Developing clinical teacher's self-efficacy in Australian general practice

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Glossary of acronyms

ACGME	Accreditation Council for Graduate Medical Education (USA)
ACRRM	Australian College of Rural and Remote Medicine
AGPT	Australian General Practice Training
AJDCF	Australian Junior Doctor Curriculum Framework
AOGP	Adelaide to Outback General Practice training
APLS	Advanced Paediatric Life Support course
BEST	Bringing Education and Service Together curriculum
CanMEDS	Framework of The Royal College of Physician and Surgeons of Canada
CCTEI	Cleveland Clinical Teaching Effectiveness Instrument
CTPI	Clinical Teaching Perception Inventory
CSSET	Clinical Supervision Self-Efficacy Tool
CTAI	Clinical Teaching Assessment Instrument
EFA	Exploratory Factor Analysis
EOSA	End of Semester Appraisal
ERIC	Education Related Information Center (USA)
FACRRM	Fellowship of the Australian College of Rural and Remote Medicine
FAIMER	Foundation for Advancement of International Medical Education and Research
FMP	Family Medicine Program
FRACGP	Fellowship of Royal Australian College of General Practitioners
G-CEL-Q	Geriatrics Clinician Educator Learning Questionnaire
GMC	General Medical Council (UK)
GP	General Practitioner
GPET	General Practice Education and Training
GPR	General Practice Registrar
GPS	General Practice Supervisor
GPSA	General Practice Supervisors Association
HWA	Health Workforce Australia

JBI	Joanna Briggs Institute
KSA	Knowledge Skill Attitude and Attributes
KMO	Kaiser-Meyer-Olkin measure
MASS	Medical Achievement Self-efficacy Scale
MAStARI	Meta-Analysis of Statistics Assessment and Review Instrument
MCTQ	Maastricht Clinical Teaching Questionairre
MIQ	Mental Imagery Questionnaire
OSCE	Objective Structured Clinical Examination
OSTE	Objective Structured Teaching Encounter
PBL	Problem Based Learning
PCA	Principal Components Analysis
PETTLEP	Physical Environment Task Timing Learning Emotion Perspective framework
PGPPP	Prevocational General Practice Placement Program
PGY2	Post Graduate Year 2
RACGP	Royal Australian College of General Practitioners
RAND	Research organisation (USA)
RAT	Resident as Teacher
RCT	Randomised Controlled Trial
RTP	Regional Training Providers
SEAT	Self Efficacy in Asthma Teaching
SECT	Self Efficacy in Clinical Teacher
SNAPPS	Summarise-Narrow differential-Analyse-Probe-Plan-Select
STEBI	Science Teaching Efficacy Belief Instrument
TEBS	Teacher Efficacy Beliefs System
TSES	Teacher Sense of Efficacy Scale
TOTR	Teaching On The Run
TtT	Train the Trainer

ABSTRACT

Developing clinical teacher's self-efficacy in Australian general practice

The Australian health system, including general practice as the main primary health care provider, faces many challenges. This includes a rapidly ageing population, the increasing burden of chronic disease and co-morbidities, increased community expectations, technological advances and balancing a burgeoning evidence base with holistic, patient centred care.

Concurrent changes include the shift from apprenticeship to competency-based education, competitive tender processes for general practitioner (GP) training with increased accountability for government funding and workforce distribution.

Though high professional standards of general practice in Australia provide a strong foundation for a mature GP training program, in addition to the clinical and financial, there are wider educational challenges.

There is an increased expectation that a GP clinically supervises and teaches undergraduate and postgraduate medical and allied health students. The GP supervisor role is pivotal, underpins all the learning, yet is complex, demanding and at times, potentially conflicting. Ageing GP supervisors, the lack of recognised qualifications, limited clinical teaching professional development and training capacity saturation, especially in rural and remote areas, are impacting on the quality of clinical teaching.

Beyond being the medical expert, GPs have other important roles in the Australian health system and are uniquely placed to lead and respond to these challenges and changes. An important pillar underpinning quality primary health care is high quality training. For the GP supervisor to function effectively in primary health care provision and be the cornerstone of GP training, there needs to be an evidence based understanding of their roles, competencies and professional development.

A consensus-developed national competency based framework provides the foundation to align clinical practice, accreditation, clinical teaching, student training, quality assurance and ongoing professional development. Articulating the GP role as a scholar, recognises the essential clinical teaching domains and defines the knowledge, skills, attitudes and attributes of a clinical teacher. Identifying these competencies informed descriptors of quality, required training, professional development and potential assessment approaches.

A new unified conceptual construct of clinical teacher self-efficacy provides a new dimension for medical education research. Clinical teacher self-efficacy is the confidence and belief that their teaching will positively influence and impact on the learner in the clinical medical environment. Knowledge translation from fields of psychology and education show that self-

efficacy is a key factor in influencing the teacher's professional behaviour, motivation and persistence. It also influences performance and student learning outcomes.

A systematic review on the effectiveness of interventions on the self-efficacy of clinical teachers identified a paucity of research. In the few published studies the interventions that positively impacted on self-efficacy in the clinical teacher included: focussed clinical teaching courses, interactivity using clinical scenarios, communication skills and teaching prompts, with peer learning, review and mentoring.

There is an international absence of a measurement tool to evaluate self-efficacy in clinical teaching. Consequently a second objective of this thesis was to develop and validate a new Self-Efficacy in Clinical Teaching (SECT) tool. A two-stage evaluation showed SECT to be an authentic and reliable measurement with good content, construct and dimensional validity.

The innovation of a low technological intervention using mental imagery and visualisation provided an interactive clinical teacher professional development, and demonstrated the development of self-efficacy in the clinical teacher. Although secondary outcomes showed no impact on indirect performance indicators (supervisor qualities or quality of clinical teaching), further research is indicated.

Self-efficacy development can form an effective and integral part of the professional development of clinical teachers and medical educators. The duality of competency and self-efficacy can provide the arms for excellence in Australian general practice and clinical teaching.

An increased recognition and support for the clinical teaching roles of the GP will provide community benefits by fostering high quality training, excellent patient care, patient safety, and cost-effectiveness.

Statement of Declaration

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university of other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

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Dr Lawrence Andrew McArthur

7th November 2016

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CHAPTER 1: INTRODUCTION, BACKGROUND, METHODOLOGY

Introduction

"Whatever the mind can conceive and believe, it can achieve."

The above quote has been attributed to the father of modern psychology, William James, over a century ago. This self-affirmation and positive thinking has inspired people from motivational writers such as Napoleon Hill to Australian Olympic athletes such as Stephanie Rice.

This quote resonates with a contemporary understanding of self-efficacy. Reflecting on the words, the connotations of body-mind-soul fit well with the holistic nature of general practice, and the educational alliance and relationship between teacher and learner in general practice training. A handwritten version often inspires me to continue my journey of enquiry, exploration and research.

Background – general practice training in Australia

Historical foundations

General practice in Australia has a strong role in the health care system, setting high professional standards and a decade old organised general practice training program.[(1)] Professional recognition as a general practitioner (GP) requires following a college endorsed pathway and assessment for Fellowship, most commonly lasting three or four years of postgraduate training. The Royal Australian College of General Practitioners (RACGP) and the Australian College of Rural and Remote Medicine (ACRRM) are jointly responsible for setting the professional standards, although they largely function independently.

The RACGP was established in 1958 and from 1974 to 2001, and was solely responsible for Australian general practice advocacy, practice accreditation, professional standards, curriculum, assessment and provided vocational training through the then Family Medicine Program (FMP).

The ACRRM was established in 1997 in response to an Australian rural health crisis. There were concerns that rural and remote medicine was a broad and distinctive specialised form of general practice, not being effectively addressed by other organisations. The ACRRM

advocated that this required a dedicated professional college, a well-designed vocational training and continuing medical education program, and resources to address significant rural workforce issues and shortages.

The rural health crisis created sustained political and community pressure for the federal government to act. The federal government looked for ways to leverage their funding support and workforce policies, exert health care expenditure control and be active in finding the best solution for Australian rural communities. The 1998 report of the ministerial review of general practice training provided the catalyst for fundamental changes.[2] Most significantly this recommended development of regionally based collaborative arrangements in GP education delivery between universities and training organisations, and a national body to provide coordination across the general practice education continuum.

From 2001, a new federal government body was established called General Practice Education and Training (GPET). It provided funding and coordinated Australian General Practice Training (AGPT), delivered through a network of independent regional training providers (RTP). The accreditation by the Australian Medical Council of ACRRM's Fellowship and assessment pathways in 2007 culminated in a decade of decisions that effectively removed the RACGP monopoly over general practice education and professional standards. The move away from the RACGP state based governance, administration and delivery resulted in a decentralised model with an initial 22 regional training providers. A key educational aim underpinning the establishment of GPET and the AGPT program was regionalisation to facilitate vertical integration of training. It fostered a competitive environment to encourage innovation, and postulated cost effectiveness, efficient regional resource, with aspirations for high quality training.[3] Through government controlled entities, this promised leverage to provide a well-trained, appropriately distributed workforce across Australia, particularly to meet the primary health care needs of rural, Indigenous issues such as an increasingly ageing population. A popular euphemism throughout the AGPT program was to "train to retain" doctors within regional areas of Australia.

Strengths

Australian vocational general practice training has several strengths. There is a national primary health care system, partially funded by the federal government through Medicare Australia. The ACRRM and RACGP provide choices to the general practice profession, with two different training pathways, and different curricula, professional standards, training

requirements and assessments. Both the RACGP and the ACRRM curricula address the wide diversity of general practice, reflect community needs and include specific Aboriginal health cultural awareness, rural health, procedural skills, workforce development and GPs as teachers. Formal training is mandatory, with both college fellowships being equivalent endpoints of Australian professional recognition. They are also recognised for the purposes of vocational registration which entitles the doctor to receive government payments for delivering health care through Medicare. The summative RACGP examination has proven validity and reliability,[4] and the ACRRM assessment pathway has demonstrated the potential to address extended rural practice workforce development.[5]

The RTPs deliver vocational training, following strict college accreditation and training standards, and established regional training infrastructure. They utilise rigorous educational processes, systematic formative assessment, and innovative high quality training resources. Bi-college accreditation by ACRRM and RACGP ensures adherence to vocational training standards. An example of the excellent quality of training is evidenced by the exemplary Adelaide to Outback General Practice (AOGP) training bi-college accreditation report in December 2014.[6] Innovation is demonstrated through development of e-learning platforms, and educational continuum provision and collaboration was initiated with the Prevocational General Practice Placement Program (PGPPP). Individual registrar needs were provided that included learning needs analysis or remediation educational processes. It is robust for the separation of delivery of training by the RTP and the summative fellowship assessment by the colleges. The RTPs nurtured regional networks of high quality general practice training environments by facilitating good local relationships and clinical placements for GP registrars (GPR). There is also recognition of the training practice and partial reimbursement for the pivotal importance of the GP supervisor (GPS), including their role as clinical teachers.

Clinical placements in general practice are important as they provide an authentic learning environment. This is where GPRs fully participate in holistic patient care and learn to integrate theory into clinical practice. This cognitive apprenticeship model provides the novice GPR with routine clinical work to develop patient consultation skills, clinical reasoning and professionalism.[7] Practically, the best clinical learning requires active engagement of the novice GPR with patients, and the doctor is respected as part of the clinical team.[8] Simple placement of the registrar in the general practice environment for training makes the assumption that learning will occur, and that there will be transfer of knowledge to real-life situations. However, the problem is that this highly contextual and authentic learning environment is primarily geared towards patient care and not the student's learning.[9]

Australian research has shown that these registrars in training see a narrow range of patients, and relatively few clinical cases are discussed with their supervising clinical teachers.[10] When clinical cases are discussed, the interactions are short in duration, focus on quick management or treatment options, involve little teaching and provide virtually no feedback.[11] Feedback and reflection are conducted infrequently and erratically in clinical settings. The imperative appears to be "to see patients", with the associated experiential student learning a secondary outcome. The clinical and learning imperative is not matched with similar emphasis on teaching, as there is scant focus on the clinical teacher

Competing demands

The competing demands on the GP clinical teacher and their practice, from provision of clinical care, patient safety, administration, research and teaching,[12] leads to the clinical learning environment not always being optimally used for registrar learning. Most clinical teachers are well prepared for and dedicated to their tasks in patient care, and are enthusiastic about helping others and teaching. The problem is that most general practitioners who are expected to teach often have no understanding of adult learning theories and curricula or received scant instruction on how to teach. There is no requirement for Australian GPs to have formal teaching qualifications by the Australian training governing bodies and colleges. A fundamental assumption appears to be that any doctor can teach others in training roles, through some limited patient and teaching interactions and possibly role modelling by being a "good doctor" themselves. This provides the learning doctor all that needs to be learned, and will ensure a high quality of patient care and safety.

This clinical teaching is interwoven with supervision of the registrar's clinical practice. The GP supervisor in Australian general practice settings was recently defined as: "*a general practitioner who establishes and maintains an educational alliance that supports the clinical, educational and personal development of a resident doctor*".[13](p1161) More than being a role model, the GP supervisor should effectively focus and pace the clinical teaching to the student's level of learning and provide constructive feedback.[9]

Initiatives by educational organisations and teaching faculties are required to help GPs create a supportive environment for learning and be professionally skilled to be excellent clinical teachers.[14] This involves the development of strategies to provide GPs with the clinical teaching knowledge, skills and attitudes. It also involves instruments to measure clinical teaching effectiveness in order to provide evidence to the organization for identifying areas

for professional clinical teacher development and most importantly for providing feedback to guide, support and motivate clinical teachers to improve their teaching.[15]

Though Australia has a solid foundation of general practice vocational training, dynamic forces continue to challenge, exert pressure and force change. Australian general practice faces several challenges. These include: a rapidly ageing population, an increasing burden of chronic disease and co-morbidities, increased community expectations of health care, balancing a burgeoning evidence base with holistic patient centred care, declining government funding and workforce distribution.[1]

Current changes and challenges

In 2015 a change in political imperatives led to fundamental changes in general practice education, with the axing of the vertical integrated education for junior doctors training (PGPPP), and the disbanding of the government owned company (GPET). This created an enforced upheaval for the existing regional training providers, 18 months of uncertainty, and an competitive open market tender process. This cost efficiency measure has resulted in no published cost savings with the reduction to nine GP training providers, and a return to essentially training based on Australian state boundaries. Only Queensland and Victoria have two regional training organisations. Other GP education functions such as selection, research and remediation have been moved to the two professional colleges. This has led to loss of collaboration in the use of training resources, lack of cohesion between various general practice organisations, loss of educational expertise, loss of innovation and loss of momentum to progress high quality general practice education.

At the same time, there has been an increased focus on competency based education,[16] and a move away from learning objectives geared towards training outcomes.[17] This is evident in the recent RACGP developed competency based framework and changes in the RACGP vocational training standards.[18] The regional training providers previously provided various supervisor and practice supports, and variably facilitated the professional development of GP supervisors, clinical teachers and medical educators. Excellent competency identification tools have been developed and used in general practice training, like the AOGP Learning Needs Analysis,[19] but although innovative and educationally effective, they are labour intensive and costly to deliver.

Further challenges include the shift in focus for health care delivery and medical education to the community, yet the role of a “good GP” has not been coherently defined in Australia.

There is a deskilling of general practitioners, yet governmental expectation is that GPs take on broader health care management roles.

Increasing numbers of undergraduate and postgraduate medical and allied health students are now concentrated in community general practice, particularly in rural and remote Australia. Training capacity is being stretched, especially in rural areas, by a decreasing and ageing population of GP supervisors, who provide the majority of the apprenticeship model of supervision, clinical teaching and even employment of GP registrars. The expertise in medical education and future supply of medical educators is threatened by funding cuts to regional training providers, lack of defined career pathways, lack of specialist recognition, and a university emphasis on high impact research.[20]

Research intent

As GP training continues to evolve and mature, it is important to respond to these challenges and changes. More than ever, exploration, research and development of new medical education constructs, cost effective approaches in general practice education, better assessment tools, innovative education interventions and practical solutions need to occur.

This thesis documents my experiential journey to integrate the clinical, teaching and research arms of general practice. It draws on decades of personal experience as a rural GP proceduralist and a medical educator, and enthusiasm to progress clinical teaching as a competency. The premise that "you are a doctor, so you can teach" is either a myth that needs to be challenged or evidenced. With a focus on the clinical teacher, a systematic inquiry and robust research can contribute to the evidence basis in general practice.

The development of my research journey around self-efficacy of the clinical teacher in general practice is a story of evolutionary steps. These steps are described in the following chapters and show the use of various research techniques. This includes a literature review, a systematic review, knowledge translation, the use of focus groups, measurement tool validation and evaluation of an intervention trial. These techniques entail and fit into an overarching research approach that can be described as case study methodology.

A review of the international literature and facilitation of Australian workshops explores the attributes and qualities of an excellent clinical teacher (*Chapter 2*). A literature review of the disciplines of psychology and education translates knowledge to a new construct of self-efficacy in medical education (*Chapter 3*). A systematic review determines the effectiveness of interventions on the self-efficacy of the clinical teacher (*Chapter 4*). To accurately

measure the self-efficacy of the clinical teacher in general practice, developing and validating a measurement tool was undertaken (*Chapter 5*). Knowledge translation from the sports and medical education literature enabled the application of mental imagery to develop self-efficacy (*Chapter 6*). The innovative development of an educational intervention as a non-randomised controlled trial using mental imagery explored developing self-efficacy in the clinical teacher (*Chapter 7*). The final chapters consist of a discussion encompassing the whole research (*Chapter 8*) and a summary (*Chapter 9*).

The intention of this research was to highlight the importance of clinical teachers in general practice, and to explore better ways to support, sustain and professionally develop them. Essentially, by helping doctors be better clinical teachers we can improve the quality of the teaching and learning experience in general practice.

Methodology

Case study methodology

Due to the dynamic and constantly evolving nature of GP training, I have chosen to use an overarching research approach called case study methodology for my PhD studies. Case study research can be seen as an intensive, holistic description and analysis of a single situation or phenomena, with a view to gain further and in-depth understanding of its meaning for those involved. It is especially useful for trying to test theoretical models in real world situations.[21] The research focus is on the process and context rather than a specific variable cause-effect outcome.

Broadly speaking, research can be described as a systematic inquiry. Qualitative case study methodology uses a naturalistic research paradigm that is focussed on exploration, discovery, insight and understanding of those being studied. Merriam[22] philosophically believes that "*research focussed on discovery, insight and understanding from the perspectives of those being studied offers the greatest promise of making significant contributions to the knowledge base and practice of education*" .[22](p3)

The method of case study research can be defined as "*an empirical inquiry about a contemporary phenomenon (e.g. a "case"), set within its real-world context – especially when the boundaries between phenomenon and context are not clearly evident*".[23](p18)

This makes case study research the ideal design and methodology for understanding and interpreting observations of a medical educational phenomena and addressing situations in

order to improve clinical teaching practice. A case study researcher gathers as much information about the problem as possible with the intent of interpreting or theorising about the phenomena.

The four essential features of case study methodology are summarised [22] as:

1. Particularistic – it focuses on a particular situation, event, program or phenomena.
2. Descriptive – it is a lifelike, holistic description of an incident or entity. It also involves interpreting the meaning of the demographic and descriptive information in terms of cultural norms, community values, deep seated attitudes and established practice. This can illustrate the complexities of a situation and explore the influence of human behaviour, interactions or time.
3. Heuristic – this illuminates the current understanding of the phenomena, helping to understand how it has come about. It explains the reasons for a problem, the background of a situation, what has happened and why. This provides insights into the phenomena.
4. Inductive – as generalisations, concepts or hypotheses emerge from the research process and data collection, there is adaptability to explore further. Thus it is the discovery of new relationships, concepts and evolving hypotheses rather than verification of predetermined hypotheses or testing of existing theory.

To clarify the terminology, case study research is quite different to:

- Casework
- Case studies
- Case history/records.

In medical practice and research, casework is the tracking of an identified cause (e.g. the Zika virus and microcephaly). Case studies are commonly published in research journals as illustrative examples for teaching, often describing rare sequelae or complications which are clinically wary. Case history or records are retrospective tracing of clinical and historical data.

There are many reasons justifying the use of case study methodology as the most suitable and appropriate approach for my research. Borne out of my own experience of being a rural general practitioner, the pragmatic assumption was that I would teach medical students, junior doctors and general practice vocational training registrars. This practical clinical teaching experience led to reflections about my competence and confidence as a clinical teacher in general practice, in the absence of any formal teacher training. There was a myth that if you are a doctor, you can teach! The limited professional teacher development opportunities led me to question how general practitioners, busy in their clinical practice,

can be assisted to become better clinical teachers. I needed a research method that could explore, unravel and investigate the complex, multiple variables of potential importance to understand the task of clinical teaching in the 'real world' of general practice.

The 'real world' context is that clinical teaching occurring in general practice is unique and complex, with multiple variables that are too difficult to delineate or control. There are too many variables and practical impossibilities to enable the use of better-known research methods like randomised control trials. The reality is that the nature of quantitative or qualitative research methods limits and contains the information collected.

From reading Albert Bandura's social cognitive theory, I realised that his self-efficacy construct[23] encompasses much more than having confidence. Self-efficacy is a personal belief in one's capability to successfully execute the behaviours necessary to attain designated types of performances.[24] According to Bandura, self-efficacy beliefs lie at the core of human functioning. [25] It is not enough for individuals to possess the requisite knowledge and skills to perform a task; they also must have the conviction that they can successfully perform the required behaviours under typical and importantly difficult circumstances. The phenomena of self-efficacy intrigued me.

Case study research has been widely used and integrates well with other disciplines like psychology, nursing[26] and geography.[27] *"In particular, theory and technique from anthropology, sociology, psychology and history have positively informed case study investigation in education."*[22](p22) The concept of applying the psychological theoretical construct of self-efficacy to an educational activity of clinical GP teaching was new and compelling.

The particularistic, descriptive, heuristic and inductive elements of case study research are best suited to the exploration of a doctor's clinical teaching in their natural environment. This includes the influences of non-cognitive (thoughts, perceptions, confidence) factors. The boundary of my research was confined to the individual GP clinical teacher, which fits the particularistic element, rather than the culture of a teaching practice or the qualities of the learner.

Descriptive elements are anchored in the real life context so that the complexity and holistic nature of clinical teaching in general practice is identified and recognised. Case study methodology is not characterised by the methods used to collect or analyse data, but rather its focus on a particular phenomena.[21] This means that the research focus is bounded by the

phenomena, and information and data relating to the case study can be collected through a variety of sources.

The heuristic element illuminates further understanding and provides insight into the uniqueness of clinical GP teaching. It also recognises the experience and expertise of general practitioners as clinical teachers.

Most importantly the inductive element of case study research allows for future evolution based on what one has found. For instance, I discovered after searching the literature that there was no suitable tool to measure self-efficacy in clinical teaching. Case study methodology allowed me to adapt to this unforeseen event and change direction during my research to develop, test and validate a suitable measurement tool.

Research techniques

The evidence in this case study research was collected from a mixture of qualitative and quantitative research techniques.

Extensive literature searches collated the evidence and understanding around the qualities and attributes of an excellent GP clinical teacher, the construct of self-efficacy in medical education, and the measurement of self-efficacy.

The use of focus groups enabled the formulation and review of various parts of this research. This included identifying the roles and competencies of an excellent teacher, the item construction of the Self Efficacy in Clinical Teaching (SECT) measurement tool, and participant responses during the self-efficacy intervention workshop.

Knowledge translation enabled further research consideration and inter-discipline application of evidence.[28] This assisted in identifying quality descriptors or gaps in knowledge, and constitutes the knowledge to action cycle.[29] Knowledge translation resulted in a new unified construct of self-efficacy in medical education as well as the application of mental imagery to develop self-efficacy as an intervention.

A systematic review was conducted to determine the effectiveness of interventions on the self-efficacy of clinical teachers in the last 20 years. A systematic review following dedicated protocol and steps is an effective research tool to synthesise and provide evidence led guidance for evolving clinical knowledge.[30]

Developing a new self-efficacy in clinical teaching measuring instrument involved the use of accepted research tools in questionnaire design, surveying and statistical analysis of the quantitative data. Specific methods, statistical and analytical techniques used are discussed in the relevant chapters. A pilot study and further second stage testing were also conducted to validate the measurement instrument.

To explore the development of self-efficacy in clinical teachers, a non-randomised intervention trial was designed with a control and intervention group. The intervention comprising a three-hour workshop called “Mastering Performance” taught mental imagery and visualisation techniques as part of the GPs clinical teaching preparation. After the intervention workshop, there was mainly informal qualitative data collected from the participants. A summary of the case study elements and types of research used is presented in Table 1.1.

Table 1.1: Methodology summary by type and case study elements

Methodology	Literature review	Focus groups	Knowledge translation	Systematic review	SECT measurement tool	Intervention
Case study elements						
Particularistic	GP clinical teacher			Self-efficacy of clinical teacher	Measurement of self-efficacy	GP clinical teacher
Descriptive	Qualities and Attributes Development of self-efficacy	Australian roles and competencies	Quality Descriptors	Interventions impact on self-efficacy	In clinical teachers	Self-efficacy Professional development
Heuristic	Uniqueness of GP clinical teacher	Quality Descriptors Development of self-efficacy	Unified self-efficacy construct	Influences that develop self-efficacy	Item construct aligned with quality descriptors	
Inductive			Mental imagery development of self-efficacy	Mental imagery development of self-efficacy	Development of self-efficacy with time and through mental imagery	Mental Imagery development of self-efficacy

CHAPTER 2: QUALITIES AND ATTRIBUTES OF AN EXCELLENT CLINICAL TEACHER

Context

Over the last decade there have been many dramatic changes in medical education across Australia.[31] Educationally there has been a move away from presenter focused didactic lectures to group problem based learning. Geographically undergraduate medical training is being increasingly delivered in clinical practices across regional, urban and rural areas. Additionally there has been governmental regionalisation of postgraduate GP training.

There is an international movement away from time and process based approaches to competency based medical education. This "*promises to become the defining framework for postgraduate medical education in the 21st century*."[16](p651) This is evident in the introduction of various competency based models like the CanMEDS framework,[32] the Scottish Doctor,[33] the USA Accreditation Council for Graduate Medical Education[34] and the 2009 Framework of undergraduate medical education in the Netherlands.[35]

Australia has been slow in responding to this paradigm shift to competency based education. There are a couple of isolated examples such as the Australian Junior Doctor Curriculum Framework (AJDCF)[36] and a recent unpublished discussion paper by the RACGP around a competency based framework.

Furthermore there has been a focus on learning outcomes, technological advances (videoconferencing, simulation, e-learning), active learner participation, competency based medical education and customising training to individual students. These changes impose new demands on the teacher with the emphasis shifting from the teacher as an information provider to the teacher as a facilitator of learning.[37] There is an increasing demand for teaching and learning to occur in Australia in the community based clinical general practice environment by already busy GPs. These GPs experience a 'tightrope' balancing act, servicing the clinical health needs of their community and training the next generation of health providers.[38]

In Australia, postgraduate specialist training in general practice is funded by AGPT and delivered by the RTPs (and Remote Vocational Training Scheme), and follows either of the professional colleges' three-year (RACGP) or four-year (ACRRM) training pathway. The

majority of this time involves experiential training in community based general practice, i.e.learning by immersion. Most days are spent undertaking patient consulting under the clinical supervision of a GP. An accredited GP supervisor (GPS) provides comprehensive in-practice training as the onsite clinical teacher.

Whilst acknowledging the pivotal importance of supervision in general practice, the professional colleges overseeing general practice specialty training in Australia (RACGP,[39]ACRRM)[40] and in the UK (RCGP)[41] define and use a variety of terminologies, including GP trainer, GP supervisor and clinical teacher, respectively. This is further compounded throughout world literature with further descriptors like preceptor, clinical educator, attending doctor, medical teacher, mentor or coach. The most commonly used definition of the GP supervisor role stems from Kilminster:

> *"Supervision involves providing monitoring, guidance, and feedback on matters of personal, professional and educational development in the context of the doctor's care of patients. This would include the ability to anticipate a doctors' strengths and weaknesses in particular clinical situations, in order to maximize patient safety."*[42] (p828)

In this GP training environment there is an interplay of multiple, dynamic and complex interrelated educational and psychological processes occurring. In world literature, the terms GP trainer, GP supervisor and clinical teacher, prevalent in the general practice training environment, are synonyms and often used interchangeable. The GP supervisor role is occasionally broader (e.g. employer) than the standard international one of clinical teacher, which usually relates to a hospital or university based clinical teacher. For simplicity, consistency and for the purposes of my research in general practice, I have chosen to use the term clinical teacher.

General practice in the private setting has shown that it can provide a quality clinical training experience with a large number of GPs involved in teaching roles, either within or external to their practice.[43, 44] However vocational and undergraduate teaching in general practice is largely dependent on the willingness of GPs to be involved as clinical teachers.[43]

Currently in postgraduate specialist general practice training in Australia, it is the experienced clinical general practitioners, referred to as GP supervisors, who provide the majority of this clinical supervision and in-practice teaching. Often these same GPs are asked to be involved in teaching and supervision of undergraduate medical student clinical

placements, rural clinical medical schools and prevocational junior doctor general practice rotations. They show a high level of altruistic interest but have received little to no training or up-skilling in this clinical supervisor and teacher role.[45]

There are limited studies about the enablers and barriers for general practitioner recruitment and retention for clinical training.[46-48] Perceived major barriers include costs, consulting room space, supervisor time, the need for teacher training, and the variable capabilities of the GP registrar. New approaches to the recruitment of clinical teachers in Australia (e.g. GP registrar as teacher) require new understanding and delineation of the general practitioner roles and clinical teaching areas and activities.[49]

Vertical integrated teaching in general practice is promoted,[50] yet there is fragmentation and lack of coordination between universities, training providers, professional colleges, government and funding organisations, resulting in limited recognition or professional development of clinical teachers in Australia.

A feasible and broad solution for Australia's response to these issues and challenges is a competency based approach, spanning clinical general practice and medical education. It needs to be universally recognised that clinical teaching is a competency.[51] Internationally, in the USA (ACGME),[52] Canada (CanMEDS)[53] and the UK (GMC Doctor as Teacher),[41] it is mandatory that junior doctors be competent in teaching, but not in Australia. In postgraduate GP training in the UK and Australia, the curriculum statements in both countries document various teaching and learning outcomes, but there is no requirement for candidates to demonstrate or be assessed on these outcomes. Across Australia, in GP training and university medical student clinical placements, there is no requirement for a demonstration of teaching competency in the selection or retention of clinical teachers.

Australia is falling behind the world, and our high quality primary health care systems and general practice training are at risk from lack of consensus, national approaches and emphasis on competency.

Shortly after the federal government formation of Health Workforce Australia (HWA) in 2010, one of their first communiqué highlighted the need to develop GPs' teaching expertise. *"Building a sustainable and quality workforce to deliver clinical supervision is essential to ensuring Australia can continue to provide education and training to students in the short, medium and long term."*[54] (p1)

Building a sustainable healthcare system to respond to these challenges and changes requires renewed efforts from all stakeholders and governments to GP supervisor workforce recruitment and retention, new models of supervision, and further clinical teaching focused investment in general practice.[55]

There is an increasing need for innovation and refinement in teaching skills across the medical education continuum (undergraduate, graduate, post graduate and continuing medical education).[47] This requires understanding the GP's role, identifying competencies of the good clinical teacher and embedding teacher development in a universally accepted framework. Moving towards more effective clinical teaching also enables wider and greater efficiency in resourcing, cost and sustainability. Anderson and Thomson suggest that *"reducing the load involves improving efficiency of teaching models within the practice situation so that GPs have more time for direct patient care"*.[43](p908)

The good clinical teacher

The GP clinical teacher role is complex, demanding and at times potentially conflicting but underpins all the learning that occurs in a postgraduate registrar's general practice training.[38, 56] Outstanding teaching is certainly a complex phenomenon, often poorly understood, but Sutkin[57] further states that "*it is imperative that we try, not only to make bad teachers better, but also to maximize the teaching effectiveness of all of us*".[57](p458)

The roles and qualities that make a good clinical teacher have been explored in literature over the last two decades. Reviewing earlier research, a key researcher from the USA, David Irby, [11] states that clinical teachers share a passion for teaching, are clear and organised, accessible, supportive, compassionate, able to establish rapport, provide direction and feedback, exhibit integrity and respect for others, and demonstrate clinical competence. They also utilise planning and orienting strategies, and possess a broad repertoire of teaching methods and scripts; drawing on multiple forms of knowledge they target their teaching to the level of the learners.[11]

In a Delphi-study, Munro[58] identifies the top five most important GP-trainer characteristics, such as honesty, availability, good communication skills, good clinical skills and a serious attitude towards the training of the GP-trainee.

Simplistically, Gibson[59] postulates that there are five Es of an excellent clinical teacher: education, experience, enthusiasm, easy and eccentricity. *"Experience alone does not equate*

to being a good clinician, nor does it necessarily make a good teacher."[59](p4) The premise in Australia underpinning clinical teaching historically has been: you are a doctor, so you can teach!

The Kilminster review highlights the paucity of empirical evidence around GP supervision due to the complexity of GP supervision, methodological problems and lack of a theoretical model.[42] Statements are based on insights gleaned from case studies, self-reporting or peer expert opinion in journal publications. A recent integrative literature review by Wearne[13] identified only 12 studies with empirical evidence, the majority being descriptive or recommendations.[13]

The RACGP is one of the professional bodies responsible for determining training standards for postgraduate specialist general practice training in Australia. Prior to 2013, to be a RACGP accredited GP supervisor simply involved being a Fellow of the RACGP, having full and unrestricted medical registration, being a good clinician and role model, having broader involvement in the GP profession, and maintaining vocational registration through continuing professional development activities. A revision by the RACGP for the 2013 vocational training standards broadened this to an outcome of "*a model of supervision (that) is developed in the context of the general practice training post to ensure quality of training for the registrar and safety for patients*"[60](p13) (RACGP standard 1.2).

ACRRM equally is responsible for determining training standards for postgraduate specialist general practice training in Australia, especially in rural and remote settings. In their vocational training guide for supervisors, ACRRM states that a *"supervisor's role is primarily to provide oversight, guidance and feedback to a registrar on matters of personal, professional and educational development".*[40](p7) The ACRRM has set the following qualifications and experience as minimum criteria for registrars to provide supervision:

- current full and unrestricted registration with the medical board of Australia,
- fellowship of ACRRM or experience and qualifications assessed by ACRRM to be equivalent,
- not less than five years full-time equivalent experience in rural and remote medicine or other rural specialist practice (including training time),
- the ability to act as an appropriate role model, exhibiting a high standard of clinical competence, communication skills and professional values in relation to patient care, and

- demonstrated commitment to ongoing professional development.

Organisations such as General Practice Supervisors Association (GPSA) in Australia provide an advocacy role highlighting the importance of the GP supervisor. Simple manuals, such as "Best practice for GP supervision in general practice",[61] have been produced. These provide practical support and encouragement for a good supervisor to be working towards strong competencies in all areas.

Roles of Australian clinical teachers

An Australian colleague, Dr Simon Morgan, discussed the balancing act of the complex roles of the GP supervisor: mentor, role model, clinical educator, assessor and pastoral carer.[38] Various other roles may be include: employer, cultural mentor, friend, examiner, medical educator, doctor and patient. It is therefore important and beneficial to clearly define the role of a GP supervisor. This ensures a clear understanding and satisfaction for the GP supervisor, clarification of role ambiguities, management of role conflicts, identification of professional development needs and improved registrar learning.

The traditional definition of a GP supervisor is imperfect, being hierarchical, unidirectional, and disengaged with modern educational principles. Principles of a shared two-way learning experience, nurturing an "*educational alliance that supports the clinical, educational and personal development*"[13](p1169) and mirroring the holistic nature of clinical general practice, are predominant. It is more appropriate for definitions and understandings of the GP supervisor role to reflect these principles.

There has been limited exploration of the roles for the GP supervisor across Australia. But there has been some preliminary work done to produce a national curriculum framework for GP supervisors.[62] Various RTPs across Australia have devised and utilised their own models of core supervision skills and short professional development programs for general practice. The Western Australia Clinical Training Network has identified seven core areas based on the grouping of various GP supervisor professional and personal skills.[63] These roles include: professional, managerial, coaching, communication, teaching, conflict resolution and emotional intelligence.

Wearne[13] has mapped the GP supervisor educational activities, *(Figure 2.1)* emphasising the centrality of good clinical care, ensuring patient safety and forming relationships.

> *"Supervisors personal characteristics, particularly their ability to form nurturing,*

ongoing relationships and balance the level of support they gave against the challenges of the residents work, provided a foundation for resident's learning."[13](p1169)

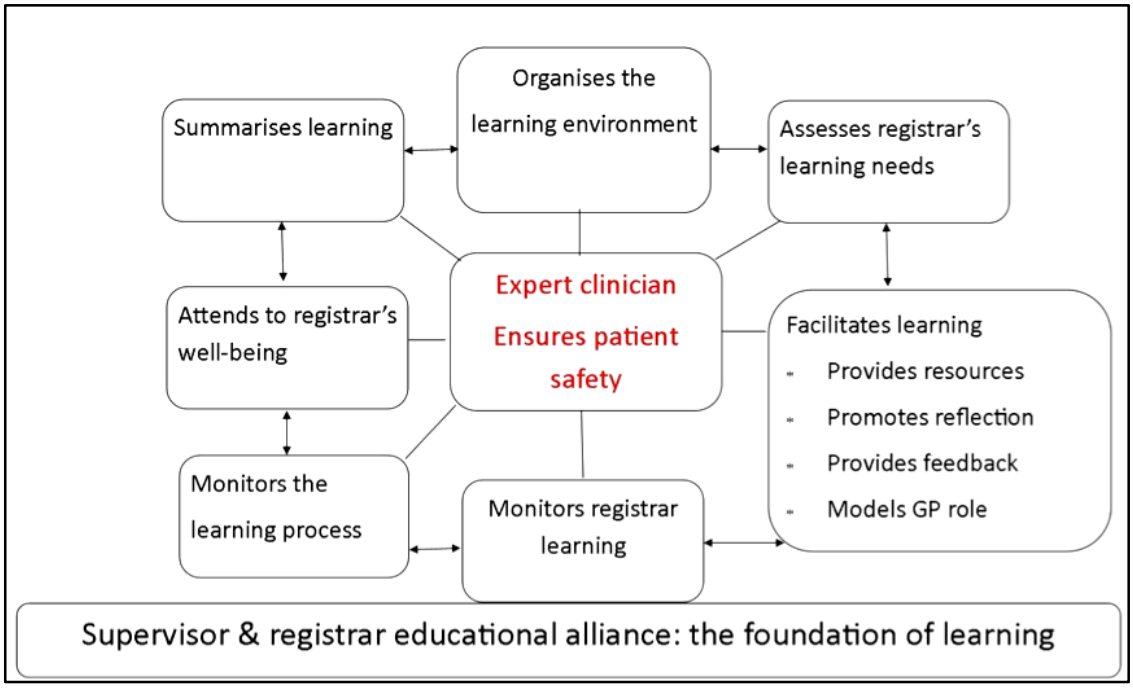

Figure 2.1: The GP supervisor's web of educational activities [13(p1167)]

This indicates that the majority of a GP supervisor's activities are educational; so a focussed approach is needed to progress clinical teacher excellence.

Progressing clinical teacher excellence

Excellent clinical teaching, although multi-factorial, transcends the ordinary, and is characterised by providing a positive supportive learning environment, actively involving, inspiring and communicating with students.[11] Understanding the skills and qualities of a good clinical GP supervisor is important in developing high quality teaching in general practice.[58, 64] It cannot be assumed that all GPs possess the teaching skills and educational experience to perform quality teaching in general practice.

New understandings

There largely is a congruence of empirical evidence and journal reviews of the skills and qualities of an effective clinical teacher; these show that clinical teachers need to be medically competent and knowledgeable. A medical expert possesses a *"defined body of knowledge and procedural skills which are used to collect and interpret data, make*

appropriate clinical decisions and carry out diagnostic and therapeutic procedures…".[65](p10) This expertise involves specialist general practice clinical skills within a community based general practice context, and keeping them up to date. This involves the clinical teacher taking a scholarly approach to locating, using and appraising the best available evidence to inform their clinical practice, and pursuing their own professional development as a clinician and a clinical teacher. Many supervisory interactions involve assuring delivery of safe patient care[66] and assisting the registrar to navigate the practice and community or health care systems. Wearne's[13] expert clinician centrality ensures that the care of vulnerable, sick people is not be jeopardised by the resident's learning. Prioritising the direct clinical supervision by the expert clinician gives positive patient outcomes.[67] Patient safety is the ultimate outcome of the RACGP 2013 training standards, but "*there is no empirical research that the effect of supervision on clinical encounters or patient care outcomes and therefore the picture is incomplete*".[60](p1169)

Not surprisingly, there is a link between good communication and rapport with patients and excellence in teaching.[68] An effective clinical teacher is a skilled communicator, adapting these communication skills to a variety of situations.[12] *"Excellent listening and speaking skills allow clinical teachers to encourage active participation, establish rapport, answer questions carefully and precisely, and question students in a nonthreatening manner."* [69](p54) This involves communicating expectations,[70] highlighting relevancy of learning opportunity, and being able to correct mistakes without belittling.[13]

Traditionally the GP supervisor provides the majority of clinical teaching, using an expert to novice paradigm, and delivering either didactic instructions or "pearls of wisdom". Early reviews like Kilminster[42] identified that "*good or effective clinical teachers needed knowledge of medicine and patients, context, learners, general principles of teaching including the importance of feedback and evaluation, case based teaching scripts".* [42](p834) A more recent literature review and survey amongst expert teachers by Srinivasan[71], classifies their work into six categories:

- medical knowledge,
- a learner-centred approach,
- communication and interpersonal skills,
- professionalism and role modelling,
- reflective practice, and
- use of learning promoting resources.

Learner-centric

Molodysky,[69] in Australia, proposes that clinical teacher training programs have a teacher centric emphasis on educational theory and principles, core clinical teaching skills, mentored instructional activities, and demonstration of achievement of clinical teaching goals.[69] This creates a skewed emphasis on teaching skills, with a distorted focus on teaching procedural skills like lumbar puncture or suturing. More accurately, in the community based general practice environment, the supervisor needs to be learner centric, and is responsible for establishing positive and safe learning environments.[72] Supervisors are brokers who can *"facilitate or obstruct access to the educational and clinical networks within a practice and its community".*[13](p1164) Creating learning opportunities, incorporating a variety of medical and allied health expertise across the practice as a teaching team, utilising clinical cases, and scheduling an appropriate scope of patients for the registrar all contribute towards effective learning. Experiential learning by consulting patients is vital, where registrars learn by the challenges posted by clinical work.[73] Learning from clinical practice is threatened when registrars are used solely as workforce, so supervisors need to manage the registrars workload and ensure cementing of learning through integration of clinical work.[74]

In an era of apprenticeship and teacher centric models, previous reviews have indicated the importance of good clinical teaching skills.[11, 57] Learning now goes beyond direct face to face teaching interactions. There is proven value of learning through peer groups,[75] e-learning,[76] research,[77] simulation,[78] reflective practice[79] and even the registrar as a clinical teacher.[80, 81]

Facilitation of the learner

Harden identifies the clinical teacher as the facilitator of all methods of learning.[56] Practically this can occur by promoting registrar reflection through direct observation of their consultations, clinical case discussion, case notes review and portfolios of work.

Learning facilitation encompasses the GP supervisor assessing and negotiating learning needs, reconciling against the syllabus, providing resources, monitoring the registrar learning and the educational process, with a feedback loop. Australian GP supervisors are expected to provide regular structured teaching time, dependant on the stage of training for the registrar (three hours per week for a registrar in the first months of GP training).[39] Discussing cases and asking questions in tutorials indicates to the supervisor that their registrar has learning needs or are uncertain or confused about a topic.[82] Registrars rate highly those teaching

encounters where the GP supervisor provides resources linked to patient records, guidelines and medical content, particularly when matched with their learning needs.[83] This resonates with the experience of many GP supervisors: that they are valued for their "real world" experience and a source of advice on how to apply knowledge in a specific general practice context.[84] *"Learning was most effective when residents did most of the talking and supervisors listened intently."*[13](p1168)

Learner feedback

The most powerful single thing that teachers can do to enhance achievement of their students is to provide them with feedback.[85] Feedback given constructively does improve learning by clarifying learning goals, providing a basis for addressing mistakes or deficiencies, and reinforcing (and motivating) good clinical performance.[86] Empirical evidence shows that learners benefit from supervisor feedback based on direct observation.[87] Registrars need clear feedback about their errors; corrections must be conveyed unambiguously so registrars are aware of their mistakes or weaknesses. Reflecting on the literature around observation of teaching encounters, Wearne[13] comments that supervisor "avoidance of being critical had a negative impact on learning",[13](p1167) and interestingly verbal praise is uncommon.

Learner relationship

Prideaux[12] further develops the concept of the clinical teacher as collaborator, which fits nicely into the community GP context around team care.

> *"Working as a member of a team requires: negotiation skills, being willing to share and accept responsibility when making decisions, learning to understand and appreciate other's strengths and weaknesses, open-mindedness, valuing each other's opinions, individuals being prepared to evaluate and assess their own behaviour as well as the function of the team, and recognizing the contributions of different professions within the health care team; all of which need to be learned."*[12] (p822)

The paradigm of sharing a learning experience, learning resources and learning responsibilities between registrar and supervisor needs to be consciously cultivated.

The quality of the supervisor-registrar relationship is probably the single most important factor for the effectiveness of supervision. There is universal agreement across medical and psychology disciplines on the importance of interpersonal qualities like empathy, enthusiasm, respect and interest in the person, flexibility, open-mindedness, and being supportive of the students' well-being. Since Kilminster[42] in 2000, ineffective supervisory

behaviours have been well documented. These include: rigidity, low empathy, failure to offer support, failure to follow the learners concerns, not teaching, indirectness, intolerance, and emphasising evaluation and negative aspects.

Professional behaviours

There is an altruistic driver to the GP's participation in teaching, i.e. a desire to improve the teaching that students receive by providing an authentic learning experience with theory integrated with real life situations or problems. An opportunity to share their experience, knowledge and skill, and to shape the registrar's desire to be a general practitioner, and to fulfil the doctor's natural role as a teacher (referring to the Hippocractic oath) is another. Though identified by Harden as a distinct role of the clinical teacher, role modelling is an important yet often inconspicuous influence.[88] Registrars learn from listening to informal meetings and conversations within their practices. They learn from supervisors managing clinical uncertainty in discussing their own difficult patients and articulating clinical reasoning steps in jointly managing patient problems.[89] Directly observing clinicians interacting with patients is effective. There is proven value in longitudinal medical student placements.[90] Particularly in rural and remote general practice, this role modelling can extend to wider bio-psycho-social mentoring, (e.g. managing on-call), juggling life-work-family and community involvements.

Prideaux[12] expands this into two further roles of the clinical teacher. Firstly, the clinical teacher as a health advocate: the act of pleading for or interceding on behalf of a person. *"Advocacy is an essential component of health promotion reflecting social, environmental and biological factors which determine the health of the individual patient, the practice population and the community."*[12](p824) Additionally, the clinical teacher as a professional: that which encompasses and integrates across all other clinical teacher roles and teaching activities. *"Delivering high quality care, demonstrating appropriate personal and interpersonal behavior and practicing medicine in an ethically responsible manner."*[12](p824)

Core competencies of the GP clinical teacher

This overview of the empirical studies and thoughts from world literature of the roles, qualities and attributes of the clinical teacher are relevant to the core skills and characteristics of a competent GP clinical teacher.

Boendermaker[87] in a Delphi study in the Netherlands showed the core characteristics to be a competent GP teacher. From two rounds of a modified Delphi procedure with a group of 51 medical educators in the field of Dutch postgraduate training for general practice, there was a consensus of 37 characteristics identified as important for a competent GP trainer.

The core characteristics,[87] unanimously agreed are that a competent GP teacher:

- is good at giving feedback,
- dares to give feedback,
- is critical of the GP trainee and the learning process,
- is good at communicating with the GP-trainee, and
- has respect for the trainee.

Closely followed by:

- invests the necessary time in teaching,
- is able to inspire reflection in the trainee,
- has insight into himself, and
- is open to criticism of his teaching.

Reflection on one's teaching is a new important theme for the clinical teacher that goes beyond the provision of medical knowledge or teaching clinical, procedural or technical skills. Ferenchick[91] previously and clearly stated: *"the common and most useful component of all these [different teachers'] activities is reflection"*.[91](p279) From Boendermaker's study an important new characteristic was also identified – *"being able to inspire reflection in the trainee"*.[87](p113) This highlights that a competent and good clinical teacher must be open to feedback, utilise a self and model feedback, and be able to give constructive feedback. Other authors may have described this as stimulating curiosity. Thus teacher feedback to the learner, based on observation and reflection, is important. There is also a double impact of reflective practice that benefits the clinical teacher. Irby adds: *"reflection is the key to continuous quality improvement in teaching"*.[11](p908)

My working experience gave me an intuitive understanding of the context and challenges of general practice clinical teaching in Australia. The literature described earlier provided new understandings of the importance of delineating the clinical teacher roles, describing areas of teaching activity and the identification of core competencies for the excellent clinical teacher. These initial findings formed the basis of a questionnaire survey and a GP workshop about the roles and clinical teaching areas for Australian GPs.

Workshop: "What makes a good clinical teacher?"

The workshop developed was titled, "What makes a good GP clinical teacher?" The three objectives were to:

- explore the roles of GP clinical teacher,
- identify the attributes of high quality GP clinical teachers, and
- describe the observable behaviours and skills of a good GP clinical teacher.

The participants' responses to this interactive workshop discussion were informally gathered. In the absence of any suitable Australian competency based framework at the time, I elected to use the widely accepted 12 roles of the clinical teacher devised by Harden[56] *(Figure 2.2).* This is because the current challenges faced in Australia, and efforts to develop and sustain high quality clinical teaching in general practice, raised the same key question Harden[56] identified in 2000: what is the role of the teacher in the context of the developments taking place in medical education?[56]

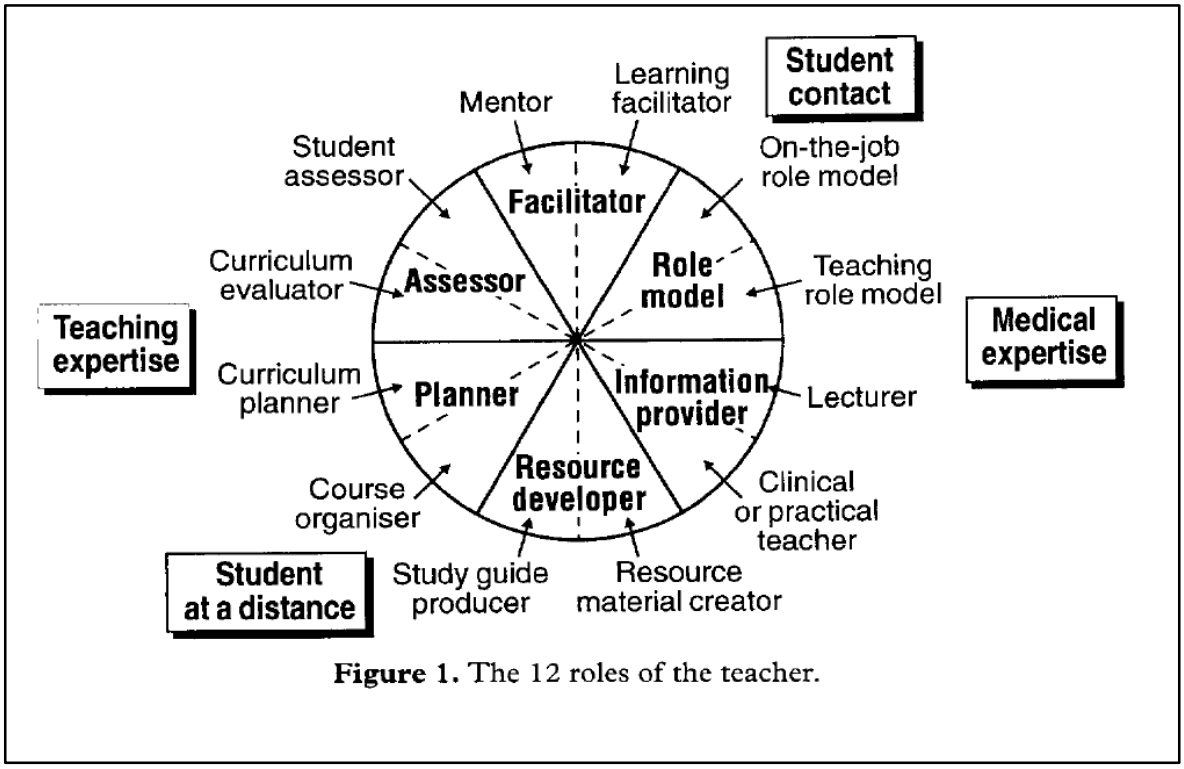

Figure 1. The 12 roles of the teacher.

Figure 2.2: Harden's 12 roles of the clinical teacher[56](p336)

Harden proposes that the clinical medical teacher is: an information provider, a role model, a facilitator, an assessor, a planner and a resource developer.

The workshop provided a framework of systematic enquiry and exploration of the diverse roles of the clinical teacher, addressing the key question of what makes a good clinical teacher in Australia. These focus group style discussions occurred as three separate two-hour sessions during 2011 (AOGP supervisor workshop, national GPET and national RACGP conferences). The participants self-selected to attend the workshop as part of the conference program for Australian GP clinical teachers and medical educators. The participants came from a variety of general practices and training organisations around Australia, though no detailed participant demographic details were collected.

The exploration included:

- a questionnaire at the start of the workshop, where each participant rated their self-efficacy around six key teacher activities,
- further group exploration of excellent qualities in the clinical teacher roles, and
- peer group identification of (ideally observable) quality descriptors in the clinical teacher (knowledge, skills, attitudes, personality attributes and behaviours).

A self-assessment questionnaire was designed with three questions pertaining to each of the six Harden roles, and scored with a five-point Likert scale, ranging from "1 – not confident" to "5 – very confident". The questions were developed from the AOGP supervisor program and the national GP supervisors curriculum that were perceived as authentic and relevant to commonly performed teaching activities in general practice.

There were two AOGP facilitated workshops; the first consisted of 32 GP supervisors in South Australia and the second, at a national GPET conference, with 40 medical educators from around Australia. The workshops used audience response remotes (Turning Point technology) to capture their individual responses to the 18 survey questions, and provided instant de-identified response feedback to assist in facilitating the workshop discussion. Not surprisingly both these peer groups of clinical teachers in general practice rated themselves reasonably similarly *(Table 2.1)*. They viewed themselves most confidently as role models and information providers, and least confidently as assessor or resource developer. No questions related to resource developer existed in the initial AOGP workshop, so further questions were developed and added for use in the RACGP workshop.

Table 2.1: Responses to the 2011 good clinical teacher workshop

Workshop - Good clinical teacher Audience Survey		**AOGP workshop** (32 GP supervisors))		**National GPET conference** (40 Medical Educators)	
Questions	**Area**	Mean Score	**Area Score**	Mean Score	**Area Score**
Teach in response to the Registrar's learning needs	**Planner**	3.8	**3.69**	3.75	**3.65**
Plan and Structure in-practice teaching sessions		3.8		3.68	
Develop a Teaching plan for the semester		3.47		3.51	
Incorporate the principles of adult learning in teaching sessions	**Facilitator**	3.59	**3.72**	3.68	**3.86**
Assist the Registrar to prepare for external assessment (FACRRM / FRACGP)		3.59		3.83	
Maximise the impact of opportunistic corridor teaching		3.98		4.08	
Facilitate access to relevant resources	**Information Provider**	3.77	**3.91**	3.85	**3.93**
Frame knowledge and skills in the context of General Practice		4.05		4.09	
Teach procedures		3.91		3.85	
Am happy to discuss the thoughts and processes underlying my actions	**Role Model**	4.45	**4.33**	4.56	**4.55**
Have enthusiasm for General Practice		4.12		4.48	
Am willing for the Registrar to sit in and observe my consults		4.43		4.6	
Monitor and Appraise Registrar performance	**Assessor**	3.8	**3.79**	3.98	**3.99**
Provide feedback that is learner-centred and balanced		3.77		4.08	
Provide constructive comments when filling in a formative assessment form				3.93	
Am confident to develop an in-practice teaching resource	**Resource Developer**			3.4	**3.22**
Have a library of useful case scenarios and resources for in-practice teaching				3.24	
Can find, critically analyse and integrate the most up to date evidence for Registrar teaching around a clinical scenario (eg TIA)				3	

The use of quality descriptors challenged the Australian groups to consider what was actually observable and thus measureable. From a behaviourist view of learning, participants were encouraged to consider their own GP clinical teaching experience and articulate the clinical teacher quality descriptors they devised, mindful of the SMART acronym (specific, measureable, attainable, realistic and timely) used in many organisation's professional development reviews. Their responses were collated and presented as quality descriptors of a good clinical teacher

Quality descriptors of a good clinical teacher

From the responses of these clinical teachers, quality descriptors in each of the main clinical teacher roles were developed within the context of Harden's model,[56] refined by the medical education team at AOGP, and summarised below.

FACILITATOR – mentor and learner

Describing the Facilitator role, the clinical teacher:

- communicates expectations (e.g. training practice orientation, job description, contract, appointment scheduling),
- creates a safe positive learning environment,
- identifies the learning needs (e.g. learning plan, direct observation, videotaping),
- formulates teaching strategies (e.g. demonstrations of skills and procedures, opportunistic case discussions),
- sets goals and aspirations (e.g. self-directed learning, patient log),
- gives feedback to the learner (e.g. competency milestone progress), and
- is learner centred.

PLANNER – course organizer and curriculum/syllabus planner

Describing the Planning role, the clinical teacher:

- orientates the learner (clinical/educational /organizational),
- schedules, plans and completes teaching sessions (with arrangements made to cover unforeseen emergencies or absence),
- displays signs of preparation (e.g. teaching plan),
- establishes learners current Knowledge Skill Attitude and Attributes (KSA),

- customises to the registrar's identified learning needs, and
- expresses the importance and linkage to wider training (general practice context, training syllabus, RACGP or ACCRM curriculum).

