2, Quote 2.3). In keeping with this perception of the value of technologies, some students also expressed interest in apps and other technological resources for possible future use in practice, but in doing so also clearly indicated concern that their knowledge or training about these technologies were not currently being provided by their lecturers or formal education. Concerns regarding technology use in clinic were also raised by students, faculty and professional leaders, particularly as relating to the potentially negative impact on patient experiences of clinical consultations and quality of care delivered. One academic expressed concern that technology may lead to clinical care without direct patient contact resulting in sub-standard care (Quote 2.4). One student similarly described their concern (Quote 2.5). However, this view was not held by all participating students, with others drawing on awareness of research findings suggesting technology has minimal impact and the use of it may not concern patients (Quote 2.6).

The use of online technology to help facilitate practitioner training was viewed differently between students, academics and professional leaders. There was also a lack of consistency and some complexity within the responses of members of these groups. For example, online technology was seen by some students as facilitating flexibility in learning (Quote 3.1). Yet, other students were less supportive of technology (Quote 3.2, Quote 3.3). Some participants – students, faculty and professional leaders - also perceived online platforms, particularly if used as a sole delivery method, as creating student isolation and limiting the development of students' communication skills with impact on their wider learning experience and outcome (Quote 3.4, Quote 3.5, Quote 3.6). Academics acknowledged the potential or realised value of online technology for education delivery. They also expressed a view that it should be implemented with discernment whereby some content, such as sciences, could be delivered online but others, such as naturopathic clinical skills, required face-to-face delivery (Quote 3.7, Quote 3.8).

Concerns regarding the impact of technology to facilitate or hinder access and equity among students were raised by student and academic study participants. Student participants also described a need, stemming from the technology used in course delivery, to purchase expensive equipment such as a laptop making the course, to their mind, inaccessible to them (Quote 4.1, Quote 4.2). Academics expressed awareness of the importance of supporting their student's ability to use the additional technology required to access their course content. However, this was also experienced by academics as a pressure on faculty to provide additional infrastructure (Quote 4.3 Quote 4.4, Quote 4.5). Some academics also observed students resisting the technology on philosophical grounds that affected both access to learning materials student learning

(Quote 4.6). Another US academic described their own philosophical resistance to technology driving an active choice to avoid much technology in their daily life (beyond computer use) (Quote 4.7).

Interlinked with the issue of equity, participants described the need to develop literacy and technology skills. These skills included the ability to operate technology as well as the ability to manage the format and quantity of information available. Some students experienced the gap as too great between the required digital literary skills and their current skill set to access digital information (Quote 5.1). Highlighting the variety of perceptions and experiences of student participants some described using technology, such as new software, to help manage electronic files, with the goal of improving their curation of information (Quote 5.2). However, some students were also critical of the technological skill level of faculty, (not reflected in faculty accounts) and suggested a need for further technology training of academics (Quote 5.3). Academics recognised the challenges students face in managing and evaluating the quality of the information available (Quote 5.4). Academics also described the ability for technology to help facilitate work-life balance among students through the creative use of technology and emphasised the empowering value for students to cultivate skills to use technology to their advantage (Quote 5.5).

4. Discussion

Our study resulted in a number of key findings. The technology issue that students in our study found most challenging was PowerPoint use in the classroom. While previous educational research suggests there can be both positives [73–75] and negatives [76,77] regarding PowerPoint use, our finding appears to move beyond this highlighting a relatively strong negative perception where CM students found it to be linear, restrictive and critical of the way in which it is being used. It is important that we further examine the use of classroom technologies and decipher the extent to which possible challenges are the result of technology design and/or human application. This student dissatisfaction could be possibly related to either teaching skills or methods (as it appears that the lecturers still use traditional/teacher-cantered approaches) and/or socio-demographical characteristics of students (and lecturers) that may influence perceptions to digital teaching tools. Furthermore, there is a need for further research to also help understand the detailed needs of both CM academics and students regarding this classroom technology and related technologies.

The CM students spoken to exhibit complex attitudes and adoption patterns to technology (*'hate it' but then 'demand it'*) [78,79]. This finding is congruent with broader educational literature. Discerning the acceptance of technology in an educational setting is rarely straightforward and necessitates understanding the complex moving parts that make up digital literacy – often including but not limited to gender, race, social class, identity, power, inequality, age and generation [80–82]. Similar to other research into institution's or fields where low digital literacy exists within the student and faculty body [83,84] our study highlights a complex learning environment where it is possible that some digital natives have not developed the digital literacy or critical thinking skills needed for higher education. There is surprisingly little research into institution's or fields where there is evidence, as is the case here in our study, of students being critical of faculty who have perceived low levels of digital literacy or where possibly a subset of the students body is well in advance of other student subsets or their teachers - a digital divide between students and academics [29,31,32,85,86]. Moreover, research has shown that where academics have been found to be critical of basic academic writing skills as is the case here in our study, further training and resources to develop preparedness for study [30] and tertiary level academic literacy skills has been needed for students [28], as well as a need for adaption of teaching practices, assessment design and feedback to students by academics, in order to assist improvement of those academic literacy skills [87].

Another important finding from our study is the perception that the requirements of providing some or all of a course (didactic and/or clinical) online potentially discriminates against older, digitally-challenged, less digitally literate students as is the case in these CM institutions [19]. In addition, the range of opinion expressed indicates a wide variety of seemingly conflicting attitudes to technologies which ranged from positive, (*flexibility, adds value, good – when done well*) to ambivalent (*this is a necessary evil, it would be negligent not to use*) to negative (*I don't embrace it. I'm dragged kicking and screaming because I have to*). The main concern expressed was about the negative impact of technologies (*when used in a one-dimensional way that creates isolation and poor clinical outcomes*). This is almost the opposite to findings from previous research and commentary that has predominantly seen learning technologies (such as MOOCs - Massive Open Online Courses) as vehicles with which to democratise learning [88], underpin a more equal global distribution of knowledge [89–92] and having the capacity to right significant social inequities and power dynamics and bring inexpensive, quality education to students in places remote to bricks and mortar institutions [93–96]. In subsequent studies this finding of 'inequality' requires clarification. Furthermore, as one of the fundamental principles of naturopathy involves an appreciation of nature, the healing power of nature, and natural approaches to life that may include work / life balance and life / technology balance (digital detox and device vacation) further research into philosophical and ideological perceptions (*there are whole lot of things you cannot do online, physical, clinical education cannot be taught online*) and experiences of CM stakeholders regarding the use of technologies in both practice and education require expansion.

5. Limitations and future research

In this study, data collection was conducted before the outbreak of the Covid-19 pandemic which has led to an inevitable surge in the use of digital technology tools (e.g., Voice over PowerPoint or video conferencing tools) in educational settings. For CM educational leadership, critical questions emerge as to how these circumstances may have changed students' perception (and/or attitude) towards the use of digital technologies in their classroom since the analysis of this data. This important limitation notwithstanding, and while many learning technology-related issues may be shared across CM and non-CM educational settings, the findings from our study do suggest a further research examination of CM specific use and experience may well be justified and provide benefit in addressing possible challenges and tensions regarding learning technologies. From the broadest perspective, part of a future research agenda could involve the development of a fit-for-purpose theoretical model with which to approach and understand adoption, perceptions and experiences, behaviours and potential change strategies regarding technologies in CM educational environments. More specific future research needs could examine the limitations of what can and cannot be taught online in CM and if and how a more nuanced deployment of technologies may be preferable to relevant stakeholders. Our findings also point to the need to know more about the wider use of clinical and practice enhancing software and technologies available, as well as perceptions and experiences of telehealth by the CM faculty and student body.

Research is needed to explore the perception and experience of faculty and students of CM education institutions as well as professional leaders within CM towards the challenges, opportunities and use of a variety of educational delivery methods and technologies within the specific needs of CM practitioner training and what culture change might be necessary and what skills need to be taught to faculty. Areas requiring further enquiry include the effectiveness of educating CM practitioners as a result of learning technology utilisation and the priorities of educational providers to keep pace with modern educational technology developments. Future research in CM health education settings could involve tools such as asset mapping or infrastructure and technology audits in order to identify the learning technologies used,

Screenshot

and the student services, faculty and IT support infrastructure that is currently in place. Possessing broader knowledge on the topic could have an impact in overall institutional strategy, curriculum design, employment status, resource allocation, infrastructure and operational imperatives for CM leaders in these private equity education environments [12]. The findings highlighted in this study and the results of further research are important for education leaders, especially if clear trends in education towards the uptake of learning technologies are not being adopted within CM educational institutions.