INFORMATION PROVIDER – lecturer and clinical/practical teacher

Describing the Information Provider role, the clinical teacher:

- articulates the purpose and relevancy of teaching activity,
- utilises a teaching strategy (e.g. SNAPPS),
- displays interactive exchange (listening, questioning technique) with the registrar,
- focuses on teaching delivery,
- articulates steps to gain knowledge, skills, attitudes or clinical reasoning,
- challenges the learner to think critically and analytically, and
- facilitates broader exploration of cultural, social, ethical and community issues.

RESOURCE DEVELOPER – resource material creator and study guide producer

Describing the Resource Developer role, the clinical teacher:

- articulates logical structure and critical thinking,
- draws on a variety of resources (evidence basis, cases, simulation models, people),
- uses technology optimally,
- builds training strategy and tailors responses to enquiry or need,
- develops problem solving, and
- documents teaching content, approach and ideas for future.

ROLE MODEL – on the job and teaching role model

Describing the Role Model role, the clinical teacher:

- displays respect, holistic interest in the registrar and enthusiasm,
- displays reflective practice (e.g. aware of own limitations),
- discusses thoughts and processes behind own actions,

- demonstrates communication/clinical skills/consultation management to registrar,
- shows professional integrity and behaviour, and
- values learning.

ASSESSOR – student and curriculum/syllabus

Describing the Assessor role, the clinical teacher:

- uses formative assessment to guide learning (e.g. observation of learner's practice),
- checks the learner's understanding and performance,
- shows evaluative approach to what KAS has changed,
- utilises feedback strategies (e.g. Pendelton) constructively, and
- seeks feedback and reviews their own teaching.

For the participants in these groups, an outcome gained for the GP supervisors and medical educators was a clearer understanding of the complexity of their clinical teacher roles in Australian general practice. Their participation enabled some interesting insights into the GP supervisor perceptions of their clinical teaching and wider discussion of Harden's[56] clinical teaching roles. Coming from the historic apprentice style training model, not surprisingly, these peer groups of clinical teachers in general practice felt most confident as role models and information providers. They showed the least confidence in their abilities to be the assessor or the resource developer. Many GPs in Australia report a poor understanding of their role as clinical teachers[92] and a low confidence in their teaching abilities.[93]

Professional development of clinical teacher competencies

Professional development of a clinical teacher can form the basis to address this lack of confidence, and to provide the defined core competencies. To inform training providers and educational faculties on what to focus on, specific teacher development activities are indicated. Interestingly one characteristic rated lowly by Boendermaker's expert group was that knowledge of teaching methods in a competent GP teacher.[87]

All the literature agrees on the necessity for the clinical teacher to have good clinical knowledge, some knowledge and skills relating to theoretical aspects of teaching, and good

communication and inter-relational abilities. These components could be used for the selection of clinical teachers and be viewed as assumed knowledge and skills.

An integrated review of Australian GP supervisors identified the three key teaching competencies to be: facilitating learning, giving feedback and building a relationship.[13] Consequently teacher development programs could focus less on educational theory and teaching methods, and more on other competencies of an excellent clinical teacher.

Using a socio-constructivist paradigm, Sommers[94] structured a formative rubric to inform the design and assessment of clinical teaching *(Figure 2.3)*. This clearly linked the competency criteria with quality descriptors and level of competence.[94]

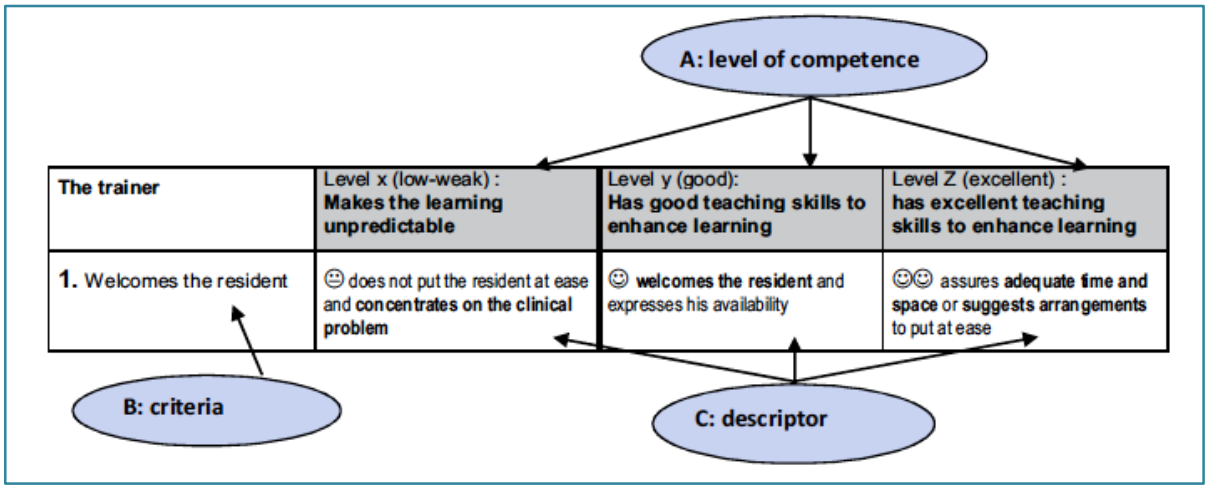

Figure 2.3: Sommer's formative rubric structure for teaching skills [94](p604)

There is widespread acceptance of quality descriptors in clinical practice to identify, progress and assess the quality of clinical practice. An example is the Objective Structured Clinical Exam (OSCE) use of a set of quality descriptors to define clinical competency.[95]

The benefit of Australian GP clinical teachers exploring and deconstructing their GP roles and clinical teaching areas, and identifying quality descriptors is that it forms the basis for reconstructing into clinical teacher competencies. Following the formative rubric structure above, the set of quality descriptors developed in the Australian workshops can be used as competency criteria and provide clear identification of the core competencies in clinical teaching. These competency criteria are observable and can be used with constructive feedback to assist the GP clinical teacher to improve the quality of their clinical teaching.

Underpinning all teaching pedagogy is Bloom's educational paradigm of KSA – Knowledge, Skills, Attitudes and Attributes.[96] Adapting the same quality descriptors from the Australian

workshops and re-categorising from the six clinical teaching areas into competency categories of knowledge, skills, attitudes and attributes provides a list for Australian GP clinical teacher competencies *(Table 2.2).*

Table 2.2: Australian GP clinical teacher competencies (McArthur)[97]

Knowledge	• expert communication/clinical skills/consultation management • orientates the learner (clinical/educational/organizational) • schedules, plans, completes teaching sessions (with arrangements made to cover unforeseen emergencies or absence) • displays signs of preparation (teaching plan) • expresses the importance and linkage to wider training (general practice context, training syllabus, RACGP or ACCRM curriculum) • articulates the purpose and relevancy of teaching activity • utilises a teaching strategy • articulates logical structure and critical thinking • articulates steps to gain knowledge, skills, attitudes or clinical reasoning • draws on a variety of resources (evidence basis, cases, simulation models, people) • uses technology optimally
Skills	• creates a safe positive learning environment • communicates expectations (e.g. training practice orientation, job description, contract, appointment scheduling), • sets goals and aspirations (e.g. self-directed learning, patient log) • establishes learners current KSA and understanding • identifies the learning needs (e.g. learning plan, direct observation, videotaping), • formulates teaching strategies (e.g. demonstrations of skills and procedures, SNAPPS, opportunistic case discussions) • customises to the learner's identified learning needs • displays interactive exchange (active listening, questioning technique) • focuses the teaching delivery • challenges the learner to think critically and analytically • facilitates broader exploration of cultural, social, ethical, community issues • builds training strategy and tailors response to enquiry or need • develops problem solving • documents teaching content, approach and ideas for future • displays reflective practice (e.g. aware of own limitations) • discusses thoughts and processes behind own actions • uses formative assessment to guide learning (e.g. observation of learner's practice) • checks learner's understanding and performance • shows evaluative approach to what KSA has changed • utilizes feedback strategies (e.g. Pendelton) constructively • gives feedback to the learner (e.g. competency milestone progress)
Attitudes and Attributes	• displays respect, holistic interest in learner and enthusiasm • is learner centered • shows professional integrity and behaviour • values learning • seeks feedback and reviews own teaching

The above items prioritised by Australian GP clinical teachers in Australian workshops demonstrate substantial concordance with the world's literature, as previously discussed as to what makes a good clinical teacher. Within knowledge of clinical teaching, there is awareness of the basics of pedagogy, educational principles and use of an evidence base. The doctor must have current clinical knowledge, use evidence in decision making, adhere to best practice, be responsible for their own professionalism and promote a scholarly approach (e.g. reflect, read, try, adapt, apply, test), to their teaching.[37]

Applying the KSA concept of knowledge, skills, attitudes and attributes, Hatem[98] from the USA similarly described the educational attributes and responsibilities of effective medical educators in 2011. Building on the teaching skills previously discussed, (communication through active listening and open questions, identifying learning needs, giving feedback), Hatem[98] postulates further specific skills in reflective mindfulness, promotion of critical thinking and effective use of information technology.[98]

Hatem's description of the clinical teacher attitudes and attributes mirrors many of the personality characteristics previously discussed but he adds other traits such as passion, enthusiasm, stimulating learner curiosity, kindness and understanding of the learner as a whole person.[98]

Further research is required to convert the various characteristics into observable behavioural criteria, leading to a standardised set of observable competencies, training objectives and assessment tools for GP trainers. This potentially could form the foundation for confidence and competency based assessment of quality clinical GP teaching.

Susan Wearne[13] states that for *"the GP supervisors to function effectively as the cornerstone of GP training, evidence on what their role is, how this links with contemporary learning theory, and how the role can be maintained is required"*.[13](p1162) This needs to be linked to educational principles like competency based medical education, identifying and prioritising the clinical teaching competencies, following a framework that integrates teacher development in the community based clinical environment.

Frameworks of clinical teacher competency

Steinert[99] commented that when mapping the teacher's role, *"in this era of increased accountability and pre-determined standards for teaching, a framework for teacher competencies is clearly needed".*[99](p371) Around the world, there have been various frameworks for clinical teacher development proposed, each offering different strengths and limitations.

International

In Scotland, the Dundee three-circle model of learning outcomes in undergraduate medicine (*Figure 2.4*) is based on the three essential aspects of competence as a generalist physician.[33] The inner sphere describes what the physician is able to do and comprises: clinical, procedural, investigation, management, health promotion, communication and information handling skills. The middle layer represents how the physician approaches the skills with knowledge and understanding, ethical/legal principles and clinical reasoning/decision making skills. The outer layer represents professional characteristics like understanding physician roles in society and their personal development as life-long learners and professionals. Utilising the Harden[17] principles of outcome based education, Shumway[100] developed a framework for the development of an effective clinical teacher, based on the Dundee three circle model.

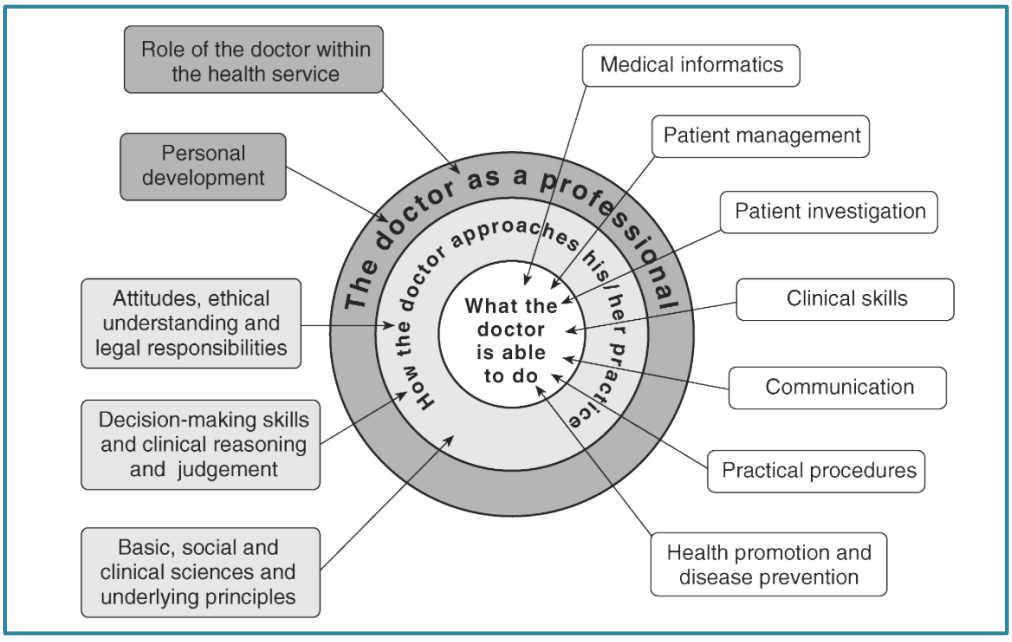

Figure 2.4: Dundee three-circle model for learning outcomes (Simpson)[33](p137)

In the UK, Hesketh[101] outlined a framework for excellence as a clinical teacher by defining competence through the 12 learning outcomes and Dundee's three-circle model. These included performance of tasks (e.g. teaching small and large groups, assessing learners) approach to tasks (e.g. understanding educational principles, attitude to teaching) and professionalism in clinical teaching (e.g. professional development).[101]

In the USA, an expert panel used previous literature and the physician clinical competencies from the Accreditation Council of Graduate Medical Education, to develop an initial conceptual model of teaching as a competency.[71] Srinivasan[71] reported that this panel identified four foundational principles that all educators should value, endorse and practice: learner engagement, learner-centeredness, adaptability and self-reflection. These researchers collapsed over 100 desirable educator skills and attributes, (from previous authorship of Irby and Hatem) into six core teacher competency areas and four specialised areas of competency for training programs.[71]

Molenaar[102] in the Netherlands presented a valuable framework of clinical teaching competencies that comprises six domains of teaching, three levels of organisation and specific educational competencies consisting of knowledge, skills and attitudes *(Figure 2.5*).[102]

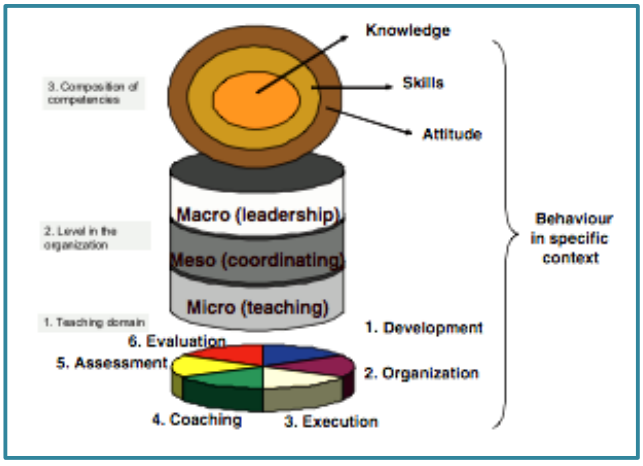

Figure 2.5: Molenaar's framework of clinical teaching competencies[102](p392)

RACGP star and domains

The RACGP renewed 2011 curriculum[39] maintained the traditional five domains of general practice with a figurative Boulen star representation.[103] There was an increased focus on competency based training and incorporated further contemporary competencies that could be added to the GP's traditional skills set. These skills included: management, teaching, research, quality and safety, teamwork, e-health and leadership. The five domains of general

practice represent the critical areas of knowledge, skills and attitudes necessary for competent unsupervised general practice in Australia *(Figure 2.6)*.

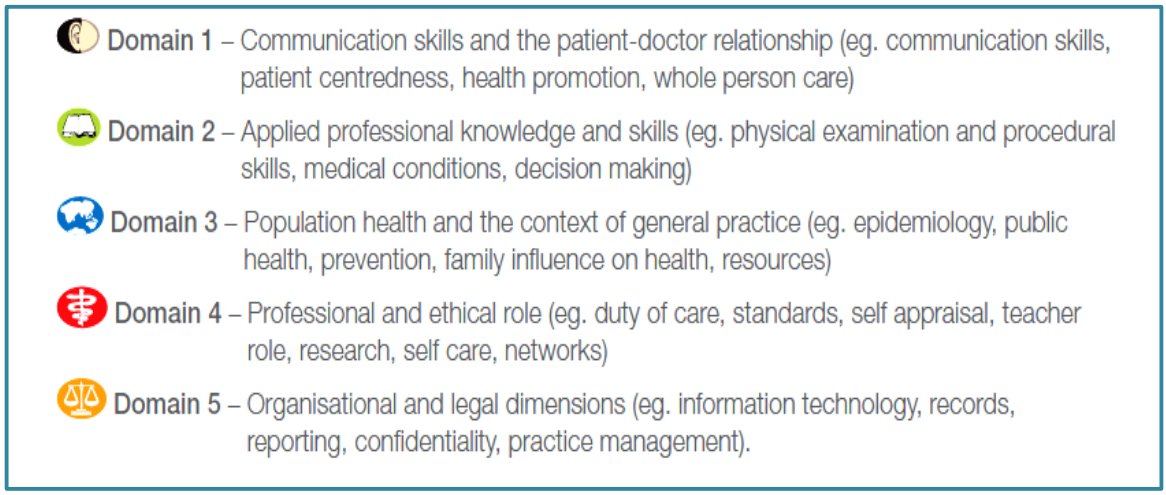

Figure 2.6: RACGP five domains of general practice[39](p xvii)

The star of general practice represented the RACGP conceptual framework, combining the historical domains of general practice, within the clinical context, for knowledge and skills to be applied, across the learning life of a general practitioner *(Figure 2.7)*.

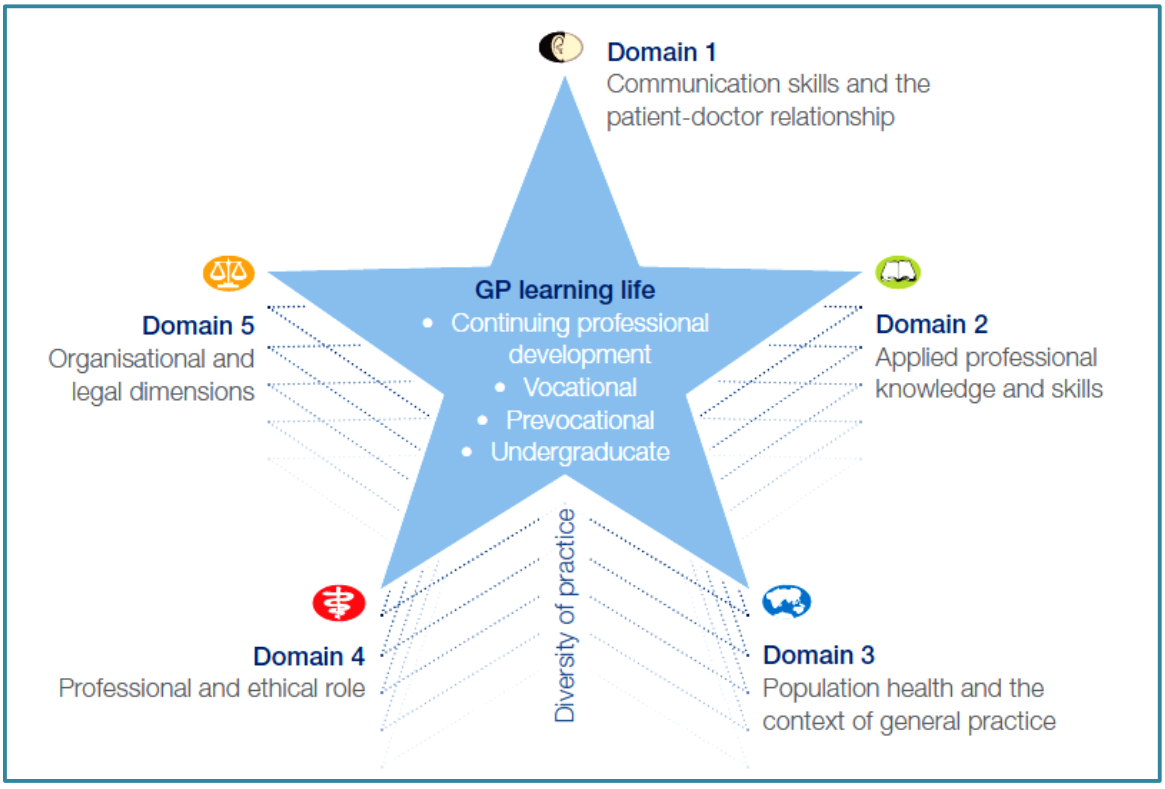

Figure 2.7: RACGP star of general practice [39] (p xviii)

The curriculum statements included a section entitled training outcomes to describe a particular knowledge, skill, attitude or attribute expected of the learner at the end of the general practice training.

This resulted in one of the 34 (mainly clinical) curriculum areas, titled teaching, mentoring and leadership in general practice.[39] Contextually the RACGP says *"all GPs educate their patients, and these teaching skills can be transferred to teaching medical students, general practice registrars, peers and health professionals".*[39](p551) There is a sketchy articulation of the importance of teaching, mentoring and leadership in everyday Australian general practice, with learning objectives and some examples of teaching across the continuum from medical student prevocational, vocational and post-vocational categories. It fails to articulate any clinical teacher competencies or framework for teacher development. This demonstrates that the current RACGP framework is not a comprehensive or robust competency framework across the whole profile of an Australian general practitioner.

ACRRM domains

In their primary curriculum, the Australian College of Rural and Remote Medicine[104] articulates seven high level ability statements called domains. These domains are a description of the generic abilities that general practitioners require to work anywhere in Australian and particularly in rural and remote settings. These seven domains arguably represent ACRRM's competency based framework for clinical practice. They are:

1. Provide medical care in the ambulatory and community setting.
2. Provide care in the hospital setting.
3. Respond to medical emergencies.
4. Apply a population health approach.
5. Address the health care needs of culturally diverse and disadvantaged groups.
6. Practise medicine within an ethical, intellectual and professional framework.
7. Practise medicine in the rural and remote context.

In one of 18 curriculum statements, there is only one page that details abilities, but not competencies required for the clinical teacher to learn.[104] The ACRRM primary curriculum's sixth domain, section 6.17 on research and teaching, under item 6.2, describes abilities to teach and clinically supervise health students, junior doctors and other health professionals *(Table 2.3)* This description fares slightly better than the RACGP by articulating some knowledge and skills of the clinical researcher and teacher, but falls short of a competency

framework. The inability to reconcile these domains of practice with the important roles and functions of clinical teacher indicates that it is not a useful competency based framework for clinical teaching.

Table 2.3: ACCRM primary curriculum section – abilities for research and teaching[104]

Abilities

R&T 6.1	Ensure safety, privacy and confidentiality of participants in clinical audit and clinical research activities
R&T 6.2	***Adhere to human research ethics guidelines*** in conduct of clinical audit and research
R&T 6.3	***Teach and clinically supervise*** health students, junior doctors and other health professionals Using 'active' educational methods that include intellectually active and 'hands-on' engagement and which challenge learners Providing handouts to accompany presentations for learners (students, peers, other staff, and patients) that are clear, factually correct, up-to-date, relevant, and at a level appropriate for the learners Using a structured approach to teaching a skill or procedure to a learner, that includes explanation, demonstration, observation of performance and feedback developing plans for learners' clinical attachments that include an orientation, scheduled learning opportunities and sessions, and involvement in supervised patient care Reliable assessment of learners when required, by effective implementation of assigned assessment tools, observing performance, and recording honest and fair judgements of their performance Clarifying how supervision will occur and allow medical students and junior colleagues input into the supervision process Providing feedback that identifies strengths and areas for improvement, relates to expected learning, is timely, specific, descriptive, detailed and honest, and includes guidance for improvement Challenging learners to develop the predisposition and skill of self-assessing their own performance as a basis for defining their learning needs, and for identifying opportunities inherent in everyday clinical practice through questioning and role modelling Analysing learners' errors (near misses or adverse events) using root cause analyses, and ensure learning from an event through discussion in a non-punitive environment
R&T 6.4	Access, interpret and critically evaluate information pertaining to own learning needs from relevant professional associations, specialty colleagues, scientific literature, reference books, meetings and electronic resources
R&T 6.5	Engage in continuous learning and professional development to maintain currency of knowledge of the scientific basis of medicine
R&T 6.6	Develop own mentoring strategy, including setting aside time for mentoring
R&T 6.7	Provide advice and guidance to others with respect to issues such as short term learning, vocational training and long term career goals
R&T 6.8	Demonstrate ability to undertake relevant research to inform practice

Symbiotic clinical education

More recently, in Australia, the challenge has been to integrate education within community based clinical general practice. This goes beyond the learner, focusing on societal outcomes that ensure quality clinical practice, patient safety and training to meet future workforce needs. Bligh, Worley and Prideaux developed the symbiotic clinical education model *(Figure 2.8)*,[105] where the *"emphasis is on achieving 'symbiosis' or mutual benefit, whereby clinical education adds value to—and occurs in the context of—clinical practice, health service delivery and personal and professional development".*[105](p110)

Figure 2.8: Worley symbiotic clinical education model[105](p114)

The four axes above represent personal and professional learning, an authentic clinical immersion and learning experience, institutional alignment of health services and training providers, and social community accountability.[106] This symbiotic framework provides a useful basis for reconstructing clinical learning, moving beyond traditional city based teaching hospitals to regional, rural and remote community and primary care clinical settings.[107]

The concept of identifying competencies to be learned, developed and attained is embedded in undergraduate medical curriculum and courses. In postgraduate general practice training in Australia, there have been recent initiatives by the RACGP to develop a competency based framework.

To date, there has been no universally identified or uniformly standardised competency based framework for clinical teachers in Australia. Each university undergraduate medical

teaching faculty in Australia has an individualised professional development program. In many universities, there are different clinical teachers involved in the medical school and rural clinical school. Across the postgraduate general practice training organisations in Australia, each conducts their own unique professional development for their network of GP supervisors. This has rarely aligned with the GP supervisor curriculum, commissioned by AGPT a decade ago. [62]

As the GP medical practice and the clinical teacher/learner apprenticeship training concurrently exist, an overarching framework for clinical competencies could be beneficial. This could integrate the roles of the GP and the roles of the clinical teacher. In each role, competency elements could be described. This could then form the basis for professional development and training.

CANMEDS competency framework

A framework has been developed in Canada that integrates competency, clinical teaching with medical and surgical practice.[32] [65] [53] It is described in the CANMEDS model,[65, 108] with each role defined and key competencies described more fully below, whilst retaining the integrity of the CANMEDS terminology The CanMEDS framework has a trademarked image of a self-described "daisy" or "flower", with the Medical Expert at the centre, surrounded by "petals" denoting the six other roles *(Figure 2.9).* [109]

Figure 2.9: CanMEDS competency framework[109] [p5]

Medical expert

As medical experts, physicians integrate all of the CanMEDS roles, applying medical knowledge, clinical skills and professional attitudes in their provision of patient-centred care. The medical expert is the central physician role in the CanMEDS framework.[108] Physicians are able to:

- function effectively as consultants, integrating all of the CanMEDS roles to provide optimal, ethical and patient-centred medical care,
- establish and maintain clinical knowledge, skills and attitudes appropriate to their practice,
- perform a complete and appropriate assessment of a patient,
- use preventive and therapeutic interventions effectively,
- demonstrate proficient and appropriate use of procedural skills, both diagnostic and therapeutic, and
- seek appropriate consultation from other health professionals, recognising the limits of their expertise.

Communicator

As communicators, physicians effectively facilitate the doctor patient relationship and the dynamic exchanges that occur before, during and after the medical encounter.

Physicians are able to:

- develop rapport, trust and ethical therapeutic relationships with patients and families,
- accurately elicit and synthesize relevant information and perspectives of patients and families, colleagues and other professionals,
- accurately convey relevant information and explanations to patients and families, colleagues and other professionals,
- develop a common understanding on issues, problems and plans with patients and families, colleagues and other professionals to develop a shared plan of care, and
- convey effective oral and written information about a medical encounter.

Collaborator

As collaborators, physicians effectively work within a healthcare team to achieve optimal patient care. Physicians are able to:

- participate effectively and appropriately in an inter-professional healthcare team, and
- effectively work with other health professionals to prevent, negotiate and resolve inter-professional conflict.

Manager

As managers, physicians are integral participants in healthcare organisations, organising sustainable practices, making decisions about allocating resources, and contributing to the effectiveness of the healthcare system.

Physicians are able to:

- participate in activities that contribute to the effectiveness of their healthcare organisations and systems,
- manage their practice and career effectively,
- allocate finite healthcare resources appropriately, and
- serve in administration and leadership roles, as appropriate.

Health advocate

As health advocates, physicians responsibly use their expertise and influence to advance the health and well being of individual patients, communities, and populations.

Physicians are able to:

- respond to individual patient health needs and issues as part of patient care,
- respond to the health needs of the communities that they serve,
- identify the determinants of health of the populations that they serve, and
- promote the health of individual patients, communities and populations.

Scholar

As scholars, physicians demonstrate a lifelong commitment to reflective learning, as well as the creation, dissemination, application and translation of medical knowledge.

Physicians are able to:

- maintain and enhance professional activities through ongoing learning,
- critically evaluate information and its sources, and apply this appropriately to practice decisions,
- facilitate the learning of patients, families, students, residents, other health professionals, the public and others, as appropriate, and
- contribute to the creation, dissemination, application, and translation of new medical knowledge and practices.

Professional

As professionals, physicians are committed to the health and well-being of individuals and society through ethical practice, profession-led regulation, and high personal standards of behavior.

Physicians are able to:

- demonstrate a commitment to their patients, profession and society through ethical practice,
- demonstrate a commitment to their patients, profession and society through participation in profession-led regulation, and
- demonstrate a commitment to physician health and sustainable practice.

The CanMEDS provides a profession led, nationally adopted, competency based medical education basis for post graduate medical training,[110] and the CanMEDS framework has been adapted to describe the clinical competencies for Family Medicine in Canada.[111] The wider benefits of a competency based framework are evident from the CanMEDS expansion into a curriculum to teach GP clinical skills, objectives for training, assessment of competencies, training accreditation standards and the professional development program for clinical teachers. The CanMEDS daisy image provides a clear and workable model for educators. This framework linkage has further led to a clinical teaching assessment tool aligned with CANMEDS.[112] There has also been implementation of the CanMEDS physician roles into rural specialist education.[113]

Future directions for Australia

Adoption of CanMED competency based framework for general practice

Studies have shown the benefit and unifying features of CanMEDS framework in Canada and internationally.[114] There is similarity in geography, government, healthcare systems, illness patterns and postgraduate training between Canada and Australia. In the absence of any

equivalent framework for clinical competencies in general practice in Australia, the CanMEDS framework could be adopted, modified and implemented for use in Australian general practice and GP training. The CanMEDS scholar role can be expanded to include clinical teaching, and the exploratory findings of the Australian workshops constitute the expansion of the scholar role, describing six areas of clinical teaching. Within the facilitator area of the scholar role, the quality descriptors form the core competencies of a good clinical teacher *(Figure 2.10)*.

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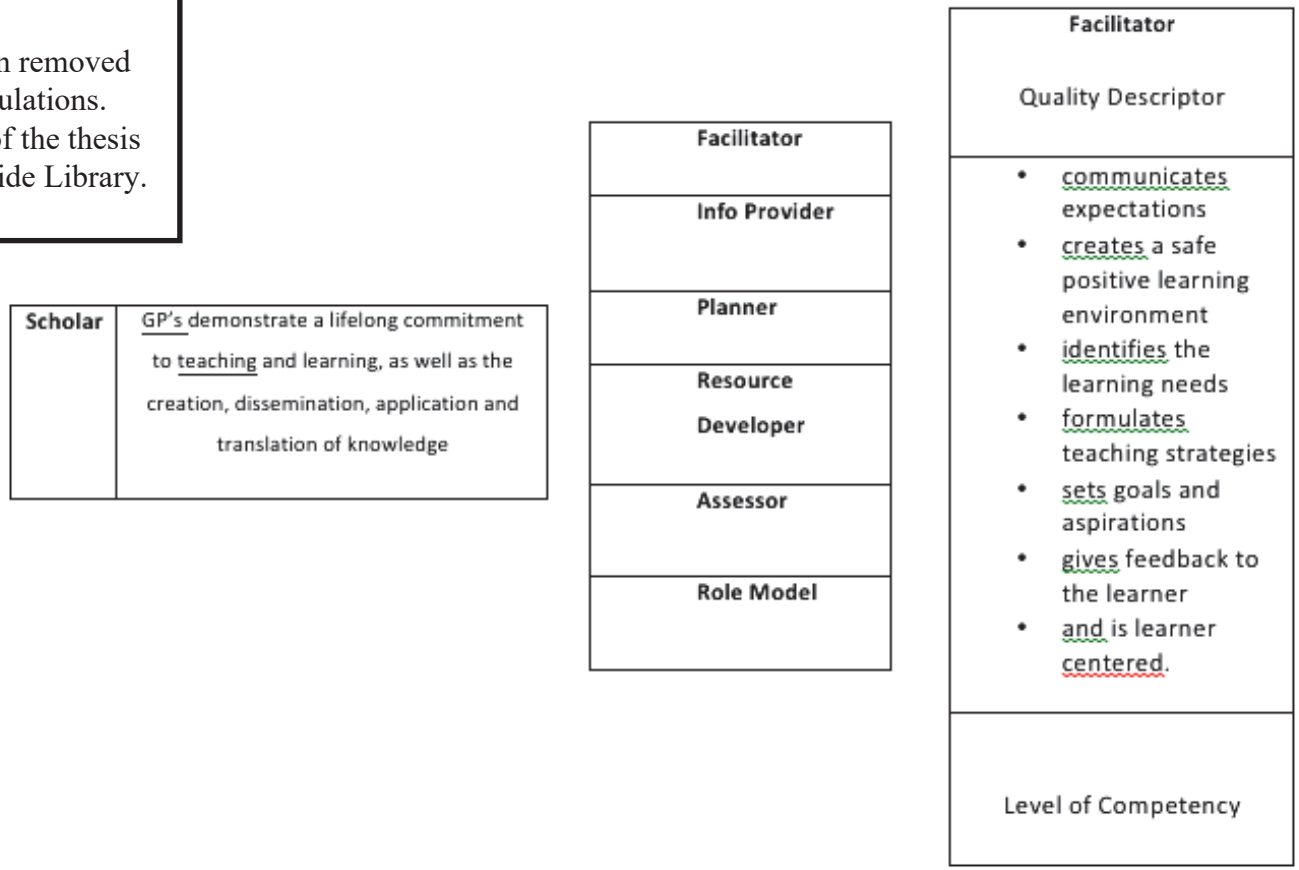


Figure 2.10: Australian adapted CanMEDS roles, areas and core competencies (McArthur)[115]

Development of non-cognitive attributes

Postgraduate clinical learning will always be grounded in the apprenticeship model – learning from patient contact – with the clinician-patient-registrar triad being essential and providing the context for "the teaching moment". It is therefore vital to integrate into future training models a clinical setting with quality care outcomes and safety for the patient, robust educational concepts (evidence base, learner centeredness, defined competencies), a unifying teacher development framework, and a professional (and moral) obligation to teach. This enables doctors to fulfil their professional Hippocratic oath: to *"honour your obligation to pass on your professional knowledge and skills to colleagues and students"*.[116](p1)

Traditionally medical education has followed the apprentice model based on transfer of expert medical knowledge to the students' identified learning objectives. In the post-modern world, with universal access to rapidly changing medical knowledge, it is more difficult to always be the expert. In the community general practice setting, clinical presentations can be ambiguous, patients' expectations unclear, and students' clinical placement learning objectives uncertain. A unique feature of clinical general practice is dealing with the ambiguous or unknown. Analogous to a GP's clinical management skills, perhaps a good clinical teacher is not a master of all areas, but knowledgeable about many.

Does the attribute of confidence in an excellent clinical teacher in general encompass the quality of not knowing? This means having the confidence to accept uncertainty as well as a willingness and confidence to create a learning environment to explore the enquiry. Is it realistic to expect teaching to be based on expert knowledge? Increasingly we see the role of the teacher that involves facilitation of a learning environment. This facilitation largely involves non-cognitive attributes and it is some of these non-cognitive attributes that can impact on the effectiveness of global teaching.

Azer[115] describes the non-cognitive attributes of a good teacher[(117)] as:

- role modelling/mentoring (as clinician, learner, teacher),
- self-awareness,
- self-reflection (ability to reflect upon one's own teaching skills with the goal of improving teaching),
- constructive and positive feedback,
- confidence,

- exploration of enquiry,
- fostering of critical thinking, and
- motivation/enthusiasm.

Each of these has been previously highlighted and discussed, with the exception of confidence. Many GPs in Australia report a poor understanding of their role as clinical teachers[92] and a low confidence in their teaching abilities.[93]

Self-efficacy in teaching

In considering teacher development, mastery of competency is one element but is it also important to be confident in one's own teaching. Additionally, could developing the confidence of a clinical GP supervisor/trainer in their approach to teaching have a positive effect on the overall quality of teaching in general practice? What could be done to build a GP's confidence in their teaching?

Furthermore, it is important to be confident so that through teaching, the learner will be impacted. As clinical teaching is behaviour, we can learn from parallel fields of thought in psychology or general education. A teacher's confidence in their teaching and conviction of impact can alternatively be called their self-efficacy in teaching.

Self-efficacy is defined as *"a person's belief about his or her ability and capacity to accomplish a task or to deal with the challenges of life."*[118](p1)

According to Albert Bandura's social cognitive theory,[23] the concept of self-efficacy lies at the heart of the psychologist. He suggests that an individual's efficacy expectations, their belief in their ability to perform certain actions, combined with their outcome expectations, and their conviction that such actions will lead to a particular outcome are predictive of how successful that individual will be in performing the action in question and in achieving the desired outcome.[25] Applying a psychological theory to the educational act of teaching leads to the compelling notion that a teacher's belief in their ability to impact student learning makes a difference in their teaching and their students' learning. In the field of education, this construct of teacher self-efficacy has been correlated with a broad range of positive student outcomes, teaching practices and teacher classroom behaviours.[119] It is clear that there would be great benefit if we could raise teacher's self-efficacy beliefs. Tschannen [120] defines teachers' self-efficacy as the teacher's belief in his or her capability to organise and execute courses of action required to successfully accomplishing a specific teaching task. In

this particular context, a review showed that this could improve global teaching performance in high schools.

According to Bandura,[25] the development and change of one's self-efficacy beliefs are derived from four sources:

- Mastery experiences in which one personally performs and experiences success in the desired action (e.g. self-awareness, self-reflection) with practice in real or simulated situations.
- Vicarious experiences in which the individual observes the successes of others (e.g. role modelling, mentoring)
- Verbal persuasion and social influence of others (e.g. motivational, constructive feedback)
- One's own physiological arousal and affective states, including emotions and mood.

Experiences that leave one with a feeling of success and provide evidence of competence bolster efficacy beliefs, with repeated successes making these beliefs stronger and more resilient. Once a resilient sense of efficacy has been developed it is not as easily weakened by experiences of failure or obstacles.

Furthermore, his social cognitive theory maintains that efficacy beliefs can transfer between one domain and another when perceived as similar enough so that mastery in one will carry over to the other.[25] Tuckman postulates that the reason student teaching increases teacher self-efficacy, despite substantial differences between student teaching and "real" teaching, is that they are similar enough in the minds of the teacher.[119]

What activities are similar enough to enable the development of clinical teacher self-efficacy?

Will developing the self-efficacy of a GP supervisor's clinical teaching show an improvement in the teaching and learning that is occurring in a clinical general practice setting?

It is postulated that developing self-efficacy in clinical teaching will effectively add to the core competencies of facilitating learning, giving feedback and nurturing relationships.

CHAPTER 3: SELF-EFFICACY CONSTRUCT FOR MEDICAL EDUCATION

The purpose of this chapter is to determine the place and construct of self-efficacy in clinical teachers within a new realm of medical education. This involves unpacking the developmental history, determining the meaning of "clinical teacher self-efficacy", explaining the underpinning theoretical framework, uncovering the anchoring evidence and finally constructing and developing new approaches and measures based on these foundations.

Self-efficacy definition

Bandura[25] defines self-efficacy as "*a person's belief and judgement of their capabilities to organise and execute courses of action required to attain designated types of performance*".[25](p3) Self-efficacy is a person's future orientated belief or conviction about the level of competence they expect of themselves to display in a given situation.[25] Bandura's social cognitive theory[23] explicitly includes two kinds of expectation: the individual's conviction that they can do what is needed to perform a task and their judgement of the outcome of that performance. In a teaching situation, this relates to the teacher's belief in their ability to impact a student's learning making a difference in their teaching and their students' learning.

The task specificity of self-efficacy distinguishes it from self-confidence, which is a stable generalised personality characteristic.[121] It is not enough for individuals to possess the required knowledge and skills to competently perform a task; they must also have the conviction that they can successfully perform the required behaviour, sometimes under difficult circumstances.[122] Personal self-efficacy is not a general disposition devoid of context, rather it is a self-judgement specific to the activity domain.[24] The task specificity of self-efficacy is what makes it distinct from other conceptions of self, such as self-concept, self-worth and self-esteem. These characteristics are considered to reflect an individual's affective evaluation of self (feelings of self-worth), where self-efficacy is a judgement about task capability that is not inherently evaluative.[120] Similarly, self-efficacy needs to be distinguished from self-esteem, which is a judgement of self-worth.

Bandura's theoretical framework

Bandura's[23] theoretical framework for explaining human behaviour is centred on efficacy beliefs – an individual's belief that they are capable of executing a particular pattern of behaviour. Experiences that leave one with a feeling of success and provide evidence of competence bolster efficacy beliefs; repeated successes help these beliefs become stronger and more resilient. Once a resilient sense of efficacy has been developed, it is not easily weakened by experiences of failure or obstacles. Individuals with a strong, resilient sense of efficacy react to failure by redoubling their effort and viewing obstacles as surmountable. On the other hand, for individuals who have yet to develop strong efficacy beliefs, the experience of early obstacles and failure can lead to the development of very low self-efficacy. Repeated failures can reinforce these beliefs as well, to the point where clear successes are even discounted.[25]

Bandura's[25] concept of self-efficacy has three generalised points. Firstly, self-efficacy has to do with the self-perception of competence rather than actual level of competency. Over or underestimating one's own capabilities occurs regularly, and these estimations may have consequences for the courses of action they choose, influencing their effort or having positive or negative impacts.

Secondly, there is a distinction between self-efficacy and Rotter's internal-external locus of control. Reflecting on this two decades later, Bandura[25] provided evidence to demonstrate that perceived self-efficacy and Rotter's locus of control are not similar phenomena measured at different levels of generality, and have no or little empirical relationship with each other. It showed that perceived self-efficacy is a strong predictor of behaviour, but locus of control was only a weak predictor.

Thirdly, Bandura [23,25] postulates that there are four sources for self-efficacy beliefs. These are:

- mastery experiences,
- physiological arousal,
- vicarious experiences, and
- verbal persuasion.

Mastery experiences are instances in which individuals actually perform the act under question. For example, when someone teaches a class or tutors a student, these are

instances that provide perspective or practising teachers with source material for the formation and development of their efficacy beliefs.

The level of physiological arousal, such as anxiety or excitement, influences the perception of mastery or incompetence.

Vicarious experiences are those in which someone else models the skill or task, and the individual uses these observations to form their self-efficacy belief. The power of vicarious experiences is dependent on the similarity of the model observed to the observer and the actions observed.

Another source of efficacy beliefs is verbal persuasion. This is found in the voiced support of friends and colleagues as they provide verbal support for attempts to take on and complete tasks. The potency of this social persuasion depends on the credibility, trustworthiness and expertise of the persuader.[120]

Teacher self-efficacy

Teacher self-efficacy was first conceived by the RAND researchers and defined by Berman et al. in 1977 as "*the extent to which the teacher believes he or she has the capacity to affect student performance*".[123](p137) The teacher's belief in their ability to impact students' learning makes a difference in their teaching and the student's learning outcomes.[124]

Definition

As the concept of teacher self-efficacy evolved over the years, there have been further attempts to define it. It has been defined as, "*the teacher's belief or conviction that they can influence how well students learn, even those who may be difficult or unmotivated*".[125](p4)

In Tschannen-Moran & Hoy's[120] examination of the theoretical and empirical underpinnings of self-efficacy in 1998, they defined teacher self-efficacy, as "*the teacher's belief in his or her capability to organise and execute courses of action required* to *successfully accomplish a specific teaching task in a particular context*".[120](p233)

More recently, Klassen[126] defined self-efficacy as "*the confidence teachers hold about their individual and collective capability to influence student learning*".[126](p21)

To understand and clarify any confusion around the definition of teacher self-efficacy, it is important to understand its historical evolution.

Historical understanding

Initial work around teacher self-efficacy was grounded in Rotter's[127] social learning theory. Teacher efficacy was first conceived by the RAND organisation researchers as an issue of locus of control.[120] Control or reinforcement of their actions lay within themselves (internal) or in the environment (external). Teachers rated the strength of their agreement of these two statements:

- *When it comes right down to it, a teacher really can't do much because most of a student's motivation and performance depends on his or her home environment. (RAND item 1)*
- *If I really try hard, I can get through to even the most difficult or unmotivated students. (RAND item 2)*

In the first RAND item, teachers who concur that the influence of the environment overwhelms a teacher's ability to have an impact on a student's learning exhibit a belief that reinforcement of their teaching efforts lies outside their control: an external locus of control. Teachers' beliefs about the power of these external factors were subsequently labelled General Teaching Efficacy (GTE) in 1982 by Ashton.[128]

Teachers who agree strongly with the second RAND item showing confidence in their ability to teach difficult or unmotivated students, indicates a belief that reinforcement of teaching lies within the teacher's control: an internal locus of control. This concept was subsequently loosely labelled as Personal Teaching Efficacy (PTE).[128]

The sum of the scores on the two items was called teacher efficacy. These first studies by Ashton[120] pointed to a substantial impact of teacher efficacy on the secondary student's mathematics achievement (with GTE) and language achievement (with PTE).[128]

Others further developed this conceptual model of teacher efficacy using locus of control. In 1981, Rose and Medway [129] developed a 28-item measure for teacher efficacy called the Teacher Locus of Control (TLC). This asked teachers to assign responsibility for student successes or failures by choosing between two competing explanations for the situations described. Validation studies indicated that the TLC scale predicted the teacher's behaviours in the classroom, including their willingness to adopt new instructional techniques following in-service training, while the earlier scales did not.

In the same year, Guskey[130] developed the Responsibility for Student Achievement (RSA) scale to measure teacher efficacy. These 30 alternative weighted items assessed the teacher's beliefs in their own control of factors influencing the academic success and failures of their students. Statistical analysis showed that the revised RSA R+ and R- subscales had a fairly good Cronbach alpha of 0.76 and 0.83, respectively.[131] Guskey showed that through this measure, there was a positive and significant relationship between teacher efficacy and teaching attitude. Specifically a higher teacher's efficacy was associated with a greater acceptance of a new teaching technique of innovation and implementation.

Tschannen[120] summarised the correlations or outcomes of teacher efficacy as researched by others of this decade using the RAND and RSA measures of teacher efficacy. Higher RSA scores of teacher efficacy pointed to substantial impacts on:

- student achievement,
- teacher's willingness to implement innovative teaching,
- lower teacher stress levels,
- less negative affect in teaching, and
- teacher's willingness to continue in the teaching profession.

Greater understanding came with the utilisation of another conceptual strand based on Bandura's social cognitive theory and his construct of self-efficacy.[23] According to Bandura,[25] self-efficacy beliefs lie at the core of human functioning. They are believed to mediate relationships between knowledge and behaviours while interacting within environmental contexts.[132] The concept of self-efficacy significantly influenced the understanding of teacher efficacy, and contributed to wider research initiatives in the field of education.[120]

Measures of teacher self-efficacy

Utilising Bandura's social cognitive theory, Gibson and Dembo[133] developed a more extensive and reliable measurement of teacher efficacy: the Teacher Efficacy Scale (TES).[133] This 30-item measure of teacher efficacy had two factors and confusingly named the factors with the same terminology used earlier by Ashton for the two RAND items. The first factor was labelled Personal Teaching Efficacy (PTE) with a Cronbach alpha of 0.75 and assumed to reflect Bandura's self-efficacy. The second factor labelled General Teaching Efficacy (GTE) with a Cronbach alpha of 0.79 was assumed to reflect Bandura's outcome expectancy.

Tschannen-Moran[120] summarised the related research that used the Gibson and Dembo measurement instrument within the field of primary and secondary school education. The evidence showed that higher teacher self-efficacy correlated with:

- positive teacher classroom behaviour (less critical of students' incorrect responses),
- persistence in teaching in face of obstacles,
- teaching experimentation and innovation (e.g. class into small groups),
- enthusiasm for teaching,
- better learner achievement,
- greater learner interest, and
- positive learner attitude.

Teacher efficacy research tended to focus on investigation of teacher efficacy beliefs in general. Bandura's self-efficacy emphasis became the dominant conceptual construct for teacher self-efficacy, broadening the focus of new research focus and development of new tools for measurement. Tschannen-Moran[120] proposed an integrated conceptual construct that encompassed growing consensus and empirical evidence supporting Bandura's theory of teacher self-efficacy (*Figure 3.1).*

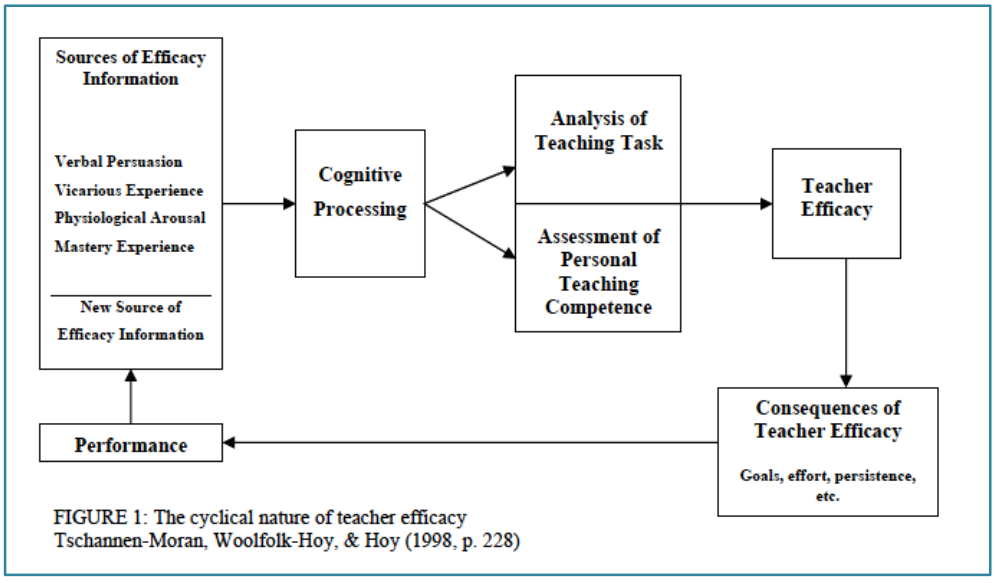


Figure 3.1: Cyclical nature of teacher efficacy[120](p228)

Recognising that self-efficacy is task, subject matter and context specific, extensive efforts by many others, often using further refinements to the Gibson and Dembo instrument, occurred to try to more specifically measure teacher self-efficacy. An example included the Riggs and

Enoch's [134] Science Teaching Efficacy Belief Instrument (STEBI), an 23-item survey using a five-point Likert scale, statistically significant two factors, with Cronbach alpha of 0.92 and 0.77, respectively, for personal science teaching efficacy and science teaching outcome expectancy, respectively. This showed that the STEBI was a valid and reliable tool for studying elementary teachers' beliefs towards science teaching.[135] In a similar manner, many other teacher efficacy tools were developed in subject matters like chemistry, classroom management and special education.[120]

Bandura[136] developed a teacher self-efficacy scale which included 30 items on a nine-point scale with seven subscales: efficacy to influence decision making, efficacy to influence school resources, instructional efficacy, disciplinary efficacy, efficacy to enlist parental involvement, efficacy to enlist community involvement, and efficacy to create a positive school climate. However, Bandura has not reported any finding regarding the validity or reliability of his instrument.[137]

Tschannen-Moran and Woolfolk Hoy[138] reported that most of the teacher self-efficacy scales did not include items on personal competence and tasks which exist in teaching processes. Moreover, Tschannen-Moran, Woolfolk-Hoy and Hoy[120] argued for the necessity of a valid and reliable teacher self-efficacy scale. In the light of these arguments, Tschannen-Moran and Woolfolk Hoy[138] developed a new scale with 52 items and named it the Teachers Sense of Efficacy Scale (TSES), originally known as the Ohio State Teacher Self-Efficacy Scale (OSTES). To validate the scores obtained from this scale, Tschannen-Moran and Woolfolk Hoy[138] constructed three different studies with 624 participants including pre-service and in-service teachers. At the end of these studies, the resulting scale had 24 items in the long form and 12 items in the short form. To make sure that both versions of the scale provided evidence for construct validity, Tschannen-Moran and Woolfolk Hoy[138] checked for the correlation between their scales and previously developed teacher self-efficacy scales as RAND items and Hoy and Woolfolk (1993)'s 10-item adaptation of Gibson and Dembo's TES. Among the resulting correlation coefficients, the highest ones were obtained with the scale measuring personal teaching efficacy. To indicate that both forms of TSES measured the same construct, Tschannen-Moran and Woolfolk Hoy[138] reported that the inter-correlations between short and long form of TSES were between 0.95 and 0.98.

Further, they conducted Principal-Axis Factoring with Varimax Rotation and concluded that TSES had a three-factor structure, naming them Efficacy for Student Engagement (ESE), Efficacy for Instructional strategies (EIS) and Efficacy for Classroom Management (ECM).

Reliability analysis indicated that total scale Cronbach alpha coefficients of 0.94 and the three subscales demonstrated high Cronbach Alpha Coefficients as 0.87 for ESE, 0.91 for EIS, and 0.90 for ECM. The alpha values and the validation study indicated that Teachers Sense of Efficacy (TSES) was a valid and reliable measurement to assess teachers' sense of efficacy in student engagement, instructional practices and classroom management.[138] This became the most commonly used measurement for teacher efficacy in the context of primary and secondary educational environments.

The Henson[139] review in 2002 appeared to validate the use of these traditional measures of teacher efficacy as producing reliable measures of teacher efficacy and teacher self-efficacy beliefs.[139] Others later pointed out various limitations with the TSES. Concerns were discussed about the construct and lack of outcome expectancy in the Tschannen-Moran model.[140] Despite assertions that self-efficacy beliefs were task specific, concerns were raised about the ambiguous use of the global teacher self-efficacy score.[141] There also appeared to be a misalignment of the theoretical basis of self-efficacy with the methodological methods and measures.[142]

Dellinger[132] argued that there was a distinction between teacher efficacy and teacher self-efficacy, and that failing to make this definitional distinction confused and created problematic issues in the tools previously described and their measurement of teacher self-efficacy beliefs. These issues included:

- conceptual construct not grounded or aligned with self-efficacy theory,
- interchangeable use of concepts (e.g. self-esteem, locus of control, self-concept, self-confidence, outcome expectancy),
- confounding of extraneous factors,
- lack of task specificity,
- failure to consider the contextual or situational environment, and
- failure to take into account, measure and analyse teacher self-efficacy in terms of the multidimensional task requirements of teaching.

He stated that the Tschannen-Moran TSES[138] measure did appear to address most of the issues above, with items reflecting the multidimensional nature of teaching and teaching task specificity, and that it focussed on teacher self-efficacy and was grounded in Bandura's concept. However, Dellinger stated that it did not reflect the context under which the self-efficacy beliefs were formed (in their working classrooms).[132]

The Teacher Efficacy Beliefs System-Self (TEBS-Self)[132] is Dellinger's attempt to address these issues and improve the quality of measurement. It was designed to assess teacher self-efficacy beliefs about tasks that are associated with and correlate with known effective teaching and learning within the context of the school classroom. An overarching statement, "*right now in my present teaching situation, the strength of my personal beliefs in my capabilities to …"* began each of the 31 items, with a four-point Likert scale response. This scale was used in three distinct validation studies by the researchers but they did not reach a consensus in terms of the factor structure of the scale.

A summary table of various measurement scales used in teacher efficacy *(Table 3.1)* follows:

Table 3.1: Some teacher efficacy measurement scales (EDUCATION)

Authors	Scale name	Sample items	Rating scale	Number of Items	Factor solution	Cronbach alpha
Ashton [127](1976)	RAND	*item 1 – When it comes right down to it, a teacher really can't do much because most of a student's motivation and performance depends on his or her home environment.* *item 2 – If I really try hard, I can get through to even the most difficult or unmotivated students.*	5 point Likert scale	2		
Rose & Medway [128](1981)	Teacher Locus of Control (TLC)	When the grades of your students improve, it is more likely a. because you found ways to motivate the students, or b. because the students were trying harder to do well.	Forced choice	7		
Guskey [129](1981)	Responsibility for Student Achievement (RSA)	When your students seem to have difficulty learning something, is it usually a. because you are not willing to really work at it, or b. because you weren't able to make it interesting for them?	Weighted or percentage choice R+ R-	30		R+ 0.76 R- 0.83
Gibson & Dembo[132] (1984)	Teacher Efficacy Scale (TES)	If a student masters a new math concept quickly, this might because I knew the necessary steps in teaching that concept.	6 point Likert scale	30	2 factors -PTE -GTE	 0.75 0.79
Riggs & Enoch [133](1990)	Science Teaching Efficacy Belief Instrument (STEBI)	I understand science concepts well enough to be effective in teaching elementary science	5 point Likert scale	23	2 factors -PSTE -STOE	 0.92 0.77
Bandura [135](2001)	Bandura Teacher Efficacy Scale	How much can you do to get children to follow classroom rules?	9 point Likert scale	30	Not published	Not published

Authors	Scale name	Sample items	Rating scale	Number of Items	Factor solution	Cronbach alpha
Tschannen-Moran & Woolfolk Hoy [137](2001)	Teachers Sense of Self Efficacy (TSES)	To what extent can you craft good questions for your students?	9 point Likert scale	24 long form 12 short form	3 factors -ESE -EIS -ECM	0.94 0.87 0.91 0.90
Dellinger [131](2007)	Teacher Efficacy Belief System-Self (TEBS-Self)	*Right now in my present teaching situation, the strength of my personal beliefs in my capabilities to …*	4 point Likert scale	31	Not valid	Not valid

Findings of teacher efficacy research

Based on the historical overview previously presented, the following statements reflect observations and implications regarding teacher efficacy. The meaning and definition of teacher efficacy has experienced change and diversity throughout the course of its development.

Any analysis of all prior studies of teacher efficacy must consider the underlying theoretical perspective of the researcher and the selection of measurement tool used. The current conceptualisation of teacher efficacy relies on Bandura's self-efficacy theory and seeks to develop an understanding of teacher efficacy nested in this work.

Measurement of teacher self-efficacy is difficult but there are useful indicators for the development of contextual and task specific new measuring instruments. The use and adaption of existing self-efficacy constructs, knowledge and measurement tools into a new context of medical education and development of clinical teachers in general practice need to be taken into account.

Little focus has been given to understanding and demonstrating the process by which self-efficacy affects teachers' daily practice. Specifically, the teaching environment, the factors that affect teachers' abilities to analyse tasks, the teacher's self-efficacy beliefs and other potential influences (knowledge, pedagogical beliefs) influence the development of efficacy. The relative influence of sources of self-efficacy to inform professional development needs consideration.

Dellinger[(132)] indicates that three issues must be addressed for a measure of teacher's self-efficacy beliefs to be accurate:

- the measure should clearly and accurately reflect the meaning of self-efficacy,

- must be within the context in which the self-efficacy beliefs are formed, and
- the specific tasks selected for measure must be meaningful.

So what has been learnt from history to inform further development of tools for measurement of teacher self-efficacy?

Developmental requisites for measurement of teacher self-efficacy

In the related field of education, there has been much research into teacher self-efficacy over the last few decades. Yet there still remains confusion around the definition and the meaning of teacher self-efficacy. Efforts to clarify the definition of teacher self-efficacy have been clouded by the use of different theoretical conceptual strands.

Additionally, history shows that teacher self-efficacy is a psychometrician's nightmare. Issues in the accurate measurement of teacher self-efficacy within the education field have persisted. The majority of research involved quantitative measures that typically captured a snapshot of self-efficacy beliefs in a group of educational institution based teachers at a particular point in time.

These historical reasons clearly show the need to develop better measuring tools and that the development of these tools needs to adhere to important imperatives.

When determining measures for self-efficacy, there are certain imperatives:

- have a clear definition of self-efficacy,
- be task specific,
- be contextually relevant,
- be a scale of intensity, and
- accurately reflect the meaning of self-efficacy.

The definition of self-efficacy was discussed earlier in this chapter. Considering task specificity, it is important to highlight that the task of student learning is different to the task of the teacher's teaching.

The context in which the participants and self-efficacy is occurring needs to be clearly elucidated. The setting of community based general practice with ambulatory patients with clinical problems is different to a simulated environment. Scales of self-efficacy must be related and tailored to the particular domain of functioning that is the object of interest.[136] High self-efficacy beliefs in one context do not necessarily mean high self-efficacy in another.

For example, a clinical teacher may have high self-efficacy for teaching a surgical excision procedure of a skin lesion, but the same clinical teacher may have low self-efficacy when explaining the clinical reasoning steps in the clinical diagnosis of the skin lesion.

The strength component of self-efficacy refers to the intensity of a person's belief in their ability to do a certain task. Consequently, for measures of self-efficacy to achieve a predictive impact, they need to be tailored within the particular context and represent graduations of task demands, thus having a scale of intensity. [(25)] Perceived self-efficacy needs to be measured against levels of task demands that represent gradations of challenges or impediments to successful performance. This is often measured using self-report surveys that ask participants to rate the strength of their self-efficacy beliefs in performing specific tasks.[(136)]

The measure of self-efficacy needs to clearly and accurately reflect the meaning of self-efficacy.[(132)] Careful wording of the self-efficacy items needs to accurately reflect the task and contextual construct. Bandura[134] recommends that items should be phrased in terms of "can do", rather than "will do". "Can" is a judgement of capability whereas "will"' is a statement of intent.

Importantly self-efficacy differs from general self-confidence in that self-efficacy is context specific rather than a stable personality trait.[(143)] Clarifying the concepts of self-efficacy, confidence and competence is vital for producing appropriate self-evaluation measurement scales.[(144)] These concepts will be discussed further to enable greater understanding. Significantly, self-efficacy beliefs do not always match the person's actual performance or ability in a specific task, and can be overestimated.[(145)]

Tschannen-Moran,[(120)] nearly two decades ago, in a seminal literature review, proposed a unified model, definition and measure for teacher self-efficacy. She also advocated the need to employ a wider variety of qualitative research methods, including interpretative case studies, to refine our understanding of teacher self-efficacy. Recent reviews of teacher self-efficacy in the field of education continue to be predominately quantitative research. Klassen[(126)] further noted that nearly half of the studies published since 1998 were conceptually suspect, based on inconsistent definitions, and often led to misleading conclusions. Another literature review by Wyatt[(146)] highlighted the continuing misalignment between theory and method in much of the literature, and the need to expand and reconceptualise previous approaches and research around teacher self-efficacy. He argued for quantitative data gathering through the use of carefully constructed surveys as a useful

first stage in a mixed methods study. He proposed an alignment of definition, a broader understanding that teacher self-efficacy beliefs are task specific, that they are complex and need further exploration through interpretative research methods, and that longitudinal studies are required to understand how beliefs change and grow.

Less is known about the sources and development of teacher self-efficacy beliefs.[147] Bandura[25] identified four sources of self-efficacy beliefs: mastery experiences, vicarious experiences, verbal persuasion and physiological arousal. When researchers compared the self-efficacy beliefs of novice and experienced school teachers,[124] not surprisingly experienced teachers showed higher self-efficacy scores using the full 24-item (TSES). This applied most in the areas of instructional strategies and classroom management, although the relative contribution of the four sources to the higher self-efficacy in experienced teachers was not studied.

Satisfaction with past professional performance was moderately related to the teacher's self-efficacy, and perhaps demonstrates that experienced teachers have more previous performances on which to draw. Verbal persuasion, as assessed by interpersonal support of administrators, colleagues, parents and community, was more important to novice teachers. Tschannen-Moran[124] points to more research needed to determine the weighted importance of the sources of self-efficacy and other contextual factors like the school environment, peer support and leadership in the development of self-efficacy. Labone[147] urges future research to broaden and deepen understanding of the self-efficacy in teaching. He stresses "more intensive qualitative research within the interpretivist paradigm"[147](p357) to provide an understanding of how teacher efficacy beliefs are formed to support the investigations of interventions to enhance teacher efficacy.

These observations and findings around teacher self-efficacy have been drawn from the field of education, mostly school teaching environments. In the next section, I will explore the variety of ways the self-efficacy concept has been adapted and used in medical and health environments.

Use of self-efficacy within medical and health environments

Bandura[25] hypothesises that self-efficacy beliefs influence the types of activities an individual will choose to pursue, the challenges and goals they set for themselves, and their effort and perseverance. People with a low self-efficacy for accomplishing a specific task may

avoid it, whereas those who believe they are capable are more likely to put in greater effort and persist longer, despite adversity or obstacles.[25] Although feeling slightly overconfident may be adaptive in most educational contexts, in the clinical setting, it is clear that greatly overestimated self-efficacy beliefs could result in an unsafe environment for patients (e.g. the junior doctor who overestimates their ability to independently manage a complex clinical case). More effort and persistence is critically important for the prolonged, deliberate practice required to achieve expert performance.[148]

Yet a simple idea of teacher self-efficacy appears to have widespread and enduring effects. There is compelling evidence over the last few decades that teacher self-efficacy is powerfully related to many meaningful educational outcomes. To summarise, these include: the teacher's persistence, enthusiasm, commitment, longevity and instructional behaviour. Student outcomes positively impacted include achievement, motivation and development of their own self-efficacy beliefs.

Reconciling this with Bandura's concept of self-efficacy,[25] a key element is that self-efficacy is context specific. It is apparent that a teacher teaching a group of students in a primary or secondary school classroom is a completely different context to a doctor teaching clinical knowledge, skills and attitudes to a postgraduate doctor in a general practice consultation setting, where patients are being cared for and treated.

Undergraduate student uses

Self-efficacy does appear in medical education research but usually involves a different target or context than clinical teaching. For instance, studies have investigated whether new educational methods have an impact on motivational variables such as self-confidence and self-efficacy in medical students. Various studies on medical students' self-efficacy are summarised and provide enlightening points. Artino's study[149] of second year medical students showed that students' task-value beliefs were positive predictors of their course related enjoyment and achievement. Similarly, their academic self-efficacy was a negative predictor of anxiety, indicating that those who were confident they could learn the course were less likely to experience anxiety. This research[149] appeared to align Bandura's self-efficacy concept for learning with Pekrun's control-valve theory of achievement emotions.[150] Artino[149] diagrammatically illustrated the linkage of self-efficacy between motivational beliefs and achievement emotions, whilst also inferring the influence of learning environment and academic outcomes (*Figure 3.2).*

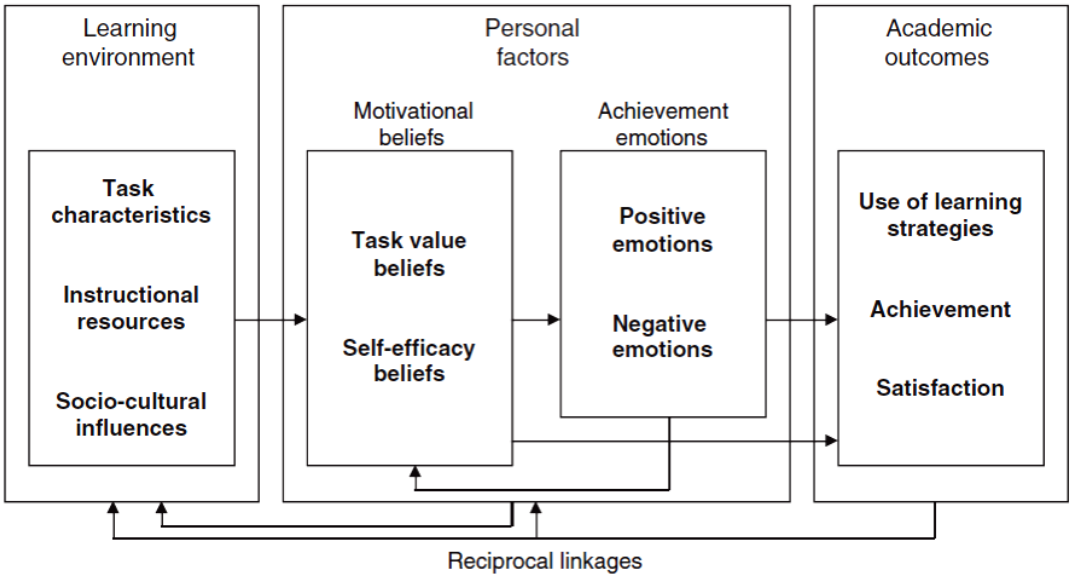


Figure 3.2: Artino's social cognitive model of academic motivation and emotion[149] adapted from Pekrun[150](p1204)

Researchers across a variety of medical and allied health fields have conceptualised whether specific educational methods have an impact on motivational variables like self-efficacy of the student. Self-efficacy has been used frequently in education and health literature to document outcomes of education programs or outcomes achieved by students.

Educational programs for medical students that specifically included self-efficacy as an outcome include:

- medical student self-efficacy outcomes in development of clinical and pharmacotherapeutic skills in final year medical students,[151, 152]
- simulation based training,[152]
- disability medicine,[153] and
- communication skills.[154]

An interesting insight comes from Aper's research[154] into the impact of three educational interventions in consulting skills for second year medical students, assessing their self-efficacy and skill acquisition. This study comprised:

- traditional approach using a standardised simulated patient consultation with a supervising physician who gives feedback,
- autonomous consultation without direct observation and feedback from patient and peers, and
- online training based on video fragments and guiding reflective questions.

The results showed that the traditional online training positively influenced the cognitive component in the consultation skills, whereas the autonomous training had a significant positive effect on the student's self-efficacy beliefs. This second finding aligns with Bandura's four sources influencing self-efficacy beliefs through:

- the direct experience of being the doctor during the entire consultation role play,
- the vicarious experience of peer observing other successful/unsuccessful consultations,
- the verbal persuasion of receiving positive feedback from simulated patient and peers, and
- the emotional arousal of feeling free to express themselves without supervising expert physicians.

Saketkoo[153] showed that a targeted educational intervention of a three-hour workshop on disability can have a positive effect on the medical students knowledge, skills and attitudes, including their self-efficacy. Importantly this study indicated how to design, construct, deliver and research self-efficacy and performance outcomes of an educational intervention.

Self-efficacy in nursing education was improved through:

- e-learning in nursing students dealing with difficult patients,[155]
- asthma teaching in primary care nurses,[156]
- the development of communication skills in nursing students,[157] and
- the clinical performance of nursing students.[158]

In allied health fields, research showed improved student self-efficacy outcomes after focused training in cardiorespiratory skills in physiotherapy students[159] and the resuscitation and retention of skills of paramedics.[160]

Furthermore, second year medical students' motivational beliefs (task-value and self-efficacy), achievement emotions (enjoyment, anxiety, boredom) and academic achievement were researched in a USA uniformed services university.[149] The results showed that the task value beliefs were negatively related to boredom, and self-efficacy beliefs negatively related to anxiety. Task value beliefs, not self-efficacy ones, did have a statistically significant association with the achievement outcome.

Perhaps indicating the general development of self-efficacy with time, or the impact of the medical curriculum. Artino[122] with a validated medical student self-efficacy measuring tool

showed significant changes in patient care self-efficacy and evidence based medicine self-efficacy from the four year groups of medical students. *(Figure 3.3)*

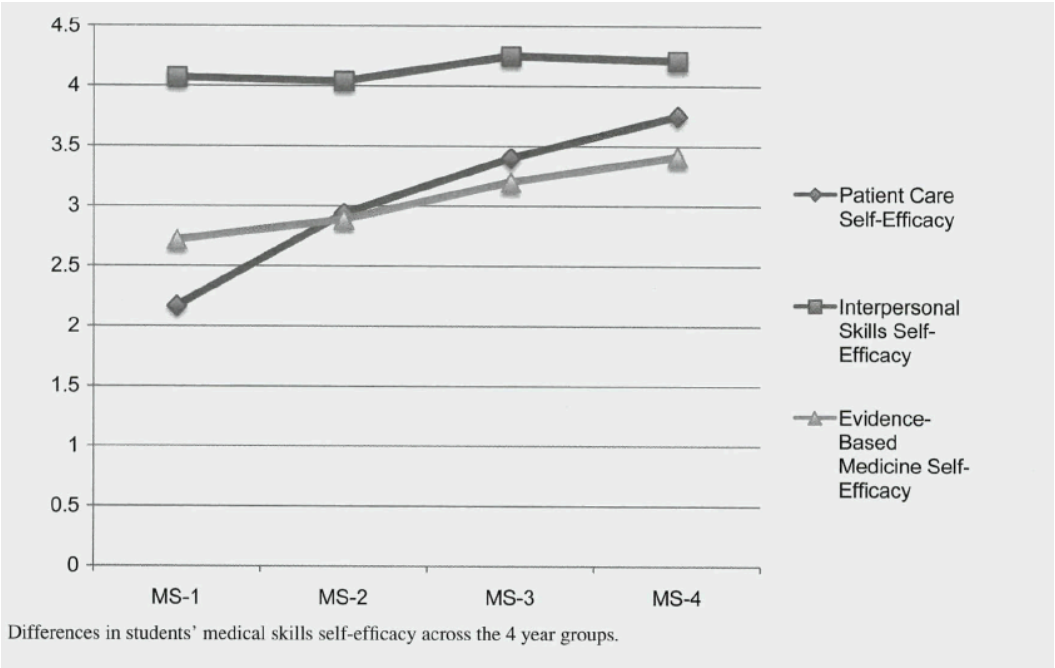


Figure 3.3: Differences in medical students' skills self-efficacy across four year groups [122][p35]

The finding that self-efficacy scores in medical students increased significantly over the years was confirmed by Turan's[161] further research on undergraduate medicine at Ghent University in Belgium. His development and validation of the Medical Achievement Self-efficacy Scale (MASS)[161] provided a useful measuring tool for medical student self-efficacy. Highlighting the importance of aligning the task specificity of self-efficacy, Turan's item development included the direct linkage to the university medical curriculum and the CanMEDS physician roles and competency domains.[53] This study also confirmed the validity of Bandura's self-efficacy theory through the predictive nature of student performance in the Maastricht Progress Test.

Post graduate uses

In the Netherlands the self-perceived competence of postgraduate GP training doctors significantly grew over their three-year training.[162] Although this was not self-efficacy, it occurred within the context of general practice, and apparently their GP training enhanced their feeling of being competent in consultations more than in knowledge and clinical skills. An exploratory study by Dory[163] further looked at the development of self-efficacy beliefs during general practice vocational training using focus groups in Belgium and France. The results showed initial feelings of incompetence and low self-efficacy beliefs were common at

the start of their training. Their self-efficacy beliefs then developed through their training, with described coping strategies aligning with the Bandura self-efficacy model. The doctors described their coping strategies in terms of choices (avoidance or persistence), cognitive processes (modifying own expectations), affective processes (anxiety), and experiences (personal success, role modelling or verbal encouragement of others). This study highlighted that some GP trainees may experience difficulties in the development of self-efficacy beliefs during their GP training.

Continuing Medical Education uses

Moving beyond undergraduate education, in Continuing Medical Education (CME) for medical practitioners, there is conclusive evidence of improved self-efficacy and self-confidence outcomes for learners. Studies have researched self-efficacy in communication skills with cancer patients,[164] dementia care,[165] family practitioners treating obesity,[166] doctors end of life palliative care consultations,[167] paediatricians smoking cessation counselling,[168] surgical residents dealing with paediatric trauma,[169] doctors doing resuscitation simulation courses[143] and the effect of an Advanced Paediatric Life Support course (APLS).[170] Resuscitation training has particularly embraced self-efficacy as one of the outcomes to be assessed. Training experiences that maximise resuscitation self-efficacy in a simulated or virtual environment are thought to the most likely to be effectively utilised in real life emergencies.[171] This is due to the reality that emergency situations requiring a doctor to perform a range of resuscitation skills are rare and unpredictable. Direct observation and assessment is difficult in real-time, yet societal and professional duties demand the doctor is prepared, competent and confident. "*Even those who are knowledgeable and skilled in resuscitation may fail to apply them successfully unless they have an adequately strong belief in their capability."*[171](p94) Self-efficacy in resuscitation situations is postulated to be important as it influences the development of and familiarity with the needed knowledge, procedural skills and crisis resource management.[143] As self-efficacy is highly predictive of behavioural performance,[25] multiple studies have used self-efficacy in resuscitation training as a surrogate measure for later performance.[157,(170, 172)]

Parle[164] described the development of a training model that improved health professionals skills, self-efficacy and outcome expectations when communicating with cancer patients[164] *(Figure 3.4).* This study illustrated the imperative for multidimensional evaluation, including self-report measures of self-efficacy and outcome expectancy beliefs as well as objective observational measures of skill in consultations with simulated patients. This consideration of

measuring self-efficacy beliefs as part of the evaluation of training provides some interesting insights. Focussing on self-efficacy before the training enables skill deficits or attitudes to be addressed in the training.

> *"The cumulative effect of deficits in skills, low estimates of self-efficacy, negative outcome expectancies and a perceived lack of support are all likely to increase the professional's anticipatory anxiety and use of self-protective behaviour like distancing or avoidance."* [164](p234)

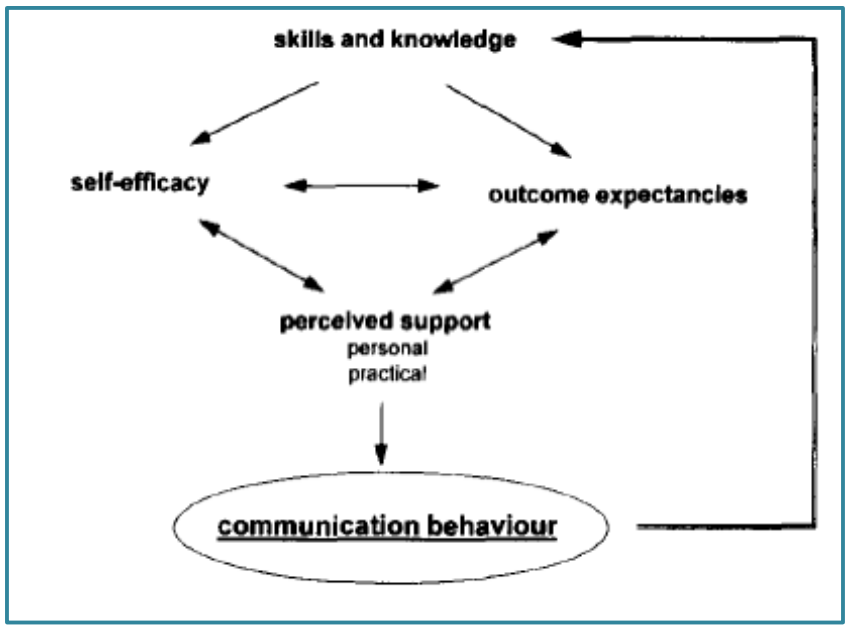


Figure 3.4: Contributing factors in health professional communication behaviours (Parle)[164](p234)

Beyond incorporating self-efficacy into a needs analysis, this communication with cancer patients' workshop also included videotaped demonstrations, discussion of skills that promote or inhibit patient disclosure, role-plays and feedback to the participants. In descending order of salience, individuals determined and modified their self-efficacy by: enactive mastery experiences, vicarious modelling, verbal persuasion and physiological arousal. It is apparent that experiential learning using role plays or simulated patients, observing others live or on video, discussing with facilitators and small groups potentially align with self-efficacy development. All 12 communication specific tasks with cancer patients showed significant improvement in self-efficacy after the workshop.

Other literature points to the impacts of educational programs on the self-confidence of doctors dealing with simulation based TIA and stroke assessment,[173] management of suicidal patients,[174] and assessment and management of falls in the elderly.[175] Short

focused training, as evidenced by a two hour communication skills program[176] of five simulated patient consultations covering five different clinical conditions (dementia, depression, obsessive compulsive disorder, early retirements, schizophrenia), showed that the medical students had improved self-confidence, knowledge and the best OSCE performance. These studies focussing on self-confidence illustrated that research misinformation comes from the interchangeable use of self-confidence and self-efficacy. Careful reading of articles from these searches was required, due to variability in use and meaning of self-efficacy terms or synonyms. Many articles used the concepts of self-efficacy and self-confidence interchangeably,[168, 177] which is an incorrect use and interpretation. I have only discussed and included the international literature that had the true definition of self-efficacy and I have generally decided not to incorporate research that used other self-concepts, like self-confidence.

The instruments used to measure self-efficacy within the medical and health environments (in the various studies) discussed above are summarised in Table 3.2. This provides an overview of the measuring scales, authors, name, participant target and rating scale information.

Table 3.2: Examples of self-efficacy measurement scales (medical education)

Authors	Scale name	Target	Rating scale	Number of Items	Factor solution	Cronbach alpha
Artino [122] (2012)		Medical student self-efficacy	5 point Likert Scale	19	3 factors -patient care -interpersonal skills -evidence based med	 0.92 0.76 0.79
Cheraghi (2009)[158]	SECP	Nursing student self-efficacy	100 point scale	42	4 factors -assessment -diagnosis & planning -implementation -evaluation	0.96
Chiang[156] (2009)	Self-Efficacy in Asthma Training (SEAT)	Primary care nurses in asthma teaching	5 point Likert Scale	20	3 factors -general teaching -specific asthma related teaching -PEF meter teaching	0.94 0.91 0.92 0.95
Copeland (1999)[15]	Cleveland Clinical Teaching Effectiveness instrument (CCTEI)	Medical student rated clinical teacher behaviors – but no self-efficacy	5 point Likert	15	1 factor	0.97
Jones[159] (2012)		Physiotherapy students self-efficacy in cardiorespirator y training	5 point Likert Scale	13	No factor analysis	Not done
Mavis[179] (2001)	Self-efficacy for OSCE	Medical student second year OSCE	6 point scale	31	No factor analysis	0.96
Peterson (2007)[165]		CME workshop on dementia care	7 point Likert Scale	17	No factor analysis	
Plant[143] (2011)		Crisis Resource Management self-efficacy tool	5 point Likert scale	24	4 factors -situation awareness -team management -environment management - decision making	 0.82 0.88 0.77 0.91
Stalmejer (2010)[198]	Maastricht Clinical Teaching Questionnaire (MCTQ)	Medical student rated clinical teacher behaviors – but no self-efficacy	5 point Likert scale	24	5 factors -Modeling -Coaching -Articulation -Exploration -Learning environment	 0.86 0.83 0.89 0.94 0.96
Turan[161] (2013)	Medical Achievement Self-efficacy Scale (MASS)	Ghent university curriculum medical students	5 point Likert scale	18	No factor analysis	0.89
Webb[205] (2010)	Modified STEBI	Self-efficacy of school teachers in HIV education	5 point Likert Scale	18	No factor analysis	Not done

Self-efficacy and performance within medical and health environments

Bandura[23] hypothesised that self-efficacy affects choice of activity, effort, persistence and achievement. Compared with persons who doubt their capabilities, those with high self-efficacy for accomplishing a task participate more readily, work harder, persist longer when they encounter difficulties and achieve at a higher level.

People acquire information to appraise their self-efficacy from their performances, social modelling of others seen as similar performing a task successfully, receiving persuasive information that they are capable of performing a task, and physiological responses like sweating or anxiety. One's performance offers a reliable guide for assessing self-efficacy. Successes raise self-efficacy and failures lower it but once a strong sense of effectiveness is developed, a failure may not have much impact.

Although self-efficacy influences the relationship between knowledge and action, alone it is not sufficient to assure successful performance.[178] An individual must possess the requisite skills associated with the task as well as some incentive to perform.[179] Accordingly, high self-efficacy will not produce a competent performance when requisite knowledge and skills are lacking. In this instance, a sense of "self-efficacy for learning" is beneficial because it motivates individuals to improve their competence. Outcome expectations or beliefs concerning the probable outcomes of actions (e.g. learn or practice more) are important because people strive for positive outcomes.

As proposed by Pajares,[145] self-efficacy beliefs should be sufficiently specific to correspond to the critical competencies of today's doctors. This highlights the importance that task-specificity of self-efficacy is aligned with medical best practice, key competencies or curriculum statements.

The relationship between self-efficacy and performance has been widely studied in academic settings,[145, 180] education, work place[181] and sport.[182] Moritz's [178] meta-analysis of 45 studies showed that the magnitude and direction of the relationship self-efficacy and sport performance varied considerably. The heterogeneity of findings and variability of the relationship, largely due to the use of general measures to measure self-efficacy and/or performance, neglected the context and task specificity of self-efficacy, performance or

achievement. This indicates the importance of matching self-efficacy with performance measures.

Within the contextual realm of medical or health fields, few studies have examined the specific relationship between self-efficacy and performance or achievement.

Mavis[179] studied medical students through a self-reporting questionnaire around self-efficacy, preparedness and anxiety immediately before their second year Objective Structured Clinical Examination (OSCE).[95] This showed that students with a high self-efficacy were more likely to score above the mean OSCE performance compared to low self-rated students. A positive correlation between self-efficacy and performance was seen (non-significant p=0.30), although self-rated anxiety had a negative significant impact and self-rated preparedness had a positive impact on self-efficacy.

On the basis of these research statistics, Mavis[179] concluded as there was no direct relationship between performance and self-efficacy; this implied a more complex model underlying competent performance.[179] He postulated a causal best-fit model (*Figure 3.5*) showing the positive and negative magnitude of relationships between anxiety, self-efficacy, preparedness and performance.

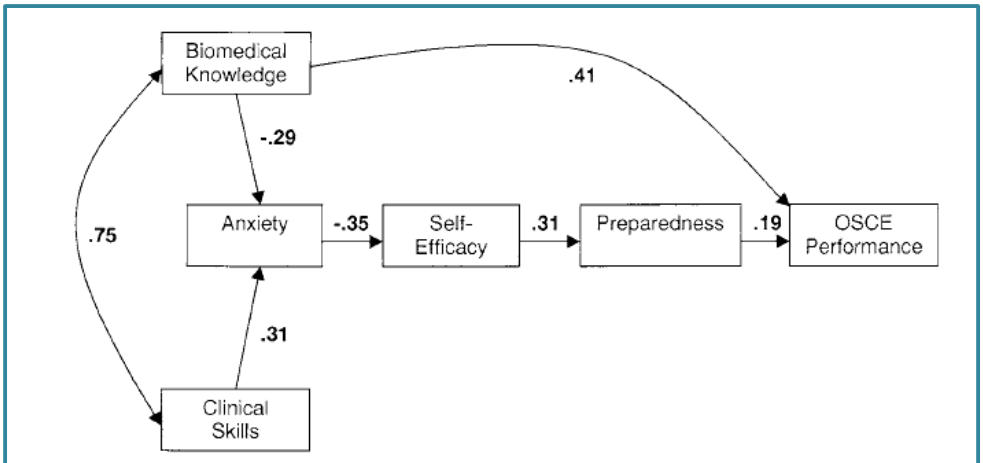


Figure 1. Path model illustrating the mediating role of self-efficacy, anxiety and preparedness in predicting OSCE performance. Beta weights are shown, indicating the magnitude and direction of the relationships between variables.

Figure 3.5: Mediating role of self-efficacy and OSCE performance (Mavis)[179](p98)

In traditional "apprenticeship" medical and surgical training, manual skills develop as a result of initially assisted and later repeatedly performed supervised procedures and tasks. Maschuw's[183] randomised controlled trial of 50 surgical trainees learning laparoscopic surgical skills confirmed that structured simulation training enhanced virtual reality

laparoscopic performance of the surgical trainees. An additional correlation to self-efficacy was found ($p<0.05$); specifically low levels of self-efficacy and negative stress-coping ability were predictive of poor virtual reality performance. [183]

In surgical skills simulation education, trainees are often required to demonstrate task competency before performing a procedure on a patient. Campbell[184] showed that a group of surgeons who learnt the open cricothyrotomy procedure (an emergency lifesaving technique) using an cognitive task analysis method had significantly higher self-efficacy scores and outperformed the control group in performing the procedural tasks in a simulated environment.

Turner's[170] research indicated that self-efficacy for resuscitation tasks increased after the APLS course, and that self-efficacy for paediatric resuscitation skills was higher in APLS trained doctors several years after the course.

> *"Self-efficacy seems to be a predictor of behaviour during a simulated resuscitation and might be useful as a measure of the likelihood of transfer of learning into clinical practice. However self-efficacy does not correlate with quality of performance and should therefore not be used unqualified to self-assess competency or the need for re-training."*[170](p917)

Interestingly this study appears to confirm Bandura's theory that a negative physiological arousal and vicarious experience, like the death of a patient during simulation resuscitation training, is a potent source of feedback to the learner and decreases their self-efficacy.

Maibach[171] recommends that resuscitation training should be modified to maximise self-efficacy, on the premise that it leads to improved simulated and real life performance and proficiency in resuscitation skills. Resuscitation knowledge and skills training can be optimised by concurrent self-efficacy development through opportunities for performance mastery, observational learning, verbal persuasion, social modelling and an awareness of personal physiological and affective reactions like anxiety.

Other studies using this hypothesis show conflicting evidence. For instance, in a study of internal medicine resident doctors' ability to follow ACLS algorithms during simulated resuscitation, there was no correlation between self-confidence and performance.[185] Analysis of this study gives further background information as it was a measure of self-confidence, not the self-efficacy, which is the focus of my research. This self-confidence outcome indicates that the study is not truly providing conflicting evidence about self-

efficacy. A more recent study showed a moderate correlation (r=0.48) between self-efficacy in general resuscitation skills and the observer's assessment of their global performance.[170] Another study by Plant[143] indicated a positively significant relationship between self-efficacy and the observed resuscitation crisis resource management performance of paediatric doctors, specifically in the areas of situation awareness (p = 0.002) and environment management. (p = 0.022).

A large multi-centred randomised controlled trial in Canada tested the hypothesis that mental imagery enhances the surgical skills of novice surgeons in their performance of a vaginal hysterectomy.[186] The study results showed statistically significant improvement post mental imagery training in the self-confidence of these surgeons, with a small statistically insignificant improvement in their objective surgical task performance. Other studies showed conflicting results of performance after mental imagery training, with improvement in the performance of cytoscopy[187] and basic laparoscopic skills.[188] Neither of these studies had a self-efficacy focus.

This self-efficacy of the learner and relationship to performance has been explored in other medical settings, including medical administration, through the quality of patient clinical notes.[189] Russo[189] explored training approaches that used two or four self-efficacy sources constructs in a clinical documentation quality training program with resident medical doctors. Although both interventions increased self-efficacy and the clinical documentation quality (the performance endpoint), the training approach that had significantly greater impact included all four of Bandura's self-efficacy source constructs.[189]

In medical education research, motivational constructs like self-efficacy have received less emphasis than more traditional measures of achievement, such as scores on standardised skill tests and observations of clinical performance.[122] The ideal ultimate outcome for clinical teaching is an improved impact on clinical care, patient health and more effective or efficient clinical practice. Evaluation of continuing medical education programs in the health profession rarely extend beyond the learner's satisfaction evaluated through the brief questionnaire immediately after the course or training program. The challenge of any medical or health training program is to demonstrate longer term impacts, such as the improved health outcomes for the patient and community. Self-efficacy offers a potential solution by contributing a multidimensional perspective, a broader evaluation, a longitudinal integration with clinical practice, and a predictive indicator for clinical performance. The

community based nature of general practice enables the longer term clinical care, patient health and primary care practice to be followed.

An example of this comes from Lorenz's[121] study of dieticians which showed a significant increase in self-efficacy for all 12 training objectives after a two-day "Sugar is Not A Poison" (SNAP) workshop. Six to nine months after the training, follow-up surveying showed a positive correlation between self-efficacy and the dietician's practice with diabetics. Specifically selecting the best meal planning strategy and the use of behaviour change strategies to help patients improve their self-management correlated significantly with practice change success.[121] Through a brief self-efficacy questionnaire, with survey items that are carefully task specific to targeted clinical skills, and inclusion of additional post surveying, a more comprehensive evaluation occurred.

Within the primary health care setting, Cabana's[168] study of paediatricians and general practitioners showed that previous training in smoking cessation counselling significantly enhanced the doctor's self-efficacy to inquire and talk about smoking cessation. The presence of previous training in smoking cessation counselling was associated with high levels of self-efficacy for all four skills including:

- inquiring about an asthma patient's smoking status (odds ratio [OR]3.91; 95% confidence interval [CI]: 1.63, 9.37),
- inquiring about a parent's smoking status (OR: 2.51; 95% CI: 1.09, 5.75),
- counselling a patient to quit smoking (OR: 5.30; 95% CI: 3.02, 9.31), and
- counselling a parent to quit (OR: 4.96; 95% CI: 2.85, 8.61).

The years since completion of hospital medical training were not associated with high self-efficacy, indicating that the doctor's self-efficacy for smoking cessation is not explained by cumulative experience alone. The context of a doctor teaching a patient or parent of a child why it is important not to smoke and ways to cease smoking is analogous to a teacher teaching a learner. So what is known about teacher self-efficacy in a health or medical setting?

Clinical teacher self-efficacy

General practitioners are called upon to educate as part of their core work: providing information on health and illness to patients and families, participating in teaching sessions for peers and other clinical staff, as well as teaching medical students on clinical

attachments.

Definition

A clear and contextually relevant definition of clinical teacher self-efficacy is needed. Adhering to the authenticity of Bandura's self-efficacy concept, and using the foundations of earlier definitions of teacher self-efficacy by Guskey,[125] Tschannen-Moran[120] and Klassen,[126] the definition for self-efficacy of the clinical teacher needed to be adapted to align with the medical education context. My new definition for the self-efficacy of the clinical teacher is therefore: **the confidence and belief that their teaching will positively influence and impact on the learner in a clinical medical environment.**

Literature

To explore what was known about clinical teacher self-efficacy in the health/medical setting, a literature search was performed. A literature review is designed to answer or inform a specific question or purpose or identify a gap in what is known about a certain topic and a useful method is to formulate a search grid.[190] Search terms were identified by a previous search of databases (including PubMed) and internet search engines (including Google and Google Scholar). Additionally each searched database was checked for predefined MeSH terms and, where available, these terms integrated into the search strategy *(Table 3.3).*

Table 3.3: PubMed search grid for clinical teacher self-efficacy (performed in 2014)

Self concept[mh:noexp] OR Self efficacy[mh] *OR* Self efficacy[tiab] *OR* Self confidence[tiab] *OR* Self confident[tiab]	teaching[mh] *OR* teaching[tiab] *OR* teacher*[tiab]	professional education *OR* medical education/syn *OR* vocational education/syn *OR* clinical teacher/syn

University of Adelaide librarian assistance was sought to ensure the correct literature search terminology was used for PubMed, PsychINFO, EMBASE, Cochrane and SCOPUS from 1994 to 2014 that included all journals, books and conference papers. The search strategy was adapted for the individual databases (described above) to account for specific vocabulary

and syntax rules. The initial scoping of the literature occurred in 2010, with follow-up literature searching undertaken until June 2014. From the above databases, a combined 614 articles were identified. After simple review of title and abstract, 604 articles were excluded, resulting in 10 articles for retrieval. Full text analysis revealed that a further nine articles involved a student learner, nurse or a school teacher; and were excluded. An article in Spanish was also excluded. No articles specifically addressed the area of self-efficacy in clinical teachers in a primary care or community based general practice setting. This medical education literature review showed that there is very little evidence of existing published work on clinical teacher self-efficacy.

Two articles partly addressed elements around self-efficacy in clinical teaching: the measurement of self-efficacy in asthma teaching by Chiang[156] and the Student-Teacher Education Program (STEP) by Erlich[191] for medical students to become competent clinical teachers. This provided the catalyst for further snowballing of related articles, a wider exploration of these two elements, and important contextual background to the phenomena of self-efficacy in the clinical teacher. The relevant literature relating to the training programs and measures that involve confidence or self-efficacy is discussed and summarised in the next section of this chapter. This includes an exploration of measurement tools used in self-efficacy and performance of clinical teachers. In Chapter 4, a systematic review is reported looking at the effectiveness of interventions on the self-efficacy of clinical teachers.

Program evaluation

A commonly utilised approach in clinical teacher training is “Train the Trainer” (TtT). This approach has been successfully used to educate doctors, nurses and other allied health care professionals to subsequently become clinical teachers in courses, covering depression, alcohol abuse, dementia and emergency care. Brimmer’s[192] study was unique in that it measured the self-efficacy of primary care physicians and health practitioners who participated in a TtT program (around Chronic Fatigue Syndrome[CFS]). These core trainers were followed up with an interview a year later, after the core trainers had then taught or presented further peer education sessions to others. The narrative information from these interviews indicated that many core trainers reported positive experiences in conducting the peer education sessions, but for some the barriers were lack of experience with CFS and lack of confidence to in answering peer questions. Unfortunately there was no follow-up self-efficacy measurement done in this study of core trainers, and no observation of their performance in teaching the sessions. [192]

It is commonplace for resident doctors to be teaching their junior peers and medical students in hospital settings. A comprehensive literature review by Walmsley[193] showed that these "residents as teachers" programs had diverse designs, variable teaching course content and limited outcome measures. Despite limitations in the congruence of the studies, he concluded that resident doctor teaching courses improved the clinical doctors self-assessed teaching behaviours and teaching confidence, though self-efficacy was not specifically measured. [193]

There is extensive literature describing medical students teaching peers and others. Erlich evaluated one program called the Student Teacher Education Programme (STEP) at Tufts University School of Medicine in the USA that is relevant to my exploration of self-efficacy in clinical teaching.[191] Final year medical students volunteered to teach in small groups and assess first year medical students by end of course OSCE in a "Medical Interviewing and the Doctor-Patient Relationship" course over 12 weeks. The peer teaching was embedded in the curriculum, followed a didactic program of lectures to the students, with small group practice. There was no formal teacher training given to medical student teacher, only the practical experiential experience. The outcome evaluation of STEP followed a modified Kirkpatrick's[194] hierarchy of curriculum evaluation: reaction, learning, behaviour and results *(Figure 3.6*).

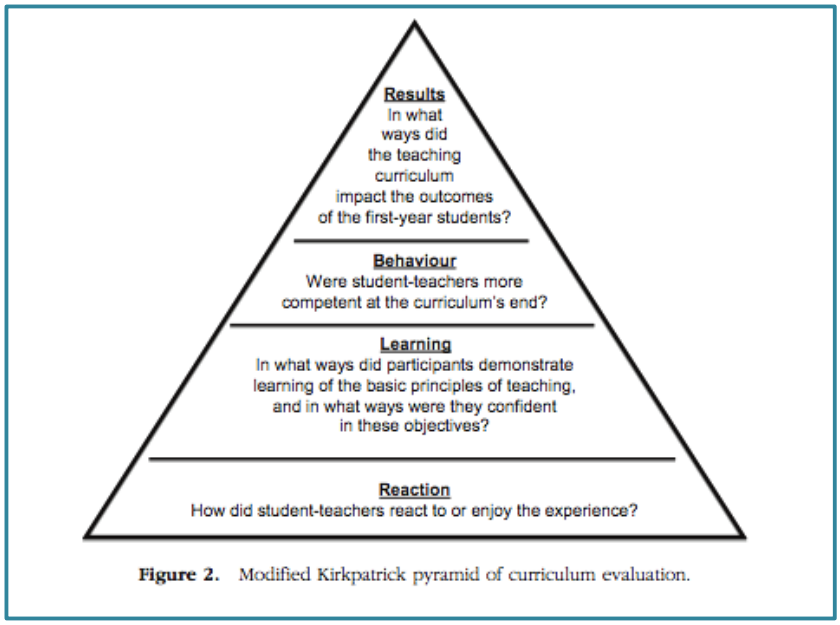


Figure 3.6: Erlich's STEP adaption of Kirkpatrick pyramid of curriculum evaluation[191](p325)

Evaluation of STEP[191] demonstrated significant improvement in the self-reported confidence of the final year medical student teachers across all nine items after the experiential

teaching. Four specific areas showed highly significant improvement with p values < 0.01. This included giving oral feedback, giving written feedback, working with a difficult learner and mentoring. Although these four items were measured in the study as confidence scores, they could be construed by their task specificity to be self-efficacy items.

Clinical teaching measures

Cleveland Clinical Teaching Effectiveness Instrument

The Cleveland Clinical Teaching Effectiveness Instrument (CCTEI)[15] provided a psychometrically sound and theory based measurement of clinical teaching widely used across the USA. In a large validation study Copeland and Hewson[15] showed the CCTEI to be reliable, valid, internally consistent, easily usable and congruent with the effective teaching concepts expressed in the literature. This instrument did show congruence across the five concepts of the effective clinical teacher:[15]

- offers feedback,
- establishes a good learning climate,
- coaches my clinical/technical skills,
- teaches medical knowledge, and
- stimulates independent learning.

The researchers indicated that it was generalisable across clinical teaching in a variety of settings as it was tested and used in anaesthetics, medicine, paediatrics, pathology, radiology and surgery teaching in departments of a university teaching medical institution. The CCTEI was not designed to assess the full range of teaching skills and specifically did not use self-efficacy of the clinical teacher as an evaluation outcome. The researchers recommended gathering other types of data (peer evaluations, self-evaluation and observations) for a more complete evaluation of clinical teaching effectiveness. The weakness of the CCTEI is that is based on some components of effective clinical teaching but does not include current learning theories of context-bound learning environments and facilitation in promoting knowledge transfer to real professional practice.[9]

In another USA based Stanford Faculty Development Program clinical teaching framework,[195,196] a 25-item instrument measuring a student rated evaluation of clinical teachers did not measure self-efficacy and was similarly not strongly linked to current learning theory.[197]

Maastricht Clinical Teaching Questionnaire

The theoretical construct of cognitive apprenticeship underpins the Maastricht Clinical Teaching Questionnaire (MCTQ),[198] with the developmental aim of providing individual clinical teachers with feedback about their clinical teaching and supervising of medical students. The 15-item instrument with a five-point Likert scale was proven to be reliable, showed very good internal consistency and had construct validity with five factors.[198] These factors align with the cognitive apprenticeship elements of:

- modelling,
- coaching,
- articulation,
- exploration, and a fifth added element of
- establishing a learning environment.

Although the MCTQ is widely used in Europe and included a global rating or overall judgement score out of 10 of clinical teaching performance, there was no self-efficacy outcome measured. Boerboom's[199] further study supported the validity of student ratings obtained by the MCTQ for evaluating teacher performance. In Irish general practice, the use of MCTQ and its basis in the apprenticeship theory was helpful in identifying strengths and weaknesses of specific aspects of clinical teaching.[200] He indicated his study also asked the GPs to self-rate their teaching before and after a faculty development workshop, but there is not enough information to clarify if this involved the clinical teacher self-efficacy.

There was an interesting adaption of the MCTQ to a different context of clinical teachers in veterinary science. Boerboom[201] showed the reliability and validity of a modified MTCQ as an instrument to evaluate individual clinical teachers' performance during students' clinical rotations in veterinary education. By following four out of five sources of evidence of validity recommended by the American Psychological and Education Research Associations, this demonstrated that the MCTQ could be adapted to other similar clinical medical contexts and be a valuable instrument for evaluating clinical teachers through self-assessment and provide a basis for feedback and professional development.

Self-efficacy in asthma teaching

Self-efficacy in the Asthma Teaching Scale (SEAT) [156] provided an exemplary guide to a "convenient scale specifically developed to measure the confidence that health care providers perceive they have to provide teaching to patients with asthma".[156](p114) The SEAT

items were constructed adhering to the current evidence based guidelines on asthma diagnosis and treatment and literature supported teaching principles. This 20-item instrument used a five-point Likert response scale representing the self-perception of confidence, with each task specific item statement beginning with "I can". In a pilot of nurse educators in Taiwan, the pilot showed that all items had very good differentiability in detecting the competencies of health care providers teaching competencies, was reliable (alpha 0.94), and had good content and construct validity. Confirmatory Factor Analysis indicated a three-factor solution that accounted for 70.8% of total variance. These were named:

- self-efficacy of general teaching (10 items, alpha 0.91)
- self-efficacy of specific asthma related teaching (6 items, alpha 0.92) and
- self-efficacy of PEF meter teaching (4 items, alpha 0.95)[156]

Singh[202] reported the impact of the fellowship curriculum delivered by the Foundation for Advancement of International Medical Education and Research (FAIMER) regional institutes located across India, Brazil and South Africa as a two-year teacher development program. A non-randomised quasi-experimental pre and post-test study into self-efficacy beliefs of these health profession teachers showed that a longitudinal education program significantly increased the self-efficacy beliefs over six months, was incremental, and that the effects were sustained for greater than one year.[202]

Clinical Supervision Self-Efficacy Tool

In unpublished research commissioned by Health Workforce Australia (HWA) in 2013, a Clinical Supervision Self-Efficacy Tool (CSSET)[203] was developed for use with novice and advanced clinical supervisors/teachers in nursing and allied health. The instrument consisted of 27 items where participants self-rated their level of confidence to perform each of the clinical teaching and supervision tasks with a seven-point Likert scale. The early pilot results showed the CSSET to be reliable and valid. All items were statistically significant, with good internal consistency and four factors that explained 73% of the total variance. The four factors were:

- plan and facilitate student learning (11 items, alpha 0.96),
- problem solve (7 items, alpha 0.94),
- facilitate improving performance (6 items, alpha 0.89), and
- relationships and communication (3 items, alpha 0.81).

The CSSET self-efficacy tool was mapped against the HWA's National Clinical Supervision Competency resource, which showed the measuring instrument broadly aligned with the competency elements. This research recommended the use of self-efficacy tools like the CSSET as the basis to identify future learning needs of clinical supervisors/teachers in Australia.[203] Consequently the concept of self-efficacy, though the term was not used, underpinned the latest iteration in Australia of this instrument called the Clinical Supervision Self-Assessment Tool.

Modified STEBI instrument

Measuring tools of self-efficacy in science teachers, like the previously discussed Riggs and Enoch's STEBI,[134] have been modified for the health teaching environment. For example, with a modified STEBI instrument, Webb[204] measured the teacher self-efficacy after a HIV/AIDS intervention targeted at the development of self-efficacy in their health teaching.

A summary of the measuring tools used for clinical teacher self-efficacy in medical education is shown in Table 3.4. All five tools described have shown good reliability, with reasonable participant numbers and higher Kaiser-Meyer-Olkin (KMO) measures, showing satisfactory sampling adequacy. Either due to no specific self-efficacy outcome or non-medical clinical teacher target, none of these currently used measuring tools were suitable for measuring self-efficacy in clinical teaching in general practice.

Table 3.4: Examples of Clinical Teacher Self Efficacy Tools (Medical Education)

Authors	Scale Name	No.	Target	KMO	Total Cronbach alpha
Chiang[155] (2011)	Self Efficacy in Asthma Training (SEAT)	281	Primary care nurses in asthma teaching	0.95	0.94
Copeland[15] (1999)	Cleveland Clinical Teaching Effectiveness instrument (CCTEI)	291	Medical Student rated Clinical teacher behaviours – but no self efficacy	n/a	0.97
Stalmeijer[198] (2010)	Maastricht Clinical Teaching Questionairre (MCTQ)	208	Medical Student rated Clinical teacher behaviours – but no self efficacy	n/a	0.90*
Schulz[203] (2013)	Clinical Supervision Self Efficacy Tool (CSSET)	76	Nursing and allied health clinical supervisors/teachers	0.9	0.90*
Webb[204] (2010)	Modified STEBI	128	Self efficacy of school teachers in HIV education	n/a	0.93

* total cronbach alpha calculation based on all factor average

n/a not available

Parallel considerations

In Australia, a teacher development program was developed by Lake,[205] called Teaching On The Run (TOTR), that has been widely used in teaching hospitals. The TOTR course and tips provided "*clinicians basic educational principles (as they) apply in the clinical setting for all phases of learning and teaching with students, junior doctors and specialty trainees*".[205](p416) The TOTR course has been adapted to clinical and medical environments outside of the hospital emergency department setting, including general practice.[206] However there has been no published evaluation of the TOTR course using self-efficacy or teaching performance as a stated outcome.

AOGP – the skilled teacher

Through work at Adelaide to Outback General practice Training (AOGP), an adaption of the TOTR course was developed for the community based clinical context. An adaption of the Lake TOTR[205] for community settings was used in the professional development of GP

supervisors and clinical teachers involved in postgraduate general practice training. This resulted in the development and delivery of the AOGP Skilled Teacher course for many years.

Evaluations of the AOGP Skilled Teacher were conducted after each course for internal quality improvement and feedback to the presenters. Each doctor completed an AOGP supervisor self-assessment tool[207] as a pre-workshop activity. This comprised a 33-item questionnaire, with a self-reported rating of confidence using a five-point Likert scale. This aligned with the roles of teacher and role model following the Curriculum Framework for GP supervisors developed by Ingham.[62] The questions were grouped around the themes of planning for learning, learning environment, teaching techniques, role modelling, appraisal and assessment. An example of a question is: "In my role as teacher, I feel confident to teach in response to the registrar's learning needs."[207](p1) The GP supervisor self-assessment tool was used as a needs assessment for the clinical teachers. It provided self-reflection showing areas of strength and developmental needs, a primer for their clinical teacher self-development. Although not published by AOGP, closer examination of the construct of the questions aligns with self-efficacy, and indirectly used self-efficacy as a needs assessment for professional development of clinical teachers in general practice.

Reflective practice

The experiences of Fryer-Edwards[208] of using reflective teaching practices in small group communication skills teaching included approaches of:

- identify the learning edge,
- propose and test hypotheses,
- calibrate learner self-assessment, and
- feedback.

From this observational study, the authors developed a conceptual model of teaching that illustrated an iterative loop of teaching practices to enhance the learner's engagement and self-efficacy[208] *(Figure 3.7).*

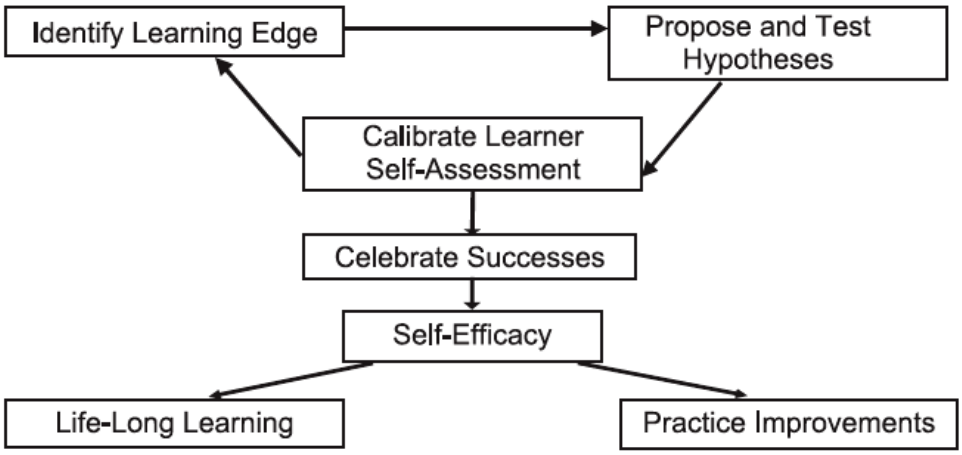


Figure 3.7: Fryer-Edwards conceptual model of teaching as reflective practice[208] (p642)

Although this conceptual model originally related to reflection on the learner's self-efficacy, it highlights the important relationship of self-efficacy, performance, reflection and feedback. Similarly applied to clinical teacher self-efficacy, when the learning objective is clinical teaching, this indicates that "self-efficacy is a form of self-referent thought that varies across activities and is structured by experience coupled with reflective thought". [179](p94) An individual's conception of skills serves as both a guide for developing competency and an internal standard for improving them. For the novice, initial conceptions of skills are rarely transformed into error free competent performance. Realistically, competency is achieved by practical performance repetition coupled with corrective feedback.

Research into clinical teacher self-efficacy

The paucity of evidence and literature regarding clinical teacher self-efficacy in the medical and allied health setting identified a significant gap in the literature. From the published and grey literature, useful insights, concepts, issues and information can guide and direct future exploration and research into clinical teacher self-efficacy.

To conduct teacher self-efficacy belief research that has the potential to benefit clinical teachers and medical educators, it is important to understand their clinical medical and teaching environment. Identification of the qualities and attributes of an excellent clinical teacher is foundational. Further refinement comes through engagement and collaboration with clinical teachers, from novice to expert, from undergraduate to postgraduate. Using clinical teachers' expertise and contextual understanding enables "backward mapping" – from the demands of teaching to the prerequisites for clinical teaching. Such mapping helps

identify the necessary support for specific kinds of teaching and learning. Similarly, determining the influences on self-efficacy in clinical teaching needs an understanding of the demands of clinical teacher roles and professional development from the clinical teacher's perspective. Through mixed methods research into the influences, development and impact of self-efficacy in clinical teachers, direction and information is provided for the professional development and support of clinical teachers in general practice.

Throughout this chapter, synthesised key research and findings around teacher self-efficacy over the past 30 years have been identified in the field of education. Extensive searches and reviews show that there is very little evidence of clinical teacher self-efficacy described or used in the medical education literature. How can these broad fields of education learning's be applied to medical education and clinical teaching in a postgraduate general practice training environment? Particularly, how might clinical teachers and medical educators translate previous teacher efficacy research into medical and clinical teaching environments?

A number of potentially useful indicators from the decade long unfulfilled promise of teacher efficacy research in education are identified.[126] Critical information to help explore, research and measure the impact of the self-efficacy in clinical teachers in the general practice setting is the valued outcome.

Summary

Firstly, a clear and contextually relevant definition of clinical teacher self-efficacy is needed. Adhering to the authenticity of Bandura's self-efficacy concept, and using the foundations of earlier definitions of teacher self-efficacy by Guskey,[125] Tschannen-Moran[120] and Klassen,[126] the definition of self-efficacy of the clinical teacher needs to align with the medical education context. The author proposes a new definition for the self-efficacy of the clinical teacher: **the confidence and belief that their teaching will positively influence and impact on the learner in a clinical medical environment.**

Secondly, the various concepts of teacher self-efficacy must be integrated into a unified conceptual construct, ensuring further research is grounded in a robust theoretical framework. To date, the models used in the construct of teacher efficacy have provided narrow conceptual views, focusing on psychological development,[120] or adding further perspectives like influence of learning environment[24] or pedagogical knowledge.[140] This has not fully expounded the concept of clinical teacher self-efficacy as most importantly it is

missing Bandura's outcome expectancy – the impact on the learner. The newly proposed unified conceptual construct of clinical teacher self-efficacy *(Figure 3.8)* provides a clear interpretation of the pivotal importance of clinical teacher self-efficacy. Chapter 8 discusses this more fully.

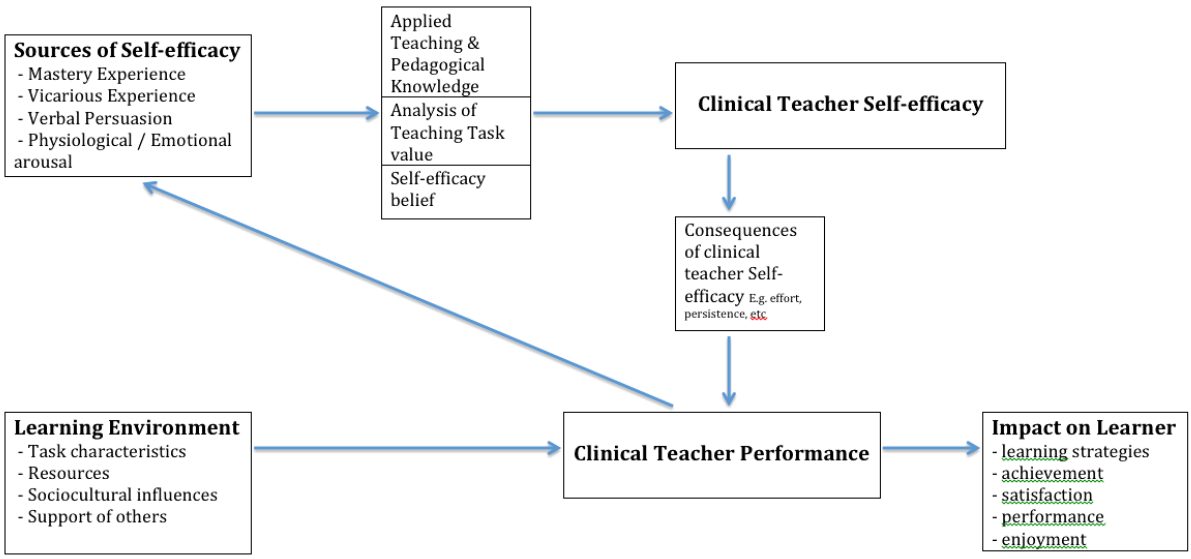


Figure 3.8: Unified conceptual construct of clinical teacher self-efficacy (McArthur)[209]

Best practice would utilise a systematic review to synthesize the best available evidence regarding the effectiveness of various interventions on the self-efficacy of clinical teachers. (Chapter 4 presents the results of this systematic review.)