6. Conclusions

This is the first study examining the interface between technologies in learning and clinical practice within CM education settings. Some students, faculty, and professional leaders of the CM professions in the US and Australia appear conflicted about the use of these widely available educational and clinical tools. More research is necessary to determine CM faculty and student perceptions, experiences and adoption patterns regarding technology, their digital literacy, the divisions and subdivisions within the faculty and student body, the way in which these groups adopt innovations and their identifiable attitudes to technologies and learning. The impact of Covid-19 on CM educational institutions has highlighted the critical nature of these questions. There is an urgent need to establish a strategic research agenda for this important aspect of health care education in order to help ensure a well-educated, effective CM healthcare workforce.

Ethics approval and consent to participate

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Authors contribution

AG led the development of a study, conceptualization, methodology, conducted the study, formal analysis, investigation, project administration, data curation and drafted the manuscript AS provided expertise on all stages of the study, supervision, review & editing of the revised the manuscript JA provided expertise on all stages of the study, supervision, review & editing of the revised the manuscript.

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Author disclosure statement

AG led the development of a study, assisted in FG and IV data collection and drafted the manuscript.

AS led the FG and IV data collection, provided expertise on all stages of the study and revised manuscript.

JA provided expertise on all stages of the study and revised manuscript.

Declaration of Competing Interest

All [illegible]eclare no competing or conflicts of interest.

Screenshot

Availability of data and material

The dataset supporting the conclusions of this article is included within the article (and its additional file).

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Appendix

Focus groups and semi-structured interview question/topic guide (see Appendix 1).

Focus Groups.

1. Background and beliefs about complementary medicine and its role
   1. Tell me what attracted you to study complementary medicine?
   2. What is your academic background?
   3. How has your involvement in complementary medicine impacted on your life outside of study?
   4. The influence of their biography of their experience (age, ethnicity)?
2. Traditional knowledge and scientific research
   5. What do you understand the term 'traditional knowledge' to mean?
   6. How important is traditional knowledge to your personal experience of complementary medicine? To your future role as a practitioner?
   7. What about scientific research? What role do you expect science to play in your study and your future practice?
   8. How would you describe the balance between science and tradition in your studies at the moment?
   9. How does this balance compare to what you expected when you started studying?
   10. Would you like to see a change to this balance?
   11. What are the strengths and weaknesses of both science and tradition in complementary medicine?
3. Education delivery methods in the training of complementary medicine practitioners

1. What types of learning environments have you experienced at this institution and elsewhere? What are your thoughts on these different environments?
2. Tell me about your personal use of technology
3. What are your views about the use of technology in society?
4. How would you describe your personal relationship with technology?
5. What is your experience of using technology for learning?
   1. How do you feel about technology being used as part of complementary medicine practitioner education?
   2. Are there any areas of practitioner education that you feel technology is better or worse suited?
   3. What has been your personal experience of using technology as part of your learning?

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Appendix K Articles and Manuscripts and Tables – Chapter 7

Manuscript associated with results reported in chapter 7. Gray AC, Steel A, Adams J. Attitudes to and uptake of learning technologies in Complementary Medicine Education - Results of an international faculty survey

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Attitudes to and Uptake of Learning Technologies in Complementary Medicine Education: Results of an International Faculty Survey

Alastair C. Gray, MSc, Amie Steel, PhD, and Jon Adams, PhD

Abstract

Objective: The complementary medicine (CM) education sector is maturing as evidenced by rising professionalization and improved educational standards. However, despite the substantial size of the CM industry the education of existing and future CM practitioners has received little research attention. The aim of the study reported here is to explore the perceptions of CM teaching academics (working across the university and nonuniversity CM education sector) to the use of learning technologies in their work.

Methods: An online survey was administered to academic staff ($n=80$) at two key CM education provider institutions, one in Australia and one in the United States. Academics were questioned regarding four specific domains: their demographics; their perceptions and experiences of technologies in general; their perceptions of the changing face of CM education and the role of the CM teacher in general; and their perceptions of their institution's infrastructure, progress, and support regarding learning technologies.