It is important to understand the development of previous measurements of teacher efficacy in education to provide useful guidance in the construct of new, better and accurate measurement tools of clinical teacher self-efficacy. The previously discussed literature on self-efficacy measurement tools informed and guided the development and validation of the Self-Efficacy in Clinical Teacher (SECT) tool (*see Chapter 5*). These required the tool to be:

- grounded in Bandura's theoretical construct,
- use a graduated measurement scale,
- easy and convenient to use,
- a self-reporting survey reflecting clinical teaching tasks,
- formulated and reviewed by a focus group of clinicians,

- triangulated with other data sources like individual characteristics, learner experience and performance,
- piloted and tested,
- statistically analysed, and
- further validated.

There is a need to research the hypothesis: that self-efficacy in the clinical teacher is an important conceptual construct that leads to global improvement in the quality of teaching in general practice (*see Chapter 7*). The lack of literature evidence created the opportunity to design, implement and evaluate an intervention that addresses my key research question. **"Can mental imagery and visualisation techniques increase the self-efficacy of general practitioner's clinical teaching in general practice by 20%?"**

Finally, as a clinician, the primary imperative is to provide high quality medical care in general practice to a patient community, and across the whole practice team (including colleagues, junior doctors and staff). As a GP supervisor and clinical teacher responsible for the professional education of doctors training in general practice and as a manager responsible for the professional development of their clinical trainers and medical educators, I approached the research in a clinically pragmatic manner. This encompassed the practical concerns of GPs who are expected to bear increasing clinical teaching responsibilities whilst providing clinical care to patients. This ensures that clinical teacher self-efficacy research is grounded in the daily realities of general practice and clinical teaching. The intention is to use this research to improve clinical teaching in general practice and promote better clinical and teaching practice.

CHAPTER 4: THE EFFECTIVENESS OF INTERVENTIONS ON THE SELF-EFFICACY OF CLINICAL TEACHERS: A SYSTEMATIC REVIEW

Background

Increasingly GPs are involved in teaching and training undergraduate and postgraduate students in addition to their usual clinical work in a general practice. [43, 54, 210] The GP's clinical trainer/supervisor role is complex, demanding and at times potentially conflicting but underpins all the learning that occurs in a postgraduate registrar's general practice training.[38] The roles and qualities that make a GP supervisor a good teacher have only been superficially explored in the literature but go beyond the provision of medical knowledge, clinical and technical skills, and clinical reasoning.[41, 56, 117] Excellent clinical teaching in the undergraduate medical setting, although multi-factorial, transcends the ordinary and is characterised by providing a positive supportive learning environment, actively involving, inspiring and communicating well with students.[57] It cannot be assumed that all GPs possess the teaching skills and educational experience to perform quality teaching in general practice.[211] Traditionally, medical education followed an apprentice model, based around the transfer of expert medical knowledge to the registrar's identified learning objectives. Due to universal internet access and rapidly expanding medical knowledge, it is more difficult for the teacher to always be the expert. In the community general practice setting, clinical presentations can be ambiguous, patients' expectations unclear, and clinical placement students' learning objectives uncertain. Additionally, with the responsibility of responding to the registrars/students presence, this leaves many clinical GP supervisors/trainers lacking confidence,[93] perceiving a deficiency of expertise and understanding of what they should teach.[58, 92] The published literature identifies attributes of an excellent clinical teacher,[56-59] with Azer[117] highlighting the importance of non-cognitive attributes of the GP, like self-awareness and confidence. Although Hatem[98] succinctly describes the attitudes, attributes, knowledge and skills of a competent undergraduate medical teacher, further influences like the self-efficacy of the teacher might be important in the effectiveness and quality of the teaching-learning encounter.[98] The impact of non-cognitive attributes like self-efficacy in medical education has rarely been researched,[126, 138], necessitating further exploration of the role and effectiveness of self-efficacy in the GP clinical teacher.

Self-efficacy can be defined as a person's belief and judgement of their capabilities to organise and execute courses of action required to attain designated types of performance.[25] The concept of self-efficacy lies at the heart of psychologist Albert Bandura's social cognitive theory.[23] He suggests that an individual's efficacy expectations, the belief in their ability to perform certain actions, combined with their outcome expectations, and their conviction that such actions will lead to a particular outcome are predictive of how successful that individual will be in performing the action in question and in achieving the desired outcome. Feelings of self-efficacy determine whether actions are tried, whether behaviors are exhibited, how much effort is expended, and how long effort is sustained in the face of an obstacle.[212] Applying a psychological theory to the educational act of teaching leads to the compelling notion that a teacher's belief in their ability to impact student learning makes a difference in their teaching and their students' learning.[25] In the field of education, this construct of teacher self-efficacy has been correlated positively with a broad range of positive student outcomes, teaching practices and teacher classroom behaviors.[119] Tschannen[120] defines teacher self-efficacy as the teacher's belief in their capability to organise and execute courses of action required to successfully accomplish a specific teaching task in a particular context. Thus teacher self-efficacy is *"the confidence teachers hold about their individual and collective capability to influence student learning".*[126](p21) Critical to the extent to which teachers believe they will be able to perform actions that promote learning is the need to focus on behaviors that affect learning outcomes. In ambulatory care settings, behaviors supportive of learning include showing enthusiasm for students, setting clear goals and expectations, using questioning skills that encourage students to become more self-directed, and using feedback to reinforce learning.[11]

Self-efficacy is specific to the context, according to Bandura.[25] Clinical teacher self-efficacy uses the above definition, applied to the specific context of doctors who teach clinical, surgical or medical skills in undergraduate or postgraduate medical training.

Various studies indicate that one's confidence in teaching is related to teaching performance. Crandall interviewed a group of physicians and found that those physicians identified by junior residents as above-average clinical teachers were confident in their clinical competence, and comfortable in their teaching and mentoring roles.[213] Skeff[195] found significant an association between physicians' perceived confidence and their ability in their own teaching. He reported that intensive personalised feedback about instructional behaviors significantly increased ratings by trained observers on the physician's display of specific learning enhancing behaviors.[195]

By focusing on the self-efficacy of a clinical GP supervisor (GPS), there may be an improvement in the teaching and learning that occurs in a clinical general practice setting. The existent literature has little to say about self-efficacy in clinical teaching, limited to an occasional article on a clinical topic like asthma [156] teaching. Most of the literature on self-efficacy relates to theoretical psychology models and in educational fields with application to junior and high school teachers.[133, 134, 137, 214, 215] Although teacher self-efficacy is an issue that has been studied for over 30 years,[138] as the discipline of medical education is relatively new internationally, it is important to determine the place and effect of teacher self-efficacy in clinical medical teaching. Of particular interest are GPs who teach in community general practice, that is, ambulatory patient and primary health settings, to postgraduate, pre-vocational or undergraduate medical students.

Some interventions have been used in the development of self-efficacy in clinical teachers, including peer reflection,[216] train the trainer courses,[191] interactive video scenarios[217] and mental imagery.[188] Mental imagery has successfully improved the skills, confidence and enhanced performance in athletics,[218] and has been further applied in surgical postgraduate training.[218] Mental imagery is the conscious action of systematically and repeatedly imagining objects and movements without physically seeing or performing them with the intention of improving performance.[219] Other terms used to describe this technique include mental practice, motor rehearsal and visualisation. Komesu[187] showed that a doctor learning the surgical procedure of cystoscopy found mental imagery to be a useful training preparation with a better surgical performance.

Some tools have been developed to measure the self-efficacy of the learner,[161] a few have been developed to measure the teacher's self-efficacy in clinical teaching, but no tools have been developed in the specific contextual setting of primary health or general practice.

There appears to be no previous medical education literature on the development of self-efficacy of clinical teachers in primary health or ambulatory care setting. Although wider literature points to mental imagery being useful in developing self-efficacy in an individual's performance or actions, in other aligned professions like nursing and paramedics,[160, 166, 220, 221] there is little known about the effectiveness or impact of mental imagery or other interventions on the development of the clinical teacher's self-efficacy in the primary health or ambulatory care medical setting.

The purpose of this systematic review was to explore and determine whether interventions are known to impact on clinical teacher self-efficacy.[222, 223] Prior to the commencement of

this systematic review, the *JBI Database of Systematic Reviews and Implementation Reports*, Cochrane Database of Systematic Reviews, and Database of Abstracts of Reviews and Effects were searched, and no previous systematic reviews on this specific topic were identified.

The objectives, inclusion criteria and methods of analysis for this review were specified in advance, documented in a protocol,[224] and registered at PROSPERO, number CRD42015023554.

Objectives

The objective of this systematic review was to synthesize the best available evidence on the effectiveness of interventions on the self-efficacy of clinical teachers in medical education.

The specific review questions that were addressed include:

- What interventions have been used to develop the self-efficacy of clinical teachers?
- Can features be identified in interventions shown to have a positive impact on the development of self-efficacy in the clinical teacher?

Secondary outcomes of interest from this systematic review included the following:

- How has self-efficacy been measured amongst clinical teachers?
- Is visualisation or mental imagery an intervention that has been used to develop the self-efficacy of the clinical teacher?
- What is the effect of visualisation or mental imagery on the clinical teacher's self-efficacy?

Review methodology

Inclusion criteria

Types of participants

This review considered studies that included clinical teachers, defined as doctors who teach clinical, surgical or medical skills in undergraduate or postgraduate education training settings.

Types of interventions

The review considered quantitative studies that evaluated the use and effectiveness of any intervention where the stated outcome involved the clinical teacher's self-efficacy. Included studies described the effectiveness of various techniques for improving self-efficacy, including teaching/training programs, mental imagery and visualisation for clinical teachers. The term mental imagery broadly covered and included other terminology like mental rehearsal, mental practice, visualisation, visual, guided and motor imagery.

Types of outcomes

The review considered studies that included any outcome that involved the clinical teacher's self-efficacy, self-confidence or self-efficacy beliefs. Additional information about the features of a professional activity, clinical teaching, medical program or teaching task, where possible, was identified. Any tool or scale used to measure the clinical teacher self-efficacy was included. Quantitative tools used to measure effectiveness such as surveys, questionnaires or self-efficacy scales were included. Studies that focused on the preparedness of the teacher or the self-efficacy of the student or learner were excluded.

Types of studies

In order to determine the effectiveness of interventions on clinical teacher self-efficacy, this review considered international literature and studies that focused on quantitative data. The studies included those of an experimental study design including randomized controlled trials, quasi-experimental, and before and after studies. Observational studies including cohort and case control studies and descriptive studies such as case series or case reports were included.

The review excluded opinion papers, editorials, letters and peer group recommendations.

Search strategy

The search strategy aimed to find both published and unpublished studies. A three-step search strategy was utilised for this review. An initial limited search of MEDLINE and PsycINFO was undertaken followed by an analysis of the text words contained in the title and abstract, and of the index terms used to describe articles. A second search using all identified keywords and index terms was undertaken with counsel of a University of Adelaide medical librarian, across all included databases. Thirdly, the reference list of all identified reports and articles was searched for additional studies.

Studies published from January 1995 to December 2014 were considered for inclusion in this review, as medical education "*is yet to be recognized as a specialty and vocational scope of practice.*" [20](p8) The search of databases was conducted from June 2014 to January 2015. Only studies published in English were considered for inclusion in this review.

The databases searched included:

- PubMed,
- The Cochrane Central Trials Register,
- Embase,
- Scopus,
- ScienceDirect,
- Education Related Information Center (ERIC), and
- PsychINFO.

The search for unpublished studies included:

- ProQuest Dissertations & Theses Database (PQDT),
- Dissertation Abstracts Online (DIALOG), and
- Association of Medical Educators Europe (AMEE).

Initial keywords used to develop the search strategy using a research logic grid are summarised in *Figure 4.1*, and were developed with the assistance of the research librarian. The search strategy is detailed in *Appendix I*.

A	B
self-efficacy self efficacy beliefs self concept personality development self-confidence	medical education health education Education, professional clinical teach* Clinical education Clinical teaching general practitioner General practice vocational training Teacher development Professional development

Figure 4.1: Summary of research logic grid

Method of the review

Quantitative papers selected for retrieval were assessed for methodological validity prior to inclusion in the review using the appropriate and standardized critical appraisal instruments from the Joanna Briggs Institute Meta-Analysis of Statistics Assessment and Review Instrument (MAStARI)[225] *(Appendix II)*. Any disagreements that arose between the reviewers (Lawrie McArthur and Zachary Munn) were resolved through discussion. It was planned to involve a third reviewer to resolve any disagreements, but this was not required.

Data extraction

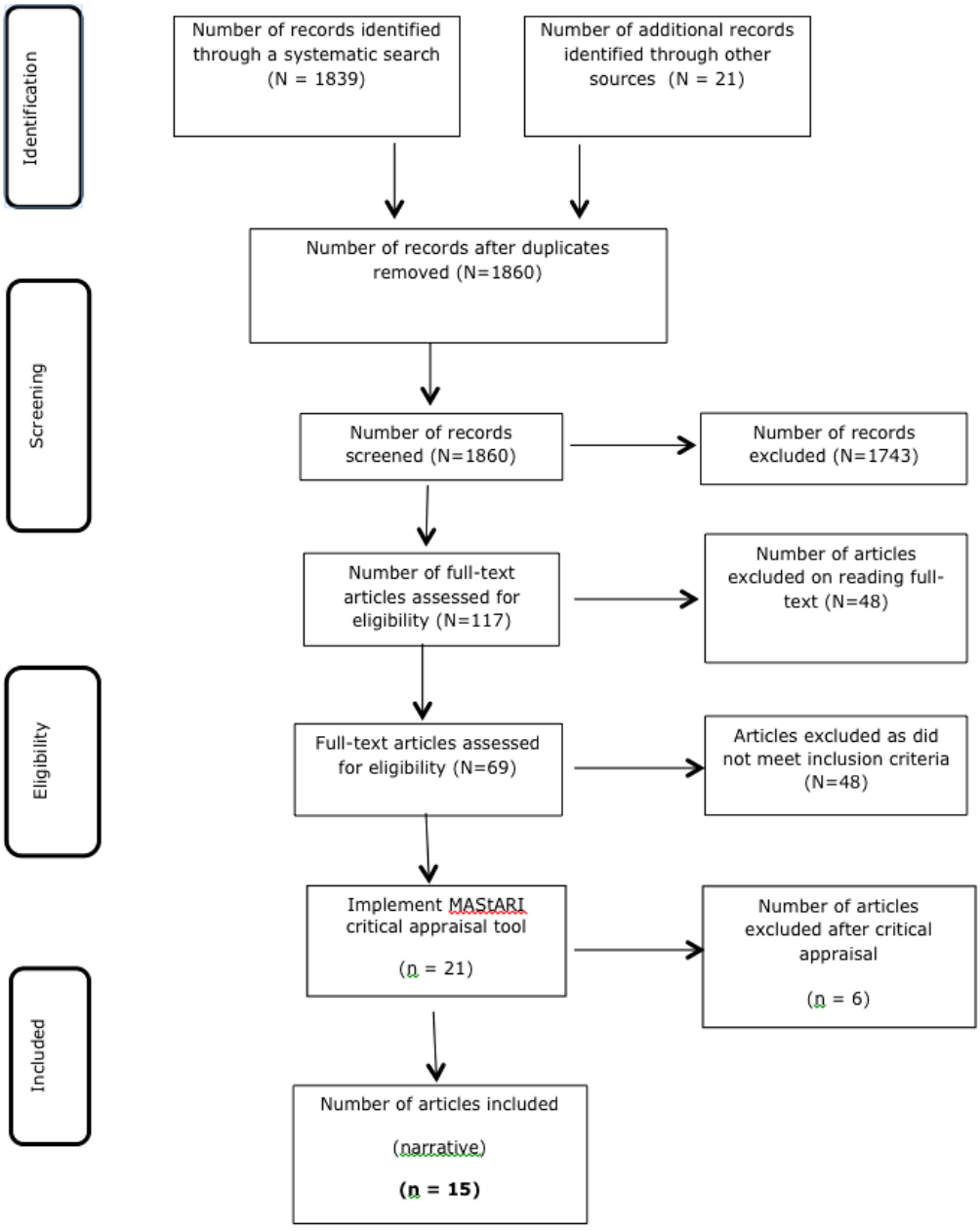
Quantitative data was extracted from papers included in the review using the appropriate data extraction tool from MAStARI *(Appendix III)*. The data extracted included specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives.

Data synthesis

We planned to pool quantitative research findings and undertake a statistical meta-analysis using JBI-MAStARI,[225] but this was not possible due to heterogeneity between and lack of suitable studies. Consequently, the findings are presented in a narrative summary with tables and figures to aid in data presentation. There was insufficient data from the population group of GPs to undertake subgroup analysis.

Results

The search strategy identified 1860 unique articles, including the additional 21 articles found via hand searching, citation searching and from the grey literature. *Figure 4.2* illustrates the systematic review flow diagram, illustrating the search and identification process of papers included in the review.



From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

Figure 4.2: Flowchart for the search and study selection process *adapted from (226)*

After review of title and key abstract words, a total of 117 articles were selected for full article retrieval and analysis. There were 48 articles excluded after retrieving the full article as they were irrelevant to the topic of interest, leaving 69 articles assessed for eligibility. Full text reading and analysis excluded a further 48 articles for not meeting the inclusion criteria. Two independent reviewers using standardized JBI-MAStARI critical appraisal tools critically appraised 21 studies.

No disagreements regarding the critical appraisal process occurred, and both reviewers agreed that six of the studies did not meet the inclusion criteria and were hence excluded (Appendix IV). The reasons for exclusion of these studies during critical appraisal warrant further comment as the highlight the complexity of the literature around self-efficacy of the clinical teacher.

The promising article, titled "Developing teacher self-efficacy via a formal HIV/AIDS intervention" was of poor methodological quality as it measured teacher self-efficacy via a modified unvalidated instrument.[204] It also only involved South African school teachers, hence it did not meet the inclusion criteria. Similarly, Lorenz's[121] study involved a target group of dieticians, and not medically qualified clinical teachers of undergraduate or postgraduate medical students.

Other studies involved measurements of teacher self-efficacy, which was a point of secondary outcome of interest in this systematic review. Though Hewson[227] used a validated 15-item Teaching Effectiveness Instrument to show a statistically significant improvement in teaching effectiveness from a Faculty Development program (core teaching seminars and coaching), there was no clinical teacher self-efficacy outcome.[227] Another study showed the usefulness and greater frequency of use of techniques, like the one-minute preceptor, but there also was no teacher self-efficacy outcome.[228]

Although Kogan's[229] exploratory research of medical faculty staff perceptions of feedback given to residents after directly observing them with patients looked promising, the intervention was not aimed at developing the clinical teacher's self- efficacy. It only showed that the medical teacher's self-confidence in their clinical and feedback skills impacted on the level of difficulty they perceived in giving feedback. [229]

Turner[170] clearly showed a correlation between self-efficacy in general resuscitation skills and observers' assessment of their global performance. Self-efficacy was higher in the doctors who had taken the Advanced Pediatric Life Support course, though death of the simulated patient had a negative effect on their self-efficacy. However this was resuscitation performance self-efficacy, not a clinical teacher self-efficacy in the teaching of resuscitation.[170]

The total number of studies included in the final review following critical appraisal was 15. A systematic review data extraction table summarising the relevant studies is found in Appendix V.

Description of studies

There were 15 published studies included that highlighted the effectiveness of interventions on the self-efficacy of clinical teachers. The majority of these papers were from the United States of America (USA),[191,202,212,230,231,232,233,236,238,239] with an international spread across the United Kingdom (UK),[235,237] Germany,[217] and Australia.[234,240] The majority of papers were published after 2003, with only two papers before this time. The majority of published articles were quasi-experimental studies or pseudo randomized trials, with one randomized controlled trial published, *(Table 4.1*) and one descriptive study *(Table 4.2).*

Methodological quality

Overall, the poor methodological quality of the included studies was poor. The lack of literature around interventions impacting on self-efficacy in the clinical teacher necessitated the inclusion of studies with a low methodological quality. The standardized critical appraisal instrument from the Joanna Briggs Institute Meta-Analysis of Statistics Assessment and Review Instrument (MAStARI) for a randomised control/pseudo-randomised trial uses ten questions *(Appendix II)*.

There was a very low compliance rate with the first five questions in the JBI-MAStARI critical appraisal checklist (Table 4.1). There was only one study that used a method of randomisation (Q1),[230] and none of the studies were designed with participant blinded allocation (Q2), treatment group concealment (Q3), participant withdrawal information (Q4), or blind outcome assessment (Q5). The majority of the studies showed the groups to be comparable at entry (Q6), and groups were treated identically (Q7). Although the outcomes were measured in the same way for all groups in the study (Q8), they were largely not measured with a reliable, validated instrument (Q9). Appropriate statistical analysis for each study occurred in all the studies, but due to the heterogeneity of the studies, pooling or statistical analysis of data was not possible.

Table 4.1: Randomized control trial/pseudo-randomized trial

Citation	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Barratt, 2004[231]	N	N	N	Y	N	U	Y	Y	N	Y
Bosse, 2010[217]	N	N	N	N	N	N/A	N/A	Y	N	Y
Buckley, 2007[237]	N	N	N	N	N	Y	Y	Y	N	Y
Bylund, 2008[232]	N	N	N	N	N	N/A	N/A	Y	N	Y
Christmas 2008[233]	N	N	N	N	N	Y	Y	Y	Y	Y
Erlich, 2014[191]	N	N	N	U	N	Y	Y	Y	N	Y
Crowe, 2000[234]	N	N	N	N	N	Y	Y	Y	N	Y
Foster, 2013[240]	N	N	N	U	N	Y	Y	Y	N	Y
Gaba, 2007[238]	N	N	N	U	N	Y	Y	Y	Y	Y
Godfrey, 2004[235]	N	N	N	N	N	U	Y	Y	Y	Y
Grady-Weliky, 2010[239]	N	N	N	Y	N	Y	Y	Y	Y	Y
Lang, 2012[236]	N	N	N	N	N	Y	Y	Y	N	Y
Morrison, 2003[230]	Y	N	N	Y	Y	Y	Y	Y	Y	Y
Singh, 2013[202]	N	N	N	N	N	Y	Y	Y	Y	Y
%	7.14	0.00	0.00	21.43	7.14	83.33	100.00	100.00	42.86	100.00

N: No Y: Yes U: Unclear NA: Not Applicable

The critical appraisal tool highlighted that the low methodological quality of the studies stemmed from poor design of the original research. The reviewers decided to include these studies to enable further exploration and discussion of the interventions relevant to a specific key objective of this systematic review: can features be identified in interventions shown to have a positive impact on the development of self-efficacy in the clinical teacher?

One descriptive study of doctors documented a self-report of their self-confidence around 28 teaching behaviors.(212) The critical appraisal process identified that this study was of moderate quality, but the study did not assess the outcomes using objective criteria (Q4) or measured them in a reliable way (Q8) (*Table 4.2*).

Table 4.2: Descriptive case series studies

Citation	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Vanek, 1996[212]	Y	Y	Y	N	N/A	Y	N/A	N	Y
%	100.00	100.00	100.00	0.00	N/A	100.00	N/A	0.00	100.00

Findings of the review

Of the 15 studies included in this review, six utilised intervention strategies focused on clinical teacher training courses, [231-235] two used interactive training activities [217, 236] and seven involved peer learning, review and mentoring.[191, 202, 212, 230, 237-239] A summary table shows the diversity of these 15 included studies and summarizes the type and impact of various teacher-training programs, specific courses, teaching scripts, interactive videos and mentoring (*Appendix V*).

The diversity and variety of each intervention showed that there was no uniformity or consistency of an effective intervention to develop self-efficacy in the clinical teacher. Furthermore, the heterogeneity in populations and variability of outcomes measured meant that meta-analysis was not possible. This necessitated a narrative approach to the critically appraised studies.

In each study, there were indicators of effective elements in an intervention shown to have a positive impact on the development of self-efficacy in the clinical teacher. Through an annotated description of each study, an understanding and insight of these indicators was heuristically gained.

The results of the systematic review are organised into three intervention strategy themes: focused clinical teacher training courses, interactive training activities, and peer learning, review and mentoring. Relevant to the intervention strategy theme, each critically appraised study is further described and discussed below to succinctly identify the unique elements and evaluation results, and provide a summary of the author's conclusions.

Focused clinical teacher training courses

These interventions involved short courses:

- Barratt[231] 2004 (clinical teaching training),
- Bylund [232]2008 (communication skills Train the Trainer course),
- Christmas[233] 2008 (geriatrics mini-fellowship),
- Crowe[234] 2000 (Teaching on the Run),
- Foster[240] 2013 (short course for clinical teachers), and
- Godfrey[235] 2004 (Train the Trainer course).

Barratt [231] reported a comparative study from 13 fulltime pediatricians in the US involved in the clinical teaching of medical student and resident doctors who participated in a clinical teacher training program of eight one-hour interactive sessions and one three-hour workshop. Topics included: bedside teaching, teaching during rounds, effective teaching and adult learning, setting goals and defining objectives for teaching, giving critical feedback, and lecturing and modeling as a teaching technique. Although presented as a pre and post-training self-assessment of teaching knowledge and skill across 21 elements, there was no control group and only retrospective self-assessment of the individuals' pre-intervention status. The study results showed a significant improvement in areas of teacher comfort level (comfortable with problem teacher-learner interactions pre 2.23, post 2.92, p value 0.003), teacher knowledge (set goals for teaching pre 2.61, post 3.69, p value <0.001), teaching skills (regularly self-assess teaching pre 2.66, post 3.41, p value 0.005), and giving feedback (give critical feedback pre 2.38, post 3.46, p value 0.001). Comments from participants in a survey three years after the program noted the long lasting effects in the areas of general teaching skills, specifically using feedback and evaluation to drive learning. The authors concluded that a local, focused clinical teacher training program was feasible, and improved the skill, confidence and comfort levels of doctors who taught general pediatrics.

Bylund **[232]** published a quasi-experimental study of a multi-disciplinary group of 33 attending physicians in the USA who volunteered to participate in a communication skills, Train the Trainer workshop, using the Comskil five-step facilitation process. This is a series of five tasks that a facilitator uses in a small group setting. Major task headings are: (1) Start the session, (2) Structure the group's learning, (3) Run the Role Play, (4) Facilitate the Feedback Process, and (5) Close the Session. As part of the workshop, there was experiential role playing, with roles for both the facilitator and learner. Participants' confidence in their ability to facilitate small group role-play increased in a statistically significant way as a result of the workshop, as measured by the retrospective pre and post questions (pre 2.76, post 4.00, p<0.001). At least 75% of the trainee facilitators agreed or strongly agreed that they felt more comfortable in each of the five facilitation tasks. The authors concluded that a focus on training is likely to increase and improve the self-confidence of physicians to successfully facilitate a communication skills workshop.

Christmas[233] in a quasi-experimental study assessed the impact of a three-day Geriatrics Mini-Fellowship course designed to increase the knowledge of specific geriatric medicine principles and to enhance teaching efficacy, followed up by a year of mentorship. Forty-two non-geriatrician clinician educators from 17 academic medical centres in the USA self-

selected to participate. Medical topics relevant to the elderly were discussed, including evaluation of altered cognition, nutrition, pain management, end-of-life principles, polypharmacy, diarrhea, pressure ulcers, acute care of the elderly, home-care and geriatrics "pearls. Basic teaching skills included an overview of principles of adult learning, teaching in small groups, teaching utilising the one-minute preceptor model, providing effective feedback, role modeling, curriculum development, presenting a stage talk, and career advancement as an educator. All participants engaged in role-playing to practise particular teaching skills utilising scenarios involving geriatric patients to help clarify geriatric knowledge objectives. Pre- and post-surveys were performed, using the University of California Los Angeles (UCLA) Test of Geriatric Knowledge and Attitudes. In addition, a specifically designed new questionnaire about self-perceived geriatrics knowledge, value of learning geriatrics for clinical care and self-rated efficacy to teach geriatrics, called the Geriatrics Clinician Educator Learning Questionnaire (G-CEL-Q), was used. The results showed that self-efficacy to teach about geriatrics as assessed by the G-CEL-Q all improved significantly over the course of the three days, specifically:

- knowledge of geriatric principles (pre 59.04, post 80.41, $p < 0.001$),
- value of learning geriatric principles for care (pre 68.55, post 83.51, $p < 0.001$), and
- efficacy of teaching geriatrics (pre 61.24, post 80.02, $p < 0.001$).

Additional follow-up showed that six months after the course, 24% of participants demonstrated a new teaching behavior reported as: teaching new courses to students, teaching geriatrics principles at the bedside, giving a new lecture on a selected geriatrics topic to residents or organising a seminar focused on teaching geriatrics. The authors concluded that an intensive teaching course in geriatrics improved non-specialist clinical teacher knowledge and teacher self-efficacy, and there was a self-reported development of new clinical teaching behaviors six months after the course.

Crowe[234] reported a quasi-experimental study of 39 surgical registrars involved in junior doctor teaching in Australia which evaluated a half day teaching workshop. This involved "teaching on the run", simulated teaching activities and small group discussion. Although there was no baseline data, an anonymous follow-up questionnaire for 22 registrars three months later showed 77% were feeling more confident with their teaching after the workshop. This exploratory study indicated a need for clinical teacher training, and an association between focused teacher training and teacher self-confidence, but there was no objective measure of teacher self-efficacy or teacher performance. The authors concluded

that a brief intervention focused on teacher skill development might enhance the confidence and enjoyment of junior clinical teachers and increase the frequency of "teaching on the run2.

Foster[240] described a study with 81 clinicians in Australia, including hospital specialists, general practitioners and senior registrars who were involved in the clinical teaching of medical student and resident doctors. Participants had undertaken a Short Course for Clinical Teachers comprising five modules (90-minute evening interactive sessions). The modules covered the practical aspects of teaching in clinical settings and were:

- bedside teaching,
- effective supervision and feedback,
- teaching physical examination and procedures,
- presentation skills and giving effective lectures, and
- facilitating development of clinical reasoning skills.

Although there was no control group nor detailed statistical analysis, raw data from the pre- and post self-reported surveys, using a five-point Likert scale, showed increased confidence of the clinical teachers in their teaching including bedside (pre 50, post 80, no p value) and ward round teaching (pre 37.5, post 87.5, no p value). They also felt more confident in their ability to give honest feedback to students and junior medical staff (pre 50, post 80, no p value). After examination of participants' comments, the authors concluded that there was a need for and evidence that an accessible practical focused teaching course improves clinical teachers' skills, confidence and motivation to teach.

Godfrey [235] in a UK quasi-experimental study looked at the impact of a three-day Training the Trainer (TtT) course on consultant doctors' self-assessed changes in their teaching and training practices over an eight to ten-month period. There were 75 participants in the TtT course, with 45 doctors on the waiting list, comprising the control group, indicating a lack of randomisation. A self-assessed questionnaire was administered before and 10 months after the course. Eighteen teaching skills aimed at developing the doctors' clinical teaching were assessed. A global rating of the levels of both teaching confidence and effectiveness was measured by a five-point Likert scale. Additionally, in the post questionnaire, respondents were asked to describe any changes made to their teaching. As a group, the TtT course participants showed an improvement on 16 of the 18 teaching skills after eight to ten months. The four statistically significant skills were: motivating learners, using questions to

stimulate learners thinking, teaching at a level consistent with learner's abilities and assessing learners' progress. The global rating of confidence in their teaching post intervention was significantly increased (p 0.017).

Interactive training activities

Interventions involved use of communication prompts or visual media in the following studies:

- Bosse[217] 2010 (interactive online training for tutors)
- Lang[236] 2012 (teaching scripts).

Bosse [217] performed a quasi-experimental study of 109 medical staff involved in Problem Based Learning (PBL) tutoring in Germany. The intervention involved an interactive online training program using video clips of simulated scenarios, and exemplary intervention strategies for dealing with obstacles arising in the PBL tutorials. This was integrated into the commonly accepted seven sequential steps of PBL (case presentation, problem definition, brainstorming, generating hypotheses, defining learning goals, self-study and synthesis), in accordance with the taxonomy of Schmidt[241] and Barrows.[242] Pre and post comparisons of the tutor's ratings revealed a significant increase across all five self-efficacy in clinical teaching outcomes:

- increased understanding PBL method (pre 48.8, post 81.92, p value <0.0001),
- role of a PBL tutor (pre 46.11, post 81.16, p < 0.0001),
- improved preparation for PBL tutoring (pre 34.46, post 70.28, p < 0.0001),
- ability to face problematic situations as a tutor (pre 36.47, post 66.99, p < 0.0001), and
- increased appreciation of PBL as didactic method (pre 61.33, post 76.2, p < 0.001).

The authors conclude that integration of video-based scenarios of critical situations into PBL tutor training is a technical advancement, well accepted, feasible and improves the self-efficacy of PBL tutors.[217]

Lang[236] from the USA reported on the preparation of teaching scripts for clinical teaching use through monthly peer support and review workshops. Teaching scripts consisted of a trigger, key teaching points and teaching strategies targeting the more commonly encountered diagnoses. Twenty-two hospital doctors from pediatric and internal medicine faculties participated. Pre and post surveying relating to self-efficacy with teaching in the target clinical diagnoses of the participants was used to evaluate the effectiveness of the

educational intervention. Across the teaching faculty, the teachers' self-efficacy showed significant improvement in seven out of the 10 common diagnosis topics. (pre mean 3.26, post mean 3.72, 95%, CI 0.35-0.51, $p < 0.0001$). In these ten common diagnoses, there was no significant difference in the number of teaching events from before to after the program. The author concludes that writing teaching scripts was an efficient approach to improve self-rated teaching skills, enhance professional development and build collegiality among clinician teacher.[236]

Peer learning, review and mentoring

These interventions involved peer teaching, review and/or mentoring:

- Buckley[237] 2007 (OSCE)
- Erlich[191] 2014 (Student Teaching Education Program)
- Gaba[238] 2007 (residents as teachers)
- Grady-Weliky[239] 2010 (psychiatry residents as teachers)
- Morrison[230] 2003 (residents as teachers)
- Singh[202] 2013 (two year teacher development)
- Vanek[212] 1996 (teaching behavior).

Buckley et al. [237] in a quasi-experimental study looked at how an Objective Structure Clinical Examination (OSCE) peer tutor training course impacted on skill enhancement and attitudes towards future teaching in 94 final year medical students cross year peer teaching of undergraduate medical students in the UK. As final year medical studies involved in a clinical clerkship, which involved teaching with a self-efficacy of clinical teaching outcome, this study was included. Results presented as a pre-post test comparison, without a control group and with grouping of change responses within the band of 1-3 points (less agreement) and 4-6 points of Likert scale (more agreement). Specifically, in the post responses, 93% of these peer tutors displayed confidence in speaking to groups. The confidence in this context was interpreted as an indication of the self-efficacy in clinical teaching of a peer tutorial but was not measured. The authors conclude that the benefits of being an OSCE tutor included perceived improvement in teaching skills, willingness for future engagement in teaching, and enhancement of the participants' personal curriculum vitae.

Erlich, [191] in a pseudo-randomized trial of 48 final year medical students teachers involved in peer undergraduate medical tutoring, studied the impact of the Student-Teacher Education Program (STEP). Thirteen student teachers participated in short teaching seminars for 12

weeks, with topics that included small group facilitation skills, reflection, mentorship, giving feedback and basic education theory that occurred immediately before and after their peer undergraduate medical tutoring. Sources of assessment of the teacher included pre and post self-reported questionnaires, field notes from the STEP facilitator and surveying the student learners. Outcome evaluation of STEP followed a modified Kirkpatrick's[194] hierarchy of curriculum evaluation, reaction, learning, behavior and results. Erlich found that the STEP program developed teaching knowledge, skills and attitudes for student-teachers that corresponded with improvements in their teaching confidence, observable teaching behaviors and outcomes of their students. Whilst self-reported confidence by the student teachers increased in nine different teaching activities, there were four skills that showed the greatest increase in teacher self-confidence: giving oral feedback (3.55, 4.91, $p < 0.0013$), giving written feedback (3.73, 4.73, $p < 0.0041$), working with a difficult learner (2.91, 4.00. $p< 0.0061$) and mentoring (3.55, 4.64, $p<0.0061$). An additional finding was that the top individual student teachers (as rated by their student learners) were also the teachers whose students performed best in their clinical examination. Correspondingly, the students of the lowest rated teachers achieved the lowest OSCE scores. The authors conclude that embedding a longitudinal didactic series of education in practical teaching experience reinforces knowledge, skills and attitudes of teaching for final year medical students, and gave them increased competency and confidence in their teaching.

Gaba [238] described a study of 24 obstetric and gynaecology resident doctors in the USA, randomised to participate in a Residents As Teachers (RAT) program. The intervention group consisted of 14 doctors who participated in a 10.5 hour teaching program of a series of seven one-and-half-hour workshops. Participants were assessed through self-evaluation of their teaching skills, through an unpublished five--point Likert scale using an 14-item instrument developed by Dennis Baker at Florida State University called the Clinical Educator Self-Assessment. The primary assessment outcome of this study was the first controlled evaluation of an obstetrics-gynaecology residents as teachers program that used a standardised six-station two--hour Objective Structured Teaching Examination (OSTE) to measure teaching performance. Gaba found a statistically significant improvement overall in the teaching performance of the doctor teachers in the intervention group. The greatest impact occurred in four out of six teaching stations:

- teaching in the setting of a case presentation (p 0.01),
- teaching a skill (p 0.01),

- bedside teaching (p 0.03), and
- giving a mini-lecture (p 0.03)

The authors state that the RAT program also improved a resident's confidence in their teaching abilities.[238]

Grady-Weliky[239] in the USA did a pilot study on psychiatric residents' self-assessment of teaching knowledge and skills following a brief didactic "psychiatric residents as teachers" course. Twelve postgraduate year two (PGY2) general psychiatric resident doctors participated in two two-hour workshops. A comparison of pre and post course participant questionnaires around themes of knowledge, skill, attitude and value of teaching was performed. There is no information around workshop content or the use of a control group. Nearly all residents agreed or strongly agreed that the development of teaching skills was important to professional development as a doctor. Statistically significant improvement in teaching skills was reported, especially in using different teaching methods ($p < 0.001$), evaluating teaching techniques ($p < 0.002$) and having a plan to improve teaching skills ($p = 0.016$). Around the theme of attitude, these psychiatric residents reported significant improvement in being comfortable teaching students ($p < 0.04$) and self-reported their perception that "my peers would describe my teaching skills as good"($p < 0.03$). These statements of being comfortable and perceptions were surrogate measures of self-efficacy in their clinical teaching. Reliability of self-assessment measures was not addressed in this study.

Morrison [230] in the USA conducted a randomised controlled trial of a longitudinal interdisciplinary residents-as-teachers program, measuring the outcome of these doctors' teaching performance and comfort with clinical teaching. Of the 23 participants (13 intervention, 10 control), 13 second year generalist resident doctors underwent a 13-hour program during one-hour noon conferences twice monthly for six months. This program consisted of practising teaching skills and receiving checklist-guided feedback. The intervention program followed the Bringing Education and Service Together (BEST) curriculum developed at the University of California, Irvine. The modules reflected results of an earlier focus group to determine the resident doctor's greatest needs for clinical teaching development. The modules included:

- leading teams/role modeling,
- orientating learners,
- giving feedback (utilizing a checklist),

- bedside teaching,
- teaching procedures,
- small group teaching/inpatient work rounds (including the five microskills model and the 'teachable moment' concept,
- teaching charting, and
- giving mini lectures.

The BEST's study primary outcome measure was a 3.5-hour eight-station Objective Structured Teaching Exercise (OSTE) designed specifically to test the clinical teaching skills of primary care residents. This was performed before and after the intervention, with raters blinded to the resident's randomisation group status. The intervention and control group characteristics and baseline OSTE were similar. In post intervention testing, across all eight OSTE stations, the intervention group achieved a grand mean OSTE score of 3.46 (SD=0.26), while the control group resident's grand mean OSTE score was 2.66 (SD=0.16). Morrison's[230] RCT intervention of a residents-as-teachers curriculum was the first published study with a reliable and validated OSTE to show a highly significant global improvement in clinical teaching performance ($t = 6.33$, CI 0.53-1.06, $p < 0.005$). More detailed results from six out of the eight focused teaching areas assessed by each of the OSTE stations showed significant improvement in a specific teaching performance: orientating a learner, bedside teaching, giving feedback, inpatient teaching, teaching charting and giving a mini-lecture.

A secondary outcome in Morrison's study used the Clinical Teaching Perception Inventory (CTPI), a 28-item Q-sort instrument that measures comfort with clinical teaching. Pre and post testing with this tool showed an improvement in ratings around self-perception of "myself as a teacher" and "my ideal teacher" in the intervention group (pre mean 28.3 points, post mean 30.6 points, gain of +2.3 points) compared to the control group (pre mean 32.0 points, post mean 30.4 points, loss of -1.6 points), but this was not statistically significant ($t = -.0.74$, $p = 0.467$).

Singh et al.,[202] based in USA but with a study conducted largely in India, reports on the development of the self-efficacy beliefs of health professional teachers during a longitudinal study[202] of a twoyear fellowship teacher development program. This occurred across five sites of the Foundation for Advancement of International Medical Education and Research (FAIMER) institute (three sites in India, one site in South Africa and one site in Brazil). Seventy clinical teachers were selected for this interventional program based on their credentials and education innovation project proposal. A control group was formed comprising non-

participating clinical teachers similar in age, seniority, academic designation and professional status for comparison. This faculty development training used mentoring by senior colleagues, previous fellows and peers, with experiential learning in the context of the projects, to learn the concepts of educational methods and leadership. This non-randomised, quasi-experimental study used the teacher efficacy belief systems (TEBS-self) developed by Dellinger,[132] which is a 30-item questionnaire marked on a four-point scale at intervals before, six months and 12 months from the start of the program. To account for the baseline differences in the participatory and control groups, statistical analysis involved using the baseline total score, earlier faculty development program attendance and years of teaching experience as co-variates. The results showed statistically significant differences between groups, implying that the intervention of a two-year fellowship training did impact on the clinical teachers' self-efficacy beliefs (*Table 4.1*). The intervention group showed consistently higher and statistically significant scores in subscale measurements across all areas (namely, communication, classroom management, motivation of students, accommodation of individual differences, higher order thinking skills, and monitoring and feedback for learning). Although this study did not identify the specific aspects of the program that contributed to the development of clinical teachers' self-efficacy, it did show that clinical teacher self-efficacy was increased, and was incremental and sustained over 12 months.[202]

Table 4.3: Singh overall self-efficacy results of FAIMER professional development [202](p362)

Overall score			
Baseline score	79.40(9.38)		72.91(10.29)
p value#	<0.05		
6-Months score	79.88(3.715)		91.06(4.078)
12-Months score	79.94(3.446)		97.93(3.783)
p value@		<0.05	

Vanek [212] conducted a descriptive study of 83 clinical teachers at a USA university medical school who self-reported their self-confidence regarding 28 teaching behaviors. The study also examined the frequency of these teaching behaviors. Physicians were most confident in relation to clinical supervision, including: substantiating patient's clinical findings, encouraging questions, giving information and providing directions for patient care. There was a positive corelation between physicians' rating of confidence in performing teaching behaviors and their ratings of frequency with which they were performed (r- 0.79). The authors conclude that a physician's confidence in their clinical teaching was a key element in their use of instructional teaching skills in the ambulatory care setting. This was more important than years of teaching experience, years of clinical practice or the amount of

direct teacher to student learning time. This study showed that a clinical teacher self-efficacy was important and influenced the extent to which a teacher believed they would be able to perform actions that promote learning. It was limited by the nature of the self-reporting of what doctors thought they were doing whilst teaching, without there being any actual performance observation or teaching quality assessment.

Discussion

Teacher self-efficacy – the confidence teachers hold about their capability to impact on and influence student learning – is considered one of the key motivational factors influencing teacher's professional behavior, performance and student learning.[126] Teacher's self-efficacy has been shown to be powerfully related to many meaningful educational outcomes such as their persistence, enthusiasm, commitment and instructional behavior as well as student outcomes, such as achievement, motivation and self-efficacy beliefs.[138] Self-efficacy has been studied from the students' learning perspective in medical training, showing that interventions like clinical simulation improves students' and resident doctors' self-efficacy in certain areas[167] and performance of specific skills.[243] An exploratory study by Dory in general practice vocational training[163] showed that although low self-efficacy beliefs are natural at the beginning of training, participants seem to develop in two ways. Either they overcome their fears and find ways to meet the challenges, and thus develop stronger self-efficacy beliefs, confidence and competency in the clinical skill or area, or they develop avoidance strategies. This can lead to newly qualified general practitioners feeling under confident and unprepared for practice, which may lead them to leave the profession or restrict their scope of practice. Clinical teaching is a specific skill, potentially influenced by the same educational psychological factors. It is important to understand the factors involved in the self-efficacy of the teacher, from the clinical medical teacher's perspective and its development. Retention of general practitioners who are the experienced mentors and clinical teachers is crucial in the Australian general practice vocational training and undergraduate medical training environment to continue to provide a sustainable clinical teaching workforce.[211] To our knowledge, this is the first systematic review examining the effectiveness of interventions on the development of self-efficacy in clinical medical teachers.

Three main themes emerged from the content of the interventions effectively used to develop self-efficacy of clinical teachers. They include:

- practical focused clinical teacher training program,
- interactive training, including use of communication prompts and media aids, and
- peer learning, review and mentoring.

Practical focused clinical teaching training program

The majority of interventions involve a dedicated training focus for doctors who are clinical teachers. Embedding a longitudinal education program with practical teaching experience reinforces the knowledge, skills and attitudes of clinical teaching. [191, 230] These teacher training sessions can be a brief intervention focused on teacher skill development.[234, 239] Grounding these training programs in adult learning theory provides familiarity for the clinical teacher and builds their understanding and confidence.[231] Greater robustness in the intervention occurs when linked to an existing educational framework. It was insightful to link the outcomes of the Student Teacher Education Program (STEP) to the modified Kirkpatrick's hierarchy of curriculum evaluation.[191] The focus of topic content for these teacher training programs that impacted most significantly on the clinical teacher self-efficacy included clinical case discussion,[238] bedside teaching,[212, 230, 233, 238] and giving feedback,[191, 230, 231, 238] especially critical feedback.[235, 240]

Interactive training

A second theme is that an effective self-efficacy intervention involves interactive training. This could be using clinical situations of real life patient scenarios, [233, 236] video based difficult scenarios,[217] problem based[191] and role playing.[232, 234]

Some of the interventions used to develop self-efficacy of clinical teachers can be grouped as communication aids and prompts. These include facilitation using the five-step Comskill facilitation process,[232] giving feedback[230, 235] and prompts like the one-minute preceptor[228, 239]or teaching scripts.[236] Irby[70] in an earlier study of exemplary clinical teachers highlighted that expert teachers often developed and utilised "teaching scripts" for commonly encountered teaching moments. A teaching script consists of a trigger, key teaching points and teaching strategies.[70] The self-efficacy developed in clinical teachers appeared to be sustained over a period of six to 12 months.[202, 233, 235]

Peer learning

Peer learning,[191, 237] peer review[236] and mentoring[202] was found to be important. The RCT trial involving resident doctors as teachers program showed a global improvement in clinical teaching performance and an increased comfort in teaching other doctors.[230] Doctor role

modeling has been highlighted as an important phenomenon in medical education, and a crucial means of transmitting professionalism.[88] Balmer et al.[244] highlighted the effectiveness of role modelling when used as an intentional learning process linked to clinical practice in which teachers explicitly described and explained their behaviors and clinical decisions.

Implications

This is the first systematic review on the effectiveness of interventions in the development of self-efficacy in clinical teachers within the field of medical education. The paucity of literature over the past 20 years and the heterogeneity of low quality studies clearly show that is an underutilised and poorly researched area.

The implications for practice include recognition of the importance of self-efficacy in clinical teaching and the incorporation of self-efficacy outcomes into the design, delivery and evaluation of clinical teacher training programs. This systematic review provides heuristic indicators for the design and development of potentially effective interventions to develop self-efficacy in the clinical teacher. These indicators include focused training on facilitation,[232] using questions to stimulate learning,[235] and case based teaching skills.[212, 231, 234, 235, 238, 240] A potentially important feature is the development of skills in giving constructive feedback.[191, 231, 233, 240] The potential for using simulation of real life scenarios in training, either by videotaped recordings[233] or role playing,[217] is promising. Teaching techniques that use scripts[236] or prescriptive prompts like the one-minute preceptor[233] appear to improve clinical teacher self-efficacy. The involvement of peers in teaching[191, 230, 237-239] and mentoring[202] appear to be important indicators in an effective intervention to develop the self-efficacy of clinical teachers.

There were secondary outcomes of interest in this systematic review. The measurement of self-efficacy used self-reporting surveys, but there was no uniformity or use of a validated measurement instrument. Only one study used a validated self-efficacy measurement instrument – the TEBS-self.[202] Commonly, self-efficacy in these described studies was a secondary outcome, and was measured using individualised, non-standardised, and un-validated instruments. The instruments were vague self-efficacy measures, as evident by the CTPI, which measured comfort with clinical teaching.[230] A research imperative is to develop standardised and validated measurement tools for self-efficacy in clinical teaching.

There was no literature around the impact of using visualisation or mental imagery techniques in the development of clinical teacher self-efficacy. Specifically, there was no

literature around the impact or effectiveness of visualisation or mental imagery on the clinical teacher self-efficacy.

In a review of self-efficacy in paediatric resuscitation, Maibach et al. argue that self-efficacy deserves specific attention during life- support training.[171] It is not sufficient that doctors have only the knowledge (know), practical skills (able to) and the right attitude (prepared to) required to intervene effectively in an emergency. They also need sufficient belief in their ability (dare to) to perform a potentially life-saving procedure. Methods that address Bandura's[25] developmental sources of self-efficacy used in life-support training include: explicit mental rehearsal, role modelling, verbal persuasion, attention to the learner's affective state, and observational learning from both peers and perceived experts.

As visualisation techniques and mental imagery use elements such as visual cues, role playing and following a script, these three identified elements could be important in the development of clinical teacher self-efficacy. Further research is needed into the use and impact of visualisation and mental imagery on the self-efficacy of clinical teaching.

The integrated nature of clinical teacher self-efficacy and teacher performance require that future studies objectively assess the impact of self-efficacy on clinical teacher performance. Additional objective measures of clinical teacher performance, perhaps building on the OSTE, are required. Integration of self-efficacy interventions and outcomes into clinical teacher programs needs to be incorporated into the design and evaluation stages. This provides the research foundation to develop better quality studies, enables pooling and better analysis of data, and provides a solid evidence basis. Further research is required to demonstrate the impact of self-efficacy of the clinical teacher and their clinical teaching performance, teaching quality and impact on the learner.

Recommendations are given using the JBI Grades of Recommendation.[245]

- Educational interventions in clinical teacher training should be designed to be inclusive of self-efficacy outcomes. (Grade A)
- The development of standardised and validated measurement tools for self-efficacy in clinical teaching is required for research rigour. (Grade A)
- Interventions to develop self-efficacy in the clinical teacher can effectively improve the clinical teacher performance and quality of teaching. (Grade B)

- Mental Imagery and visualisation techniques are effective in the development of self-efficacy in the clinical teacher. (Grade B)

Limitations

There are several limitations that influence the findings of the systematic review.

Firstly, within the studies there are inconsistently defined outcomes of self-efficacy that included similar terms like self-confidence and comfort with teaching. This is exacerbated by inaccurate and invalid measurement of the self-efficacy outcome. The measures largely rely on self-report and are thus retrospective and could potentially lead to bias. Results in descriptive studies that are based on primary care physicians' appraisals of what they think they do while teaching may limit their validity.[212] Tschannen-Moran[120] states that measures of self-efficacy should reflect judgments of forward-looking capacity, not current ability. There was only one randomised control study, and many of the studies lacked a control group in their quasi-experimental design. Across the studies the inconsistently defined outcomes, variable design methodology, and lack of objective self-efficacy measures, make it impossible to do statistical analysis or pooling.

There are four key points in this systematic review at which studies are excluded. Step one, whilst reviewing the title and abstract key words after literature search; step two, after retrieving and scoping the full article; step three, when reviewing full article with application of the inclusion criteria; and finally, after using a critical appraisal tool. Jewett's[246] historical study of 1982 which showed that a workshop to clinical teaching resident medical officers did increase their self-confidence in teaching was excluded and not critically appraised as it was conducted more than 20 years ago.[246] Many of the studies on self-efficacy in medical education were from the student learner perspective, and thus could not be included in this systematic review focusing on the clinical teacher's perspective. Even though the article title included Train the Trainer, the actual self-efficacy outcome was specific to clinical diagnosis or management of Chronic Fatigue Syndrome, and not the teaching of others.[192] A number of excluded studies involved developing self-efficacy in the skills of the learner through clinical simulation,[167] mental rehearsing/practice[187, 243, 247, 248] and mental imagery.[218]

A significant limitation is that only one study by Morrison[230] actually looked at the linkage between the perceived self-efficacy of the clinical teacher and their real and observed clinical teaching performance, using an Objective Structured Teaching Examination (OSTE).[230] Although focused teaching development sessions were shown to be beneficial, there was little information in the studies about the content of the clinical teacher training program. It

was unclear what specific elements of the clinical teacher training program were most effective in the development of clinical teacher self-efficacy.

There may be inherent limitations in the systematic review process itself. Various authors use different words to describe self-efficacy outcomes, like self-confidence and self-efficacy belief. The various synonyms used for self-efficacy are mitigated through the using these words in the search strategy and with the expertise of medical librarians in searching databases, but it is possible that a relevant published study may been inadvertently missed. There is a possibility that by only focusing on studies published in the English language, some studies have been missed, though the range of authorship countries in the included studies points to worldwide coverage. It is plausible that in research situations where little literature is found or the quality of studies is low that the use of a systematic review is problematic. The majority of studies retrieved in this systematic review, were quasi-experimental trials yet scored poorly using the appropriate critical appraisal tool. It is likely that this reflects poorly designed original studies but it could also indicate that the critical appraisal tool was not ideally matched.

This systematic review points to the development of self-efficacy being an important element in the professional development of clinical teachers. However the literature shows that this may be a relatively undervalued concept, and that self-efficacy of the clinical teacher could be an important element in medical education and training.[147] The paucity of literature in this area shows that qualitative teacher self-efficacy research is overwhelmingly neglected,[138] is rarely considered in teacher development programs[171] and teacher self-efficacy is erratically and poorly measured.[142]

Conclusion

The self-efficacy of the clinical teacher is a key factor influencing a teacher's professional behaviour, motivation, performance, persistence and student learning, yet it is under-researched.

Interventions shown to positively impact and develop the self-efficacy of the clinical teacher include:

- practical and focused clinical teaching training courses,
- interactivity with real or simulated clinical scenarios, with communication skills like facilitation and feedback, and utilising prompts or teaching scripts, and

- the use of peer learning, review and mentoring.

Interestingly mental imagery uses many of the same elements such as visual cues, prompts, role playing of simulated scenarios by visualisation, mental rehearsing and following a mental rehearsal script.

This systematic review revealed that interventions involving mental imagery have not been fully researched in medical education. Interventions and research to date have not specifically focused on self-efficacy in the clinical teacher or used an outcome that accurately measures self-efficacy in the clinical teacher working in medical education environments. Developing the self-efficacy of the clinical teacher is critical in medical education and needs to be a focus of future clinical teacher professional development.

Further research is needed to develop a universal and specific measuring tool for self-efficacy in clinical teaching. Other recommendations are the need to incorporate self-efficacy outcomes in teacher development programs, demonstrate the link between the quality of teaching and the self-efficacy of the clinical teacher, and research the impact of mental imagery and visualisation in the development of self-efficacy in the clinical teacher.

CHAPTER 5: DEVELOPMENT AND EVALUATION OF A MEASUREMENT TOOL FOR SELF-EFFICACY IN CLINICAL TEACHING

Introduction

There is a unique interplay of clinical practice and training within the Australian general practice environment. This includes two specialist general practice colleges that are responsible for professional standards of practice and training.[40, 60] There are multiple pathways to attain fellowship, which is the community and legislative requirement for recognition of professional general practice specialisation for doctors to access Medicare rebates. The majority of general practices are privately owned businesses. Vocational training in general practice is based on a historical conglomerate of apprenticeship, hospital residency terms, college training standards and regional training organisations.[3] The reality is that the majority of postgraduate general practice training occurs in a community based primary care facility, and is conducted by general practitioners who often have no professional teacher development or qualification.

Increasingly, a general practitioner (GP) is involved in teaching and training undergraduate and postgraduate students.[43] The GP clinical teacher role is complex, demanding and at times potentially conflicting.[38] International literature identifies the attributes of an excellent clinical teacher, though the impact of non-cognitive attributes like self-efficacy in medical education has rarely been researched *(see Chapter 2).*

Adhering to the authenticity of Bandura's self-efficacy concept[25] and using the foundations of earlier definitions of teacher self-efficacy by Guskey,[125] Tschannen-Moran[120] and Klassen,[126] the definition for the self-efficacy of the clinical teacher needed to be adapted to align with the medical education context. I have defined self-efficacy of the clinical teacher to be: the confidence and belief that their teaching will positively influence and impact on the learner in a clinical medical environment.

Self-efficacy has been correlated positively with a broad range of positive teacher and student outcomes, including teaching practices, teacher behaviours and positive learner outcomes.[120] This link between clinical teacher self-efficacy, global teaching and impact on the learner needed further research in the clinical general practice training environment.

To develop the self-efficacy in clinical teaching by doctors in Australian general practice, as previously discussed, there was no valid or appropriate measuring tool identified in world literature. This necessitated the development of a specific and appropriate tool to measure the self-efficacy of doctors' clinical teaching.

Ethical approval for this study and wider PhD research was obtained through the University of Adelaide Ethics Committee *(Appendix VI).* Included *w*ith each invitation to participate was a survey and participant information sheet. Each participant voluntarily signed an informed consent form.

A new instrument was developed to measure the self-efficacy of the doctor's clinical teaching and this was piloted in Australian general practice and conducted as a two-stage evaluation.

Background

According to Bandura,[23] self-efficacy beliefs lie at the core of human functioning and each individual possesses a measure of control over their thoughts, feelings, motivation and actions. This "can-do" cognition gives a person a sense of mastery over their environment.[249] Self-efficacy beliefs are believed to mediate relationships between knowledge and behaviours while interacting within environmental contexts.[132]

The theoretical construct for self-efficacy in medical education has been fully discussed in Chapter 3. In summary, for a measure of self-efficacy to be genuinely authentic to Bandura's concept, [23] various components need to be considered. Importantly, self-efficacy is task specific. The task of student learning is different to a teacher's teaching. A pivotal component is the contextual nature of self-efficacy. The setting of a community based general practice of ambulatory patients with clinical problems is different to a simulated or hospital environment. Scales of self-efficacy must be tailored to the particular domain of functioning that is the object of interest.[136] High self-efficacy beliefs in one context do not necessarily mean high self-efficacy in another. For example, a clinical teacher may have high self-efficacy in teaching a surgical excision procedure for a skin lesion, but the same clinical teacher may have low self-efficacy in explaining the reasoning steps in the clinical diagnosis of that skin lesion. Self-efficacy beliefs vary in strength. The strength component of self-efficacy refers to the intensity of a person's belief in their ability to do a certain task. Consequently, for measures of self-efficacy to achieve predictive power, they need to be tailored to the context and represent graduations of task demands, that is, a scale of intensity.[25]

A measure of self-efficacy needs to clearly and accurately reflect the meaning of self-efficacy.[132] The wording of the self-efficacy items needs to accurately reflect the task and contextual construct. Bandura[136] recommended that items should be phrased in terms of "can do", rather than "will do". Can is a judgement of capability, whereas will is a statement of intent.

In educational research, perceived self-efficacy needs to be measured against levels of task demands that represent graduations of challenges or impediments to successful performance. This is often measured using self-reporting surveys that ask participants to rate the strength of their self-efficacy beliefs to perform specific tasks.[136] However self-efficacy beliefs do not always match the person's actual performance or ability in a specific task, and can be overestimated.[145] In medical education research, motivational constructs like self-efficacy have received less emphasis than more traditional measures of educational success, such as scores on standardised tests and observations of clinical performance.[122]

As previously discussed in Chapter 3, it is important to understand the development of previous measurements of teacher efficacy in education. These provide useful guidance in the construct of new, better and more accurate measurement tools of clinical teacher self-efficacy. Various tools to measure self-efficacy are discussed in Chapter 3, but these mainly focused on the learner.[161] Dellinger[132] identified three issues that must be addressed if measuring teachers' self-efficacy beliefs is to improve. First, the measure should clearly and accurately reflect the meaning of self-efficacy. Second, the measure must assess teachers' self-efficacy beliefs in the context in which the beliefs are formed. Third, the specific tasks selected for the measure should be meaningful. His Teacher Efficacy Beliefs System (TEBS) [132] self-measure, though, is focused on school teachers, so could not be used with a different target of clinical teachers in a different context of general practice.

No previous published research on self-efficacy scale development could be found that measured clinical teacher self-efficacy in the primary health care or general practice setting.

Therefore there was a need to develop a new Self-Efficacy in Clinical Teaching (SECT) tool for use in the unique situation of clinical teaching in Australian general practice.

Methodology

The methodology comprised two distinct phases – creation of the initial scale called Self-Efficacy in Clinical Teaching (SECT) and a wider evaluation for reliability and validity of the SECT scale.

The creation phase began with literature searches, clinical teaching domain identification, followed by item generation and appropriateness. A focus group reviewed, assessed and finalised the initial SECT questionnaire. The initial SECT was then tested on a sample group of clinical teachers for ease of use and feasibility. Preliminary statistical analysis occurred around reliability, item uniqueness and factor analysis to guide further development and implementation of the SECT measure.

The evaluation phase involved collection of participant data from a different and larger sample, a more comprehensive statistical analysis around reliability and factor analysis and exploration indicating elements for validity.

Literature search

No previous published research on self-efficacy scale development could be found that measured clinical teacher self-efficacy in the primary health care or general practice setting. Previous published measurement tools from other disciplines of education or psychology, or from allied medical and health fields, could not be modified or adapted to produce newer scales as self-efficacy is context and task specific.

However, understanding of the literature descriptions of these self-efficacy measurement tools informed and guided the developmental requirements for the new SECT measurement tool. These included that the tool be:

- grounded in Bandura's[25] theoretical construct,
- a graduated measurement scale,
- easy and convenient to use,
- a self-reporting survey reflecting clinical teaching tasks,
- formulated and reviewed by a focus group of clinicians,
- triangulated with other data sources like individual characteristics, learner experience and performance,
- piloted and tested, and
- statistically analysed.

A comprehensive literature search identified existing measures of teacher self-efficacy, previously discussed in Chapter 3. In fact, only a few tools had been developed to measure teacher self-efficacy in clinical teaching in a medical environment. Specifically, this identified five previously published clinical teacher self-efficacy measures used in medical education *(Table 5.1).*

Table 5.1: Examples of clinical teacher self-efficacy tools (medical education)

Authors	Scale Name	No.	Target	KMO	Total Cronbach alpha
Chiang [156] 2011	Self Efficacy in Asthma Training (SEAT)	281	Primary care nurses in asthma teaching	0.95	0.94
Copeland[15] 1999	Cleveland Clinical Teaching Effectiveness Instrument (CCTEI)	291	Medical student rated clinical teacher behaviors – but no self-efficacy	n/a	0.97
Stalmeijer[198] 2010 (MCTQ)	Maastricht Clinical Teaching Questionairre (MCTQ)	208	Medical student rated clinical teacher behaviors – but no self-efficacy	n/a	0.90*
Schulz [203] 2013 (CSSET)	Clinical Supervision Self Efficacy Tool (CSSET)	76	Nursing and allied health clinical supervisors/teachers	0.9	0.90*
Webb [204] 2010	Modified STEBI	128	Self-efficacy of school teachers in HIV education	n/a	0.93

** total cronbach alpha calculation based on all factor average n/a not available*

Research showed that they were all reliable with good internal consistency (total Cronbach alpha scores >0.80 in all the analyses). For a detailed explanation of these clinical teacher self-efficacy measures, refer to Chapter 3.

The first four clinical teacher self-efficacy measuring scales (SEAT,[156] CCTEI,[15] MCTQ,[198] CSSET[203] were closely reviewed. The Cleveland Clinical Teaching Effectiveness Instrument (CCTEI)[15] is reliable, valid and widely used in the USA hospital training programs to measure clinical teaching. Closer review of the CCTEI showed that it was not designed to assess the full range of teaching skills, and specifically did not use self-efficacy of the clinical teacher as an evaluation outcome.

Similiarly, the Masstricht Clinical Teaching Questionairre (MCTQ)[198] was shown to be reliable and valid, and is widely used across Europe, but self-efficacy of the clinical teacher is not

measured. Chiang's self-efficacy in Asthma Teaching (SEAT)[156] scale showed the most promise, was used in Taiwan, but with primary health care nurse teachers, and was specific to asthma teaching. In Australia, the Clinical Supervision Self-efficacy [203] tool was piloted with clinical supervisors in nursing and allied health, but was not used in the general practice clinical teaching context.

The fifth measure, by Webb,[204] used to score the self-efficacy of South African school teachers in HIV education, was not considered further because, although the teaching topic was medically focussed, the target was school teachers. Additionally, the author used a modified STEBI[134] and was of the assumption that the robustness of the instrument in a variety of contexts and with a number of modifications had been proven.[135]

There is no all-purpose measure of perceived self-efficacy.[136] As the nature of self-efficacy is by definition context specific, the use of a general self-efficacy scale is of little relevance when measuring a specific set of perceived beliefs, attitudes or behaviours.[249] Bandura states that "the one measure fits all" approach has limited explanatory and predictive value because most of the items lose relevance to the domain of functioning. [136] As the four scales did not meet the contextual or specific parameters of my research area, it was decided that they could not be directly used to measure clinical teacher self-efficacy. This was due to : a lack of clinical teacher target, self-efficacy clinical teaching outcome and relevance to the primary health care or general practice environment, or too narrow a medical teaching task specificity. There needed to be a new scale constructed to measure the self-efficacy of clinical teachers in general practice.

In an ideal world, any new measurement instrument would be compared to an existing standard of measurement. None of the above mentioned existing scales were an appropriate measure of the phenomenon of self-efficacy, the clinical teaching task or had been used in the relevant context of general practice. Therefore they could not be used to for comparing different instrument assessment or measurement of self-efficacy in general practice clinical teaching.

Clinical teaching domain identification

The information from these scales did however provide useful insight and guidance into the initial design and construct for the new measure of self-efficacy in clinical teaching. Additionally, these clinical teaching domains needed to truly reflect the context of general practice, the role of the clinical teacher, the clinical teaching competencies and the authenticity of self-efficacy.

Reviewing the literature relating to the attributes and qualities of an excellent clinical teacher *(see Chapter 2),* and from my medical education and general practice training experience, a theoretical framework for teacher competencies was established. This aligned with the earlier exploration of Harden's 12 roles of a clinical teacher, grouped into six domains:

- facilitator – mentor and learner,
- planner – training organiser and syllabus planner,
- information provider – lecturer and clinical teacher,
- resource developer – resource material and study guide,
- role model – on the job and teaching role model, and
- assessor – student and curriculum.

These clinical teaching domains provided a framework for item generation in the SECT.

Item generation

The knowledge, skills, attitudes and attributes of a competent clinical teacher described by Hatem[98] provided a starting point for item generation in the SECT. Consideration of these competencies informed items that met the task specificity of self-efficacy. As an example of this initial consideration, Hatem[98] identified that a competent clinical teacher identifies a learner's needs. This generated a specific item in the SECT: I can correctly appraise the learning needs of a registrar (*Appendix VII*). Conversely, Hatem's competency that the clinical teacher demonstrated teacher passion did not generate a specific item, as this attribute does not fit the task specificity of self-efficacy. [98]

Items in the four clinical teacher self-efficacy measuring scales (SEAT,[156] CCTEI,[15] MCTQ,[198] CSSET[203]) were reviewed. Some guidance in item generation and wording was elucidated from the cognitive apprenticeship theoretical model of the MCTQ,[198] the components of clinical teaching in the CCTEI[15] and the task specificity of the SEAT.[155]

Each item was linked to specific teaching tasks, based on personal clinical teaching experience and commonly encountered general practice training interactions. In the initial SECT, items were designed in relation to: learning needs, teaching instruction, observation, assessment, feedback, learning environment and facilitation to reflect current learning theory.

Each question's wording used language that followed a "can do" rather than a " will do" template, as recommended by Bandura.[137] Of the four clinical teacher self-efficacy measuring scales (SEAT,[156] CCTEI,[15] MCTQ,[198] CSSET[203]), the construct and item formulation in the Self Efficacy in Asthma Teaching provided the most useful guidance in determining the appropriate wording for each question or item. See samples of item statements in *Table 5.2*. The CCTEI and MCTQ item formulation and wording were not authentic to Bandura's construct of self-efficacy scales.

Table 5.2: Items sample of clinical teacher self-efficacy tools

Scale Name	Likert Rating scale	Items	Sample items	Factor solution	Factor Variance % of total [total]
Self Efficacy in Asthma Training (SEAT)[156]	5 point	20	I can select appropriate teaching strategies when encountering different asthma patient needs	3 factors -general teaching -specific asthma related teaching -PEF meter teaching	[70.8%] 21.4% 25.1% 24.30%
Cleveland Clinical Teaching Effectiveness Inst (CCTEI)[15]	5 point	15	Establishes a good learning environment (approachable, nonthreatening, enthusiastic, etc)	1 factor	[70.6%]
Maastricht Clinical Teaching Questionairre (MCTQ)[198]	5 point	24	The clinical teacher … …adjusted his/her teaching activities to my level of experience	5 factors -Modelling -Coaching -Articulation -Exploration -Learning environment	 24% 24% 16% 12% 27%
Schulz Clinical Supervision Self Efficacy Tool (CSSET)[203]	7 point	27	Provide consistently clear and constructive feedback including checking the student's understanding of my feedback	4 factors -facilitate student learning -problem solve - facilitate performance -relationships and communication	[73%] 25.4% 21.7% 17.2% 8.6%
Webb Modified STEBI[204]	5 point	18	I am able to involve the community in HIV/AIDS education in my school	4 factors -knowledge of HIV -help learners cope -help colleagues -community role	n/a

n/a: not available

A pool of 31 potential items were formulated to encompass the six clinical teaching domains identified in the construct for the new measure of self-efficacy for general practice clinical teaching.

Appropriateness

The self-efficacy in clinical teaching initial questions were reviewed by a focus group of four GP clinicians, supervisors and medical educators as content and context experts. They provided a useful range of experience and knowledge in assessing the scale items. Reflection and discussion by this expert focus group ensured that the SECT survey was relevant to general practice, aligned with teaching competencies and truly reflected important clinical teaching tasks. This expert focus group reviewed the clinical teaching domains, item formulation, teaching task specificity, order, appearance, and wording of each question.

Consideration of the validated clinical teacher self-efficacy measures factor solutions (*Table 5.2*) provided guidance into a preconceived thematic grouping of the items in the initial SECT. Other scales like the Medical Achievement Self efficacy Scale (MASS)[161] highlighted the importance of aligning the task specificity of self-efficacy.

The focus group changed several items to improve their readability, and deleted six items considered redundant, ambiguous or lacking in task specificity. Each item assessed the self-efficacy belief of a different clinical teaching competency. Discussion around the order and grouping of homogenous questions also occurred. This resulted in a one-page initial SECT with 25 questions (or items) under three titles of self-efficacy of general teaching, self-efficacy of specific curriculum areas teaching and self-efficacy of the professional (*Figure 5.1*). The focus group also reviewed the face validity of the SECT questionnaire (e.g. if the content made sense), if it was easy, acceptable and convenient to use, and provided advice around feasibility in administrating the process.

Following Bandura's own guidelines for development of self-efficacy scales[136] and the widespread research acceptable practice,[145] a self-reporting questionnaire was employed. In designing a measure of self-efficacy in clinical teaching, a scale of intensity was required to determine the strength of the self-efficacy belief. Perceived self-efficacy should be measured against levels of task demands that represent increments of challenges or gradations of strength.[136] Self-efficacy scales previously reported in the literature measured the gradated responses, using a Likert scale, ranging from least confident to most confident, to document the self-perceived strength of self-efficacy belief.[15, 156, 198, 203]

Please rate yourself, circling a number, using a scale of 1 to 7, where 1 is least confident and 7 is most confident.

Note – Registrar, trainee or student on clinical placement is interchangeable.

Self-efficacy of general teaching

1.	I can correctly appraise the learning needs of registrars	1 2 3 4 5 6 7
2.	I can write individualised learning objectives based on a registrar's unique situation.	1 2 3 4 5 6 7
3.	I can provide appropriate instructional content, based on a registrar's learning need.	1 2 3 4 5 6 7
4.	I can select appropriate teaching strategies when encountering different registrar's needs.	1 2 3 4 5 6 7
5.	I can provide clinical instruction in a clear manner that registrars can understand.	1 2 3 4 5 6 7
6.	I can correctly demonstrate clinical skills such as management of the patient consultation/interaction.	1 2 3 4 5 6 7
7.	I have the ability to change the attitude/values of a registrar.	1 2 3 4 5 6 7
8.	I can design teaching plans for registrars.	1 2 3 4 5 6 7
9.	I have the ability to evaluate the effectiveness of a registrar's clinical and consulting efforts through direct observation.	1 2 3 4 5 6 7
10.	I can refine teaching content and methods based on a registrar's learning needs and confounding factors.	1 2 3 4 5 6 7

Self-efficacy of specific curriculum areas teaching

11.	I can prepare learning objectives across a registrar's area of development.	1 2 3 4 5 6 7
12.	I can give instruction on strategies and resources in a registrar's area of development.	1 2 3 4 5 6 7
13.	I can teach what the registrar needs to know.	1 2 3 4 5 6 7
14.	I am confident to teach an area that is not my expertise	1 2 3 4 5 6 7
15.	I can teach registrars to determine their professional boundaries	1 2 3 4 5 6 7
16.	I can stimulate the registrar to learn areas of curriculum that don't interest them.	1 2 3 4 5 6 7

Self-efficacy of the professional

17.	I can handle most difficult registrar questions or situations.	1 2 3 4 5 6 7
18.	I can tailor my feedback to be constructive and developmental.	1 2 3 4 5 6 7
19.	I can facilitate a positive clinical learning environment for the registrar.	1 2 3 4 5 6 7
20.	I can provide appropriate support for helping registrars learn and sustain work/life/family balance and personal wellbeing.	1 2 3 4 5 6 7
21.	I am effective in my clinical training	1 2 3 4 5 6 7
22.	I am well organised and prepared for the in-practice teaching.	1 2 3 4 5 6 7
23.	I am concerned for my registrars wellbeing	1 2 3 4 5 6 7
24.	I actively encourage registrars learning and participation.	1 2 3 4 5 6 7
25.	I give clear explanations to questions around clinical scenarios.	1 2 3 4 5 6 7

Figure 5.1: Self-Efficacy in Clinical Teaching (SECT) tool

Early statistician involvement advised the use of a seven-point Likert scale, where 1 is least confident and 7 is most confident. The experienced statistician explained that this balanced the participant user acceptance with the need for precision of measurement and the hypothesised 20% change expected with an intervention. Although larger numbers in the scale may lead to expectation of greater precision in measurement, most of the self-efficacy measurement literature used a five to seven-point Likert scale.[15, 156, 198, 203, 249]

The statistician also advised on surveying certain demographics of the participants, and the feasibility of the data collection process and analysis. The recommended pilot sample size number was determined to be 50 participants.

Pilot SECT testing

A pilot rollout using the SECT tool was initiated in the last half of 2011. The SECT pilot participants comprised GP clinicians, supervisors and medical educators attending two national conferences organised by the RACGP and GPET. This occurred as an adjunct to a two-hour workshop titled, "Doctors as Teachers", delivered by the author, exploring the roles, qualities and attributes of the clinical teacher. A total of 54 doctors accepted the invitation to participate in the pilot study and signed a consent form. These participants, by the nature of their conference and workshop attendance, were construed to be largely representative and interested in GP clinical teaching. There was no other personal data collected about their general practice, either of a broad general demographic or of the nature of their clinical teaching.

Piloting of the initial SECT survey involved gaining information about the face content validity, ease of use and feasibility of administrative processes. The data collected were contained in their responses to the 25 items in the initial SECT. Preliminary statistical analysis tested the appropriateness, reliability, internal consistency, construct validity and interpretability of the scores.

A second stage of development and evaluation of the SECT tool was planned with a larger and different population sample to validate the tool. The purpose of the two stage evaluation of the SECT measurement tool was to determine a reliable and validated tool for baseline and intervention measures of self-efficacy in clinical teachers.

Statistical analysis methodology

The STATA software version 13.0 (Statacorp, Texas, USA) was used in all the validation analyses. Additionally, using the same software, data was screened for accuracy and missing values, and each survey item response pattern was checked for normality. With statistician assistance, appropriate software procedures were used to evaluate the SECT measurement instrument for reliability and to investigate the factor structure.

Reliability

Reliability refers to the accuracy and precision of a measurement procedure.[250] Reliability may be viewed as an instrument's relative lack of error. In addition, reliability is a function of properties of the underlying construct being measured, the test itself, the groups being assessed, the testing environment and the purpose of assessment. It is important to calculate reliability as it addresses how well an instrument measures and what it is intended to measure. Reliability can be assessed by:

- repeating the same test or measure (test-retest),
- administering an equivalent form (parallel test forms), and
- using single-administration methods
    i. subdividing the test into two or more equivalent parts
    ii. internal consistency – measured by Cronbach's alpha coefficient.

Internal consistency is a procedure to estimate the reliability of a test from a single administration of a single form. Internal consistency depends on the individual's performance from item to item based on the standard deviation of the test and the standard deviations of the items.

In this research, reliability was measured and reported as the total instrument's and each item's Cronbach alpha coefficient. This followed the approach of previously published studies on self-efficacy measurements.[156, 204]

Acceptable levels of reliability depend on the purpose of the instrument. Acceptable reliability of instruments developed for research purposes can be as low as 0.60. An acceptable reliability level of a diagnostic instrument used for making decisions about individuals (e.g. a psychological measure) should be much higher, e.g. 0.95.[251]

The Cronbach alpha coefficient can provide a basis for comparison of assessment instruments, when measurement is expressed in different scales. A second assessment with a higher reliability coefficient could provide a more consistent measurement for individuals. The four clinical teacher self-efficacy measuring scales (SEAT,[155] CCTEI,[15] MCTQ,[198] CSSET[203]) all had Cronbach alpha general scores of > 0.80, but as previously discussed, they could not be used. There was no existing gold standard self-efficacy in clinical teaching measurement instrument with which to compare the newly developed SECT tool. Additionally, due to the nature of the sample in the pilot study and because no additional data was collected to identify the participants, the test-retest method was not considered as a way to evaluate reliability. Consequently, in this research, an additional measure could not be included in the design.

Validity

Validity refers to the degree in which the test or other measuring device is truly measuring what it is intended to measure. Abell(252) discusses validity as a composite of characteristics that need to be deconstructed into "bits and pieces" to be meaningfully interpreted as an integrated psychometric whole. These "bits and pieces" relate to the historical and varied names used for characteristics of test validity. Furthermore these were sequenced as elements of evidence for scale score validity, in the order in which they are pragmatically examined, and he summarised relevant fundamental questions (Table 5.3).

Table 5.3: Establishing evidence of scale score validity (reproduced from Abell)[(252)(p101)]

Type of evidence	Fundamental questions
Face	*Does the scale appear to measure what it claims to measure?*
Content	*Does the item content reflect the construct definition?*
Factorial	*Does the scale measure the number of constructs it claims?*
Construct	
• **Convergent**	*Do variables that should correlate with the scale score do so?*
• **Discriminant**	*Do variables that should not correlate with the scale not do so?*
Criterion	
• **Concurrent known- groups**	*Do scale scores adequately categorize respondents with known characteristics?*
• **Concurrent known- instruments**	*Do categorisations based on new scale scores adequately match those based on previously standardized measures?*
• **Predictive**	*Do scale scores accurately predict future behaviours or attitudes of respondents?*

To explore validity of the SECT test, I followed the above approach, "although none (of the elements) are adequate in themselves to defend the accuracy of scale score interpretations, each contributes something to the ultimate assessment of how well a scale measures what it's intended to".[252)(p99)] Face validity evidence was established by determining that the scale "looked like" it measured what it was intended to measure, through use of the focus group in the design phase.

Abell states that the evidence for content validity "requires a logical process of judging, intuitively or subjectively, how well item content reflects the definition of the target construct".[252)(p103)] This resides "not in the test, but in the judgement of experts about domain relevance and representativeness".[253)(p41)] Inter-rater discussion and agreement in the design focus group formed the basis of the appropriateness between item content and construct definition. The deliberate blend of academically minded medical educators and practice based clinical teachers in the design focus group and first respondents of the pilot SECT was intended to provide this expert judgement.

Based on the focus group's expertise and aligned with Chiang's SEAT[156)] design, three grouping titles (self-efficacy of general teaching, self-efficacy of specific curriculum areas teaching and self-efficacy of the professional) were preconceived for ease of reading, understanding and responding to each of the SECT items. The aim was not to use these preconceived groupings for statistical testing and evidence for factorial validity but for a later exploratory factor analysis.

Convergent construct validation, according to Abell,[252)] is a process of approximation, similar to the contemporary saying, "If it looks like a duck, walks like a duck, and quacks like a duck, it must be a duck!" Communality values could be determined to identify which items were unique, with values greater than the traditional recommended values of >0.4 to be retained. This indicated which were making significant contributions to the overall SECT instrument. Evidence for discriminant construct validity was determined when the measure that should not correlate meaningfully with the new SECT scale score was found not to do so.

Due to lack of an international measurement of self-efficacy, it was not possible to research the evidence for criterion validity. There was no "gold standard" established absolute measurement to serve as an external reference point for the new SECT tool to be

comparatively assessed or adequately matched and replaced. The predictive element of validity was beyond the scope of this pilot.

Exploratory factor analysis

A further method to be used in the evaluation of SECT was exploratory factor analysis. This can be described as orderly simplification of interrelated measures. Traditionally factor analysis has been used to explore the possible underlying structure of a set of interrelated variables without imposing any preconceived structure on the outcome.[254] Factor analysis seeks to discover common factors.

Exploratory Factor Analysis (EFA) was chosen for the preliminary statistical analysis of the initial SECT, as this is best suited to "real world" data from social services and psychology. The norm is to use Principal Components Analysis (PCA) with orthogonal rotation and Kaiser criteria as this is essentially a reduction method for raw data.[251]

By performing EFA, the number of latent constructs and the underlying factor structure were identified. Excluding the three pre-conceived themes, the use of an EFA, helped to explain what were the possible groupings behind the group of 25 items. This provided a means of explaining variation among the items, grouping into hypothetical factors (e.g. condense information) and of offering an indication of the content or meaning of the factor groupings.

The technique for extracting factors attempts to take out as much common variance as possible in the first factor. Subsequent factors are in turn intended to account for the maximum amount of the remaining common variance until hopefully no common variance remains. Determining the number of factors to extract in a factor analytic procedure is dependent on meeting appropriate criteria.[251] Some of the recommended criteria are:

- Kaiser's criteria, which considers factors with an eigenvalue > 1 as common factors
- Cattel's scree graph. The name is based on an analogy between the debris, called scree, that collects at the bottom of a hill after a landslide, and the relatively meaningless factors that result from overextraction. On a scree-plot, because each factor explains less variance than the preceding factors, an imaginary line connecting the markers for successive factors generally runs from top left of the graph to the bottom right. If there is a point below which factors explain relatively little variance and above which they explain

substantially more, this usually appears as an "elbow" in the plot. This plot bears some physical resemblance to the profile of a hillside. The portion beyond the elbow corresponds to the rubble, or scree, that gathers. Cattell's guidelines call for retaining factors above the elbow and rejecting those below it. This amounts to keeping the factors that contribute most to the variance.

- a predetermined amount of the variance (e.g. 10%) keeps the factor, and
- interpretability criteria

    i. Do the items have significant loadings (generally a cutoff >0.30 is recommended). The item loading explains the correlation value of each item with each factor. A loading score lower than that indicates the item is poorly explaining the theorised factor.

    ii. Do the variables that load on a factor share some conceptual meaning?

    iii. Do the variables that load on different factors seem to measure different constructs?

    iv. Does the rotated factor pattern demonstrate a simple structure (like high loadings on one factor and low loadings on other factors)?

    v. Does each item contribute uniquely and differently to the whole instrument? In factor analysis this is called communality.

For the testing of the SECT, the eigenvalues of each factor are determined, a scree graph plotted, and Exploratory Factor Analysis performed. Factor extraction is based on the following criteria:

- eigenvalue >1, and
- plotting of scree graph to determine the "elbow" point.

Additionally, the literature indicates best practice for solid and consistent factor grouping is achieved by individual item high loading of > 0.5 and a factor grouping with five or more items.[230] In this approach, each possible factor solution is further scrutinised for a strong and consistent factor solution, using the following criteria:

- each item loading score is > 0.50,
- a potential factor contains no or few item cross loading, and
- no factor contains less than three items and preferably greater than five items.

Rotation

Rotation does not alter the basic aspects of the analysis, such as the amount of variance extracted from the items.[255] Rotation applied to the reference axes means the axes are turned about the origin until some alternative position has been reached. The simplest case is when the axes are held at 90 degrees to each other (orthogonal rotation). Orthogonal rotation produces factors that are uncorrelated so that each factor is distinct and independent of the other. Varimax is a type of orthogonal rotation and is the most common choice. Conventional wisdom advises researches to use orthogonal rotation because it produces more easily interpretable results.[255]

The theoretical construct that generated the SECT instrument involved three themed groups around self-efficacy of general teaching, of specific curriculum areas teaching and of the professional *(see Chapter 3).* Not wanting to presume a correlation among these three arbitrary themes, this SECT themed grouping was excluded, and the raw 25 items were analysed using the EFA and orthogonal rotation. The pilot testing of the initial SECT used orthogonal rotation to give some indication of the possible grouping of factors and to evaluate if the order and construction of items within these three groups were appropriate.

When it is expected the factors are correlated, the use of orthogonal rotation will result in loss of valuable information, misleading results, so theoretically oblique rotation is more accurate and potentially reproducible.[255] Oblique rotation methods (like Promax) allow some factors to be correlated. Rotating the axes through different angles gives an oblique rotation (not at 90 degrees to each other). In social sciences, like psychology, there generally is an expectation that there will be some correlation between factors, since behaviour is rarely partitioned independently of other elements.[255] Consequently, the oblique rotation method was also performed to evaluate the performance of the SECT instrument in the pilot study.

Pilot SECT results

A total of 54 participants completed the SECT survey, but due to missing data only 37 data responses were analysed. The data collected focussed on feasibility, ease of use, explorations

of face and content validity, reliability and an initial factor analysis of the SECT questionnaire responses.

From the raw data, calculations were made for each item's scores, and mean and standard deviations. This raw analysis indicated that all items were generally rated in the higher half of the seven-point Likert scale, and had a reasonable range of minimum to maximum scores *(Table 5.3).* The reliability indicated by the total Cronbach´s alpha coefficient was 0.93, resulting in very good internal consistency of the SECT instrument.

Table 5.3: Pilot SECT item mean and Cronbach alpha scores

Item	Mean Score	SD	Min	Max	Alpha
Q1	5.16	0.93	3.0	7.0	0.92
Q2	4.97	1.07	2.0	7.0	0.92
Q3	5.38	0.76	4.0	7.0	0.93
Q4	5.05	1.00	2.0	7.0	0.92
Q5	5.62	1.16	3.0	7.0	0.92
Q6	5.68	0.97	3.0	7.0	0.93
Q7	4.58	1.04	2.0	6.5	0.92
Q8	5.16	1.07	3.0	7.0	0.92
Q9	5.86	0.75	4.0	7.0	0.92
Q10	5.18	0.93	3.0	7.0	0.92
Q11	5.23	0.99	3.0	7.0	0.92
Q12	5.11	0.99	3.0	7.0	0.92
Q13	5.19	1.10	3.0	7.0	0.92
Q14	4.26	1.47	1.0	7.0	0.92
Q15	5.43	0.99	3.0	7.0	0.92
Q16	4.70	1.08	2.0	7.0	0.92
Q17	5.27	0.96	2.0	7.0	0.92
Q18	5.62	0.89	3.0	7.0	0.92
Q19	5.84	0.93	3.0	7.0	0.92
Q20	5.24	1.01	3.0	7.0	0.92
Q21	5.35	0.86	3.0	7.0	0.92
Q22	5.03	1.14	2.0	7.0	0.93
Q23	6.30	0.78	5.0	7.0	0.92
Q24	6.14	0.86	4.0	7.0	0.92
Q25	5.76	0.93	3.0	7.0	0.92
			Total SECT alpha		**0.93**

Using Kaiser's criteria *(Table 5.4),* six factors obtained an eigenvalue >1 (model with orthogonal rotation), which explained 74% of the total variability.

Table 5.4: SECT pilot eigenvalues

Factor Analysis	Eigenvalue	Difference	Proportion	Cumulative %
1	9.386	6.604	0.38	38%
2	2.781	0.547	0.11	49%
3	2.234	0.590	0.09	58%
4	1.645	0.325	0.07	64%
5	1.320	0.122	0.05	69%
6	1.198	0.275	0.05	74%
7	0.923	0.097	0.04	78%
8	0.827	0.094	0.03	81%
9	0.732	0.090	0.03	84%
10	0.643	0.051	0.03	87%
11	0.592	0.046	0.02	89%
12	0.546	0.105	0.02	91%
13	0.441	0.045	0.02	93%
14	0.395	0.086	0.02	95%
15	0.309	0.059	0.01	96%

Looking further at the factor analysis, Cattel's scree graph was plotted to determine the point of a distinct elbow *(Figure 5.2).* This suggested a five-factor solution.

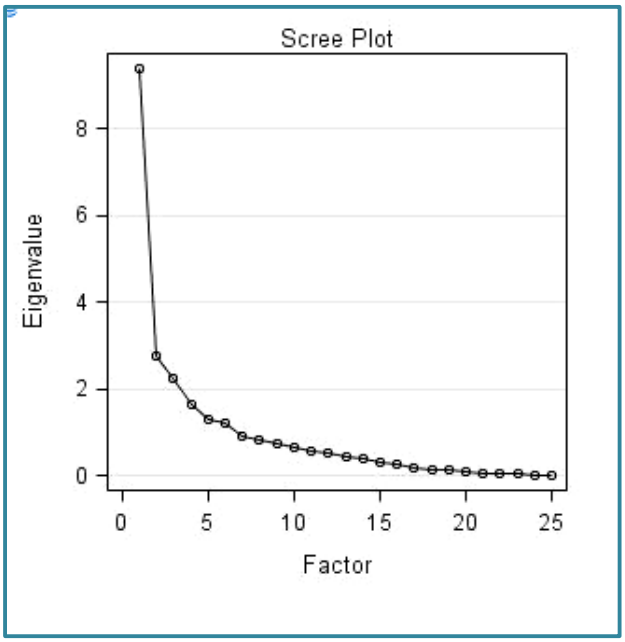


Figure 5.2: Pilot SECT scree graph plotting

The cleanest factor structure that best met the requirements of eigenvalues > 1, the elbow of the scree graph, the Exploratory Factor Analysis, and the NFACTOR criterion was a five-factor

solution. This cumulatively explained 69% of the variance in item responses and data observations.

Of these factors, only the first factor contained more than five items, while factors four and five showed a weaker structure with four and three items, respectively. Evaluating the item loadings to meet the criteria for strong and consistent loading, all except two of the 25 items in the SECT instrument showed loadings >0.5 and no cross-loading between the factors, suggesting that these items could be kept in the model *(Table 5.5).*

Table 5.5: SECT rotated factor pattern

Rotated Factor Pattern - VARIMAX						
		Factor1	Factor2	Factor3	Factor4	Factor5
Q6	Q6	0.80384	0.02243	0.00306	0.23866	-0.16576
Q5	Q5	0.78794	0.09079	0.30497	0.17783	0.03404
Q25	Q25	0.78405	0.24282	0.07454	-0.04270	0.20687
Q3	Q3	0.71703	-0.02147	0.03592	0.07740	0.12128
Q22	Q22	0.65530	0.09418	0.04044	-0.05685	0.38377
Q21	Q21	0.55076	0.40257	0.18079	0.23052	0.36754
Q17	Q17	0.22652	0.77543	0.09675	-0.02780	0.02597
Q20	Q20	-0.13261	0.72999	0.19183	0.24550	0.26368
Q9	Q9	-0.01095	0.69621	0.29159	0.24948	-0.04605
Q7	Q7	0.14874	0.66558	-0.03788	0.13520	0.21200
Q18	Q18	0.12773	0.64576	0.45432	-0.06323	0.19214
Q16	Q16	0.47261	0.49393	0.15948	0.25624	0.09334
Q15	Q15	0.13823	0.45451	0.44376	0.18369	0.41684
Q2	Q2	0.21893	0.17757	0.79476	0.11166	-0.04501
Q8	Q8	-0.10073	0.25053	0.74426	0.10030	0.24056
Q1	Q1	0.16084	0.40783	0.61414	0.24883	0.10442
Q10	Q10	0.22583	0.16398	0.60239	0.45959	0.16965
Q4	Q4	0.30257	-0.14470	0.52336	0.43270	0.33416
Q14	Q14	-0.04474	0.22801	0.28553	0.78784	0.01213
Q13	Q13	0.19542	0.23320	-0.03074	0.76259	0.26248
Q11	Q11	0.02961	-0.02693	0.45680	0.74993	0.25683
Q12	Q12	0.43917	0.14864	0.09847	0.69725	0.02563
Q23	Q23	0.13014	0.14441	0.11534	0.20239	0.87463
Q24	Q24	0.19845	0.20772	0.16671	0.19987	0.85682
Q19	Q19	0.13212	0.54906	0.20202	0.01024	0.58361

On reviewing the multiple potential factor solutions, items that were problematic (low loading score, cross loading, freestanding) prompted the consideration of other factor solutions or, if the item was not meaningful, excluding them from further analysis. These questions were “I can teach registrars to determine their professional boundaries”(Q15) and “I can stimulate the registrar to learn areas of curriculum that don´t interest them”(Q16).

These two factors could potentially fit into other factor groupings if a slightly weaker item loading was accepted. However the cross loading did not clearly indicate which factor grouping would be a good fit. As this was just a pilot exploratory study, the researchers decided not to exclude these questions.

The communality for each item was calculated *(Table 5.6),* and all items except question 6 (I can correctly demonstrate clinical skills such as management of the patient consultation/interaction) showed values greater than the traditional recommended values of >0.4. Although there was a lower communality for item 6, it was the one with the highest loading (0.80 in factor 1). On the other hand, items 15 and 16, which had lower loading and cross-loading between the items, showed appropriate communality levels. Therefore, in general, the communality values indicated that the items were unique and made different contributions to the overall SECT instrument.

Table 5.6: SECT item communality

SECT	Item	Communality
Q1	I can correctly appraise the learning needs of registrars	0.66
Q2	I can write individualised learning objectives based on a registrar's unique situation	0.55
Q3	I can provide appropriate instructional content, based on a registrar's learning need.	0.37
Q4	I can select appropriate teaching strategies when encountering different registrar's needs	0.57
Q5	I can provide clinical instruction in a clear manner that registrars can understand.	0.60
Q6	I can correctly demonstrate clinical skills such as management of the patient consultation/interaction.	0.38
Q7	I have the ability to change the attitude/values of a registrar.	0.47
Q8	I can design teaching plans for registrars.	0.50
Q9	I have the ability to evaluate the effectiveness of a registrar's clinical and consulting efforts through direct observation.	0.52
Q10	I can refine teaching content and methods based on a registrar's learning needs and confounding factors.	0.68
Q11	I can prepare learning objectives across a registrar's area of development.	0.59
Q12	I can give instruction on strategies and resources in a registrar's area of development.	0.60
Q13	I can teach what the registrar needs to know	0.58
Q14	I am confident to teach an area that is not my expertise	0.52
Q15	I can teach registrars to determine their professional boundaries	0.69
Q16	I can stimulate the registrar to learn areas of curriculum that don't interest them	0.65
Q17	I can handle most difficult registrar questions or situations	0.49
Q18	I can tailor my feedback to be constructive and developmental	0.58
Q19	I can facilitate a positive clinical learning environment for the registrar	0.60
Q20	I can provide appropriate support for helping registrars learn and sustain work/life/family balance and personal wellbeing	0.55
Q21	I am effective in my clinical training	0.74
Q22	I am well organised and prepared for the in-practice teaching.	0.43
Q23	I am concerned for my registrars wellbeing	0.56
Q24	I actively encourage registrars learning and participation.	0.64
Q25	I give clear explanations to questions around clinical scenarios	0.53

The preconceived design that generated the SECT instrument involved three themed groups around self-efficacy of general teaching, of specific curriculum areas teaching and of the professional. In performing the EFA, these three themes were excluded to determine if other groupings could explain the theoretical construct better. Comparing the three themes with the EFA five factors, the items included in the first two factors did not agree with the pre-concieved grouping in the SECT tool (self-efficacy of general teaching, self-efficacy of specific curriculum areas teaching, and self-efficacy of the professional). The first factor included questions equally from the first (questions 3, 5, 6) and third group (questions 21, 22, 25). The

second factor also included questions from the first (questions 7 and 9) and the third group (questions 17, 18, 20). On the other hand, factor 3 included questions just from group 1 (questions 1, 2, 4, 8, 10), factor 4 just from group 2 (questions 11-14), and factor 5 from group 3 (questions 19, 23, 24).

When the factor analyses were repeated using oblique rotation (PROMAX), no substantial changes were observed in the five factor composition, and the proposed factors basically maintained the same items (*Table 5.7*, coloured yellow). There was still cross loading (coloured red in the same table) in the previous factor solution, indicating problematic questions 15 and 16. However, other cross-loading instances became apparent for extra items (questions 1, 4, 10, 11, 18, 19, 21). These results suggested that some correlation existed between the factors, and some of the questions in the SECT tool could explain more than one aspect of self-efficacy in clinical teaching.

Table 5.7: SECT Pilot – factor structure (correlations) – Promax

Factor Structure (Correlations) - PROMAX						
		Factor1	**Factor2**	**Factor3**	**Factor4**	**Factor5**
Q6	Q6	0.80352	0.10459	0.11608	0.32743	-0.00732
Q25	Q25	0.81378	0.35456	0.22239	0.12759	0.36048
Q5	Q5	0.82991	0.23537	0.43009	0.35064	0.23346
Q3	Q3	0.72332	0.08314	0.14066	0.19144	0.22889
Q22	Q22	0.68283	0.21402	0.17250	0.09296	0.47462
Q21	Q21	0.65367	0.54344	0.40577	0.41011	0.56249
Q17	Q17	0.30970	0.79263	0.25809	0.10281	0.21594
Q20	Q20	0.01052	0.77750	0.39087	0.35326	0.43246
Q9	Q9	0.10845	0.73118	0.44617	0.35768	0.16575
Q7	Q7	0.24485	0.69570	0.16255	0.23160	0.36023
Q18	Q18	0.23863	0.72791	0.57898	0.12618	0.38759
Q16	Q16	0.56405	0.58609	0.35813	0.40096	0.30829
Q2	Q2	0.30612	0.31489	0.82252	0.30011	0.16358
Q8	Q8	0.01904	0.38156	0.79462	0.27165	0.39352
Q1	Q1	0.28615	0.53668	0.73817	0.42825	0.32979
Q10	Q10	0.35241	0.33044	0.74049	0.62023	0.38009
Q4	Q4	0.40047	0.04715	0.63615	0.57637	0.47251
Q15	Q15	0.27457	0.59129	0.61748	0.36712	0.59640
Q14	Q14	0.09028	0.32228	0.46566	0.82898	0.19604
Q13	Q13	0.31955	0.33810	0.22636	0.80498	0.41508
Q11	Q11	0.16752	0.13741	0.61728	0.83472	0.41302
Q12	Q12	0.53307	0.26406	0.31032	0.76770	0.22105
Q23	Q23	0.24910	0.30387	0.32135	0.33838	0.92097
Q24	Q24	0.32507	0.37757	0.38579	0.35960	0.93368
Q19	Q19	0.25402	0.65567	0.39664	0.18058	0.71073

The factor analysis suggested for factors 3, 4, and 5 was similar to that proposed in the survey (which was constructed based on focal groups), but for factors 1 and 2, which explained more of the variability, there was a combination of items belonging to groups 1 and 3 from the survey. Nevertheless, it was also possible that this lack of a cleaner factor solution would be related to the sample included in the pilot study. Unfortunately, no information was obtained on demographic or other characteristics of the participants (such as years of teaching experience) to provide a more appropriate evaluation of the results.

The pilot results gave a preliminary overview and showed that the SECT instrument had very good reliability, with some evidence indicative of face and content validity. All 25 items were deemed consistent and valuable with the initial theoretical construct of self-efficacy. The exploratory factor analysis showed meaningful structure for five groups, across the 25-item SECT instrument, which was less consistent with the initial presumption of three themed domains in the SECT tool.

Based on this preliminary statistical analysis, a decision was made that no questions or items needed to be eliminated or changed from the SECT tool based on the results of the pilot study. This was further explored in a more comprehensive statistical analysis in the subsequent stages of the validation process.

Conclusion

The results of the preliminary statistical analysis of the pilot, with 37 clinical teachers and medical educators from around Australia, showed the initial SECT to be an appropriate measurement instrument of self-efficacy in clinical teachers. It showed very good reliability (Cronbach of 0.9257), internal consistency, item communality, with some evidence indicative of face validity, construct validity (factor analysis) and content validity (factor loading). This preliminary analysis suggested that in general the tool had good appropriateness, structure, item formulation and item order to retain the integrity of the initial SECT questionnaire. Nevertheless, further testing is indicated to explore issues like appropriateness of the questions, as well as further confirmation of content and dimensional validity.

Evaluation SECT data analysis

A second stage of development and evaluation of the SECT tool occurred in a larger and different sample.

Participants

The sample was selected from the Adelaide to Outback General Practice training (AOGP) network of GP supervisors. These GP supervisors were invited to participate because of their involvement as practising GPs across South Australia, and their role as clinical teachers and supervisors in postgraduate general practice training programs in Australia.

In 2012, there were 97 supervisors within the AOGP network of 64 accredited general practice training posts. Of these, 86 (88.7%) accepted an invitation to participate in the study.

The participants answered the SECT questionnaire (self-reported) and also provided information on some demographic and professional characteristics. The collected information included sex, university medical degree (Australian or international), postgraduate qualifications, location of teaching practice, years of clinical practice (after graduation), area of clinical interest, years of clinical teaching, area of teaching interest, main target focus of their clinical teaching and previous teaching professional development.

Methods

Before analysis, the data was screened for accuracy and missing values, and each survey item response pattern was checked for normality. Previous data from the SECT pilot was kept separate and not combined with this new data.

Similar statistical methods used in the pilot were used in this stage and the STATA statistical software (version 13.0) was also used to perform the analyses. Other additional analyses were included, such as the evaluation of the participants to item ratio, the sampling adequacy through calculation of a Kaiser-Meyer-Olkin measure[256] and the Bartlett test of sphericity.[257]

A review by Costello[255] on best practices in factor analysis indicated optimal statistical analysis could be achieved by:

- true factor analysis extraction(Maximium Likelihood or Principal Axis Factors),
- oblique rotation,
- eigenvalue scree plots,
- multiple test runs (3, 4, 5, 6 factors), and
- subject to item ratio (10-20:1).

Following Costello's recommendations,[255] the statistical analysis followed four steps:

- factor analysis extraction method of PFA,
- determining the clean factor structure,
- clarifying the factor structure by oblique rotation, and
- analysis of the strength, adequacy and correctness of the thematic groupings.

For this second stage of evaluation, confirmatory factor analysis (CFA) was performed instead of principal factor analysis. This method allows the researcher to test the hypothesis that a relationship between the observed interrelated variables and their underlying latent construct(s) exists (a factor solution). The researcher uses knowledge of the theory, empirical research, or both, postulates the relationship pattern *a priori* and then tests the hypothesis statistically.[251]

The dimensional validity is determined through the interpretation of the statistically significant factor groupings with the literature evidence. Oblique rotation was also used in the analysis, considering the expected correlation between the factors.

Results

For the second stage of evaluation, the characteristics of the population sample were analysed and results summarised in *Table 5.8*. Most of the participants were males, had finished their undergraduate course in an Australian university and obtained some type of postgraduate fellowship degree. The majority held a Fellowship of Royal Australian College of General Practitioners (FRACGP) or a Fellowship of the Australian College of Rural and Remote Medicine (FACRRM). The median duration of clinical practice was 23 years (interquartile range 15-29 years), with a median duration of clinical teaching being nine-and-a-half years (interquartile range six to 15 years). The principal location of teaching practice in

the sample was an urban area, with postgraduate registrars as the principal focus of teaching, followed by undergraduate medical students and pre-vocational doctors in general practice. The most common teaching professional development activities undertaken were Adelaide to Outback GP professional development, whilst participation in teaching development conferences or a university certificate was reported for less than 10% of the sample.

Table 5.8: Characteristics of the sample used to validate the questionnaire

	n	%
Gender		
Female	25	29.1
Male	61	70.9
University of medical degree		
Australia	71	82.6
Other	15	17.4
Have a fellowship (FACRRM* or FRACGP**)		
No	9	10.5
Yes	77	89.5
Number of years of clinical practice (mean 23 years, IQR 15-29)		
1-10 years	7	8.1
11-20 years	34	39.5
>20 years	45	52.3
Number of years of clinical teaching (mean 9.5 years, IQR 6-15)		
1-5 years	20	23.3
6-10 years	32	37.2
>10 years	34	39.5
Location of teaching practice		
Urban	52	60.5
Rural	34	39.5
Focus of teaching (N=86; % of yes)		
Postgraduate registrar		96.5
Pre-vocational doctor in general practice		25.6
Hospital based		7.0
Undergraduate medical		51.2
Undergraduate allied health		7.0
Professional development teacher activities undertaken		
AOGP training		68.2
Teaching development conferences		8.2
Teaching development university certificate		9.4

**FACRRM – Fellowship of Australian College of Rural and Remote Medicine*
***FRACGP – Fellowship of Royal Australian College of General Practitioners*

The population sample size was larger and different to the original SECT pilot. Considering the number of participants (86) and items in the SECT questionnaire (25), the subject participants to item ratio was 3.4:1.

From the raw data, calculations were made for each item's mean score and standard deviation *(Table 5.9).* Similar to the pilot SECT, this raw analysis indicated that all items were generally rated in the higher half of the seven-point Likert scale.

In this second stage of evaluation of SECT, the reliability was assessed and the Cronbach coefficient alpha was 0.95.

Table 5.9: Validation SECT items

Item	Mean Score	SD	Cronbach Alpha
Q1	5.0	1.0	0.95
Q2	4.6	1.2	0.95
Q3	5.2	0.9	0.95
Q4	4.9	1.0	0.95
Q5	5.6	0.8	0.95
Q6	5.7	0.8	0.95
Q7	4.8	1.2	0.95
Q8	4.7	1.3	0.95
Q9	5.5	0.9	0.95
Q10	5.0	1.1	0.95
Q11	4.7	1.1	0.95
Q12	4.9	1.2	0.95
Q13	5.2	0.9	0.95
Q14	4.3	1.2	0.95
Q15	5.2	1.2	0.95
Q16	4.7	1.2	0.95
Q17	5.1	1.1	0.95
Q18	5.4	0.9	0.95
Q19	5.7	0.8	0.95
Q20	5.5	1.2	0.95
Q21	5.3	0.8	0.95
Q22	4.9	1.3	0.95
Q23	6.3	0.7	0.95
Q24	6.0	0.8	0.95
Q25	5.8	0.8	0.95
SECT total			**0.95**

Using Kaiser's criteria, three factors obtained at an eigenvalue > 1 when orthogonal rotation was used, indicating that three factors could be explored, which explained the 86% of the total variance (*Table 5.10).* A similar result was observed when exploring the Cattel's scree graph to determine the point of a distinct elbow *(Figure 5.3).*

Table 5.10: SECT validation Eigenvalues

Factor Analysis	Eigenvalue	Difference	Proportion	Cumulative %
1	11.73028	10.26136	0.7002	70%
2	1.46892	0.27133	0.0877	79%
3	1.1976	0.5046	0.0715	86%
4	0.693	0.03465	0.0414	90%
5	0.65834	0.06718	0.0393	94%
6	0.59117	0.17433	0.0353	98%

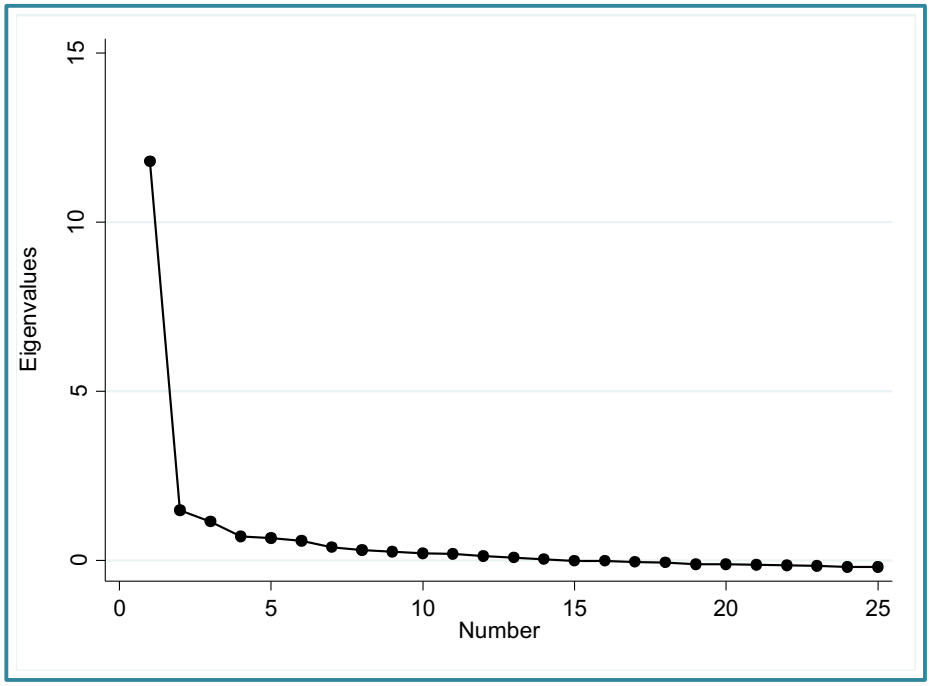


Figure 5.3: Screeplot after principal component analysis of the 25 self-efficacy items (results without rotation)

The three-factor solution was further tested by running multiple CFA with oblique rotation, and setting the number of factors to retain manually. Potential 3, 4, 5, 6 factor groupings were tested and examined by comparing the item loading tables for the cleanest factor structure. The cleanest factor structure was determined to be the three-factor solution.

Strong positive correlations were observed between the three factors *(Figure 5.4),* confirming that there was some correlation between the factors and that oblique rotation method was most suitable.

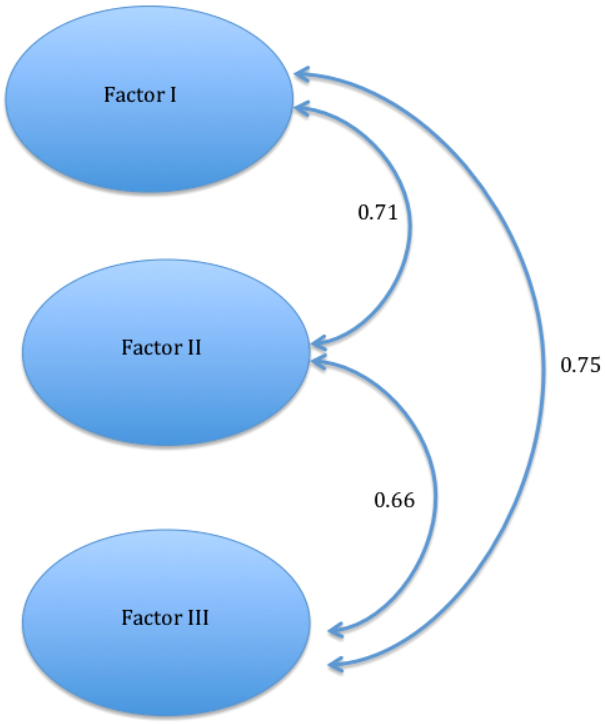


Figure 5.4: Intercorrelations of factorial structure

Statistical analysis of individual item loading and review of the correlation value of each item with a factor occurred *(Table 5.11).* The correlation matrix showed an excellent sampling adequacy, with a Kaiser-Meyer-Olkin Measure[256] of 0.91, which is higher than the recommended 0.60. The Bartlett test of sphericity[257] (p-value <0.001) suggested that the correlation matrix did not occur by chance, and all measures of sampling adequacy were deemed sufficient.

The three different factors obtained in the oblique rotation met the criteria for strong and consistent loading, as at least five items were included in each factor, with correspondent factor loadings ≥0.50 for each item. The percentage of factor loading variance explained by Factor I was 53.7%, Factor II was 49.2% and Factor III was 48.4%. The Kaiser-Meyer-Olkin[256] measure of sampling adequacy of 0.91 was rated in the original ranges as marvellous.

Table 5.11: Results of the factor analysis with oblique rotation to evaluate Self-Efficacy in Clinical Teaching (N=86)

Items	Mean(SD)	α	Factor loading			Communality	KMO
			1	2	3		
1. I can correctly appraise the learning needs of registrars	5.0(1.0)	0.95	0.697			0.615	0.92
2. I can write individualised learning objectives based on a registrar's unique situation	4.6(1.2)	0.95	0.605			0.702	0.89
3. I can provide appropriate instructional content, based on a registrar's learning need.	5.2(0.9)	0.95	0.597			0.653	0.93
4. I can select appropriate teaching strategies when encountering different registrar's needs	4.9(1.0)	0.95	0.777			0.767	0.91
5. I can provide clinical instruction in a clear manner that registrars can understand.	5.6(0.8)	0.95		0.565		0.504	0.87
6. I can correctly demonstrate clinical skills such as management of the patient consultation/interaction.	5.7(0.8)	0.95		0.781		0.591	0.91
7. I have the ability to change the attitude/values of a registrar.	4.8(1.2)	0.95			0.536	0.546	0.93
8. I can design teaching plans for registrars.	4.7(1.3)	0.95			0.751	0.588	0.89
9. I have the ability to evaluate the effectiveness of a registrar's clinical and consulting efforts through direct observation.	5.5(0.9)	0.95		0.514		0.423	0.93
10. I can refine teaching content and methods based on a registrar's learning needs and confounding factors.	5.0(1.1)	0.95	0.667			0.708	0.92
11. I can prepare learning objectives across a registrar's area of development.	4.7(1.1)	0.95			0.566	0.808	0.94
12. I can give instruction on strategies and resources in a registrar's area of development.	4.9(1.2)	0.95			0.696	0.560	0.89
13. I can teach what the registrar needs to know	5.2(0.9)	0.95	0.714			0.614	0.89
14. I am confident to teach an area that is not my expertise	4.3(1.2)	0.95	0.185	0.286	0.324	0.436	0.92
15. I can teach registrars to determine their professional boundaries	5.2(1.2)	0.95		0.552		0.647	0.88
16. I can stimulate the registrar to learn areas of curriculum that don't interest them	4.7(1.2)	0.95			0.503	0.477	0.92
17. I can handle most difficult registrar questions or situations	5.1(1.1)	0.95		0.538		0.558	0.95
18. I can tailor my feedback to be constructive and developmental	5.4(0.9)	0.95		0.580		0.541	0.90
19. I can facilitate a positive clinical learning environment for the registrar	5.7(0.8)	0.95	0.218	0.480	0.231	0.608	0.94
20. I can provide appropriate support for helping registrars learn and sustain work/life/family balance and personal wellbeing	5.5(1.2)	0.95			0.684	0.548	0.88
21. I am effective in my clinical training	5.3(0.8)	0.95	0.510			0.663	0.97
22. I am well organised and prepared for the in-practice teaching.	4.9(1.3)	0.95	0.647			0.495	0.93
23. I am concerned for my registrars wellbeing	6.3(0.7)	0.95		0.524		0.406	0.92
24. I actively encourage registrars learning and participation.	6.0(0.8)	0.95	0.126	0.448	0.411	0.445	0.89
25. I give clear explanations to questions around clinical scenarios	5.8(0.8)	0.95		0.667		0.496	0.87
Total scale performance		0.95	53.7*	49.2*	48.4*		0.91

Red indicates weak or crossloading problematic items

*α=Cronbach's Alpha; KMO=Kaiser-Meyer-Olkin measure of sampling adequacy; *=Total variance explained by the factor (in %)*

These results confirmed good reliability of the SECT instrument as there were uniform high item loadings (> 0.50), at least five items in each factor, and in general no cross-loadings were observed. Additionally, each item had a communality > 0.4, indicating their unique contribution to the instrument and that the SECT measurement had good internal consistency.