Results: Respondents reported having taught for a mean of 9.6 years overall and a mean of 5.3 years at their current institution. More respondents identified as female, and most participants were employed on duration-specific contracts ($n=57$, 72.2%). A majority of permanent employees (71%) reported not currently being in clinical practice, while most contract employees (82%) were in clinical practice. Participants reported that teaching practice was changing due to the availability of learning technologies (mean 4.2: standard deviation [SD] 0.79) and that confidence and capability with digital technologies were essential to being a successful academic (mean 4.2: SD 0.74). Contracted academics were significantly more in agreement than the tenured academics with regards to their institution being more advanced with regards to the effective use of digital technologies ($p=0.025$). Tenured academics were significantly more likely than the contracted academics to perceive themselves as having a positive influence upon recommendations for new technologies to be adopted by their institution ($p=0.001$), as well as input to decision-making about which technologies are implemented in their area of work ($p<0.001$).

Conclusion: This in-depth empirical study of CM academics' perspectives provides novel but measured preliminary insights into the place and value of learning technologies in CM education. This research is consistent with other educational research suggesting that academics have complex patterns of technology adoption and that over simplified interpretations of resistance to change among academics require modification and should not be seen as the rejection of technologies by academics. Ultimately, more research exploring the interface of CM education and learning technologies is needed, including comparisons with staff and academic perspectives within and across other CM institutions, integrative medicine institutions, and medical education settings.

Keywords: complementary medicine, learning technologies, e-learning, education, faculty

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Appendix L Articles and Manuscripts and Tables – Chapter 8

Manuscript associated with results reported in chapter 8. Gray AC, Steel A, Adams J. Complementary medicine students' perceptions, perspectives and experiences of learning technologies. A survey conducted in the US and Australia

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Research paper

Complementary medicine students' perceptions, perspectives and experiences of learning technologies. A survey conducted in the US and Australia

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ABSTRACT

Introduction: The education of complementary medicine (CM) practitioners has received little research attention even though CM occupies a significant role in the Australian and US healthcare systems and the CM education sector continues to grow and professionalise. The objective of this study was to explore the perceptions of CM students to learning technologies.

Methods: A cross sectional survey was administered to students (n=271) at two CM education institutions, in Australia and the US - countries with similar CM provision and education standards. Students were questioned regarding four areas. Contextual questions were asked about demographics; perceptions of technologies in general; perceptions of the andragogical and technology driven transformation taking place in tertiary education; before focussing on questions pertaining to their institution's infrastructure, progress and support regarding learning technologies.

Results: Most students reported studying naturopathy (n=126, 46.2%) and nutritional medicine (n=84, 30.8%). No identifiable differences were found between students in Australia and the US, but the majority of students in both countries perceive themselves to be more technology and media literate than previous generations. Using the categories of Rogers' Diffusion of Innovation theory there were many students who self-declared as 'early majority' (34.6%), and substantially fewer 'laggards' (3.8%). Many participants viewed their institution as unsupportive and having a responsibility to prepare them with relevant digital skills.

Conclusion: There are broad challenges to improving the educational experience for CM students, academics and institutions. Further research is necessary to explore the complexity of digital technology use in CM institutions and the wider social issues they relate to.

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Appendix M Articles and Manuscripts and Tables – Chapter 9

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Learning technologies and health technologies in complementary medicine clinical work and education: Examination of the perspectives of academics and students in Australia and the United States

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ABSTRACT

Background: The use of technologies continues to grow in healthcare provision, and learning technologies now dominate tertiary education. Meanwhile, complementary medicine (CM) constitutes a substantial component of contemporary healthcare, yet the education of existing and future CM practitioners has received little empirical attention. In direct response, our study examines the perceptions of CM students and faculty related specifically to health and learning technologies in clinical CM work and education.
Methods: A cross-sectional online survey was administered to all current students (n = 4851) and tenured, contracted and adjunct academics (n =530) at two CM education institutions – in the US and in Australia.
Results: Most student respondents (n = 134, 49%) reported that they either felt they were unsure if they would use telehealth in clinical practice or that they would use it (n = 116, 43%). The majority of all academic respondents did not believe it possible to conduct basic clinical processes online such as reading a patient's body language (M3.8, SD 1.0), conducting quality clinical training in CM settings (M3.2, SD 1.3) or learning rapport skills (M3.2, SD 1.2). Of those academics who were also in clinical practice, only a small number reported conducting virtual consultations in their CM work (n = 7,15.9%).
Conclusion: Our findings highlight a potential disparity of perceptions between academics and students in these CM educational settings especially in relation to telehealth. Academics expressed hesitancy to fully rely on technologies to develop practitioners in a field where 'formation of professional character' is considered so important.

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