There were just three problematic items (highlighted in red in *Table 5.11*) due to weak or cross loading:

- item 14 *(I am confident to teach an area that is not my expertise)* had a weak load in each of the three factors (≤0.32),
- item 19 *(I can facilitate a positive clinical learning environment for the registrar)* had a weak load in Factors I and III, while Factor II showed only moderate loading, and
- item 24 *(I actively encourage registrars' learning and participation)* showed a weak loading in Factor I, with cross-loading for Factors II and III.

In the interest of finding a strong factor solution, it had been decided before analysis that any question with an item loading < 0.5 would not be used. For these reasons, these three items were excluded from further statistical analysis.

A global assessment of the correctness/incorrectness of the three factor structure was then conducted. The grouping and source wording of each item was reviewed from the original 25 SECT question statements to check that the meaning of each question made sense within the factor grouping:

- Factor I – (questions 1, 2, 3, 4, 10, 13, 21, 22),
- Factor II – (questions 5, 6, 9, 15, 17, 18, 23, 25), and
- Factor III – (questions 7, 8, 11, 12, 16, 20).

Thus, the three factors included items from the three groups of questions included in the original tool. Looking at the grouping of questions in each factor obtained after PCA, similar themes were identified and new names were attributed to all of them:

- Factor I – Customising Teaching to Learning Needs,
- Factor II – Teaching Prowess, and
- Factor III – Impact on Learner's Development.

These three thematic dimensions reflect what is found in literature and the practical experience of clinical teaching in general practice. This fits and resonates with the evidence

discussed about the qualities and attributes of an excellent clinical teacher *(see Chapter 2).* The impact on the learner in this new factor structure adds a new thematic dimension, which fits and integrates with the definition and theoretical construct of self-efficacy in the clinical teacher (*see Chapter 3)*.

A foundation of teaching knowledge and skills (prowess and customising) is required before self-efficacy can be most effective. Finally, the author's new definition of self-efficacy in the clinical teacher was "*the confidence and belief that their teaching will positively influence and impact on the learner in a clinical medical environment*". Significantly, the dimensions remain authentic to Bandura's outcome expectancy with an impact on the learner. This confirms that the SECT instrument has good dimensional validity, with the item loading for each factor being statistically robust, and the dimensional themes encompassing the self-efficacy phenomena.

For further analyses, the original answers to each questions were added up according to the corresponding factor (Factor I: questions 1, 2, 3, 4, 10, 13, 21, 22; Factor II: questions 5, 6, 9, 15, 17, 18, 23, 25; Factor III: questions 7, 8, 11, 12, 16, 20). The final resultant score in each factor was then re-scaled to generate scores ranging from 0 (the lowest) to 100 (the highest) to provide comparable variables.

Extreme group construct validity

Further evaluation of the construct validity of the instrument was through the comparison of the generated scores for each factor in extreme groups (*Table 5.12*). It was hypothesised that higher scores would be observed among those with a larger number of clinical teaching years and among those with a larger number of professional development teacher activities. A positive trend was observed for Factor I (customising teaching) and Factor II (teaching prowess) according to these two variables. Factor III (impact on learner) showed a positive trend just with the number of professional development teacher activities. As expected, the medical degree country, or having a fellowship, were not associated with the scores. The three scores were slightly higher among males, but no significant associations were found.

Table 5.12: Bivariate associations between some individual characteristics and the three factors of self-efficacy in clinical teaching

		Factor 1 IDENTIFYING LEARNING AND CUSTOMIZING TEACHING		Factor 2 TEACHING CONFIDENCE AND POSITIVE ENVIRONMENT		Factor 3 INTERPERSONAL – MOTIVATIONAL	
	n	Mean (SD)	p-value*	Mean (SD)	p-value*	Mean (SD)	p-value*
Overall	**86**	**71.5(12.0)**		**79.8(9.5)**		**69.8(13.3)**	
Sex							
Female	25	68.3(12.8)	0.115	76.7(10.5)	0.054	68.1(15.5)	0.461
Male	61	72.8(11.5)		81.0(8.9)		70.4(12.3)	
University of medical degree							
Australia	71	71.2(12.1)	0.624	80.0(9.8)	0.655	69.5(13.4)	0.741
Other	15	72.9(11.7)		78.8(8.3)		70.8(12.8)	
Have a fellowship (FACRRM or FRACGP)							
No	9	68.8(9.7)	0.491	76.4(11.4)	0.265	66.7(8.7)	0.464
Yes	77	71.8(12.2)		80.1(9.3)		70.1(13.7)	
Number of years of clinical teaching							
1-5 years	20	66.8(9.4)	0.062**	75.1(6.8)	0.024**	67.1(11.7)	0.817**
6-10 years	32	72.3(13.3)		80.7(10.8)		72.3(12.1)	
>10 years	34	73.4(11.5)		81.6(8.9)		68.9(15.0)	

* t-test *** ANOVA test for trend

** t-test *** ANOVA test for trend*

a – including *Outback GP training, teaching development conferences, teaching development university certificate, and other professional development teacher activities*

Discussion

"The evaluation of clinical teaching is a vitally important endeavour."[258](p862) High quality clinical teaching can only be achieved with the assistance of competent and confident teachers, who are appropriately trained, supported and resourced. To assess the quality of clinical teachers and their competencies, there needs to be appropriate, reliable and validated measurement instruments. It is important that these instruments adhere to good measurement properties.[259] To ensure excellent evaluation of clinical teaching, attention must be given to key fundamental evaluation principles:[258]

- clearly define and articulate the evaluation goals, aiming for high levels of validity, reliability, feasibility and efficiency,
- ensure the evaluation is consistent with the environmental context, organisational culture and educational framework by including perspectives of others beyond the learner,
- through clinical teacher input, seek acceptance and ownership in the evaluation process, measurement development and feedback, and respect confidentiality,
- ensure evaluation of attributes are related to all the doctor roles or domains of clinical teaching, and
- plan a systematic investigation into links between the quality of teaching and potential outcomes (e.g. educational process, teacher's perspective or performance, student's learning, better health care practice).

The design and development of the Self-Efficacy in Clinical Teaching (SECT) instrument followed these key evaluation principles. The goal of the evaluation was clearly expressed, to help doctors become better clinical teachers by providing reliable and relevant feedback on their clinical teaching strengths and weaknesses that fits within their general practice context and peer agreed competencies. Planned pilot and validation testing, using robust statistical analysis, showed the SECT to have excellent reliability and good validity, was easy to use, and provided useful information. From the embryonic beginnings, groups of GPs, clinical teachers and medical educators accepted, participated and contributed to the development and testing of the SECT. The SECT related to the doctor's domains of clinical teaching identified by earlier literature and refined by Australian clinical teachers. A subsequent use of the SECT using repeated measures over 12 months, in the self-efficacy intervention, provided an exploratory investigation into the links between self-efficacy in clinical teaching, the authentic quality of the instrument and potential outcomes.

Fluit's[236] systematic review identified the existing instruments used for assessing clinical teachers for their content (what they measured) and quality (how well they measured). Given the large amount of clinical teaching that occurs in universities and postgraduate medical training around the world, and the complexity of clinical teaching, the 32 instruments identified in this systematic review is a relatively low number. The authors concluded that no published instrument covered all the relevant aspects of teaching and only a third of the measurements reflected the CanMEDS competency framework.[(259)] Most commonly, the instruments were limited to teaching skills, supportive learning environments and giving feedback. None of these existing clinical teacher assessments measured self-efficacy of the clinical teacher. To address this international need and to progress the research into quality of teaching, a new instrument to measure Self-Efficacy in Clinical Teaching (SECT) was conceived.

This assessment also needed to be authentic to the context of self-efficacy and relevant to clinical teaching in general practice. Unlike existing measurements of clinical teachers that were based in hospital inpatient settings,[(259)] a strength of this research was that it involved a relatively homogenous group of clinical teachers primarily working in community based general practice.

Clinical teaching is complex, so it is unlikely that a single instrument could successfully measure teaching competency, behaviours and learner outcomes across a diverse range of educational settings.[(260)] Design of the SECT included linkages to the domains of clinical teaching. The self-efficacy intervention included features to analyse the association among self-efficacy, quality of clinical teaching, learner experience and teacher performance.

Validity criteria

Beckman emphasised the importance for consistency in statistical analyses of measurement instruments designed to assess clinical teachers.[(261)] Existing instruments emphasised an instrument's internal structure validity by demonstrating dimensionality (using factor analysis) and internal consistency of teaching domains (using Cronbach's coefficient alpha). In the development and evaluation of SECT, an attempt was made to broaden the construct and content validity by collecting evidence from a range of sources.[(262)] This followed the model of standards published by the American Psychological and Education Research Associations which distinguished five sources of validity:[(263)]

- content – SECT underpinned by the theory of effective apprenticeship learning,

- response process – analysing the responses elicited by asking the participants to articulate their thought processes during completion of the instrument response (e.g. wording, order, ease of use, adequacy of scoring, reporting),
- internal structure – reliability and factor analysis, (i.e. the unidimensionality of the subscales, reliability of the scores, and statistical and psychometric characteristics of the instrument),
- relations to other variables (e.g. correlations with other clinical teaching elements like global rating, supervision time), and
- consequences – the effect of the use of an instrument on those being evaluated.

SECT evaluated the validity using all of the above sources, and attempted to triangulate against other variables, but no positive correlations were demonstrated. This may be due to the small numbers analysed. There are no established instruments to measure self-efficacy in the clinical teacher. This makes it impossible to assess the SECT measurement tool against a current gold standard of self-efficacy measurement as a usual method to confirm validity. This lack of comparison and convergence between this new measure and established instruments does not indicate that the validity of SECT is problematic, provided that the appropriate standards and statistical methods around validity have been followed.

As discussed earlier, the five sources of validity were followed and the first four statistically analysed. Furthermore, the fifth source of validity was explored, with subsequent evaluation of the consequences of using the instrument, through the innovative intervention to develop self-efficacy in clinical teachers (full details in *Chapter 7*). Control and intervention participants in that study had a longitudinal follow-up of over 12 months. Their repeated use of the same SECT survey showed a non-statistically significant increase in their self reported SECT score and average over 12 months. This response by the participants from repeated use of the SECT tool could indicate that merely doing the SECT survey increased their familiarity or understanding of the influence of self-efficacy in the clinical teacher. The participant responses and consequences, as sources of validity, could be further researched through participant semi-structured interviews and thematically evaluated.

Following Abell's[252] approach, some evidence indicating elements of validity was shown: face validity, content validity and convergent construct validity. For the participants in the focus group, the pilot and the subsequent study, SECT was easy to read, use, understand and "looked like" it measured self-efficacy as an indicator of face validity. The items of the SECT tool indicated content validity as they were "relevant to and representative of the targeted (self-efficacy) construct for a particular assessment purpose."[264][p238] The variables that were intended to correlate with the scale score did so, indicating evidence for convergent

construct validity. The majority of items showed high communality, where each separate item contributed to the self-efficacy construct and overall SECT measurement tool slightly differently, uniquely and significantly.

From the expert focus group, initial content and face validity phase, three dimensions were identified as important in the SECT design. This resulted in the grouping of questions under three sub-titles – the self- efficacy of general teaching, of specific curriculum area teaching and of the professional. The pilot testing and preliminary factor analysis of SECT did not support the focus groups' presumed thematic grouping.

Through a larger and focused GP clinical teacher participant sample (P:I ratio 3.4:1) in the validation SECT study, a three-dimensional scale was demonstrated. These dimensions included:

- customised teaching,
- teaching prowess, and
- impact on learner's development.

In the original SECT, the items were grouped based on the proposed three thematic dimensions of the expert focus group. Through this evaluation process, three item questions were excluded and the remaining items were grouped into three dimensions based on factor analysis. The result was a robust SECT tool, with three dimensions that fitted the theoretical construct for self-efficacy of the clinical teacher. The final instrument tool was reformulated based on the initial validation process and the 22-questions SECT tool; the new dimensions is presented in *Figure 5.5*.

One of the questions excluded, item 14 *(I am confident to teach an area that is not my expertise),* on face value would appear, through use of the term confident, to be the item statement most closely related to self-efficacy.

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SECT – a Self-Efficacy in Clinical Teacher Tool

Please rate yourself, circling a number, using a scale of 1 to 7, where 1 is least confident and 7 is most confident.

Note – Registrar, trainee or student on clinical placement is interchangeable.

Customising Teaching to Learning Needs

I can correctly appraise the learning needs of registrars	1 2 3 4 5 6 7
I can write individualised learning objectives based on a registrar's unique situation.	1 2 3 4 5 6 7
I can provide appropriate instructional content, based on a registrar's learning need.	1 2 3 4 5 6 7
I can select appropriate teaching strategies when encountering different registrar's needs.	1 2 3 4 5 6 7
I can refine teaching content and methods based on a registrar's learning needs and confounding factors.	1 2 3 4 5 6 7
I can teach what the registrar needs to know.	1 2 3 4 5 6 7
I am effective in my clinical training	1 2 3 4 5 6 7
I am well organised and prepared for the in-practice teaching.	1 2 3 4 5 6 7

Teaching Prowess

I can provide clinical instruction in a clear manner that registrars can understand.	1 2 3 4 5 6 7
I can correctly demonstrate clinical skills such as management of the patient consultation/interaction.	1 2 3 4 5 6 7
I have the ability to evaluate the effectiveness of a registrar's clinical and consulting efforts through direct observation.	1 2 3 4 5 6 7
I can teach registrars to determine their professional boundaries	1 2 3 4 5 6 7
I can handle most difficult registrar questions or situations.	1 2 3 4 5 6 7
I give clear explanations to questions around clinical scenarios.	1 2 3 4 5 6 7
I can tailor my feedback to be constructive and developmental.	1 2 3 4 5 6 7
I am concerned for my registrars wellbeing	1 2 3 4 5 6 7

Impact on Learner's Development

I have the ability to change the attitude/values of a registrar.	1 2 3 4 5 6 7
I can design teaching plans for registrars.	1 2 3 4 5 6 7
I can prepare learning objectives across a registrar's area of development.	1 2 3 4 5 6 7
I can give instruction on strategies and resources in a registrar's area of development.	1 2 3 4 5 6 7
I can stimulate the registrar to learn areas of curriculum that don't interest them.	1 2 3 4 5 6 7
I can provide appropriate support for helping registrars learn and sustain work/life/family balance and personal wellbeing.	1 2 3 4 5 6 7

Figure 5.5: Validated SECT tool 2016[265]

Limitations

It is important to consider that the development of the SECT instrument and self-efficacy intervention represented both new and exploratory research. Rather than research being perfect, it is a research enquiry. Limitations occurred, and a variety of limitations were identified.

Historically, the assessment of clinical teachers in postgraduate education has often been based on questionnaires, usually completed by the learner (e.g. junior hospital doctors).[235] Evidence gained from the learner's perspective about clinical teaching in hospitals has shown that these junior doctors tend to rate their teachers very highly.[(262)] In the rating scales of data, like the End of Semester Appraisal (EOSA), this can have a ceiling effect, where the majority of responses are near the maximum score and so cannot be improved. The raw data from this research showed that the spread of responses were in the higher score range, indicating a ceiling effect. The EOSA was the evidence used of the learner's experience and observation to indicate the quality of teaching and supervisor qualities. This was based only a single registrar's learner reported observations. There was no distinction made between a registrar learner being at an early or late stage in their GP training. This could have potentially influenced their expectations of the clinical teacher's involvement. A major limitation was the assumption that the EOSA was a proxy indicator of the clinical teacher's performance, qualities or quality of teaching.

The use of a questionnaire survey tool (SECT) for the clinical teacher to self-report their own self-efficacy in clinical teaching is appropriate for beliefs and attitudes.[(136)] Although the accuracy of self-assessment lacks a solid evidence basis, there is some evidence that it can be enhanced by feedback, explicit assessment criteria and benchmarking guidance.[(266)]

Overconfidence can lead to overestimation of abilities, and one study linked overconfidence as a cause of physician diagnostic errors.[(267)] This fits with a wider study that showed that the accuracy of physician self-assessment, compared to observed measures of competence, appears to be limited.[(268)] Potentially, the use of SECT in cases where the person who rates themselves very highly may assist their training organisation and teaching faculty to recognise and address the overconfidence.

This study's participant: item ratio of 3.4:1 is a possible limitation of size, though very strong criteria were used, including factor loading > 0.50 and at least five items per factor. There was a difference between the original structure of the 25-item instrument and the final validated 22-item SECT, with some amendments to the thematic grouping. The small size of

the expert group and its influence on the formulation of the original item statements could be a possible limitation. The wording of the item statements could also be a possible limitation. As item 14 was excluded, it appears that the use of the word "confident" in item statements could be misleading or inappropriate.

The complexity of self-efficacy in the clinical teacher means that confirming the validity of the SECT tool is difficult. Due to lack of an international measurement of self-efficacy, it is not possible to absolutely prove it is measuring self-efficacy in the clinical teacher and show the evidence for criterion validity. There is no established and absolute "gold standard" measurement to serve as an external reference point for the new SECT tool to be comparatively assessed, and for it to adequately match or replace. The predictive element of validity is also an area for further research.

The preconceived design that generated the SECT instrument involved three themed groups around self-efficacy of general teaching, of specific curriculum areas teaching and of the professional. On reflection, these three themes were chosen more for ease of readability and page style, following the template of a previous survey (SEAT),[(156)] rather than based on a theoretical construct. This explains why these three themes were discarded in the pilot SECT and an EFA used – as an attempt to discover more meaningful groupings in the five factor solution. It was clear in the second phase of evaluation, in a larger participant sample with a greater cumulative variance of 86%, that a three-factor solution was most appropriate for further confirmatory factor analysis. The lack of consistency in theoretical construct, from the preconceived three themes in the SECT design to the EFA five factor solution, to the final three-factor solution indicated in the more detailed CFA testing, could be viewed as a limitation. However, "content validation of an assessment instrument unavoidably involves validation, and sometimes refinement, of the targeted construct".[(264)(p239)] This "varies depending on how precisely the construct is defined and the degree to which 'experts' agree about the domain and facets of the construct".[(264)(p239)] This study has addressed a topic previously not internationally researched, and laid the foundation for further validation of the three dimensional SECT construct and measurement by CFA.

The lack of demographic information and characteristics about the participants in the pilot study could be a source of difference between the pilot and validation study. The characteristics of the validation study participants showed the majority to be male GPs, Australian university trained, with over 20 years of clinical practice experience, teaching

postgraduate registrars. A potential limitation is whether the proposed new SECT instrument can be used in other scenarios and populations in Australia or internationally.

Implications

Clinical teaching is complex. There are different requirements for clinical teaching in hospital in-patient and community based general practice. Further research could focus on approaches that are learner-centric, teacher-centric, on the organisation, on the teaching faculty or the professional development programs.

Of interest to the learner is whether self-efficacy is influenced by various elements, such as their perception of the self-efficacy of the clinical teacher, the teacher's SECT score, and the development of their own self-efficacy beliefs. Clinical teaching needs vary based on differing learner levels. This research used evidence from the same learner present for 12 months with an individual GP supervisor clinical teacher. Multiple student learners completing the same SECT-like questionnaire in relation to the one clinical teacher would provide more information. A study in veterinary science clinical teachers showed that to achieve reliable factor results on the dimensions of clinical teaching, there needed to be between 10-12 students for each factor, and to obtain a reliable global assessment of clinical teaching, there needed six to eight student responses.[201]

Further research is recommended regarding the consequences of self-efficacy, teachers' perceptions, clinical teaching dimensions and ultimately performance. This aligns with the fifth source of validity evidence discussed earlier: evaluating the consequences of doing the SECT survey on the clinical teachers (e.g. through semi-structured interviews.) This could focus on the perceived value of the SECT, impact on motivation or the influence the SECT has on their clinical teaching behaviour. Stalmeijer's[198] findings indicated that the clinical teacher dimensions of scaffolding, reflection and exploration can be only properly evaluated in longer placements with the one clinical supervisor.

A recommendation is that further evaluation using CFA is performed to confirm the three dimensional theoretical construct of the SECT tool. This will also provide further evidence around elements of construct and predictive validity. Further studies using the SECT are also required to explore associations with validated measures of clinical teacher performance. Multi-source assessment that incorporates peers and learner ratings, direct observation of performance, simulated scenarios, videotaped clinical teaching sessions and objective structured teaching encounters (e.g. OSTE) are required.

For this triangulation of evidence to effectively occur, it is recommended that both the self-efficacy and competency research arms follow an established competency based framework and that clinical teacher assessment is conducted across all the CanMEDS roles and Australian domains of teaching. Use of validated clinical teaching measurements, like the CTAI (rather than the MCTQ), is recommended, as it measures competencies that clearly align with the CanMEDS roles.

Self-assessment is integral in licensing and professional development requirements of many medical professional organisations. General practitioners and clinical students are increasingly expected to identify their own learning needs through self-assessment. The use of self-reporting surveys on self-efficacy, like SECT, in combination with other qualitative and quantitative measures can inform professional development programs and improve learning and professional clinical practice.[266]

Longitudinal research is indicated to study the impact of the SECT measure on the clinical teacher's awareness of the construct of self-efficacy, the effectiveness in improving clinical teaching behaviour and long term impacts on elements of teaching or learning outcomes. Further reliability and validity of the SECT tool can be determined by the longitudinal use and test-retesting of participants. Interventions targeting self-efficacy and the use of extreme groups can also build the evidence on the elements of construct and criterion validity.

The unique cultures and settings of clinical teaching across multiple learner levels, varied training organisational structures and geographically diverse clinical practices, ranging from hospital to remote Aboriginal health clinics, may ultimately limit the generalisability of even the most carefully designed instruments.[261] The generalisability of the SECT across this diversity of clinical teaching cannot be assumed and warrants further research.

Summary

The second stage of evaluation in a larger and different population of the SECT tool[265] demonstrated better reliability (Cronbach´s alpha 0.95) and internal consistency (communality > 0.4). This initial evaluation study comfirmed a three-factor solution with evidence indicative of face, content, construct and dimensional validity. Three dimensions or themes were identified as important to the measurement of self-efficacy in the clinical teacher which are authentic to the phenomenon of self-efficacy.

These are:

- customised teaching,
- teaching prowess, and
- impact on the learner.

An authentic and accurate measurement of clinical teacher self-efficacy is essential for the further exploration and evaluation of interventions that develop the clinical teacher's self-efficacy, competency and performance.

CHAPTER 6: MENTAL IMAGERY AND SELF-EFFICACY

Introduction

Mental imagery is "the process of imaging the performance of a skill with no related overt actions."[269][3] It is further described as a mental experience that replicates a real experience.[270] In its purest form mental practice is the cognitive rehearsal of a task without overt physical movement.[271] Mental practice may involve exercises such as thinking about the procedure or activity, in full or in parts.[272] It can involve different imagery techniques, with the purpose of maximising equivalence to the real physical environment, like visualisation of the teaching situation, the nature of the learner, or using imagery scripts.

There is an array of various other terms that have been used interchangeably with mental imagery, including synonyms like visualisation, mental practice, mental rehearsal and mental training. Schuster[273] found that systematic searching of the mental imagery literature was constrained by the lack of a MeSH term in PubMED. Mental imagery is the umbrella term best suited for the various mental synonyms mentioned above.

Mental imagery has been widely used across the disciplines of psychology, sport, music, education and medicine over the last 30 years, with recommendations around best practice.[273] An author's simple observation of a small boy playing with a balloon was the catalyst for the hypothesis that mental imagery can build self-efficacy, and influence subsequent performance. This small boy was observed to be commentating on his visualised task, with his non-preferred left foot simulated kicking of the balloon through the doorway 'goal' from an extremely difficult angle. Two days later this same boy was observed in a real football match to replicate the same left foot kicking task from the similarly extremely difficult angle to score the goal.

Mental Imagery in Sport

In sports psychology there is accepted evidence and understanding that mental practice can accelerate learning, improve motor skills, and improve performance.[274] Mental imagery has been found to improve the performance of olympic athletes,[275] basketballers,[276] gymnasts,[270] tennis players,[277] rugby players[278] and golfers.[279] Mental imagery is effective for both novice and expert athletes and has been found to distinguish between the elite and non-elite athlete.[218] Robin showed that tennis players who were better at mental imagery

experienced greater improvements in their tennis serve return accuracy following a mental imagery intervention compared to those with lower imagery ability.[277]

Evidence of the significant impact of mental practice in contemporary professional sport abounds. One has only to remember the final of the 2003 Rugby world cup, between England and Australia, at Telstra Stadium in Sydney before a crowd greater than 82,000 people. Scores were tied at fulltime, tied after extra time 17-17 and with 30 seconds to play, Jonny Wilkinson kicked a 25 metre drop goal to win the game for England. In his autobiography, Jonny explains that it was visualisation, mental rehearsing, goal setting and positive self-talk that were pivotal to his success. His kicking approach in précis form was to "imagine the path you are sending the ball down, visualize the feel of the ball, the contact, the successful outcome."[278] (p34)

The world's best golfer in 2015, Rory McIlroy confessed in a media interview the most significant turning point in his career came after his spectacular implosion, when he squandered a four-shot lead at the 2011 US golfing masters on the famous Augusta golf course. He explained his mental strategy involved relaxing between his golf shots to ease the intensity and pressure.

> "Only as I approach the ball do I switch back on……to consider the shot in hand, pull the club from the bag, and visualize….. I create a picture of the flight of the ball, seeing in my mind what the ball is going to do. And then the final piece is to strike it."[280](p16)

Golfers often credit the benefit of mental rehearsal for an improvement in their putting technique and scorecard.[281]

An overview of the uses of mental imagery in athletics by Jones[274] provides evidence of mental imagery being effective and enhancing athletic performance:

- as a sole approach,
- when combined with other cognitive techniques like relaxation, stress inoculation, goal setting and audio playbacks of successful performance routines,
- when combined with physical practice,
- with visuomotor behavioural rehearsal, and
- by increasing or decreasing the athletes level of physiological arousal.

Mental imagery compared to other psyching-up techniques, like self-talk, was found to be of equal or greater effectiveness to increase physiological arousal. Use of mental imagery for relaxation is widely accepted to lessen physiological arousal of performance anxiety. This indicates that mental imagery may fulfil the source of self-efficacy around physiological and affective arousal by enabling individuals to experience optimal activation levels.[282]

There is however a significant difference in effectiveness of mental practice between novice and elite athletes.[283] This indicates that mental practice, although beneficial for learning new skills among inexperience athletes, is more beneficial for athletes with some ability and previous experience.

The majority of the empirical evidence around mental imagery interventions comes from case studies. Tennis players who participated in mental imagery training had a significantly higher self-confidence than players who did not.[284] Perhaps mental imagery increases self-confidence by being used as a form of positive affirmation. This fits with Bandura's construct of self-efficacy[25] that when people visualise themselves executing activities skilfully, it raises their perceived belief that they will be able to perform better. Nordin[285] reported increased self-efficacy and performance using mental imagery in dart throws.

PETTLEP framework

The PETTLEP framework[286] was devised to facilitate mental imagery interventions for athletes. It comprises seven components (physical, environment, task, timing, learning, emotion and perspective). This relates to the physical position of the individual, the environment that has to be imagined, the task involved, the timing or duration of the imagery, the learning or changes involved in the imagery, the emotions associated with the task and the imagery perspective. Incorporating the PETTLEP framework into mental imagery use improved sporting performance more effectively that traditional imagery use. [286]

Evidence also showed the significant benefit of pre-competition positive mental imagery and giving self-instruction in the accuracy and improved performance of the tennis serve.[287] Immediately before the serve, the players were taught two mental imagery scripts – a self-instruction and/or a visualisation of the whole serve. The list of self-instructions included:

- see the target zone,
- line up toes,
- toss the ball to contact height,
- straight toss,

- bend (coil),
- see the ball,
- reach up (uncoil),
- contact the ball, and
- other self-instruction of own choice.

Both mental imagery techniques were commonly used and both resulted in better tennis serves. The equivalence in effect of positive imagery and self-instructions is similar to the results of Kornspan's study of golf putting.[288]

Cooley's[289] systematic review showed that there were wide methodological variations in mental imagery interventions used in sport, indicating that that the use of mental imagery and imagery scripts or instructions is widespread.

Unfortunately mental imagery research has suffered from lack of clearly defined terminology, interchangeable use of mental training techniques and lack of a framework consensus in the design and measure of mental imagery interventions to guide further research. The use of mental imagery for motor learning has long been used with success in enhancing the performance of elite athletes. Literature on mental imagery in sport indicates that use of visualisation, self-talk, relaxation exercises, mental rehearsing and instruction scripts could be used to design an intervention to develop self-efficacy and task performance.

Mental imagery in medicine

Research from sports psychology has been adapted, for mental imagery use in medicine, particularly in rehabilitation following a neurological event such as a stroke.[290] Mental imagery is a process in which a function, behaviour or task is mentally rehearsed, as if it is actually being performed by the person. For stroke victims relearning a motor movement or activity of daily living, it is thought that mental imagery works by gathering information from memory and undergoing the experience of seeing the motor or activity performance with the mind's eye. Liu[290] recommended a protocol for the use of mental imagery in training stroke patients that involved nine steps *(Table 6.1).*

Table 6.1: Liu Experimental protocol for use of mental imagery[290] [p1404]

Task analysis enhancement	1. Show patient the beginning and ending steps 2. Get patient to identify the steps in the task through mentally imagining the task 3. Present patient with randomly sequenced picture cards 4. Get patient to rearrange the picture cards into the correct sequence
Problem identification	5. Get patient to visualize his/her own performance with the help of the picture cards, which are in the correct sequence 6. Get patient to identify the problems encountered and solutions in each step by going through the mental process
Task performance	7. Get patient to imagine his/her own task performance with the rectified steps 8. Get patient to actually perform the task and videotape the performance 9. Get patient to evaluate the performance on the videotape to adjust the problems and solutions Repeat steps 6–9 until patient learns the tasks with the proper method

The performance and orchestration of fine and gross motor skills in a time and environmentally pressured environment has led to analogies between sports and surgery. Expert surgical performance can be viewed as similar to an elite athletes performance. The literature discusses what could be learnt from the cognitive psychology training strategies employed by elite athletes and applying it to surgical training.[219] This has led to some researchers using the term – mental practice – a systematic use of mental imagery to "see" and "feel" an action in one's imagination without engaging in the actual physical movements involved.[291] The use of synonyms in definitions illustrates the interchangeable use of the terms.

Hall[218] concluded that (mental) imagery practice provides a mechanism for the explicit learning of surgical skills. Explicit learning requires a conscious and concerted effort to learn a task, whereas implicit learning is a non-episodic learning of information, in an incidental manner without an awareness of what has been learned.

> *"Knowing how to perform an operation requires more than simply knowing the steps involved. For example, the perceptual information gained from previous performances is paramount in how we plan and execute future motor movements*

(e.g. how to move your wrist and hand to rotate a suture when closing an incision).”[219] (p266)

“Mental training is the process of rigorously mentally rehearsing the movements of a task and can be likened to using the mind as a simulator.”[188] (p544) This involves initial identification and familiarisation of a script of sequential steps to the operation, including as many sensory cues as possible. The trainee visualises the operation of others or himself and then mentally performs the operation using the mental imagery script. Relaxation exercises are carried out before starting the process to reduce stress and optimise concentration and mental readiness. Using this “mind’s eye” approach, Eldred-Evans[188] showed that additional mental training led to improved laparoscopic skill development and concluded that mental training is an important adjunct to surgical education.

Mental training in surgical training

When applying mental training to surgical education, various studies have shown improved self-efficacy and performance of the novice surgical procedural learners. In second year medical students, the use of mental imagery rehearsal of incision and suturing procedures produced better surgical performance on a live anaesthetised rabbit, than studying the steps in a textbook.[247] This study identified that for novice learners, there needs to be some initial degree of physical practice of making incisions, forming sutures and tying knots. This indicates that for a novice learner, mental practice cannot replace physical practice of the new skill, but is a beneficial supplement. Sanders[247] concluded that initial physical practice followed by mental imagery rehearsal maybe a cost effective method of training medical students when learning basic surgical skills.

For learning more complex minimally invasive surgical tasks, mental imagery has been included in training in cystoscopy,[187] cricothyrotomy,[292] vaginal hysterectomy[186] and laparoscopic surgical skills.[248] Based on a RCT it was evident that novice surgeons who used preoperative mental imagery had a significantly better surgical performance score and were better prepared, but showed no different operative times in doing their first cystoscopy.[187] Another study showed that the combined use of cognitive task analysis, kinesiology (hands on practice) and mental imagery in cricothryotomy training improved the short term acquisition of this specific skill.[292]

In a multicentred RCT, Geoffrion[186] researched the use of mental imagery for learning vaginal hysterectomies by novice surgeons. There was a small and statistically insignificant improvement in the objective surgical performance of novice gynaecological surgeons after

mental imagery, though others have disputed the validity of this result due to lack of measure of imagery ability and imagery script compliance.[293] The mental imagery intervention did show that the self-confidence ratings significantly improved. [186]

In a study by Arora[243] on novice and experienced surgeons learning laparoscopic cholecystectomy skills, various elements of mental imagery were used. These included: a relaxation exercise, viewing a video of an expert performance with talkover, and learning and verbalising a mental practice script of step by step instructions for the procedure. The study results showed that experienced surgeons scored significantly higher than novices in all aspects of mental imagery before the training. [243] Both the novice and experienced surgeons performed better after the mental practice training. This study also validated the use of a Mental Imagery Questionnaire (MIQ) for the assessment of quality of mental imagery in surgical settings *(Table 6.2).*

Table 6.2: Arora Mental Imagery Questionnaire[243][p181]

	1 = not at all	2	3	4	5	6	7 = very much
1. How ready or "energised" do you feel to carry out a laparoscopic cholecystectomy?	1	2	3	4	5	6	7
2. How confident do you feel to carry out a laparoscopic cholecystectomy?	1	2	3	4	5	6	7
3. How well do you think you can perform a laparoscopic cholecystectomy compared to others at your stage?	1	2	3	4	5	6	7
4. How helpful is the activity you have just been performing in preparing you to perform a laparoscopic cholecystectomy?	1	2	3	4	5	6	7
5. How easily can you "see" yourself performing a laparoscopic cholecystectomy?	1	2	3	4	5	6	7
6. How vivid and clear are the images of a laparoscopic cholecystectomy in your mind?	1	2	3	4	5	6	7
7. How easily can you "feel" yourself performing a laparoscopic cholecystectomy?	1	2	3	4	5	6	7
8. How easily would you be able to talk someone through the steps of a laparoscopic cholecystectomy?	1	2	3	4	5	6	7

Note: Laparoscopic cholecystectomy is used as an illustration. The name of the procedure of interest, depending on the focus of the assessment or training, should be used in the form.

For the experienced and expert surgeon, the nature of mental imagery used to optimise their performance may be different to the novice learner. This could involve transferring skills from an established technique, maintaining professional competency, preoperative preparation, mental readiness or management of stress or anxiety.[218]

Immenroth[294] evaluated the effect in a RCT of mental practice among a group of experienced surgeons learning a new surgical procedure (laparoscopic cholecystectomy). The

90-minute mental training involved a short relaxation exercise, a script (breaking the procedure down into steps with specific phrasing and sequenced instructions), visualisation of the operation and a talk through.

The mental training resulted in greater improvement in the cognitive aspects of the laparoscopic cholecystectomy, reflected in the task-specific checklist, and a positive but lesser impact on the motor components. The addition of this mental training was more effective than additional simulated practical training in laparoscopic cholecystectomy, and was easily delivered, convenient and more cost effective.

McDonald[295] investigated mental strategies related to surgical performance excellence and found that expert surgeons identified mental readiness as more important than psychomotor readiness. Their descriptions of strategies to be "mentally ready" included high self-belief, positive thinking, positive mental imagery (envisioning good outcomes with minimal complications) and having a "game plan".

The evidence that mental imagery is an effective stress management tool for surgeons[296] reflects the wider literature in sports psychology. Wetzel[297] specifically showed the benefit of mental rehearsal on the coping strategies and stress reduction in a RCT of stress management training for surgeons during simulated surgery. These surgeons reported improved decision making under stress, enhanced mental rehearsal skills and increased confidence in managing surgical crises.

Mental imagery in medical education

In medical education, the traditional apprenticeship model is increasingly being challenged as a result of theoretical and practical difficulties. There are considerations around competency basis, learner centeredness, training post constraints, quality of clinical teaching, clinical practice demands, increasing community expectations, time pressures (e.g. shorter working weeks), technological advances, cost efficiency and patient safety. Traditionally medical training has occurred using the "see one, do one, teach one" approach – an apprenticeship model where novice medical and surgical trainees learn their profession through repeated supervised practice, often on real patients.

Amidst these clinical teaching and learning challenges, new and innovative methods of training are being developed. There has been research, training and development interest in simulation training, often technologically driven, to enable trainees to competently learn and safely practise their skills and mimic the real-life environment. Furthermore, there appears to

be a huge body of research around simulation in medical education but a paucity of literature around other innovative interventions like mental imagery.

Sevdalis' [291] systematic review of the application of mental imagery to surgical training across 12 different datasets of peer reviewed literature identified only 13 articles. Of these, ten were randomised controlled trials with a control group relating to a specific surgical procedure, two were qualitative studies and one a pre/post intervention without a control group.

On review of the available evidence relating to mental imagery use, and the implementation and application to medical education, it is evident that there are some definition, methodological and resource allocation issues. Across the literature, there is no consistently defined or used terminology. Mental imagery is an umbrella term that has many synonyms. The methodological issues include an unknown time between or time lag of > 48 hours between mental imagery intervention and the performance of the surgical task. Additionally, there is lack of a validated measure of mental imagery. Sevdalis[291] concludes that the Mental Imagery Questionnaire (MIQ)[243] appears to be the only available instrument for the assessment of the quality of mental imagery within surgical contexts, though this is task specific to laparoscopic cholecystectomy. None of the above studies used a validated mental practice protocol in their interventions, a few studies did not appropriately compare the intervention and control group characteristics, and in some studies the surgical performance outcomes were technical.

Compared to other performance enhancing interventions currently available to medical educators, mental imagery has many potential benefits. It does not require access to expensive training facilities, can be conveniently utilised by health professionals at any time, and can be adapted to the clinical environment and personal preference for optimal use.

Further research is warranted to explore the application of mental imagery in medical and clinical teaching. Developments of mental imagery based interventions are required to enable professional skill development of clinical teachers. The intervention can utilise different mental imagery elements with multiple sensory inputs. This could include relaxation techniques, visualisation or viewing an expert performance, a "talk-through" by self or others and following a mental practice script of validated step by step instructions for the task. An ideal educational intervention could add further elements of kinesiology (hands on practice), reflection, feedback and peer mentoring. Further mental imagery through relaxation exercises can modulate the emotional and physiological state of the clinical

teacher. Measurable outcomes like self-efficacy, performance and learner experience using validated tools need to be considered.

The following chapter discusses the development of an innovative intervention, using mental imagery, to develop the self-efficacy of clinical teachers.

CHAPTER 7: AN INNOVATIVE INTERVENTION TO DEVELOP SELF-EFFICACY IN CLINICAL TEACHERS IN AUSTRALIAN GENERAL PRACTICE

Introduction

The clinical teacher role in general practice is complex, demanding, and underpins all the learning that occurs. International literature identifies the attributes of an excellent clinical teacher *(see Chapter 2),* though there is little research about the impact of non-cognitive attributes like self-efficacy of the clinical teacher in medical education.

The application of Bandura's[25] psychological construct of self-efficacy to the educational act of teaching in a clinical medical environment has not previously been researched. This leads to the compelling notion that a teacher's belief in their ability to impact student learning makes a difference in their teaching and their students' learning.

Medical education has not yet defined the concept or determined the value, effect or professional development implications of clinical teacher self-efficacy. An extensive literature review (discussed in earlier chapters) of self-efficacy in teaching and mental imagery informed and guided the development of an intervention. This chapter describes the design and development of a novel and innovative intervention in self-efficacy. A new measure for self-efficacy in clinical teaching was used, (SECT),[265] following its earlier development, as discussed in earlier Chapter 5. A workshop entitled Mastering Performance was delivered and a non-randomised trial conducted to investigate the impact of the postulated hypothesis.

Hypothesis

Self-efficacy in the clinical teacher is an important conceptual construct that leads toglobal improvement in the quality of teaching in general practice. The lack of literature evidence created the opportunity to design, implement and evaluate an intervention that addresses my key research question, which is:

"Can mental imagery and visualisation techniques increase the self-efficacy in the clinical teacher in general practice by more than 20% compared to a control group? "

Theoretical basis

Understanding previous applications of self-efficacy in school teachers in the field of education, and the common use of mental imagery to build self-efficacy and performance in the field of sports psychology is critical *(see Chapters 3 and 6).* The innovation is the development, through mental imagery and visualisation techniques, of self-efficacy in the clinical teacher in the field of medical education. This requires a coherent theoretical basis that links mental imagery and visualisation to the development of self-efficacy. It must also align with what is currently known about clinical teaching in medicine. The systematic review of the effectiveness of intervention on the self-efficacy of clinical teachers was informative. This information guided the development of an intervention to increase clinical teacher self-efficacy in general practice. A succinct discussion follows about these elements that summarises the key guiding principles and justifies the theoretical basis for the self-efficacy intervention for clinical teachers.

The key guiding principles for the development for the intervention needed to be:

- genuinely grounded in Bandura's[25] construct of self-efficacy,
- align with proven sports psychology approaches,
- formulated and reviewed by a focus group of experts (clinicians, medical educators, sports psychologist),
- relevant to the daily realities of general practice and clinical teaching,
- educationally robust,
- easy and convenient to administer,
- measured by a validated scale,
- piloted in a professional development workshop for GPs,
- triangulated with other data sources like individual characteristics, learner experience and performance, and
- statistically analysed.

Genuine self-efficacy

Alignment of the intervention design occurred with Bandura's[25] four developmental sources of self-efficacy:

- mastery experiences,
- vicarious experiences,
- verbal persuasion, and
- emotional and physiological arousal.

In the context of the clinical teacher in general practice, my experience and observations have formulated the following interpretations of self-efficacy development. Mastery experiences occur when individuals mentally practice or actually perform clinical teaching. Visualising the clinical teaching (environment, learner situation, training event), forming a mental practice script (teaching plan) and mentally rehearsing the steps in the clinical teaching task provide the GP clinical teachers with source material for the formation and development of their self-efficacy beliefs.

The peer observation of others talking through or practising their teaching plan is a vicarious experience where the skill or task is modelled by someone else and the individual uses these observations to form their self-efficacy beliefs. The verbal persuasion occurs through the voiced support of friends and colleagues, who provide verbal support for the attempts to take on and complete the task in clinical teaching. The potency of this social persuasion depends on the credibility, trustworthiness and expertise of the persuader

The mental and practised performance and the post peer discussion of thoughts, emotions or feelings aroused create awareness of one's own emotive state and physiological arousal, (e.g. anxiety or excitement). This is an important influence on the perception of mastery or incompetence.

Aligned sports psychology

The proven Holmes PETTLEP framework[286] for design of mental imagery interventions in sport was adapted to the clinical teaching context. The PETTLEP comprises seven components: physical, environment, task, timing, learning, emotion and perspective. This relates to the physical situation of the individual GP clinical teacher, the environmental context imagined, the clinical teaching task involved, the timing or duration of the imagery,

the learning or changes involved in the imagery, the emotions associated with the task and other perspectives.

The PETTLEP framework[286] guided various mental imagery imperatives to be utilised in the intervention, that included:

- visualisation of whole clinical teaching event, environment,
- cognitive task analysis,
- mental practice script (individualised),
- positive mental imagery (envisioning good outcomes with minimal complications),
- self-talk – mental rehearsal following the script, and
- game plan (teaching plan).

Ideally additional educational methods could be added for further impact like:

- kinesiology (hands on practice),
- reflection,
- peer feedback and mentoring, and
- discussion of the clinical teachers emotional and physiological responses

Design of intervention

Applying the PETTLEP framework,[286] the GP supervisor workshop was designed to introduce the new perspective of a non-cognitive attribute to clinical teaching – self-efficacy. The objective was for participants to become familiar with the concept of self-efficacy and instruct each participant in the use of mental imagery techniques. First was the use mental imagery to visualise the physical and environmental situation – GP, clinical teaching session, own and registrar's state. This included visualising a good successful clinical teaching session and reflecting on what they saw or felt when teaching well. By utilising a recent clinical teaching scenario, the GP clinical teacher focused and did a cognitive task analysis on the teaching task or topic, deconstructed the important pieces of knowledge, skills and attitudes, then identified the important sequence of teaching steps. This became the foundation for a second mental imagery technique, where each individual developed their own mental rehearsal steps for a clinical teaching session. Preparation also included the scheduling and timing of the teaching session, identifying clear learning outcomes and a teaching plan. Discussion with peers around any difficulties in the teaching scenarios and recognition of

their own emotions could prompt further use of mental imagery to visualise how to handle tangential deviations or unforeseen situations. This involved other mental imagery techniques like relaxation exercises or positive self-talk.

Development and planning of intervention

After the initial intervention was designed using mental imagery and visualisation, further discussion, planning and refinement occurred. As the techniques of mental imagery and visualisation have been widely used in elite sportsmen, the expertise of a reputable sports psychologist, Tim Dansie, was sought and utilised. His background is as a professional cricketer, school teacher, and currently an educational and sports psychologist working with elite athletes in football, cricket, netball, golf and tennis. His experience and expertise in using mental imagery techniques was instrumental in the design and development of the intervention. He also provided credibility, to assist in the delivery of the interventional workshop. The intervention workshop used innovative training approaches to build understanding about the use of mental imagery techniques, with sporting illustrations, drawing similarities and instructing the doctors in adapting sports psychology mental imagery techniques to their clinical practice.

A group of three experienced people who were either experienced GP clinical teachers, or medical educators reviewed the self-efficacy measurement (SECT) and intervention workshop. This ensured that the measurement and intervention was grounded and relevant to the daily realities of clinical teaching in general practice. It also provided face validity, that ensured the measurement survey (SECT) and intervention workshop was appropriate, relevant and simple to use.

The self-efficacy intervention workshop was planned as a three-hour professional development activity called Mastering Performance. Final minor refinement of the intervention occurred during the logistical planning with AOGP (e.g. venue proximity and participant access to the Clare Golf course practice putting green).

Delivery of intervention

All general practitioners who were active clinical teachers (primary GP supervisor) within the AOGP Training network were invited to be involved in the research project. Their participation was voluntary, and with provision of participant information and signed consent, the participants were divided into an intervention and control group based on their attendance at the annual AOGP general practice supervisors residential workshop. The three-

hour self-efficacy intervention was delivered twice as part of a wider AOGP general practice training workshops in October and November 2012 in Clare, South Australia. The Mastering Performance workshop program and participant responses are presented in *Appendix VIII.*

Measurement of Self-Efficacy in Clinical Teaching (SECT)

Earlier development and pilot testing of the SECT provided a reliable and accurate measuring tool of the self-efficacy of the clinical teacher in general practice. It is authentic, robustly aligned to Bandura's psychological self- efficacy construct, reflective of clinical teaching practice, realistic, and convenient to use.

The SECT was conducted before and 12 months after the intervention, in both the control and intervention groups. The purpose was to measure the impact of self-efficacy intervention training, using visualisation and mental rehearsal techniques, and to explore whether changes occurred with time. In a subgroup of the intervention group of participants, further SECT surveying was done immediately after the intervention, at one month and at three months to monitor time lapse impacts.

Triangulation with other information

Each participant provided some personal and demographic baseline information. This baseline information included gender, university medical degree (Australian or international), postgraduate qualifications, location of teaching practice, years of clinical practice, area of clinical interest, years of clinical teaching, area of teaching interest, main target focus of their clinical teaching and previous teaching professional development.

The AOGP training collects an End of Semester Appraisal (EOSA) by the registrar every six months. This information comes from a registrar reported questionnaire that uses a Likert scale of response and covers two broad themes. Firstly, the GP Supervisor (clinical teacher) attributes and qualities are appraised in 11 statements and scored on a five-point Likert scale. Secondly the quality of clinical teaching by the GP are appraised in six statements and scored using a four-point Likert scale. A cumulative sum determines a total score for this thematic area of clinical teaching

A unique identification code was used for each participant to enable de-identification of the data. Using the unique identification code for each participant, known only to the principal

researcher, the data from the self-efficacy in clinical teaching (SECT) survey and the learner experience of the quality of clinical teaching (EOSA) could be triangulated and analysed by standard statistical analytical measures.

A performance measure for clinical teaching was not possible. This was due to the lack of a validated and appropriate instrument to measure clinical teaching performance. There had been no collection of clinical teaching performance by AOGP to use as a baseline measure. Additionally independent and direct observation of clinical teaching performance was not feasible in the original research design. As an indicator, the quality of clinical teaching was implied by the learners experience in the GP registrar's EOSA.

Intervention methodology

An extensive literature review relating to self-efficacy in teaching and mental imagery informed and guided the development of the intervention *(see Chapters 3 and 6).* The intervention was designed to adhere to Bandura's theoretical construct of self-efficacy[23] and the sources for its development,[25] and aligned with the sports psychology experience of using the PETTLEP framework.[286]

Further development occurred through a focus group of experienced GP clinical teachers and medical educators. The guidance and assistance of an experienced sports psychologist was also sought in further development and to assist in the delivery of the self-efficacy intervention in a GP professional development workshop. This intervention was then piloted using the following protocol with the specific aim of testing whether mental imagery enhances the self-efficacy and quality of clinical teaching in general practice.

The protocol included:

- baseline and follow-up surveys, using the previously tested Self Efficacy in Clinical Teaching tool,
- control and intervention groups with pertinent participant's information,
- a workshop designed and developed to focus on building the self-efficacy of GP clinical teachers,
- the delivery of an interactive workshop learning visualisation with a mental imagery script, applied to clinical teaching situation, practised and shared with peers for feedback and refinement, and
- triangulation of learners' experiences of the clinical teaching in general practice.

Ethical approval

This research was approved by the Human Research Ethics Committee, The University of Adelaide, on the 30 September 2011 (project number H-252-2011) (*Appendix VI*). As part of my PhD research, all participants were provided with detailed verbal and written explanations of the nature of the research, were voluntary participants and provided signed consent *(Appendix VII)*. The standard ethical approaches were followed (e.g. signed consent, databases using a re-identifiable coding approach). In addition, the AOGP research committee approved this research in October 2012, prior to the delivery of the intervention as part of a professional development workshop for GPs.

Participants

The sample was selected from the network of GP supervisors (clinical teachers of vocational GP training doctors) actively involved in the AOGP training program from October 2012 to December 2013. In 2012, there were 97 GP supervisors working with AOGP. These are the clinical teachers in general practice for the postgraduate vocational training in Australia. An invitation, research information and workshop program was sent to all GP supervisors in the AOGP network, two months before the scheduled yearly GP supervisors workshop. The Mastering Performance session was part of a wider two-day professional development workshop. The AOGP GP supervisors workshop is held twice, with the same program repeated, to enable two different calendar dates for participating doctors. A total of 86 doctors, out of 97 invited (88.7%) participated in this non-randomised control study. All doctors attending the AOGP two-day workshops decided to participate in the intervention session.

GP supervisors who accepted the invitation to attend the workshop were assigned to the intervention group and those who did not attend the control group. The pragmatic realities transformed the study design into a non-randomized control trial.

The same program was conducted at each workshop, in October and November 2012. Each participant in the intervention group completed a baseline demographic and SECT survey, participated in an innovative teacher self-efficacy development exercise, and completed again the SECT surveys 12 months after the workshop. A subgroup of participants were followed and also surveyed at intervals during the year following the workshop (at 1 and 3 months).

The control group was formed from the same pool of AOGP supervisors who did not attend any workshop. Each control group participant completed a baseline demographic and SECT survey, and had a follow-up 12 months later to answer the SECT survey again.

Statistical analysis

Before analysis, we screened the data and each item response for accuracy, missing values and normality. Each participant was given a unique identification code, known only to the researchers, to enable de-identification of data. The statistical software Stata version 13.0 (StataCorp, Texas, USA) was used in all the analyses.

This analysis included:

- descriptive statistics, with absolute and relative frequencies for categorical variables. For numerical variables, mean and standard deviation or median and interquartile range were used depending on the normality of the data,
- comparison of control and intervention groups characteristics (using Chi Square test and Fisher exact test),
- comparison of pre and 12 months post intervention self-efficacy scores in control and intervention groups (using t test),
- subgroup analysis of time interval changes immediately after the intervention, one month, three months and 12 months in the intervention group,
- evaluation of the relationship between the three factors of self-efficacy (customised teaching, teaching prowess, and impact on learner) with the intervention and timeline effect,
- evaluation of the relationship between the three self-efficacy factors with supervisor qualities and attributes. (using spearman correlation coefficient and β regression coefficient), and
- evaluation of the relationship between the three self-efficacy factors with the quality of clinical teaching.

Results of intervention

The intervention group (n=47) attended one of the professional development workshops and the Mastering Performance session conducted between October and November 2012. The 39 supervisors who did not attend the workshop but who agreed to be surveyed formed the control group. This constituted 86 GP supervisors (88.7%) who agreed to participate in this non-randomised control trial.

No differences were observed between the intervention and control group in terms of individual or teaching characteristics *(Table 7.1).*

Table 7.1: SECT intervention – comparison of some characteristics of participants

	Intervention (n=47) %	Control (n=39) %	p-value*
Gender			
Female	21.3	38.5	0.081
Male	78.7	61.5	
University of medical degree			
Australia	76.6	89.7	0.110
Other	23.4	10.3	
Have a fellowship (FACRRM or FRACGP)			
No	12.8	7.7	0.502**
Yes	87.2	92.3	
Number of years of clinical practice*			
1-10 years	8.1	10.5	0.876
11-20 years	38.0	41.3	
> 20 years	52.3	47.8	
Number of years of clinical teaching			
1-5 years	23.4	23.1	0.964
6-10 years	17.5	14.5	
>10 years	38.3	41.0	
Location of teaching practice			
Urban	61.7	59.0	0.797
Rural	38.3	41.0	
Focus of teaching			
Postgraduate registrar	97.9	94.9	0.588**
Pre-vocational doctor in general practice	23.4	28.2	0.629
Hospital based	4.3	10.3	0.404**
Undergraduate medical	48.9	53.9	0.671
Undergraduate allied health	10.6	2.6	0.215**
Professional development teacher activities undertaken			
Outback GP training	63.0	74.4	0.264
Teaching development conferences	8.7	7.7	1.000
Teaching development university certificate	10.9	7.7	0.721

* Chi square test ** Fisher exact test

Impact

Initial results from raw data analysis indicated there had been a change in the self-efficacy of the clinical teacher, as postulated in the research hypothesis.

In the control and intervention groups, the raw data from the SECT was calculated as a “least mean square” total and average score at baseline and at 12 months. This showed an increased total score *(Figure 7.1)* and mean average *(Figure 7.2)* in the control group and the intervention groups over the 12 months.

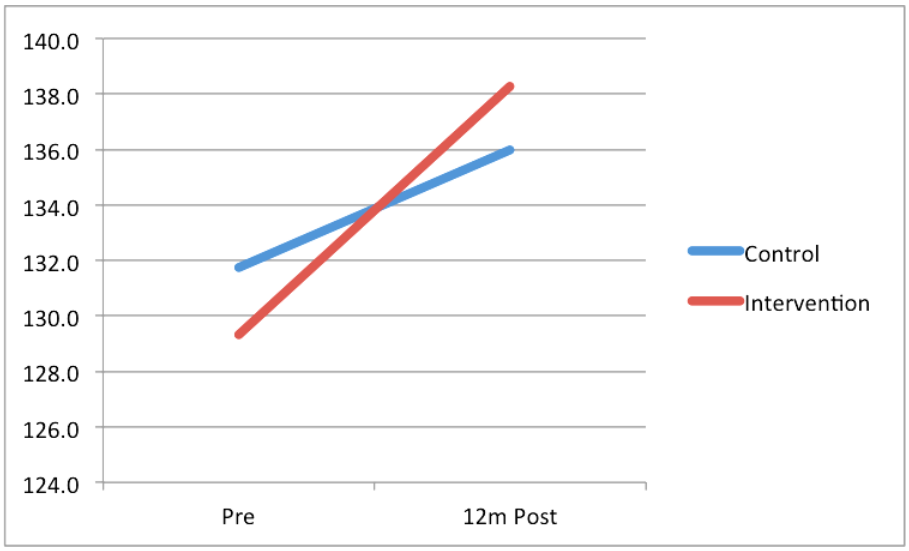


Figure 7.1: SECT total score over time

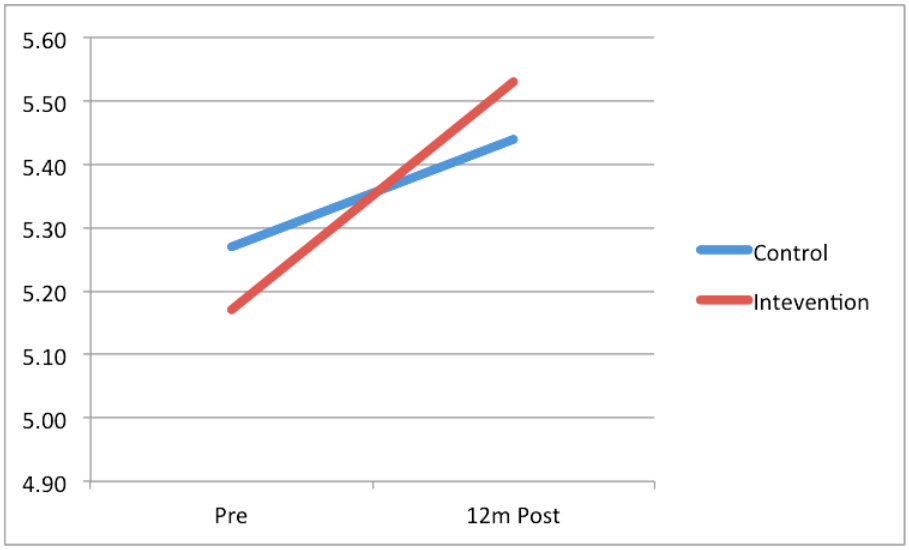


Figure 7.2: SECT mean average score over time

Simple statistical procedures were used to compare the pre and 12 months SECT scores, in the control and intervention groups to quantify the impact of the change. A unilateral ANOVA separate analysis of variance for each of the questions in the SECT questionnaire was conducted, comparing the control and intervention groups at baseline and at 12 months. This presented univariate results for each dependant variable.

Further multivariant analysis resulted in combination of the baseline SECT scores (pre-intervention) for the control and intervention groups that provided a pre mean score. The combined control and intervention groups 12 months calculation provided a post 12 months score *(Table 7.4).* The F value was calculated as the ratio of two mean square values (pre and

post mean scores) and the p value by the Pr > F value, which showed the change over time in the Self-Efficacy in Clinical Teaching (SECT) items in the intervention and control groups.

Table 7.4: SECT Intervention multivariant analysis over time

Number	Pre Mean score	Post mean score	F value	Pr > F
1	4.98	5.26	2.59	0.11
2	4.62	4.92	2.11	0.15
3	5.19	5.49	3.62	0.06
4	4.90	5.34	6.54	0.01
5	5.65	5.78	0.84	0.36
6	5.75	5.92	1.31	0.25
7	4.85	4.91	0.09	0.76
8	4.82	5.24	5.34	0.02
9	5.51	5.68	1.04	0.31
10	5.02	5.34	3.31	0.07
11	4.73	5.12	4.15	0.04
12	4.94	5.43	7.86	0.01
13*	5.21	5.43	1.91	0.17
14	4.30	4.73	5.46	0.02
15	5.30	5.64	1.49	0.22
16	4.70	5.00	2.47	0.12
17	5.10	5.40	2.55	0.11
18	5.45	5.72	2.92	0.09
19	5.66	5.93	3.3	0.07
20	5.53	5.74	1.62	0.21
21	5.27	5.55	4.13	0.04
22	4.99	5.29	2.51	0.12
23*	6.27	6.35	0.3	0.58
24	6.02	5.00	6.22	0.88
25	5.76	5.92	1.23	0.27

Three SECT factor outcomes

All the SECT items in each measurement were grouped, scored and reweighted following the results obtained in the validation process *(see Chapter 6).* The 22 questions in the SECT tool provided three different scores of self-efficacy in clinical teaching (customising teaching, teaching prowess and impact on the learner), all of them ranging from 0 (lower score) to 100 (higher score). The three scores in the intervention and control groups were further compared in the baseline and after 12 months of the intervention *(Table 7.5).* No significant differences were observed between the intervention and control group for any of the three outcomes, neither at the baseline nor after the intervention. Sensitivity analyses were also

performed at 12 months, using last observed data for missing information, but even in this case no differences between the intervention and control group were observed.

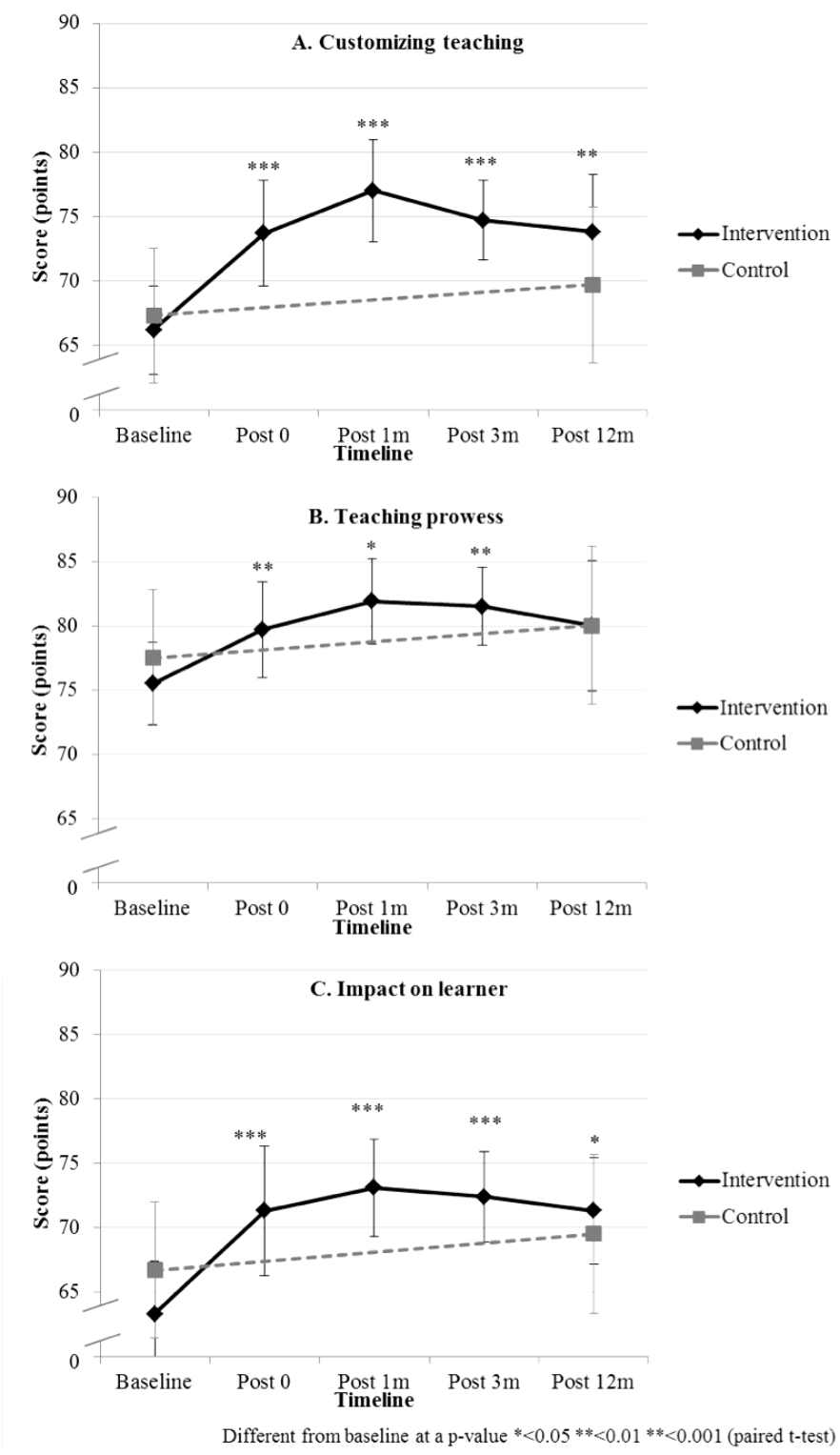
Table 7.5: Intervention results reconciled to three SECT factors

		Factor 1 CUSTOMIZING TEACHING		Factor 2 TEACHING PROWESS		Factor 3 IMPACT on LEARNER	
	n	Mean (SD)	p-value*	Mean (SD)	p-value*	Mean (SD)	p-value*
Baseline							
Intervention	47	66.2(11.8)	0.710	75.5(11.0)	0.390	63.3(14.1)	0.313
Control	39	67.3(16.3)		77.5(11.1)		66.7(16.5)	
Post-intervention (12 months)							
Intervention	33	73.8(12.8)	0.264	80.0(14.6)	0.994	71.3(11.8)	0.629
Control	27	69.7(15.7)		80.0(11.1)		69.5(16.0)	
Sensitivity analysis**							
Intervention	47	71.2(13.7)	0.881	78.1(13.9)	0.356	67.5(14.9)	0.472
Control	39	70.7(14.7)		80.6(11.0)		69.9(15.1)	

* t-test ** Post-intervention (12 months) sensitivity analysis, using baseline information for missing data

Further analysis evaluated the effects over the time of the intervention in the treatment (immediately after intervention, one month, three months and 12 months) and control group (baseline and after 12 months). These timeline effects are demonstrated in *Figure 7.3*.

Compared to the baseline results, there was a significant increase in all the scores just after the intervention, with a peak after one month. This was lower but still an increase after three months of the intervention. Although the 12 months results were still different from the baseline (except for teaching prowess), the results were no different from the control group, as the last also showed a slightly increase during the period.



The p-values compare the mean score at each point with the baseline result in the correspondent group (intervention or control group). Vertical lines represent the 95% CI

Figure 7.3: Timeline effects of the intervention SECT dimensions score

Secondary outcomes

Additional information from the registrar's (or learner's) six-monthly EOSA had been collected, as an appraisal of in-practice teaching performed by the GP clinical teacher. This included information about supervisor qualities and attributes, and the quality of clinical teaching, from the learner's observation and experience. We attempted to analyse this additional data by collating the learner's EOSA and triangulating with the GP clinical teacher's SECT responses as a secondary outcome. A subgroup of participants was constructed that comprised the extra data from the EOSA, combined with the SECT data responses for individual GP participants. This sub-group consisted of 18 GPs from the intervention group and seven GPs from the control group. Further statistical analysis of this subgroup enabled two further avenues of evaluation.

Firstly, an evaluation of the relationship between the three self-efficacy factors with the supervisor qualities and attributes was conducted. This was statistically analysed using Spearman´s correlation coefficients and β-regression coefficient (*Table 7.6*). This showed no significant correlation or relationship between the supervisor qualities and attributes and the three self-efficacy factors.

Table 7.6: Subgroup correlation with supervisor qualities

	Intervention (n=18)				Control (n=7)			
	Baseline		Post 12 months		Baseline		Post 12 months	
	r	β (SE)	r	β (SE)	r	β (SE)	r	β (SE)
Customizing teaching	0.51	0.26 (0.10)*	0.02	0.03 (0.06)	-0.24	-0.06 (0.10)	0.00	-0.01 (0.05)
Teaching prowess	0.52	0.28 (0.10)*	-0.28	0.00 (0.05)	0.22	0.05 (0.17)	-0.19	-0.03 (0.07)
Impact on learner	0.28	0.18 (0.10)	0.00	0.04 (0.07)	0.00	-0.03 (0.09)	-0.04	-0.02 (0.04)

r=Spearman correlation coefficient; β= regression coefficient; SE = standard error of β
* P-value <0.05

Secondly, an evaluation of the relationship between the three self-efficacy factors with the quality of clinical teaching was conducted. The results showed that there were no differences identified between the GP clinical teacher self-efficacy in clinical teaching factors and the learner experience of the quality of In-Practice Teaching (IPT) (*Table 7.7*).

Table 7.7: Subgroup correlation with clinical teaching

	Teaching							
	Intervention (n=18)					Control (n=7)		
	Baseline		Post 12 months			Baseline		Post 12 months	
	r	β (SE)	r	β (SE)		r	β (SE)	r	β (SE)
Customizing teaching	0.05	0.00 (0.05)	0.25	0.08 (0.04)		0.79	0.08 (0.04)	-0.17	-0.03 (0.06)
Teaching prowess	-0.08	-0.03 (0.05)	0.37	0.04 (0.03)		0.43	0.05 (0.09)	-0.44	-0.10 (0.08)
Impact on learner	-0.25	-0.03 (0.05)	0.32	0.05 (0.04)		0.80	0.07 (0.04)	-0.20	-0.02 (0.05)

r=Spearman correlation coefficient; β= regression coefficient; SE = standard error of β
* P-value <0.05

A secondary outcome of the intervention addressed the question: did the self-efficacy intervention improve the Teaching by Supervisor total score? This was based on the learner rated six elements of the GP supervisor in the EOSA:

- defining educational objectives,
- frequency of feedback,
- content of feedback,
- teaching time given,
- quality of teaching, and
- confidence to achieve.

The results of the self-efficacy intervention on the IPT of the clinical teacher showed no evidence of a direct effect *(Table 7.8).*

Table 7.8: Results of the intervention on IPT

		Supervisor qualities		Teaching	
	n	Mean (SD)	p-value*	Mean (SD)	p-value*
Baseline					
Intervention	18	48.9(1.2)	0.780	20.5(0.5)	0.158
Control	7	49.6(1.8)		22.0(0.9)	
Post-intervention (12 months)					
Intervention	18	50.7(0.9)	0.790	20.4(0.6)	0.592
Control	7	51.1(0.8)		21.0(1.0)	

* t-test

Discussion of self-efficacy in clinical teachers intervention

The results of this study showed a statistically significant early increase in self-efficacy of the clinical teachers in general practice after the intervention, with a peak after one month, and decreasing after three months. Nevertheless, there was a natural increase in self-efficacy probably related to the clinical practice, as even in the control group showed improvement after 12 months. The intervention group showed a slightly higher, but statistically non-significant increase in self-efficacy in their clinical teaching after 12 months. The study indicates that self-efficacy is relevant and important in the future professional development of clinical teachers in general practice, particularly as the Australian general practice training environment is changing and evolving.

Australia has established a national vocational training program that is inclusive of two professional colleges (ACRRM and RACGP), with the political imperative of providing a rural doctor workforce with high quality educational training, innovation and regionalisation. General practice education has a strong foundations of government supported funding and selection of 1500 new GP registrars in 2016, college vocational training standards, curriculum statements and summative fellowship examination, and federal government leverage over doctor workforce distribution through allocation of training places and provision of Medicare provider numbers. A change in political imperatives, led to fundamental changes in general practice education in 2015, with the axing of the vertical integrated education for junior doctors and the Prevocational General Practice Placement Program (PGPPP) and the disbanding of the government owned company, General Practice Education and Training (GPET). This had comprised the majority of Australian general practice training since implementation of the national vocational training program in 2002. This created an upheaval for the existing Regional Training Providers, 18 months of uncertainty and an open market with a competitive tender process. This cost efficiency measure has resulted in no published cost savings, with the reduction of 17 to 11 GP training providers, essentially based on Australian state boundaries. Other GP education functions like selection, research and remediation have been moved and split between the two professional colleges. This has led to a loss of collaboration in use of training resources, lack of cohesion between various general practice organisations, loss of educational expertise, loss of innovation and loss of momentum to progress high quality general practice education.

At the same time, there has been an increased focus on competency based education, and a move away from learning objectives geared towards training outcomes. This is evident by the recent RACGP developed competency based framework and changes in the RACGP vocational training standards. The regional training providers previously provided various supervisor and practice supports, and variably facilitated the professional development of GP supervisors, clinical teachers and medical educators. Excellent competency identification tools had been developed and used in general practice training, such as the AOGP Learning Needs Analysis but, although innovative and educationally effective, are labour intensive and costly to deliver.

The goal was to advance the new construct of self-efficacy in medical education by researching the development of self-efficacy in the clinical teacher and determining the impact on IPT in general practice. The use of mental imagery and visualisation to develop self-efficacy in clinical teaching is innovative and a relatively simple technique to learn. It promotes a dimension of clinical teaching, and has been used to identify areas for professional development. The self-efficacy intervention provides a new, engaging and interactive clinical teacher professional development activity. Additionally it can be used in combination with other competency-based measures in skill training. For instance, by identifying the overly confident but barely competent doctor in a medical or surgical skill, measures can be implemented to protect patient safety and the community. The Mastering Performance workshop had a specific emphasis to develop self-efficacy in the GP supervisors who were the main clinical teachers in Australian general practice training. It integrated with the wider AOGP supervisor professional development, promoted clinical teaching as an important role, and was a unique domain worthy of the same process in skill acquisition learning and competency attainment, as any other medical or surgical skill.

The 88.7% response rate to participate in this self-efficacy in clinical teaching research is very high amongst medical practitioners for research participation. This could be attributed to their high personal enthusiasm for clinical teaching, the opportunity for professional development, and/or the long-standing relationship and support offered by AOGP to their training practices and supervisors.

The self-allocation into attending the workshop and thus be in the intervention group was chosen by 47 out of the 97 GP supervisors invited. Offering the same workshop on two different dates could have influenced this good participation response. Of the remaining who could not attend either workshop and were therefore self-allocated into the control group,

39 agreed to be involved in the initial and 12 months SECT surveying. There were no participants lost to follow-up.

Non-randomised allocation to control and intervention groups can lead to bias, especially when participant groups are relatively small. Pragmatically in the context of busy clinicians, working in geographically dispersed locations with financial and time constraints, and an intervention that required face-to-face interaction, allocation based on attendance at a pre-planned workshop was the only feasible method of selection. The participant sample was certainly representative of the clinical teachers in general practice. It is significant, that there was no difference in the characteristics of the intervention and control groups and this enabled further exploration of the self-efficacy intervention.

The results showed an increase in self-efficacy in clinical teachers over 12 months. This occurred after 12 months in the control group and, to a greater but not significant extent, in the intervention group. The control group by increasing their self-efficacy, through continued clinical teaching in general practice over the 12 months, fitted and reflected theoretical and pragmatic understandings. Considering that self-efficacy, according to Bandura,[25] develops through mastery experiences, continued clinical teaching will understandably provide mastery experiences and build self-efficacy. Commonly, educationalists and society use the phrase “practice makes perfect”. Pragmatically, this reflects the incremental development of competence and confidence in skill acquisition.

Two questions in the SECT specifically showed an intervention effect but not a time effect. Question 13 stated, “I can teach what the Registrar needs to know.” Question 23 stated, “I am concerned for my Registrar’s wellbeing.” Presumably not being time affected, these two questions relate to an element of self-efficacy that cannot be developed by practice and mastery experience alone. This could be attributed to the verbal persuasion source of self-efficacy development, where an attitudinal change of mindfulness of the registrar occurred as the result of participation in the intervention.

There appeared to be no association between the three dimensions of self-efficacy in clinical teaching (customising teaching, teaching prowess, and impact on learner), prevalent in the whole sample of clinical teachers, and the absence of a significant impact after the intervention at the 12 month follow-up. This could be due to the relatively small sample size of the participants. The intervention had a 3.4:1 item to participants ratio. A larger 10-20:1 item to participant ratio is needed, before the lack of association can be discounted.

Further analysis of the timeline effects on the three dimensions of self-efficacy did show a statistically significant increase in each of the three dimensions at the one-month mark after the intervention. This then plateaued over the remaining months to be no different from the natural course of development of self-efficacy. This indicates that the self-efficacy intervention did have an impact in the early months, and is a positive indicator of the value of using mental imagery and visualisation. The greatest and most significant dimensional impact was in customising teaching, next the teaching prowess, and least but still significant impact was that on the learner. Although the control group SECT was not measured at the one and three months mark following the intervention, it can be assumed to be illogical and unlikely to peak at similar times in its natural course of development.

A secondary outcome of the impact of self-efficacy and the performance of the clinical teacher was explored. The results showed no association between the three dimensions of self-efficacy and the supervisor qualities and attributes. Similarly, there was no impact or correlation between the three dimensions of self-efficacy and the quality of clinical teaching by the GP supervisor. This result appears to indicate that the self-efficacy intervention had not impacted on the clinical teacher performance. The in-practice teaching, composed of supervisor qualities, attributes and quality of clinical teaching, did not improve. This result is problematic due to the small size of the subgroup, the use of learner rated EOSA, the logistical difficulty of observing clinical teaching in geographically dispersed training locations and the unavailability of any validated clinical teaching performance assessment tool for general practice.

Limitations identified in this research include the small sample size, lack of randomisation, lack of detailed timeline data in the control group, and no accurate measure of the performance for the clinical teacher. Recruitment of the control group was also limited to those GP supervisors who did not or could not attend the workshop. These non-attending doctors may have been less interested in continuing medical education, busy in their clinical practice or unwell at the time. This could have led to a potential bias.

A limitation is that the control group was not evaluated at one and three months, but as they did not participate in the intervention, the same peak would not have been expected, as in the intervention group. Nevertheless, the SECT validation study showed (as hypothesised in *Chapter 6*) that the years of clinical teaching through mastery experiences naturally increase the self-efficacy of the clinical teacher. Cross contamination of the control and intervention groups was mitigated through the different location of each participant's general practice

and clinical teaching. Each location was separate and independent of other participants, with a vastly dispersed distribution across urban, rural and remote postcodes. There were no other AOGP organised activities during this time, where a large number of supervisors and participants were able to congregate, share or influence each other.

In the session delivery, the mental imagery intervention could have been improved with the use of a standardised mental practice script, instead of relying on individuals to create their own. The advice of psychologists, who regularly used mental imagery (during the design and implementation phase of the intervention) was that the greatest impact of mental imagery occured with an individual developing their own mental script for personal use and mental rehearsal. A study limitation was that the mental script that each individual developed was not documented and there was no demonstration of subsequent use and mental rehearsal before a clinical teaching activity over the following year.

As an intervention, the "Mastering Performance" workshop comprised three components: a self-efficacy familiarisation exercise, a mental imagery training exercise and a mental imagery teaching application exercise. A potential limitation is that it was not possible to determine which of these components had a positive effect. Self-efficacy and mental imagery were a new concept and technique to many doctors, so it was not possible in this intervention to separate out the various components.

The impact of other influences on the development of clinical teacher self-efficacy is plausible. Areas like the use of personal reflection around own clinical teaching could be important, and warrants further research. Despite the flaws in the study, this is the first self-efficacy intervention trial in the world evaluating mental imagery and visualisation as a professional development innovation for clinical teachers in general practice.

The strengths of the study included the high doctor participation and response rate. It offers new insight and understanding to the construct of self-efficacy in GP medical education. It piloted an innovative clinical teacher professional development session. The topic and training in self-efficacy was engaging to these doctors. The simplicity of the self-efficacy intervention, the use of low technology and the capacity to replicate the mental imagery training makes it cost efficient.

Results of the intervention have shown enough potential to indicate that the use of mental imagery and visualisation can impact the development of self-efficacy. The significance and meaning of the effect needs further research. For instance, there needs to be further

research with a larger sample. For the validated 23-item SECT to reach a 20:1 item to participant ratio 230 participants would be required. Further research is also indicated for the development of a standardised mental practice script, the exploration of timeline effects on both the control and intervention groups, and the use of additional research methods, such as semi-structured interviews with the clinical teachers to understand how self-efficacy training influences them. This could help to answer questions such as:

- What mental imagery component is most useful?
- What changes have they made to their teaching practice?
- Are the dimensions of self-efficacy grounded in reality?

Two vital future research areas are the development of an objective standardised clinical teaching assessment tool for Australian general practice, and the long-term tracking of the impact on the learner's outcome. The current endpoint or learner outcome is the ACRRM or RACGP summative examination. For future self-efficacy in clinical teacher interventions to authentically align with Bandura's theory, it needs to incorporate these two components of clinical teacher performance and impact on the learner.

A final recommendation is that strategies to improve self-efficacy in the clinical teacher form an integral part of professional development planning. A useful practical implementation is using self-efficacy as an indicator for the needs assessment for areas of professional development. This study indicated that self-efficacy needs to be periodically incorporated and reinforced as part of a GP's annual professional development.

Summary of intervention results

General practitioners who were active clinical teachers within the AOGP training network were invited to be involved in a workshop to develop self-efficacy in clinical teaching. Voluntary participation resulted in an intervention group (n=47) who attended the professional development workshop and a control group (n=39) who did not. There were no differences between the two groups in individual or teaching characteristics.

There was an increase in the self-efficacy in clinical teaching of both the control and intervention groups over 12 months. Self-efficacy increased naturally over time in the control group, possibly through the experience of clinical teaching. Focussed interventions to improve self-efficacy in the clinical teacher resulted in immediate and early statistically

significant increases at one to three months. The higher self-efficacy in the intervention group was maintained at 12 months but was no longer statistically significant compared to the natural increase in the GPs who continued to clinically teach in the control group.

Further analysis of three subscales showed the largest increase in the self-efficacy factor of customised teaching over the 12 months, followed by Factor III (impact on learner) and then Factor II (teaching prowess). The timeline effects on the three clinical teaching self-efficacy subscales were highest one month after the intervention and essentially plateaued to the same increased level as other GP clinical teachers after one year. No significant relationship was identified between the GP clinical teacher qualities, attributes and teaching quality, and the three self-efficacy factors. A secondary outcome showed no effect of the self-efficacy intervention on the learner's experience and appraisal of the GP's clinical teaching.

This innovative intervention of mental imagery and visualisation has shown development of self-efficacy in the clinical teacher. This trial explored the feasibility of mental imagery training and the complementary value in a professional development program for clinical teachers in general practice.

The next chapter is a comprehensive discussion around self-efficacy in clinical teaching within Australian general practice.

CHAPTER 8: DISCUSSION

The purpose of this chapter is to integrate each of the previous chapter's findings, and to discuss how the results fit into the wider picture of self-efficacy in clinical teaching and provide deeper insights into general practice and broader medical education in Australia, and the research implications of the results. Several areas are potentially impacted by the results of this research; these are considered in turn and include: medical education, case study methods, GP competency, assessment of clinical teachers, self-efficacy of clinical teachers, mental imagery and the pivotal educational role of GPs.

This research has been a personal journey of exploration and systematic inquiry, integrating clinical practice, education and research. Mindful of the initial goal, to help doctors become better teachers, this quality improvement research followed a Plan-Do-Study-Act (PDSA) cycle. Plan-Do-Study-Act cycles are the core of learning in health professional education,[298] and are widely used for iterative development and scientific testing of improvements in complex healthcare systems.[299] Planning occurred through formulating questions, reviewing evidence, translating knowledge between fields, and developing ideas. This research developed new constructs, created new measures, adapted competency frameworks, initiated trials and explored pilots. The study involved analysis of results, reflection and interpretation of meaning. Actions include the documentation of the process and findings throughout this thesis, discussing the syntheses' key learning points, and identification of the implications, changes required and future steps for clinical teaching, general practice and medical education.

Key learnings

There are ten synthesised key learnings that form the basis of this thesis discussion chapter:

1. Medical education needs to demonstrate an evidence base. Knowledge translation among aligned disciplines enables new avenues of research discovery and evidence.
2. Case methodology is a robust research approach, well suited to medical education.
3. A national GP competency based framework that integrates the roles and competencies of the GP provides clear guidance for GP training, milestones of competence attainment and performance quality indicators.

4. The need to recognise the importance of the core competencies of the GP clinical teacher.
5. The evaluation of clinical teaching content and assessment of clinical teachers is significantly lacking in Australia.
6. Self-efficacy is a useful construct for medical education, is a neglected yet basic educational principle and adds a potential application to further improve the quality of GP training.
7. Self-efficacy is integral to clinical teaching, complements existing approaches in skill development, and contributes an exciting new dimension.
8. Self-efficacy is linked with clinical teacher training and performance, and impacts on learner experiences and outcomes.
9. Self-efficacy is an attribute that can be developed using mental imagery and visualisation.
10. The SECT is a reliable and valid measurement instrument.

Medical education

Internationally, medical education is a relatively new discipline. The three-legged stool metaphor of medical education consists of clinical work, education and research. Research is necessary for the creation of new knowledge and effective education is essential to generate high quality doctors, both of which help deliver high quality clinical practice.

Medical education in Australia has developed over recent decades through four main streams – university medical schools, prevocational training, vocational training and continuing medical education programs. The Australian Medical Education synthesis study[31] commented that Australia has a strong basis for quality medical education which is rated highly by international standards and that medical schools have risen to the challenges of adapting their courses to current needs and community expectations. These statements appear to be partly based on stakeholder submissions and the opinion of the authors, as there is no evidence of the international equivalent. To justify these opinions and statements of Australia's high quality medical education, there is a need for a deliberative focus and robust medical education research. Research focussed on clinical teaching practice, competency, assessment and its associated professional development is important in building a sustainable medical and teaching workforce. Throughout the discipline of medicine, there is an increasing demand by the profession, government and the community for clinical practice, decision-making, funding and management to be evidence based. The

training, competency and professional development of medical doctors also needs to be evidence based.

The explicit purpose of this research was to promote, support and professionally develop more effective clinical teachers in general practice. This thesis reviewed what was already known about the qualities and attributes of a good clinical teacher. In a novel way, this research highlighted the importance of the GP as a scholar and teacher, through the adaption of a competency based framework. This research further evidenced the nature of self-efficacy as a clinical teacher competency attribute that can be influenced and developed. The universal nature of the clinical teacher-student interactions heuristically indicates that this research about clinical teaching in Australian general practice has international relevance.

Innovative approaches

The dynamic and evolving changes in a complex healthcare system demand research inquiry, evidence based practice and innovative approaches for effective medical education. Evolving contextual issues in anaesthesiology education are relevant to GP training.[300] These include reduced opportunities for patient contact, (mandated reduced working hours), patient safety, exponential growth in medical knowledge and medical technological advances. In addition, there are greater and arguably unrealistic expectations of universal and instant access to the latest medical treatments by the community. Governmental funding and increased accountability understandably seek to support cost effective programs. Inadvertently, decisions made by government often compound the issue and increase the costs, through extra administration, constantly changing political agendas and tender processes.

New areas of research can occur from serendipitous discovery but more commonly occur through intentional research, using systematic inquiry, evaluation and review. Research that is grounded in the work environment, "industrial research", is most likely to provide the desired outcomes in cost efficiency and quality improvement. Translational research involves considering the knowledge base and theory, and converting this into activities and actions. Knowledge transfer can also be interdisciplinary, and Bould[270] argues that we must look outside our own field for innovation. The effectiveness of simulation training in medical education is a good example of an innovative development, applied from a completely different field.[301]

Cognitive and experimental psychology has provided insight into factors of potential importance for medical education, like attention,[302] pattern recognition,[303] clinical reasoning,[304] individual differences in learning,[305] feedback,[306] and the effect of stress and fatigue.[307] Bandura's[25] social cognitive theory and self-efficacy concept, combined with the educational literature evidence of improved teacher and learner outcomes, provide a compelling avenue for medical education research. Such knowledge translation among aligned disciplines enables new avenues of research discovery and evidence to be established. This research into developing and measuring the self-efficacy in clinical teachers in general practice is an example of a new construct in medical education.

Academic research rigour

Like all academic research, medical education research must adhere to appropriate study design, robust methods, rigorous analysis, and logical and supported findings. This builds an evidence base that can inform theory, practice and policy. Medical education research is typically considered to be a biomedical science, but its value is often downgraded, unless its path follows the same biometric assessment and quantitative methods as clinical medical science.[308] In medicine, the randomised controlled trial is seen as the gold standard of quantitative research and is well suited to skill performance and patient outcomes. However, some research enquiries, questions, theoretical constructs, educational interventions and outcomes like attitudinal or behavioural change are more optimally researched using qualitative or mixed methods of research.[300] Fundamentally, medical education research is more aligned with the social science fields, like psychology, anthropology or education. Monrouxe[309] states that construction of medical education research is valuable as it informs theory, practice and policy through the continual interchange of evidence. In critically appraising the evidence in a journal article in order to correctly interpret the findings, a key question is asked about the methodology that underpins the study. The same rigour and robust methodology are applied in medical education research, but there are two additional key questions that must be addressed.[310] Firstly, the educational theories, conceptual frameworks and concepts that underpin the study must be explicitly stated. Secondly, there must be a clear demonstration of how the existing literature (sometimes in terms of a systematic review) has informed and influenced the directions of the current research. In this research, extensive literature searches and underlying theories were discussed. This existing interdisciplinary evidence provided insight and guidance. The conduct of the systematic review on the effectiveness of intervention on the self-efficacy of clinical teachers indicates an emerging area in medical education research. This research contributes to a wider

understanding, knowledge and evidence base for Australian GP training and the discipline of medical education.

Case study methodology

The overarching research approach used in this thesis was case study methodology. Mention of this research approach commonly leads to misunderstanding in medical research, where it is generally applied to a single focus of medical interest. Case study methodology is a widely accepted[311] and rigorous[26] form of qualitative research. *"For a novice researcher, a case study is an excellent opportunity to gain tremendous insight into a case."*[312(p556)] For a variety of reasons, it was a perfectly appropriate and robust research approach to be used.

Firstly, it has been previously used extensively across the disciplines of psychology, health and education. Research reading of the literature reviews, theoretical understandings and evidence base crossed these three disciplines. Secondly, case study methodology facilitates an exploration of the phenomena of self-efficacy in the context of clinical teaching in Australian general practice, using a variety of data sources. As Baxter[281] states, *"this ensures that the issue is not explored through one lens, but rather a variety of lenses, which allowed for multiple facets of the phenomena to be revealed and understood".*[312(p554)] This resulted in the use of various research lenses that included literature reviews (including a systematic review), knowledge translation, focus groups, measurement tool validation and evaluation of an intervention trial. Following Yin's[313] design enabled the collection of information about GPs who are clinical teachers, exploration of the phenomenon of self-efficacy in clinical teaching from theory, interpretation to practice, and the development of tools and research outcomes.

Each of the essential features of the case study methodology (descriptive, heuristic inductive, particularistic)[22] influenced the course and progress of this PhD research. At the commencement of this research journey, the direction, outcomes and end-point were not known or preconceived. Discussion around each of the features of case study methodology illustrates the value of case study methodology in medical education. The starting point involved integrating the world literature around the qualities and attributes of an excellent clinical teacher, with Australian general practice "real" experience, utilising focus groups and my involvement in the management and professional development of GP supervisors. This constituted the descriptive element of case study methodology.

The limited requirements to be a clinical teacher in the Australian GP training system, the lack of a professional development structure for GP clinical teachers, the predominant focus on clinical updates for GP supervisors and the voiced theme that GP clinical teachers lack confidence in their clinical teaching provided a heuristic insight into the problems facing medical education in the community. Inductive reflection and further literature review revealed the compelling psychological construct of self-efficacy as a potential avenue to develop the clinical teacher. This inductive element resulted in a new application for medical education – the unified construct of clinical teacher self-efficacy. The observation from everyday family life of a boy kicking a goal with a balloon using elements of mental imagery and visualisation triggered the proposed hypothesis that mental imagery can develop self-efficacy.

Within the complexity of clinical teaching and learning interactions in GP training, a particularistic focus on the self-efficacy of the clinical teacher created the bounded context. In a quantitative research study, the inclusion and exclusion criteria for sample selection establish the boundaries of research focus. In case study methodology, the boundaries of context include the width and depth of any aspects related to the phenomenon of self-efficacy in clinical teaching. This fitted into Stake's instrumental type[314] or to use a different classification system, Yin's explanatory type of case study methodology.[313] Theoretical propositions that lead to the development of a conceptual framework that guides the research are a necessary part of case study methodology.[312]

Rather than a limitation, Flyvberg argues the value of the contextual dependence of case study methodology.[315] He states that in teaching and learning, context dependant knowledge and experience actually lie at the very heart of expert performance. By its very nature, self-efficacy is also context specific. Hence, it is ideal that case study research methodology is inclusive and tolerant of context. Another limitation could be my subjective bias as the area of research falls in close proximity to my own professional experiences and roles. This was declared outright at the beginning, and through following ethical research approaches, it did not influence any data collection. It potentially could have influenced the analysis and discussion of the literature, and intervention results. Flyvberg[284] states that although case study methodology requires hypothesis and theory generation, there is no greater bias towards verification of the researcher's preconceived notions than any other method of research inquiry.[315] Case study research falls within an interpretive tradition, and although the subjective bias of the researcher is accepted, an awareness of the strategies for

negating narrative fraud is followed.[27] There is a strong element of narrative in the reporting and discussion of findings from case study methodology, which can make summarising and generalising findings problematic. This equally applies to all evidence based medical findings, as the results are often misconstrued well beyond the parameters of the original research sample or exact findings.

General practice competency framework

Imperative

There have been three frameworks describing clinical teaching commonly used in Australia. Each of these has attempted to integrate education with community based clinical general practice but are incomplete or an inadequate description, failing to fully incorporate the complexity, context and competencies. The major historical and clinical based conceptual framework – the RACGP star and domains of general practice[39] – fails by not articulating clinical teacher competencies. The symbiotic clinical education model developed by Flinders university[106] provided a new dimension of community and social accountability but lacks context and resembles a stakeholder representation. The recently described GP supervisor's web of educational activities by Wearne[13] articulates the centrality of an expert clinician, the importance of patient safety and some key competencies of the clinical teacher, but not the complexity. Not included in this web are important roles like role modelling or health advocacy.

Around the world, health systems, including primary health care, are facing enormous challenges. These include health inequalities, pharmaceutical globalisation, increasing governmental costs, aging populations, expensive medical technological advances and complex co-morbidities. The issues facing Australia in healthcare delivery and training are well documented and accepted as commonly faced.[31] These challenges are:

- limited funding in both university and clinical environments,
- economic and time pressures on hospitals and the shift in focus of clinical experience to the community,
- higher student load, including increasing learner numbers, fewer clinical educators, fewer clinical opportunities, and tensions between teaching and service provision,
- maldistribution of doctors, with limited clinical service in areas of high need, like rural general practice and Indigenous health, and

- rapidly accelerating changes in the doctor's scope of clinical practice and challenges on curricula to comprehensively meet the competency requirements.

Attempts to address these challenges are struggling to be successful in Australia, and around the world. The number of medical students and selection of junior doctors into GP training in Australia is at an all-time high, but the answer is not about quantity. In an era of increasing accountability, the medical profession and government must justify the societal investment and provide patient safety by demonstrating quality in both training and clinical practice.

A global outlook by the Lancet commission[316] in 2010 identified that there needed to be a transformation of professional health education to strengthen health systems in an interdependent world. This report proposed that this needed to occur through two avenues in each country – transformative learning and interdependence. Transformative learning involves competency driven approaches, inter-professional education and strengthened educational resources. The interdependence avenue arises from policy alignment, collaboration and integration across all healthcare organisations.

Currently, Australian general practice suffers from professional delineation, with fragmentation of health care delivery and training. In universities, there are medical schools and rural clinical schools for undergraduate and postgraduate medical training. There is junior doctor training that varies between states and territories of Australia. There are numerous medical specialist colleges, including two general practice colleges that professionally contribute towards the training of doctors in areas of selection, curriculum, and summative assessment. There are 11 Regional Training Organisations to deliver specialist postgraduate general practice training, but no coordinating national general practice education and training organisation. There are federal and state government health departments funding and providing primary health and emergency care. Across urban, rural and remote Australia, the privately employed general practitioners provide the frontline of primary health and emergency care to the majority of the population. Across this multitude of healthcare delivery and training organisations, there is no clear policy alignment, collaboration or integration.

National approaches

To maintain the high quality health care and education Australia has enjoyed, health care training reform is required. For the benefit of the nation, various organisations must agree and be united to a common purpose, determine an overarching blueprint and state clear outcomes that then inform the strategic plans, programs and activities of each organisation.

The vital first step is a nationally convened meeting of the various organisations, a shared ownership of the common issues faced, with a view to determining a consensus agreement of purpose and a national framework. There is no record of any meeting occurring in Australia that has included state and federal health departments, Deans of Australian medical schools, ACRRM, RACGP, state based institutes of medical education and training, and the regional training providers around medical education or general practice training.

Specifically, in medical training across Australia, there is a lack of national sharing, standardisation, coordination and collaboration in student education and assessments. This is evident by an absence of national meetings, agreement to match training to workforce needs, and open sharing of education resources. There are different curriculums, different selection criteria, and variable assessment tools.

A unification of clinical practice with training is required, and this can be achieved by a competency based framework. There is currently a lack of an Australian nationally agreed competency based framework for clinical practice and training. The RACGP in early 2016 are currently looking to adapt their old historical star of general practice and link this to RACGP curriculum core skills to provide an unpublished conceptual competency based model *(Appendix VI).*

This approach fits with a notable USA medical education expert, Professor Steinert, who exhorts the medical profession to develop a description of competencies that resonate internationally and to replicate the process of working with key stakeholders from diverse institutions and organisations nationally.[99]

Adaption of CanMEDS framework

In the absence of any equivalent framework for clinical competencies in general practice in Australia, an alternative approach is to follow an international model. The CANMEDS framework[53] can be adopted, modified and implemented for use in Australian general practice and training. The CanMEDS framework is a medical education guide to the essential competencies that physicians need to have for high quality patient care. The strength of the CanMEDS framework is that it was the result of national sharing, discussion and consensus between organisations involved in medical delivery and training across Canada. It also provided a clear educational design that aligned with the CanMEDS framework to guide clinical teachers in a progression of competency approach through learning objectives and formative assessment.[317]

The Canadian CanMEDS experience demonstrates a clear pathway of integration and coordination across many universities and training organisations. From the original CanMEDS framework released by the Royal College of Physicians and Surgeons of Canada, there has been over a decade of further development, implementation and adaption into other disciplines (e.g. Family Medicine).[318] The CanMEDS model is based on the seven roles that encapsulate the competencies required to become a skilled, confident and well-rounded family physician to provide primary health care in Canada. It has also been implemented in rural and remote regions of Canada,[113] and adapted to undergraduate medicine[319] and specific areas of need like global health.[320]

The benefit of the CanMEDS – FM model was that it also focussed on the educational needs of medical students and junior doctors learning to become family physicians.[321] This led to the redesigning of the Family Medicine program across Canada[322] and a working group to develop a new Family Medicine curriculum. The Family Medicine curriculum was the next step in designing, delivering and evaluating the national family medicine program that aligned with the College of Family Physicians of Canada's standards in postgraduate education. It was effective because it incorporated the core competencies of Family Medicine education, contextual education values and dynamic learning approaches.[321] Further progress also led to the development of competency based assessment in family medicine across Canada, using key feature problems.[323]

The Canadian experience clearly demonstrates that a national general practice competency based framework would greatly benefit Australian primary health care and medical training. The benefits include all general practice and medical training organisations following the one blueprint. There would be interdisciplinary collaboration, coordination of clinical and teaching provision, shared development of educational resources, combined professional development and robust curriculum, with progressive competency milestones from selection to completion.

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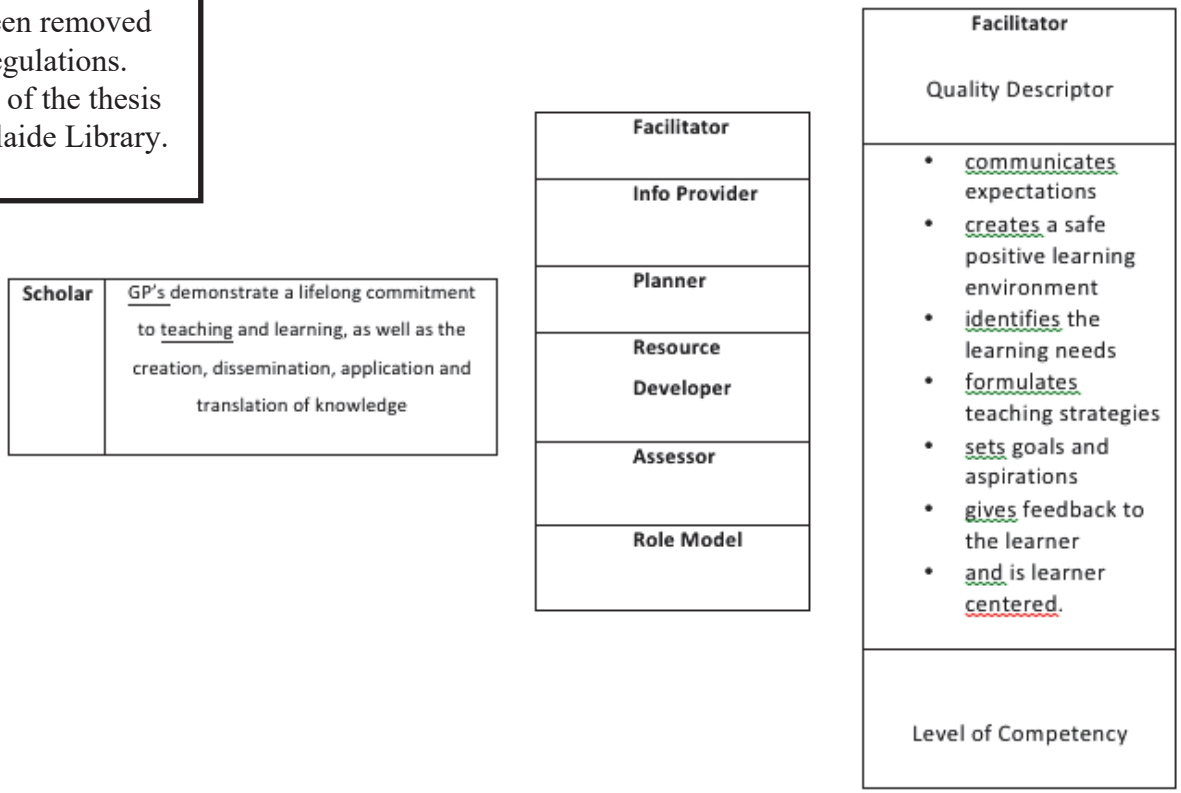

Figure 8.1: Australian adapted CanMEDS roles, areas and core competencies (McArthur)[115]

An adaption of the CanMEDS model for Australia general practice has provided a more comprehensive, modern, contextually relevant framework of the roles of the general practitioner (GP). This adaption is simply reconciled with the historical RACGP star and ACRRM domains. In this adaption, the terminology is changed from Family Physician to the GP, generalised the reflective learning into "learning" and added "teaching" into the scholar role. This enables expansion of the scholar role to incorporate the Australian refined clinical teaching areas, based on Harden's 12 roles of the clinical teacher (*Figure 8.1*). Through the Australian focus group reflection, discussion and exploration, the complexity of the various roles of a GP clinical teacher have been clearly delineated.

Molenaar's[102] three dimensional framework of teaching competencies for physicians, dentists and veterinarians demonstrated how a framework informs organisation, educational competencies and professional development. Following a similar approach, combined with this understanding of the roles of the GP clinical teacher, the core competencies can be determined.

Core competencies of the GP clinical teacher

Professional competence is defined as *"the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values and reflection in daily practice for the benefit of the individual and community being served."*[324] (p226)

Domains

The qualities and attributes of an excellent clinical teacher in general practice have been identified from the literature and provide the evidence base for determining the core competencies of the GP clinical teacher. The Australian focus groups conceptualised and identified the key quality descriptors in each of the clinical teaching domains – facilitator, information provider, planner, resource developer, assessor and role model *(see Chapter 2).*

A criticism in the further exploration of the roles of the clinical teacher could be directed to the use of an older Scottish based framework. The decision to use Harden's[56] model was based on the intention to use an established theoretical model with a group of experienced clinical teachers to explore further their understanding of clinical teacher's roles, qualities and attributes in the Australian general practice context. Responses from many participants certainly indicated that for the first time they understood they were also responsible for other roles. Especially prominent were the assessment and resource development roles. The

six roles identified in Australia are almost completely matched by a more recent Canadian study that defined the key roles and competencies of the clinician-educator.[325] This mixed methods study used focus groups and a national survey of all Canadian universities, medical training programs and continuing medical education organisations to rate the importance of the roles (domains of competence) for a clinician-educator. Their results determined the most important roles were around communication, clinical teaching, assessment, curriculum development, program evaluation and educational leadership. The one role the Australian group did not identify as a quality descriptor was being a scholar. In the Canadian study, scholarship also was rated by more than 50% of respondents as important and was included by the authors as a key feature. Sherbino[325] defined scholarship as involving more than a simple understanding and application of educational theory or applying evidence based medicine in clinical practice. Scholarship is a broader role, encompassing discovery, research translation and teaching. For these reasons, the conclusion was made that the scholar role is better suited at a higher order in the competency based framework and this confirms its position as one of the seven major roles in the CanMEDS competency framework.

Quality descriptors

The role of clinical teaching consists of various competencies. The use of quality descriptors challenged the Australian focus groups to consider what is actually observable and thus measureable. From a behaviourist view of learning in these focus groups, participants were encouraged to consider from real life GP clinical teaching and articulate the clinical teacher quality descriptors they devised, mindful of the SMART acronym (specific, measureable, attainable, realistic and timely) used in many organisation's professional development reviews.

The previously documented roles, domains, qualities and attributes were foundational to describe the core competencies for the Australian GP clinical teacher. This fits with other researcher findings from around the world. A competency of giving constructive feedback, highlighted by Boendermaker[87] in the Netherlands as the most important characteristic for a competent GP trainer, was included. Other competencies, like identifying learning needs, monitoring learner progress, direct clinical observation, utilising a teaching strategy or detailing clinical reasoning steps, resonate with Kilminster's effective supervisory behaviour.[64] The clinical teacher competency relating to orientating the learner and creating a safe learning environment aligns with the literature.[8] The Australian inclusion of "facilitates broader exploration of cultural, social, ethical and community issues" addresses important attitudinal competencies in the clinical teacher.

Reflective practice is a specific competency, previously identified as most useful component in teacher activities[91] that can be realistic, timely and measurable. If reflection is the key to continuous quality improvement in teaching,[11] then this is a desirable and attainable competency.

The core competencies for the Australian GP clinical teacher fit nicely with the knowledge, skills, attitudes and attributes categorisation described by Hatem.[98] The value of describing competencies by using a knowledge, skills, attitudes and attributes categorisation provides a basis for reconciliation of clinical teaching activity, an emphasis for professional development and a targeted assessment approach. It is conceivable that a lot of a clinical teacher's time, effort and resources could go into preparing and giving a lecture on a topic. A simple time-motion observation could feasibly indicate that a competency focus on the skill of listening and questioning technique could be more time, cost, resource and educationally effective. Using this example, listening and questioning could become a catalyst for professional development or could be simply measured by timing the teachers and learners talking in a teaching session.

More than 20 years ago, Hesketh[101] developed an outcomes based framework, using 12 clinical teacher competencies as learning objectives for the professional development of the doctor as a teacher. Using the example of learning objective 3, (a competency around planning learning), a detailed list of teaching activities was described that included activities like undertaking a learner needs assessment or defining the learning outcomes. The strength of an outcomes based framework was the competency identification for the individual doctor, and a nationally standardised, coordinated and assessed professional development for Scottish clinical teachers. It was equally applicable to both undergraduate and postgraduate teaching and training in the hospital and the community.

In Canada, birthing from the CanMEDS roles, there have been fundamental teaching activities devised for Family Medicine.[326] Yet in Australia, there is no national recognition of medical educators, no nationally coordinated professional development program for clinical teachers and a lack of recognition of clinical teacher competencies.

Australia is falling behind the international advances in medical education. To transition from the historical apprenticeship training models, we urgently need to comprehensively embrace a competency-based framework, approaches and outcomes in training and clinical general practice. This integrates training and clinical practice to provide quality care outcomes, patient safety, robust educational concepts (evidence base, learner centeredness) and

clinical teacher professional development, and to support and sustain the professional (and moral) obligation to teach.

Assessment of clinical teachers

The evaluation of clinical teaching quality and assessment of clinical teachers has been significantly lacking in Australia. A new dimension to this vexed question can be progressed through the measurement of clinical teacher competencies. The public, learners, teachers, universities, training programs, professional accreditation organisations, government funders and the health care system have a vested interest in high quality clinical training in general practice. The approach to competency based education involves four steps – competency identification, competency components, competency evaluation and overall assessment of the process.[327] The competency components (or performance indicators or benchmarks) are tasks or activities that either sequentially, incrementally or in combination make up a competency. There is a pre-determined threshold for demonstrating competency.

A direct linkage to an Australian competency based framework provides the identified competencies and impetus to further develop specific measurement tools to provide evidence of high competent clinical teachers and high quality medical education. The Clinical Teaching Assessment Instrument (CTAI) was specifically designed and developed, with clear linkages to the CanMED roles of manager, communicator, professional, medical expert, scholar, collaborator and health advocate.[112]

Competency components, linked to the CanMEDS-FM framework, have been developed using Laval developmental benchmark scales[328] and have used the consensus of experts about expected time frames for achievement during the years of Canadian Family Medicine residency training. The resultant pictorial scale, with graded use of colours, for competency acquired at better than expected timing, expected timing, and slightly delayed or delayed timing, is easy to use and interpret. The progressive developmental benchmarks are used for teaching and evaluation purposes, help to focus clinical teaching on identified competency need and target remediation strategies to the learners who are delayed. A criticism could be that the focus on an individual competency is reductionist, too narrowly focussed and potentially subject to bias.[318] This can be mitigated through professional education around competency assessment with the clinical teachers and other measures, such as global performance.

Outcome based education and performance assessment are closely related paradigms. Outcome based education involves an educational approach, where decisions about curriculum and evaluation are driven by learning outcomes that the students should achieve.[17] The product (students learning outcomes) defines the process (instructional methods) and learning opportunities. In performance assessment, the product (competency components) defines the process (professional development and training opportunities). This is quite different to the RACGP 2011 training standards[60] which were input based on the premise that better process would result in better outcomes (e.g. three hours of clinical teaching each week). Shumway[100] matched Steinert's 12 learning outcomes for assessment purposes,[99] against the most appropriate level of the Miller Pyramid.

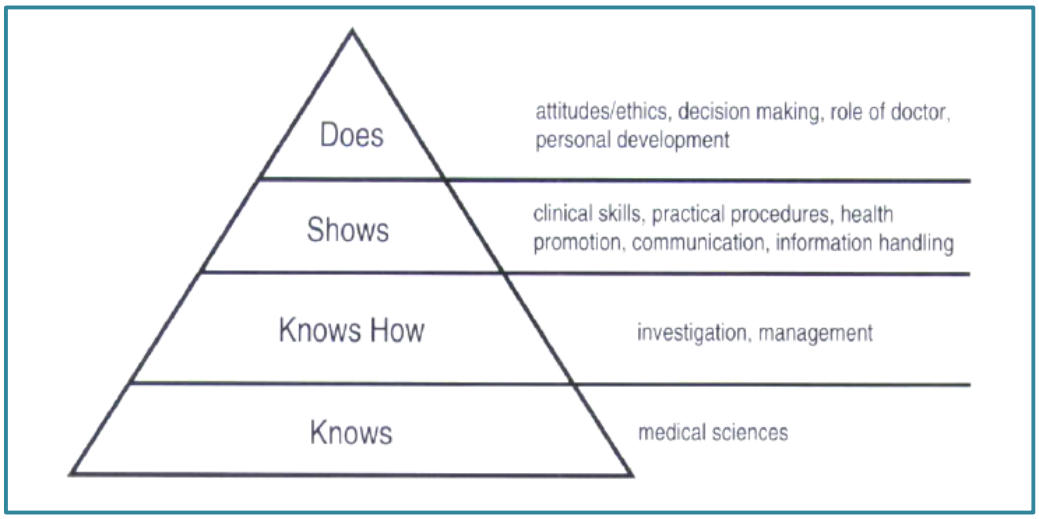

Figure 8.2: Shumway 12 learning outcomes in Miller pyramid[307] (p578)

This indicates that the competencies of the clinical teacher, including roles, attitudes and personal attributes, are best viewed as the clinical teacher displays them – so it becomes a real time performance assessment.

A limitation of my research in Australia was the lack of an available measurement for the quality of the clinical teaching. Direct observation of clinical teaching is impractical across a diverse and widespread range of general practice. There was no suitable, contextually relevant, valid measurement instrument. Exploration and consideration of developing an objective structured teaching interaction measure occurred. Anecdotally, there was apprehension by the Australian GP clinical teachers to be directly observed, or videotaped in their teaching.

For the above reasons, the learners reported experience relating to supervision and quality of teaching in the AOGP End of Semester Appraisal was used as a proxy measure of the

quality of clinical teaching. Global assessments of performance have previously been proven to be useful.[197]

Further research is indicated to develop, test, validate or adapt clinical teaching assessment tools. A systematic review found only eight studies that described the effect of an Objective Structured Teaching Encounter (OSTE) throughout the world.[329] The majority showed an improved self-perceived teaching performance of the participants, reliability, variable validity and no outcome that the OSTE improved the clinical teaching. At the time of my research, there was no suitable, reliable and validated OSTE tool to measure the quality of clinical teaching. The authors concluded that the OSTE concept is promising and potentially innovative. A recommendation from our research indicates that a competency based objective structured teaching measure could be a theoretically better construct. Further research using the Clinical Teaching Assessment Instrument (CTAI)[112] could be used as an adjunctive clinical teacher performance measure in the future. This is a recently validated measurement of clinical teacher performance, linked to the CanMEDS roles, though being learner reported is a limitation. Further research is required into the CTAI being used in conjunction with the SECT tool to measure performance and self-efficacy.

Self-efficacy is a useful construct for medical education

Self-efficacy in the learner or student has been widely researched in medical education.[122, 173, 176, 187] It is therefore evident that self-efficacy is a useful construct for learning in medical education.

Self-efficacy beliefs form the core of human functioning.[23] They mediate the relationship between knowledge and behaviour whilst interacting within environmental contexts.[132] In many ways, the ubiquitous nature of self-efficacy in many human behaviours and interactions indicates that self-efficacy also occurs in clinical teaching. The fields of education, cognitive psychology and academia support the influence of self-efficacy on secondary school teaching. This research builds on the very little medical education literature or research into the self-efficacy of clinical teaching to provide a unified conceptual construct.

Self-efficacy is an underutilised yet basic medical educational construct that adds potentially wide applications to further improve the quality of GP training. The concept of self-efficacy informs its formative development, is linked to motivations, provides insight into resilience, and impact on the learner. So self-efficacy is important in the clinical teacher's motivations,

confidence, resilience and professional development, and potentially impacts on educational outcomes.

The author's unified conceptual construct of clinical teacher self-efficacy[316] provided the theoretical basis for this innovative and exciting area of research. As illustrated in *Figure 8.3*, the construct illustrates the development and importance of clinical teacher self-efficacy on the clinical teacher's performance and the student's learning.

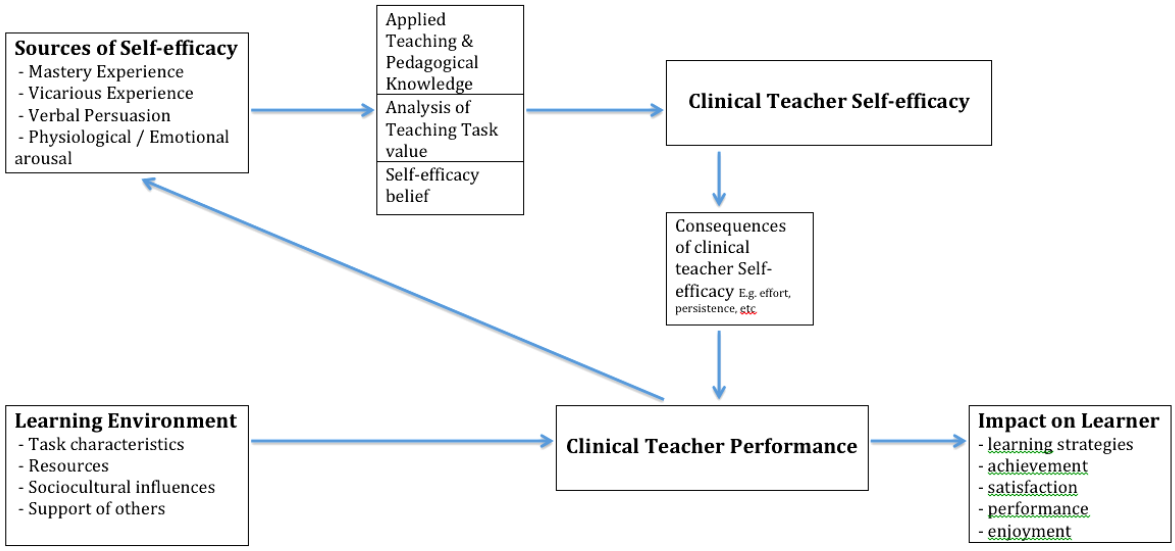

Figure 8.3: Unified conceptual construct of clinical teacher self-efficacy (McArthur)[209]

This self-efficacy construct fits well with widely accepted current learning theories in medical education. Prominent among adult learning theories is andragogy. Knowles' five assumptions of andragogy[330] postulate that:

- adults are independent and self-directing,
- their accumulated experiences are a rich source of learning,
- learning integrates with the demands of everyday life,
- people are more interested in immediate problem centred approaches, and
- they are motivated to learn more by internal than external drivers.

Various other current learning theories are relevant for self-efficacy in medical education.[331] Self-efficacy aligns with the behaviourist model. In this teacher centric approach, the educator's role is to design and influence the learning environment, and to produce a specific response and/or behaviour change. So a teacher centric approach meets the impact on learner nature of self-efficacy. Cognitive orientated learning and explanations focus on

internal mental processes within the learner's control. The development of self-efficacy requires a degree of critical and reflective thinking. Humanist theories involve the learner taking primary responsibility for their own learning and self-efficacy can be used to identify learning needs. In the social learning model, the locus of learning is in the interaction among the person, the learning environment and the desired behaviour. A constructivist learning approach involves learning occurring through the orderly assembly of "building blocks" of competencies, tasks and life experiences.

Motivation is an important pillar on which adult learning is built. A motivational content theory, Maslow's hierarchy of needs, is seen to be an internal driver of motivation. The hierarchy moves from the most basic needs, such as physical and safety to the apex of self-actualisation, according to Abela.[332] A motivational process theory, like the expectancy theory, states that motivation depends on two perceptions – either an expectation that an outcome will bring the desired rewards or the required performance is within the capability of the person.

Recent research into Australian GPs' motivation to become or continue as a GP clinical teacher reveals that it is primarily intrinsic, including enjoyment of teaching, the variety provided by teaching and the desire to contribute to the profession and the ongoing health of the GP's communities.[333] Self-efficacy offers a plausible reason and focus for the progression to the culmination of self-actualisation. Theoretically, the mastery experience of self-actualisation also brings positive benefits to the clinical teacher. Attention to the development of self-efficacy in the clinical teacher is aligned with developing competencies in the clinical teacher. Self-efficacy will not produce a competent performance when requisite knowledge and skill are lacking, but it motivates individuals to improve their competence.

Dory's[163] research into the self-efficacy beliefs of GP trainees highlight that their self-perceived competence in consultations significantly increase over the years, more than their knowledge or clinical skills. However, some will experience difficulties in the development of self-efficacy beliefs during their GP training. My intervention study shows that self-efficacy is present in the GP clinical teacher and does increase over time, in those who continue to teach. It is plausible that some clinical teachers will experience difficulties in their development of self-efficacy during their careers.

My unified conceptual construct of clinical teacher self-efficacy is new and innovative in the field of medical education. The development of self-efficacy is aligned with the concurrent

development of competencies, and complements existing skill development in clinical teaching. This construct provides a strong theoretical foundation for my exploratory research into clinical teacher self-efficacy, the development of a measurement instrument (SECT) and intervention study.

Self-efficacy is integral part of clinical teaching

Self-efficacy of the clinical teacher has been newly defined as the belief of a clinical teacher that their teaching will positively influence and impact on the learner in a clinical medical environment. This adheres to the authenticity of Bandura's self-efficacy concept, uses the foundations of earlier definitions of teacher self-efficacy, [120],[125],[126] and has been adapted for the general practice context.

Self-efficacy permeates the whole competency based framework. Self-efficacy cannot be described as a role a teaching area, a competency or a quality descriptor of a competency. It is a belief, comprised of conviction and confidence. The self-efficacy belief empowers the GP in the medical expert role as the facilitator of clinical teaching to perform a competency with confidence and to be observed by others to be fulfilling a quality descriptor.

To draw an analogy , the duality of self-efficacy and competency is the equivalent to the concept of the Yin and Yang. This Chinese philosophical concept is to *"describe how opposite or contrary forces are actually complementary, interconnected and interdependent in the natural world, and how they give rise to each other as they interrelate to one another".* [335](p1)

This research has shown that self-efficacy occurs in the learner and the teacher. It can be used in training, as a reflective activity, as a learning needs assessment, or as a professional development activity. Further research is required to explore the impact of self-efficacy on actual performance.

Development of validated competency components and performance measures need to occur which can be accurately linked to the self-efficacy belief. Longitudinal studies are needed to explore the impact of self-efficacy on the learner's experiences, development of own self-efficacy beliefs, formative assessment, summative examinations and clinical performance.

A reliable and valid Self-Efficacy in Clinical Teaching (SECT) measurement

The design and development of the Self-Efficacy in Clinical Teaching (SECT) instrument followed key evaluation principles[258] and showed good measurement properties[334] *(see Discussion in Chapter 5).*

Validation testing, after the initial pilot analysis, of the SECT instrument demonstrated better reliability (Cronbach´s alpha 0.95) internal consistency (communality > 0.4) and a more accurate three-factor solution that has good construct validity (factor analysis), content validity (factor loading) and dimensional validity.

Three dimensions or themes were identified as important to the measurement of self-efficacy in the clinical teacher and authentic to the phenomena of self-efficacy. These were: customising teaching, teaching prowess and impact on the learner

The new reliable and valid self-efficacy in clinical teaching measurement is presented in *Appendix IX*. Further research is needed to determine the complementary application, with other competency based assessment tools.

Mental imagery intervention

Self-efficacy is an attribute that can be beneficially developed in the clinical teacher using mental imagery and visualisation. This intervention was designed to explore the new unified conceptual construct of clinical teacher self-efficacy in medical education. It was deliberately linked to the identified domains of clinical teaching and to promote a new dimension to the clinical teaching role. The educational intervention was aligned with the CanMEDS competency based framework and designed to follow the same educational principles for skill acquisition and competency attainment as any other medical or surgical skill. The goal of the research was simply to explore ways to help doctors be better clinical teachers. Previous professional development with these clinical teachers developed their understanding of the multiple, often conflicting roles of the GP supervisor and the domains of clinical teaching.

The participants were a relatively homogenous group of experienced clinical teachers in general practice. Their baseline SECT scores were in the higher range and the increase in the control group's SECT scores over 12 months, showed that active continuous teaching built

self-efficacy. This is authentic to Bandura's underlying theory that through mastery experiences, self-efficacy develops.

The low technological intervention was engaging, interactive and well received by the participants. The intervention involved using a clinical teaching example (topic or situation) development of a mental script, mental rehearsal, visualisation of positive outcome and peer reflection and discussion.

The GP clinical teachers who received the mental imagery training and visualisation training showed a significant increase in their SECT scores that peaked at one month after the intervention, and then gradually fell to a level that was not significantly different to the control group at 12 months. This indicated that self-efficacy did develop naturally in these clinical teachers who continued to teach, presumably through mastery practice. The intervention was an effective and immediate boost in the initial few months, with the gradual decline in self-efficacy over time, congruent with other studies in paramedic paediatric resuscitation skills.[160] Mental imagery and visualisation significantly improved the self-efficacy in the clinical teachers.

This answered the first part of the intervention research question. Mental imagery and visualisation does increase the self-efficacy of the clinical teacher in general practice. However, the impact was not the postulated 20% or significantly higher, compared to other GP clinical teachers.

These timeline effects were greatest in the customising teaching dimension of self-efficacy, followed by the teaching prowess dimension. The longer term follow-up potentially indicated that the timing for a refresher professional development activity was best timed before 12 months.

There appeared to be no associations between the three dimensions of self-efficacy measured in the SECT and either the supervisor qualities and attributes or the quality of teaching measures. Due to small sample size, lack of validated clinical teacher performance measures and difficulty of independent direct observation, this lack of association between self-efficacy and performance was unreliable.

This was the first self-efficacy intervention trial in the world that used and evaluated mental imagery and visualisation as a professional development innovation for clinical teachers in general practice. The strengths of the study included the high doctor participation rate, the simplicity of mental imagery, the low technological resourcing and the capacity to easily

replicate, transport and adapt. Mental imagery, visualisation and the development of self-efficacy could potentially be widely applied across many clinical teaching domains and environments.

Further research

Further improvement into the self-efficacy intervention from this exploratory research is required. The concept and understanding of mental imagery is too broad. This is reflected in the world literature where there is no agreed or standardised use of terminology relating to mental imagery.

Future design and development of mental imagery interventions require a stronger link to the structured approach of a proven PETTLEP model. As relaxation techniques are the commonest form of visualisation, this could be an additional mental imagery technique to be implemented. Semi-structured interviews and involvement with a wider focus group is required in the development phase of future mental imagery interventions.

A constraint was the mental imagery intervention relied on individuals to determine their own teaching topic or clinical teaching situation. A refinement for the future would be to use a focus group of experts and implement a standardised validated mental practice script.

Further benefit of this research could be gained by finding out from the participants what visualisation component of mental imagery was used. This could be achieved by the addition of the validated Mental Imagery Questionnaire[243] and participant responses around their visual images.

The information from the clinical teachers about the application of the intervention was poor, particularly around the timing of the subsequent use of mental imagery and the clinical teaching performance. Sevdalis's[291] review indicated that the shorter time lag (< 48 hours) between mental practice and task performance, the stronger and more effective the impact of mental practice.

Lack of accurate, relevant and validated clinical teacher performance measures need to be a research imperative to progress the assessment of the quality of clinical teaching. Until these performance measures are developed, further research into the impact of self-efficacy on clinical teaching competencies, domains and performance remains problematic.

By virtue of definition and dimension, an important component of self-efficacy is the impact on the learner. It is important that self-efficacy research continues to evaluate and document

evidence of the learner's perspective, learning strategies, competency performance and other learner outcomes like enjoyment, self-efficacy belief, resilience and summative examination results.

This new and innovative clinical teaching intervention in general practice resonates with the experience and evidence from the sporting and psychology fields, that mental imagery and visualisation does build and develop self-efficacy. The use of mental imagery in medical education is currently underutilised and needs refinement.

Benefits

The proposed benefits of this research are widespread and can be discussed from various perspectives. Their application can result in benefits to an individual's clinical teaching, or to a group of GPs involved in clinical teaching. Potentially, educational organisations, universities and training networks could utilise this research to assist in their work. There are broader benefits to Australian general practice and international medical education.

The benefits to the individual's clinical teaching include:

- a new skill of visualisation and mental rehearsing,
- increased confidence,
- improved preparation,
- articulated teaching plan,
- increased global teaching quality,
- adaptable across multiple learner levels (vertical integrated), and is
- adaptable across allied health (inter-professional).

The benefits to the group of general practitioners are that it:

- reinforces educational principles of observation and feedback,
- is innovative and interactive training,
- enhances clinical teaching professional development,
- provides self-reflection of teaching,
- stimulates innovative thinking and group discussion around teaching,
- builds on previous GPS workshops around roles, domains, competencies and qualities of a good clinical teacher, and
- increases peer self-esteem around the much maligned clinical teacher.

The benefits to training organisations and faculties include:

- professional development of clinical teachers (forms basis for an annual workshop),
- integration of research into the cutting edge of clinical teaching,
- inspiring medical education teams to think about doing their own research,
- showing leadership in integrating clinical general practice, teaching and research,
- demonstrating quality improvement and innovation,
- meeting an organisation's strategic plan Key Result Area around quality educators, and
- creating competent and confident GPs.

The benefits to wider general practice training across Australia are that it:

- builds on existing general practice infrastructure,
- complements current general practice training programs,
- develops better clinical teachers,
- addresses literature gap analyses that GPs lack confidence,
- provides an evidence basis,
- promotes research into clinical teaching in the Australian context,
- raises awareness and recognises the critical importance of teaching and learning in a GP environment,
- articulates some of the complexities of high quality clinical teaching by GPs,
- meets an Australian workforce imperative,
- promotes importance of competency based framework and self-efficacy across Australia, and
- contributes to a wider understanding of the quality of clinical teaching.

The benefits to the international world of medical education include:

- self-efficacy in clinical teaching in medical fields is an identified gap,
- contribution to the "new" world of medical education,
- development of a new Self-Efficacy in Clinical Teaching tool development, and
- promotion of Australian GP training and research internationally.

CHAPTER 9 - CONCLUSION

Australian health systems, including general practice as the main primary health care provider, face many challenges. This includes a rapidly ageing population, the increasing burden of chronic disease and co-morbidities, increased community expectations of health care, technological advances, and balancing a burgeoning evidence base with holistic, patient centred care. Concurrent medical education changes include the shift from apprenticeship to competency based education, competitive tenders and increased accountability for government funding and workforce distribution.

General practice in Australia has a strong foundation which includes high professional standards and an organised general practice training program. Excellent clinical teaching, although multi-factorial, transcends the ordinary and is characterised by providing a positive supportive learning environment, actively involving, inspiring and communicating well with students. It cannot be assumed that all GPs possess the teaching skills and educational experience to perform quality teaching in general practice. International literature has identified many attributes of an excellent clinical teacher,[57, 92] whilst others have highlighted the importance of non-cognitive attributes of the GP, like self-awareness and confidence.[117] There is scant research about the impact of non-cognitive attributes like self-efficacy of the clinical teacher in medical education.

There is an increased expectation that general practitioners (GP) provide clinical education to undergraduate and postgraduate medical and allied health students. The GP supervisor (GPS) role is pivotal, underpins all the learning, yet is complex, demanding and at times potentially conflicting.[38] Through Australian focus group reflection, discussion and exploration, the roles were expanded and refined areas of clinical teaching incorporated, based on Harden's 12 roles of the clinical teacher.[56] Ageing GPs, lack of recognised qualifications, limited clinical teaching professional development and training capacity saturation, especially in rural and remote areas, are impacting on the quality of clinical teaching.

Beyond being the medical expert, GPs have other important roles in the Australian health system, and are uniquely placed to lead and respond to these challenges and changes. An important pillar underpinning high quality primary health care is high quality training. For the GP supervisor to function effectively in primary health care provision and be the cornerstone

of GP training, there needs to be an evidence basis and understanding of their roles, competencies and professional development.

The CanMEDS competency based framework[53] informed an Australian adaption[308] and provided the foundation to align clinical practice, accreditation, clinical teaching, student training, quality assurance and ongoing professional development. Incorporating the GP role of scholar, recognised the essential domains of clinical teaching and defined the knowledge, skills, attitudes and attributes for a clinical teacher.[112] Identifying these competencies informed the descriptors of quality, required training, potential professional development and assessment approaches.

A new unified conceptual construct of clinical teacher self-efficacy[316] provided a valuable new dimension to medical education research. Clinical teacher self-efficacy is the confidence and belief that their teaching will positively influence and impact on the learner in a clinical medical environment. Knowledge translation from fields of psychology[25] and education[119] showed that self-efficacy is a key factor in influencing the teacher's professional behaviour, motivation, persistence and performance, as well as the student's learning outcomes.[120]

A systematic review on the effectiveness of interventions on the self-efficacy of clinical teachers showed that this is an under-researched area. The few published studies showing interventions positively impacting on self-efficacy in the clinical teacher included focussed clinical teaching courses, interactivity using clinical scenarios, communication skills and teaching prompts, with peer learning and mentoring.

There was an international absence of a measurement tool to evaluate self-efficacy in clinical teaching. In a world first, the development and validation testing of a new Self-Efficacy in Clinical Teaching (SECT) tool was undertaken. The two-stage evaluation demonstrated SECT to be a reliable measurement instrument with initial indications of good content, construct and dimensional validity. It was authentic, robustly aligned to Bandura's[23] psychological self-efficacy construct, reflective of clinical teaching practice, realistic and convenient to use.

The innovative development of a low technological intervention using mental imagery and visualisation provided an interactive clinical teacher professional development activity, and showed the development of self-efficacy in the clinical teacher. The intervention was also authentic to Bandura's[25] development sources of self-efficacy and provided a proxy mastery experience to real life, vicarious colleague modelling, social persuasion through peer feedback, and managing affective states such as own anxiety. There was an increase that did

not reach statistical significance in the self-efficacy in clinical teaching of both the control and intervention groups after 12 months. Further analysis of three subscales showed the largest increase in Factor I (customised teaching) over the 12 months, followed by Factor III (impact on learner) and then Factor II (teaching prowess). The timeline effects on the self-efficacy of clinical teaching's three dimensions were highest one month after the intervention, with statistically significant improvement in the early months, with a gradual plateau to a higher level after 12 months. This early impact indicates that mental imagery and visualisation can boost clinical teacher self-efficacy, albeit as a short term effect. Although secondary outcomes showed no impact on indirect performance indicators, (supervisor qualities or quality of clinical teaching), further research is required.

Self-efficacy development can form an effective and integral part of the professional development of clinical teachers and medical educators. The duality of competency and self-efficacy can provide the arms for excellence in Australian general practice and clinical teaching. Further development of mental imagery scripts, validated competency based assessment tools and longitudinal research of learner impact are indicated.

The construct of self-efficacy, the validation of an appropriate measure and the development of self-efficacy by mental imagery are potentially valuable for doctors who clinically teach in a community based general practice setting. These findings could be generalisable to other clinical teaching health settings, (e.g. nursing, physiotherapy) and other countries with similar primary health care delivery and GP training models (e.g. UK, Canada, Singapore, Hong Kong, New Zealand, Netherlands).

An increased recognition of clinical teaching competencies, the value of self-efficacy and support for the roles of the GP will provide community benefits in high quality training, excellent patient care and patient safety. Developing focussed interventions to develop self-efficacy in the clinical teacher in general practice complements current professional development activities. It requires few resources, builds on existing general practice training infrastructure, is potentially low cost and has positive impacts.

APPENDICES

Appendix I: Search strategy

Imagination[tw] *OR* Visuali*[tw] *OR* Mental rehears*[tw] *OR* Mental practic*[tw] *OR* Mental imagery[tw] *OR* Mental training[tw] *OR* Mentally train*[tw] *OR* Imagery[tw] *OR* Mindfulness[tw] *OR* Teaching script*[tw]	Self-efficacy[tw] *OR* Self-confidence[tw]	Education, professional[mh] *OR* Medical education[tw] *OR* professional development[tw] *OR* Clinical teach*[tw]

Appendix II: Quantitative appraisal instruments

JBI Critical Appraisal Checklist for Randomised Control / Pseudo-randomised Trial

Reviewer _____ Date _____

Author _____ Year _____ Record Number _____

	Yes	No	Unclear	Not Applicable
1. Was the assignment to treatment groups truly random?	☐	☐	☐	☐
2. Were participants blinded to treatment allocation?	☐	☐	☐	☐
3. Was allocation to treatment groups concealed from the allocator?	☐	☐	☐	☐
4. Were the outcomes of people who withdrew described and included in the analysis?	☐	☐	☐	☐
5. Were those assessing outcomes blind to the treatment allocation?	☐	☐	☐	☐
6. Were the control and treatment groups comparable at entry?	☐	☐	☐	☐
7. Were groups treated identically other than for the named interventions	☐	☐	☐	☐
8. Were outcomes measured in the same way for all groups?	☐	☐	☐	☐
9. Were outcomes measured in a reliable way?	☐	☐	☐	☐
10. Was appropriate statistical analysis used?	☐	☐	☐	☐
	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info. ☐

Comments (Including reason for exclusion)

JBI Critical Appraisal Checklist for Descriptive / Case Series

Reviewer _____ Date _____

Author _____ Year _____ Record Number _____

	Yes	No	Unclear	Not Applicable
1. Was study based on a random or pseudo-random sample?	☐	☐	☐	☐
2. Were the criteria for inclusion in the sample clearly defined?	☐	☐	☐	☐
3. Were confounding factors identified and strategies to deal with them stated?	☐	☐	☐	☐
4. Were outcomes assessed using objective criteria?	☐	☐	☐	☐
5. If comparisons are being made, was there sufficient descriptions of the groups?	☐	☐	☐	☐
6. Was follow up carried out over a sufficient time period?	☐	☐	☐	☐
7. Were the outcomes of people who withdrew described and included in the analysis?	☐	☐	☐	☐
8. Were outcomes measured in a reliable way?	☐	☐	☐	☐
9. Was appropriate statistical analysis used?	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

Appendix III: Data extraction instrument

MAStARI data extraction instrument

JBI Data Extraction Form for Experimental / Observational Studies

Reviewer _____ Date _____

Author _____ Year _____

Journal _____ Record Number _____

Study Method

RCT ☐ Quasi-RCT ☐ Longitudinal ☐

Retrospective ☐ Observational ☐ Other ☐

Participants

Setting

Population

Sample size

Group A _____ Group B _____

Interventions

Intervention A

Intervention B

Authors Conclusions:

Reviewers Conclusions:

Appendix IV: Quantitative excluded studies (after critical appraisal)

MAStARI

1. Furney S, Orsini A, Orsetti K, Stern D, Gruppen L, Irby D. Teaching the one-minute preceptor: A randomized controlled trial. 2001.[228]

Reason for exclusion: Showed usefulness of one minute preceptor, but no teacher self efficacy

2. Hewson M, Copeland H. Outcomes assessment of a faculty development program in medicine and pediatrics.1999.[227]

Reason for exclusion: no self-efficacy outcome and author if 2000 essay alluded to use of additional Cleveland Self-assessment of teaching competence but not reported in this study

3. Kogan J, Conforti L, Bernabeo E, Durning S, Hauer K, Holmboe E. Faculty staff perceptions of feedback to residents after direct observation of clinical skills. 2012.[229]

Reason for exclusion: This was a qualitative study - Intervention noted as secondary outcome teacher self efficacy, but did not influence/change or measure teacher self efficacy

4. Lorenz R, Gregory R, Davis D. Utility of a brief self-efficacy scale in clinical training program evaluation. 2000.[121]

Reason for exclusion: Dieticians, not clinical teachers, and self efficacy questions around teaching and management of patients

5. Turner N, Lukkassen I, Bakker N, Draaisma J, ten Cate O. The effect of the APLS-course on self-efficacy and its relationship to behavioural decisions in paediatric resuscitation. 2009.[170]

Reason for exclusion: Correlation between self-efficacy in general resus skills and observers assessment of their global performance. The only pre-test post-test measurement on self-efficacy is the death of the patient

6. Webb P, Gripper A. Developing teacher self-efficacy via a formal HIV/AIDS intervention. 2010.[204]

Reason for exclusion: School teachers inservice training, HIV AIDS education in school, used STEBI

Appendix V: Systematic review data extraction summary table

Study details	Study method	Participant details	Intervention A	Intervention B	Outcome measures	Study results	Author conclusions and reviewer's comments
Barratt et al (2004), USA	Quasi-experimental study	Inclusion criteria Clinical teachers in Paediatrics Exclusion criteria Unclear Mean±sd age of entry to trial Not known Gender Male no. 3 (23%) Female no. 10 (77%) Setting University of Texas Faculty of	Teaching program (n=13):- bed- side teaching, teaching during rounds, feedback, evaluation. effective teaching, adult learning, setting goals, defining objectives for teaching, giving critical feedback, lecturing, modeling teaching		1. teacher comfort 2. teacher knowledge and skills 3. giving feedback	significant improvement in Teacher comfort level, teacher knowledge, teaching skills, giving feedback (esp critical feedback)	Author's conclusion: Teaching program improves clinical teacher confidence Reviewer's comments: Confidence contributes to teacher self-efficacy, but not accurately measured

Study details	Study method	Participant details	Intervention A	Intervention B	Outcome measures	Study results	Author conclusions and reviewer's comments
		Paediatrics					
Bosse et al (2010), Germany	Quasi-experimental study	Inclusion criteria 109 medical teachers Exclusion criteria Unclear Mean±sd age of entry to trial 34.04 +/- 7.43 years Gender Male no. (63.37%) Female no. (35.63%) Setting University of Heidelberg Medical Faculty	Problem Based Learning (PBL) tutor training (n=109):- interactive online training tool which incorporates video clips and exemplary intervention strategies for dealing with obstacles arising in tutorials.		Teacher self-efficacy :- Steps of PBL, role of PBL tutor, preparedness for tutor, managing problematic tutorial situations, value of PBL approach	significant changes in all five self-efficacy outcomes	Author's conclusion: Online video interactive PBL tutor training improves clinical teacher self-efficacy Reviewer's comments: Online training increases elements of teacher self-efficacy, but no linkage to teaching performance

Study details	Study method	Participant details	Intervention A	Intervention B	Outcome measures	Study results	Author conclusions and reviewer's comments
Buckley et al (2007), UK	Quasi-experimental study	Inclusion criteria Final year medical students as peer tutors Exclusion criteria Unclear Mean±sd age of entry to trial Unclear Gender Male no. 32(32%) Female no. 62 (68%) Setting University of Birmingham	Objective Structured Clinical examination (OSCE) peer tutor training course (n=94):-		practical teaching skills, confidence in speaking to small groups, communication and own learning skills	Improved confidence in speaking to small groups	Author's conclusion: Improved generic or educational skills, confidence and willingness to engage in teaching in future Reviewer's comments: No comparative control group. Confidence contributes to teacher self-efficacy, but not accurately measured.
Bylund et al (2008), USA	Quasi-experimental study	Inclusion criteria Clinical teachers	Train the trainer workshop for communication		Clinical teacher confidence in small group	confidence in their ability to facilitate small group role	Author's conclusion: Train the trainer

Study details	Study method	Participant details	Intervention A	Intervention B	Outcome measures	Study results	Author conclusions and reviewer's comments
		in Internal medicine Exclusion criteria Not known Mean±sd age of entry to trial Not known Gender Male no. (%) Not known Female no. (55%) Not known Setting Memorial Sloan-Kettering Cancer Center	skills training (n=33):- using Comskil five step facilitation process and experiential learning through role play		facilitation	play increased significantly)	facilitation skills and role plays improves clinical teacher confidence Reviewer's comments: Confidence in facilitation skills, role plays and small group management contributes to teacher self efficacy, but not accurately measured
Christmas et al (2008), USA	Quasi-experimental study	Inclusion criteria 42 Non-geriatrician clinical teacher	3 day mini Fellowship course(n=42):- topics related to the elderly,		UCLA Test of Geriatric Knowledge and Attitudes	Significant improvement in self-efficacy to teach about geriatrics after 3	Author's conclusion: Intensive teaching course in geriatrics

Study details	Study method	Participant details	Intervention A	Intervention B	Outcome measures	Study results	Author conclusions and reviewer's comments
		doctors Exclusion criteria Not known Mean±sd age of entry to trial 44 years (30-62) Gender Male no. 20 (48%) Female no. 22 (52%) Setting John Hopkins University	principles of adult learning, teaching in small groups, teaching utilizing the 1-minute preceptor model, providing effective feedback, role modeling, curriculum development, presenting a stage talk, role plays and career advancement as an educator		Questionnaire about self-perceived geriatrics knowledge, value of learning geriatrics for clinical care, and self-rated efficacy to teach geriatrics designed for this course, the Geriatrics Clinician-Educator Learning Questionnaire (G- CEL Q)	days. 6 months post course, 24% of participants demonstrated new teaching behavior:- teaching new courses to students, teaching geriatrics principles at the bedside, giving a new lecture on a selected geriatrics topic to residents, and organizing a seminar focused on teaching geriatrics	improves clinical teacher self efficacy, and new teaching behaviours developed 6 months post course Reviewer's comments: Improved clinical teacher self efficacy in geriatrics leads to teaching behaviour change
Crowe et al (2000), Australia	Quasi-experimental study	Inclusion criteria 39 surgical registrars	Half day teaching workshop involving "teaching on the		Pre and Post questionnaire	77% feeling more confident with their teaching after the workshop	Author's conclusion: Brief intervention

Study details	Study method	Participant details	Intervention A	Intervention B	Outcome measures	Study results	Author conclusions and reviewer's comments
		involved in junior doctor teaching Exclusion criteria Not known Mean±sd age of entry to trial Not known Gender Male no. (%) Female no. (%) Setting Prince of Wales Hospital NSW	run", simulated teaching activities and discussion small groups				focused on teacher skill development may enhance the confidence and enjoyment of junior clinical teachers and increase the frequency of "teaching on the run" Reviewer's comments: Exploratory study that indicates need for clinical teacher training, and an association between focused teacher training and teacher self

Study details	Study method	Participant details	Intervention A	Intervention B	Outcome measures	Study results	Author conclusions and reviewer's comments
							confidence, but no objective measure of teacher self efficacy or teacher performance
Erlich et al (2014), USA	Quasi-experimental study	Inclusion criteria 13 final year medical students undergraduate peer tutoring Exclusion criteria Unclear Mean±sd age of entry to trial Not known Gender Male no. (%) Female no. (%)	12 week Student Teacher Education Program (STEP)	Control 35 student teachers conducting same peer undergraduate tutoring	Final year student teacher outcomes Self assessment of confidence and competence in teaching skills Student appraisal STEP tutor assessment	1. Found the STEP program to develop teaching knowledge, skills and attitudes for student teachers corresponded with improvements in their teaching confidence, observable teaching behaviours and outcomes of their students. 2. Four skills showing greatest increase in teacher self-confidence were giving oral	Author's conclusion: Embedding a longitudinal education in practical teaching experience reinforces knowledge, skills and attitudes of teaching for final year medical students, and gives them increased

Study details	Study method	Participant details	Intervention A	Intervention B	Outcome measures	Study results	Author conclusions and reviewer's comments
		Setting Tufts University School of Medicine in Boston, Massachusetts, USA				feedback, giving written feedback, working with a difficult learner, and mentoring. 3. The top individual student teachers (as rated by their student learners) were also the teachers whose students performed best in their clinical examination. Correspondingly the students of the lowest rated teachers, achieved the lowest OSCE scores	competency and confidence in their teaching. Reviewer's comments: Clear teacher self efficacy outcome and linkage to Kirpatrick's heirachy of curriculum evaluation is insightful
Foster et al (2013), Australia	Quasi-experimental study	Inclusion criteria 81 medical consultants, GP's and registrars	Five 90 minute modules comprising the NCS Short course for Clinical Teachers topics	No control group	Pre and Post questionnaire around self efficacy statements	- Increased confidence in beside and ward round teaching -More confident in ability to give	Author's conclusion: An accessible practical focused teaching course can

Study details	Study method	Participant details	Intervention A	Intervention B	Outcome measures	Study results	Author conclusions and reviewer's comments
		involved in clinical teaching of medical students Exclusion criteria Unclear Mean±sd age of entry to trial Not known Gender Male no. (%) Female no. (%) Setting Northern Clinical School, University of Sydney, NSW	include 1. Bedside teaching 2. Effective supervision and feedback 3. Teaching physical examination and procedures 4. presentation skills and effective lectures 5. facilitating development of clinical reasoning skills			honest feedback to learner	improve clinical teachers skills, confidence and motivation to teach. Reviewer's comments: Lacks robustness in outcome analysis, shows increased confidence in clinical teaching and is indicative of subtle shift to more reflective approach to the complexity of teaching post training
Gaba et al (2007), USA	Quasi-experimental study	Inclusion criteria Resident doctor	Resident as Teacher (RAT) program (n=14):-		1. Teaching performance by six station 2	Significant improvement in overall teaching	Author's conclusion: RAT program

Study details	Study method	Participant details	Intervention A	Intervention B	Outcome measures	Study results	Author conclusions and reviewer's comments
		teachers in obs/gynae Exclusion criteria Unclear Mean±sd age of entry to trial 27 Gender Male no. 3 (23%) Female no. 10 (77%) Setting George Washington University School of Medicine	Used framework of a 3 function model of clinical teaching. Workshops included bed- side teaching, teaching in setting of a case presentation, giving feedback, giving a mini-lecture, orientation a learner, teaching a skill		hour OSTE 2. Clinical educator self assessment	performance, greatest impact on case presentation teaching, skill teaching, bedside teaching, and giving a mini-lecture.	improves residents teaching skills and improved confidence in teaching abilities Reviewer's comments: Confidence contributes to teacher self efficacy, but not accurately measured
Godfrey et al (2004), UK	Quasi-experimental study	Inclusion criteria Consultant doctors across	3 day Training the Trainers (TOT) program (n=75):-	Control (n=45)	1. self assessed survey of 18 teaching skills pre and 8-10	significant improvement in Teacher comfort level, teacher	Author's conclusion: As a group the TOT course

Study details	Study method	Participant details	Intervention A	Intervention B	Outcome measures	Study results	Author conclusions and reviewer's comments
		various specialties Exclusion criteria Unclear Mean±sd age of entry to trial Not known Gender Not known Setting University of Sheffield and Hospitals across Trent Region			months post intervention 2. global rating of teaching confidence and effectiveness 3. self reported changes to teaching	knowledge, teaching skills, giving feedback (especially critical feedback)	participants showed an improvement on 16 of the 18 teaching skills after 8-10 months, with four being statistically significant. These included motivates learners, using questions to stimulate learners thinking, teach at a level consistent with learner's abilities, and assessing learners progress. The global rating of confidence post intervention in their teaching

Study details	Study method	Participant details	Intervention A	Intervention B	Outcome measures	Study results	Author conclusions and reviewer's comments
							was significantly increased. Reviewer's comments: Indicates that TOT course effective for increasing teaching skills and global confidence
Grady-Weliky et al (2009), USA	Pilot study	Inclusion criteria Psychiatric PGY2 resident doctors Exclusion criteria Unclear Mean±sd age of entry to trial Not known	Brief Didactic two 2 hour psychiatry residents as teachers workshops (n=12):- Overview of medical school psychiatric curriculum, roles, adult learning principles, small teaching, using one minute preceptor clinical	No Control	1. value of teaching 2. teacher knowledge, skills and attitude	Nearly all residents agreed or strongly agreed that the development of teaching skills is important to professional development as a doctor. Statistically significant improvement in teaching skills was reported, especially in using different	Author's conclusion: Brief workshop may enhance psychiatric resident doctors self assessment of teaching knowledge, skills and comfort. Reviewer's comments:

Study details	Study method	Participant details	Intervention A	Intervention B	Outcome measures	Study results	Author conclusions and reviewer's comments
		Gender Not known Setting University of Rochester School of Medicine and Dentistry	teaching method, and using RIME feedback method			teaching methods ($p < 0.001$), evaluating teaching techniques ($p < 0.002$) and having a plan to improve teaching skills ($p = 0.016$). Around the theme of attitude, these psychiatric residents reported significant improvement in being comfortable teaching students ($p < 0.04$) and self reported their perception that "my peers would describe my teaching skills as good". ($p < 0.03$) Statements that reflect self efficacy in their clinical teaching.	Attitudinal statements about comfort level with teaching and perception of others rating of their clinical teaching are self efficacy statements.

Study details	Study method	Participant details	Intervention A	Intervention B	Outcome measures	Study results	Author conclusions and reviewer's comments
Lang et al (2012), USA	Quazi-experimental study	Inclusion criteria Clinical teachers in Paediatrics / internal medicine faculty Exclusion criteria Unclear Mean±sd age of entry to trial Not known Gender Not known Setting University of Rochester School of Medicine and Dentistry, New York	Preparation and review monthly workshops developing teaching scripts around common diagnoses (n=22):-	No control	Pre and Post Clinical Teaching Self efficacy around 10 common diagnoses Number of teaching activities around 10 common diagnoses	faculty self efficacy with teaching was available for 7 out of the 10 common diagnoses, and showed significant improvement. (Pre mean 3.26, Post mean 3.72, 95% CI 0.35-0.51, p < 0.0001). No significant difference in the number of teaching events from before to after the program in the 10 common diagnoses. The author concludes that writing teaching scripts was an efficient approach to improve self-rated teaching skills, enhance professional	Author's conclusion: Writing teaching scripts was an efficient approach to improve self-rated teaching skills, enhance professional development and build collegiality among clinician teacher. Reviewer's comments: Preparing teaching scripts contributes to teacher self efficacy, but indirectly measured.

Study details	Study method	Participant details	Intervention A	Intervention B	Outcome measures	Study results	Author conclusions and reviewer's comments
						development and build collegiality among clinician teacher.	
Morrison et al (2003), USA	Randomised Controlled Trial	Inclusion criteria PGY2 generalist resident doctors Exclusion criteria Projected absence Mean±sd age of entry to trial Not known Gender Male no.11 (48%) Female no. 12 (52%) Setting University of California,	Teaching program (n=13):- longitudinal interdisciplinary residents-as-teachers program, following the BEST curriculum. A 13 hour program during one hour noon conferences twice monthly for six months.	Control (n=10)	3.5 hour eight station OSTE designed specifically to test the clinical teaching skills Clinical Teaching Perception Inventory (CTPI), a 28 item Q-sort instrument that measures comfort with clinical teaching	Highly significant global improvement in clinical teaching performance. Significant improvement in a specific teaching performance orientating a learner, bedside teaching, giving feedback, inpatient teaching, teaching charting, and giving a mini-lecture. Improvement in ratings around self perception of "myself as a	Author's conclusion: Resident-as-teachers program showed global improvement in clinical teaching performance and increased perception of self and comfort in clinical teaching. Reviewer's comments: Study links clinical teacher performance and self efficacy.

Study details	Study method	Participant details	Intervention A	Intervention B	Outcome measures	Study results	Author conclusions and reviewer's comments
		Irvine, College of Medicine				teacher"	Comfort in teaching contributes to teacher self efficacy, but not accurately measured
Singh et al (2013), USA	Quazi-experimental study	Inclusion criteria Health professional teachers in FAIMER institute Exclusion criteria Unclear Mean±sd age of entry to trial Not known Gender Male no. 3 (23%) Female no. 10	Fellowship Teaching program (n=70):- Two year faculty development training uses mentoring by senior colleagues, previous fellows and peers, with experiential learning in the context of the projects to learn the concepts of educational methods and leadership		Teacher Efficacy Belief System(TEBS self)	Significant impact on the clinical teachers self-efficacy beliefs. The intervention group showed consistently higher and statistically significant scores in subscale measurements across all areas. (namely communication, classroom management, motivation of students,	Author's conclusion: Results demonstrate that the fellowship program has a significant influence increasing the levels of self efficacy beliefs in health professional teachers and the effects persist even after a year.

Study details	Study method	Participant details	Intervention A	Intervention B	Outcome measures	Study results	Author conclusions and reviewer's comments
		(77%) Setting FAIMER institute across India, South Africa and Brazil				accommodation of individual differences and higher order thinking skills)	Reviewer's comments: Although this study did not identify the specific aspects of the program that contributed to the development of clinical teachers self efficacy, it does show that clinical teacher self efficacy was increased, and is incremental and sustained over twelve months.
Vanek et al (1996), USA	Descriptive study	Inclusion criteria Primary care clinical physician	Questionnaire (n=83):- Self reported 28 teaching behaviour	No control	Self reported confidence Self reported frequency of use	Most confident around clinical supervision substantiating patient's clinical	Author's conclusion: Physician's confidence in their clinical

Study details	Study method	Participant details	Intervention A	Intervention B	Outcome measures	Study results	Author conclusions and reviewer's comments
		teachers in undergraduate medicine Exclusion criteria Unclear Mean±sd age of entry to trial Not known Gender Not known Setting Case Western Reserve University of Medicine, Cleveland Ohio	questionnaire,with a 5 point Likert scale rating their confidence and frequency of use.			findings, encouraging questions, giving information and providing directions for patient care. There was a positive relation between physician's rating of confidence in performing teaching behaviours and their ratings of frequency with which they performed them (r- 0.79))	teaching is a key element in their use of instructional teaching skills in the ambulatory car setting Reviewer's comments: Confidence contributes to teacher self efficacy and frequency of use, but not accurately measured

Appendix VI: University of Adelaide ethics approval

THE UNIVERSITY of ADELAIDE

RESEARCH BRANCH
RESEARCH ETHICS AND COMPLIANCE UNIT

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30 September 2011

Professor J Beilby
Health Sciences

Dear Professor Beilby

PROJECT NO: H-252-2011
Developing self efficacy in clinical GP supervisor/trainer's teaching in a General Practice setting

I write to advise you that on behalf of the Human Research Ethics Committee I have approved the above project. Please refer to the enclosed endorsement sheet for further details and conditions that may be applicable to this approval.

The ethics expiry date for this project is: 30 September 2012

Where possible, participants taking part in the study should be given a copy of the Information Sheet and the signed Consent Form to retain.

Please note that any changes to the project which might affect its continued ethical acceptability will invalidate the project's approval. In such cases an amended protocol must be submitted to the Committee for further approval. It is a condition of approval that you immediately report anything which might warrant review of ethical approval including (a) serious or unexpected adverse effects on participants (b) proposed changes in the protocol; and (c) unforeseen events that might affect continued ethical acceptability of the project. It is also a condition of approval that you inform the Committee, giving reasons, if the project is discontinued before the expected date of completion.

A reporting form is available from the Committee's website. This may be used to renew ethical approval or report on project status including completion.

per **PROFESSOR GARRETT CULLITY**
Convenor
Human Research Ethics Committee

Appendix VII: SECT scale pilot version

Self-Efficacy of Clinical Teaching Survey and Workshop

Information for Participants

Developing Self Efficacy of GP's who teach

Increasingly General Practitioners are involved in teaching and training undergraduate and postgraduate students in a clinical General Practice.

I worked for many years as a rural GP in Clare, in the developing world, and most recently as a rural locum with RDWA. Throughout my twenty year General Practice career, I have been interested and involved with teaching medical students, junior doctors and GP registrars doing their post graduate specialist training, and currently as medical director of Adelaide to Outback GP training.

It is difficult to be the expert in the community General Practice setting, where clinical presentations can be ambiguous, patients expectations unclear, and clinical placement student's learning objectives uncertain. There is so much more to clinical teaching in the General Practice setting than the transfer of knowledge. Is an attribute of an excellent clinical teacher in General Practice, being confident in not knowing, but a willingness to create a learning environment, that explores to find an answer? With the additional responsibility of responding to the registrars/students presence and needs, this leaves many clinical GP supervisors/trainers lacking confidence, and a perceived lack of expertise and understanding of what they should teach.

I am interested in assisting GP's to feel more confident and be better teachers, to ultimately recognize their clinical teaching expertise in the General Practice setting.

I am currently undertaking postgraduate research at the University of Adelaide focusing on the self-efficacy of a clinical GP supervisors/trainers teaching. Self-efficacy is more than confidence, and can be defined as a person's belief about his/her ability and capacity to accomplish a task or deal with the challenges of life. By developing this particular attribute, can there be an improvement in the teaching and learning that is occurring in a clinical General Practice setting.

I welcome the experience, expertise, thoughts and ideas you can contribute to this important and poorly understood area of General Practice teaching. Your participation in this survey and skill development workshop is entirely voluntary.

You are asked to fill in a short questionnaire, Self Efficacy in Clinical Teaching, that will take up to 10 minutes to complete. This will be confidential, given a de-identified number so that the data will be collated together, and only used for my personal and aggregated research. The RACGP or ACRRM number is used to provide you with Continuing Medical Education or Professional Development Program Points.

You will be involved in a teacher development workshop involving visualization and mental rehearsing, and be asked to complete a follow-up questionnaire. This work is part of AOGP and University of Adelaide postgraduate research.

For any queries, or concerns, please contact Dr Lawrie McArthur on 0400 366 955. Alternatively contact the co-investigators by email on lawrie.mcarthur@adelaide.edu.au or Professor Justin Beilby on justin.beilby@adelaide.edu.au

Adelaide to Outback GP training program Customised Personalised Specialised

THE UNIVERSITY of ADELAIDE

Self Efficacy in Clinical Teaching (SECT)

GP Supervisors/Clinical Trainers Workshop 2012

Researcher – Dr Lawrie McArthur

The information for participants in the Self Efficacy in Clinical Teaching Survey and Workshop has been satisfactorily explained and I agree to participate in this ethically approved research.

Participants signature _____

Number (ACRRM/RACGP/other) _____

Sex Female ☐ Male ☐

University of Medical Degree Within Australia ☐ Internationally ☐

List Post-Graduate qualifications _____ _____ _____

Number of years of clinical practice _____

Postcode of clinical practice _____

Areas of Special Clinical Practice Interest 1._____

2._____

3._____

Is your teaching practice?

- ☐ Urban
- ☐ Teaching Hospital
- ☐ Outer metropolitan
- ☐ Rural
- ☐ Remote

Number of years of clinical teaching _____

Teaching area of expertise 1._____

2._____

3._____

Main focus of teaching

- ☐ Postgraduate Registrar
- ☐ Pre-vocational Doctor in General Practice
- ☐ Hospital based
- ☐ Undergraduate medical
- ☐ Undergraduate allied health

List any Professional development teacher activities undertaken 1._____

2._____

3._____

Document information
Document custodian: Dr Lawrie McArthur
Version: 1.1

aogp Adelaide to Outback GP training program Customised Personalised Specialised

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Note – Registrar, trainee or student on clinical placement is interchangeable.

Self-efficacy of general teaching

1.	I can correctly appraise the learning needs of registrars	1 2 3 4 5 6 7
2.	I can write individualised learning objectives based on a registrar's unique situation.	1 2 3 4 5 6 7
3.	I can provide appropriate instructional content, based on a registrar's learning need.	1 2 3 4 5 6 7
4.	I can select appropriate teaching strategies when encountering different registrar's needs.	1 2 3 4 5 6 7
5.	I can provide clinical instruction in a clear manner that registrars can understand.	1 2 3 4 5 6 7
6.	I can correctly demonstrate clinical skills such as management of the patient consultation/interaction.	1 2 3 4 5 6 7
7.	I have the ability to change the attitude/values of a registrar.	1 2 3 4 5 6 7
8.	I can design teaching plans for registrars.	1 2 3 4 5 6 7
9.	I have the ability to evaluate the effectiveness of a registrar's clinical and consulting efforts through direct observation.	1 2 3 4 5 6 7
10.	I can refine teaching content and methods based on a registrar's learning needs and confounding factors.	1 2 3 4 5 6 7

Self-efficacy of specific curriculum areas teaching

11.	I can prepare learning objectives across a registrar's area of development.	1 2 3 4 5 6 7
12.	I can give instruction on strategies and resources in a registrar's area of development.	1 2 3 4 5 6 7
13.	I can teach what the registrar needs to know.	1 2 3 4 5 6 7
14.	I am confident to teach an area that is not my expertise	1 2 3 4 5 6 7
15.	I can teach registrars to determine their professional boundaries	1 2 3 4 5 6 7
16.	I can stimulate the registrar to learn areas of curriculum that don't interest them.	1 2 3 4 5 6 7

Self-efficacy of the professional

17.	I can handle most difficult registrar questions or situations.	1 2 3 4 5 6 7
18.	I can tailor my feedback to be constructive and developmental.	1 2 3 4 5 6 7
19.	I can facilitate a positive clinical learning environment for the registrar.	1 2 3 4 5 6 7
20.	I can provide appropriate support for helping registrars learn and sustain work/life/family balance and personal wellbeing.	1 2 3 4 5 6 7
21.	I am effective in my clinical training	1 2 3 4 5 6 7
22.	I am well organised and prepared for the in-practice teaching.	1 2 3 4 5 6 7
23.	I am concerned for my registrars wellbeing	1 2 3 4 5 6 7
24.	I actively encourage registrars learning and participation.	1 2 3 4 5 6 7
25.	I give clear explanations to questions around clinical scenarios.	1 2 3 4 5 6 7

Document Information
Document custodian: Dr Lawrie McArthur
Version: 1.0
Date modified: August 2011

Appendix VIII: Workshop – Mastering Performance

An outline of the workshop program is described.

Pre-activity – SECT survey

Introduction - Know that in Sports psychology, techniques of visualisation and mental rehearsing are known to assist elite athletes develop their self-efficacy and thus improve their performance. Many classic examples – Golfers, kicking a ball at goal in football, even swimmers.

Objective of this mastering performance session today then is to teach you visualisation and mental rehearsing techniques, and adapt them into a clinical teaching scenario, to assist you in your clinical teaching.

"whatever the mind can conceive and believe, it can achieve!"
Stephanie Rice, originally Napoleon Hill, a US journalist.

Overview of Concept and Benefits of Visualisation(V) and Mental Rehearsing(MR) in elite Athletes

- Tim's personal sharing of teaching and experience in sports psychology
- Explanation of Imagery of Sports Psychology – seeing successful outcome, see self positively doing and achieving, immediately before (http://www.youtube.com/watch?v=SrwaN7Ux8M0)
- Explanation of Mental Preparation and Visualisation –visualize the overall environment, develop race mantra, game plan (http://www.youtube.com/watch?v=PCk5v-t7SjM)

- Explanation of Mental Imagery Scripts for V&MR - first need basic skill competency, develop mental rehearsing routine,

Interactive V&MR skill development

- Explanation of putting (http://www.youtube.com/watch?v=s0JWegnHp-o)
- Use model script for golf putting
    - Practice swing
        - Stand tall – shoulders apart
        - Club parallel – elbows in
        - Bend forward from hips
        - Left eye over ball – weight 60% over left foot
        - Rotate Chest – legs and head stable
    - Three steps
        - Read the green – imagine line from the ball to the cup
        - Walk in - Aim putter at starting line
        - Putter face through starting line

    - Create own script - Feet, shoulders, parallel hands, elbows in, head over ball, pendulum.
- Split into two groups – golfers (skilled) and nongolfers (nonskilled)
- Practice V&MR of imagery script on putting green
- Develop preparation routines, to get into really good mental and emotional state of mind, visualize different situations to prepare contingency strategies.

Facilitation V & MR in GP's clinical teaching

- A most important element in using mental imagery is to create own mental practice script. To assist athletes to create own script simply ask question, "When you are playing well, what would I see?" Deconstruct the skill into pieces or steps – keep head still, drive through with hips, rotate and pivot, club head over back shoulder to bottom. Use these four elements to create own mental practice script. Get the person to describe and use their own words
- How could you use V&MR skills in your clinical teaching? (Large Group brainstorming)
- For each GP to consider – "When you are teaching well, your reflection by self what goes well, or what others see?"

Specific GP clinical teacher skill development in V&MR

- Small group – how to use V&MR and apply
- Think of clinical teaching example
- E.g. EBM for Prostate screening, ear syringe, giving injection to a 2 year old, using liquid nitrogen, breaking bad news, how to finish a consult
- This deconstructed the clinical teaching activity and skill into important pieces and steps.
- Write own script, then present to small group of 3 –
- Practice of V&MR skill, third person observation & feedback and refinement to scripts

Discussion of V&MR skill

- Usefulness, need skill base first, then mental imagery is really good way to build confidence and self-efficacy, get people to reflect on what they are doing well

Responses of participants

Mastering Performance Responses by GP's

1. How could you use V&MR skills in your clinical teaching? - GP Responses included "set the scene", see the successful learning outcomes, preparation for clinical teaching, reinforce what I do well, reflect, evaluate
2. When you are teaching well, your personal reflection of what goes well, or what others would see?" - GP Responses included when I am listening, empathizing, developing a rapport, presenting options, have provisional diagnosis after a good history, broad set of differential diagnoses, empower. Behavioral responses like role modeling, tone of speech, open posture, eye contact, ensure privacy
3. Responses of using mental imagery in clinical teacher preparation included:
    - Loosen up - Walk in unhurried
    - Breath and Smile

4. Responses of using mental imagery cues included:
    - Consider the learner
    - Listen
    - Curiously explore
5. Responses from small group a specific teaching task example that they deconstructed, identified key steps, mentally rehearsed and talked through the steps in clinical teacher preparation included:
    - managing a suicidal patient,
    - clinical decision making,
    - the surgical removal of a sebaceous cyst,
    - conducting a good consultation,
    - managing drug seeking patient behaviour,
    - performing an ear syringing procedure.
6. Large group responses about the usefulness of mental imagery, visualisation and mental rehearsal, in their clinical teaching.

These techniques give me the confidence to prepare and know that I am teaching well by:

- factoring in the registrar situation,
- concentrating,
- listening,
- not rushing,
- being happy as well prepared,
- taking a breath,
- using humour,
- communicating,
- encourageing,
- drinking coffee,
- asking questions,
- prepared,
- relaxed and smiling,
- anticipating,
- confident,
- sharing my own experiences,
- interacting,
- curious and creative.

Post-activity – SECT survey

Appendix IX: Self-Efficacy in Clinical Teacher Tool

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SECT – a Self-Efficacy in Clinical Teacher Tool

Please rate yourself, circling a number, using a scale of 1 to 7, where 1 is least confident and 7 is most confident.

Note – Registrar, trainee or student on clinical placement is interchangeable.

Customising Teaching to Learning Needs

I can correctly appraise the learning needs of registrars	1 2 3 4 5 6 7
I can write individualised learning objectives based on a registrar's unique situation.	1 2 3 4 5 6 7
I can provide appropriate instructional content, based on a registrar's learning need.	1 2 3 4 5 6 7
I can select appropriate teaching strategies when encountering different registrar's needs.	1 2 3 4 5 6 7
I can refine teaching content and methods based on a registrar's learning needs and confounding factors.	1 2 3 4 5 6 7
I can teach what the registrar needs to know.	1 2 3 4 5 6 7
I am effective in my clinical training	1 2 3 4 5 6 7
I am well organised and prepared for the in-practice teaching.	1 2 3 4 5 6 7

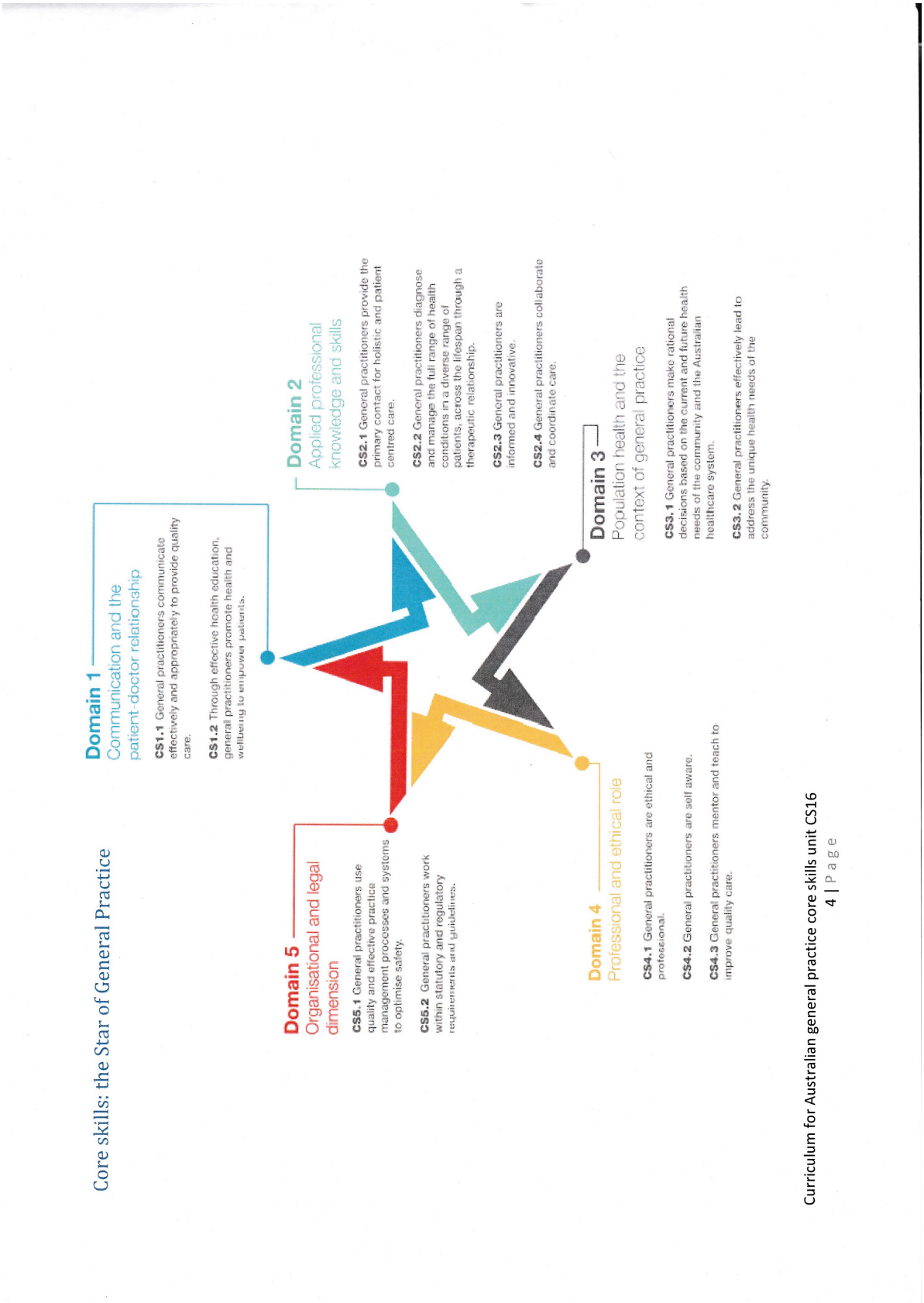
Teaching Prowess

I can provide clinical instruction in a clear manner that registrars can understand.	1 2 3 4 5 6 7
I can correctly demonstrate clinical skills such as management of the patient consultation/interaction.	1 2 3 4 5 6 7
I have the ability to evaluate the effectiveness of a registrar's clinical and consulting efforts through direct observation.	1 2 3 4 5 6 7
I can teach registrars to determine their professional boundaries	1 2 3 4 5 6 7
I can handle most difficult registrar questions or situations.	1 2 3 4 5 6 7
I give clear explanations to questions around clinical scenarios.	1 2 3 4 5 6 7
I can tailor my feedback to be constructive and developmental.	1 2 3 4 5 6 7
I am concerned for my registrars wellbeing	1 2 3 4 5 6 7

Impact on Learner's Development

I have the ability to change the attitude/values of a registrar.	1 2 3 4 5 6 7
I can design teaching plans for registrars.	1 2 3 4 5 6 7
I can prepare learning objectives across a registrar's area of development.	1 2 3 4 5 6 7
I can give instruction on strategies and resources in a registrar's area of development.	1 2 3 4 5 6 7
I can stimulate the registrar to learn areas of curriculum that don't interest them.	1 2 3 4 5 6 7
I can provide appropriate support for helping registrars learn and sustain work/life/family balance and personal wellbeing.	1 2 3 4 5 6 7

Appendix X: RACGP core skills, domains and star of general practice



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