

# **The Use of Entrustable Professional Activities Embedded in an e-portfolio to Support the Development of Dietetic Student Competencies**

Submitted by

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## Abstract

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Entrustable Professional Activities (EPAs) are a novel concept in health professions education, emerging in response to challenges of implementing competency-based assessment. EPAs describe observable work performed by competent health professionals with performance measured by an entrustment scale describing independence of the learner to execute activities at the standard required. There is a lack of a well-accepted tool to assess dietetic students during their professional placements and limited published research into the development of dietetic competence. This thesis sought to address these gaps by exploring novel use of EPAs combined with established evidence-based assessment strategies of e-portfolios and student self-assessment in the clinical and community and public health dietetic contexts. This was achieved through the following program of research:

1. A scoping review of 30 studies exploring EPAs in entry-level health professional education showed rapid uptake of EPAs for assessment, motivated by a desire to improve assessment practices and address misalignment between expectations and performance. This study also identified potential of EPAs for curriculum improvement and educational research.
2. A mixed-methods exploratory study confirming the need for improvement of current assessment practices and the preference of dietetics students and supervisors to use EPAs, student self-assessment and an e-portfolio format for work-based assessment.
3. Two action research studies set in clinical and community and public health dietetic placement program exploring design, implementation and evaluation of EPAs embedded in an e-portfolio with student self-assessment. The utility of EPAs for work-based assessment in clinical settings was rated highly by dietetics students and supervisors. Community and Public Health dietetic supervisors rated the utility of the EPA based tool highly.
4. A longitudinal study analysing educational data from three cohorts of clinical dietetic students determined construct validity of EPAs and confirmed the potential of EPAs to increase understanding of how dietetic skills develop in work-based assessment.

## Statement of Authorship

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This thesis includes work by the author that has been published or submitted for publication as described in the text. Except where reference is made in the text of the thesis, this thesis contains no material published elsewhere or extracted in whole or in part from a thesis accepted for the award of any other degree or diploma.

No other person's work has been used without due acknowledgment in the main text of the thesis.

This thesis has not been submitted for the award of any degree or diploma in any other tertiary institution.

All substantive contributions by others to the work presented including jointly authored publications is clearly acknowledged.

All research undertaken in this thesis has been approved by the La Trobe University Human Research Ethics Committee.

Student Signature

Date 18 December 2021

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## Candidate's Declaration

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For chapters 2, 3, 5, 6, 7

Chapter	Publication Title	Publication Status	Contribution
2	Entrustable Professional Activities: Focus on Assessment Methods	Published	55 %
3	Entrustable Professional Activities in entry-level health professional education: A scoping review	Published	70 %
5	E-portfolios and Entrustable Professional Activities to support competency-based education in dietetics	Published	70%
6a	Design, implementation and evaluation of novel work-based clinical assessment tool: an e-portfolio with embedded Entrustable Professional Activities	Published	80%
6b	Development and evaluation of Entrustable Professional Activities for work-based assessment in community and public health dietetics	Under review	80%
7	Validity and educational impact of Entrustable Professional Activities for work-based assessment of entry-level dietetic students: Evaluation of a 3-year implementation study	Under review	80%

Signed

Date 18/12/2021

## Supervisors' Declaration

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I hereby certify that the declaration above is a correct reflection of the extent of the contributions made by the student candidate towards each chapter in this thesis.

Name of Supervisor

Signature

Adrienne Forsyth

Lisa McKenna

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## Abbreviations

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AACN	American Association of Colleges of Nursing
ADIME	Assessment Diagnosis Intervention Management Evaluation
CanMEDs	Canadian Medical Education Directives for Specialists
CBA	Competency based assessment
CBE	Competency based education
CPH	Community and public health (dietetics)
DAA/ DA	Dietitians Association of Australia more recently known as Dietitians Australia
EPA	Entrustable Professional Activity
FSM	Food Service Management
ICM	Individual Case Management
MCQ	Multiple Choice Questionnaire
NCP	Nutrition Case Process
NCS	National Competency Standards (for dietitians in Australia)
NOOSR	National Office of Overseas Skills Recognition
OSCE	Objective Structured Clinical Exam
OWA	Observable Work-based Activity
PEI	Performance Evaluation Instrument
PI	Performance Indicator
WHO	World Health Organisation
WIL	Work integrated learning
WBA	Work based assessor/ Work based assessment

## Publications arising from this thesis

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All manuscripts included in this thesis, published and submitted were conducted and written during the candidature for the degree of Doctor of Philosophy. Each manuscript was formatted as required by the relevant journal including references and is included as published. Where required by the journal, permission to include the publication can be found in Appendix 2. Sections of this thesis that have not been published or submitted for publication are referenced according to APA7 style and are included in the references.

### Published

#### Journal Articles

**Bramley, A. L.,** Thomas, C. J., Mc Kenna, L., & Itsiopoulos, C. (2021). E-portfolios and Entrustable Professional Activities to support competency-based education in dietetics. *Nursing & Health Sciences*, 23(1), 148–156. <https://doi.org/10.1111/nhs.12774>

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**Bramley, A.,** Forsyth, A., & McKenna, L. (2021). Design, implementation and evaluation of novel work-based clinical assessment tool: An e-portfolio with embedded Entrustable Professional Activities. *Nurse Education Today*, 107, 105101. <https://doi.org/10.1016/j.nedt.2021.105101>

#### Book chapter

**Bramley A.,** McKenna L. (2020) Entrustable Professional Activities: Focus on Assessment Methods. In: Nestel D., Reedy G., McKenna L., Gough S. (eds) *Clinical Education for the Health Professions*. Springer, Singapore. [https://doi.org/10.1007/978-981-13-6106-7\\_82-1](https://doi.org/10.1007/978-981-13-6106-7_82-1)

#### Oral Presentations

**Bramley, A.L.,** Forsyth, A., McKenna, L. Development, implementation and evaluation of an EPA-based student placement assessment tool in clinical dietetics. *Dietitians Australia National Conference*, Melbourne, 2021

**Bramley, A.L.,** Toohey, K., Barrington, V., Forsyth, A. Improving Assessment and Feedback. The use of Entrustable Professional Activities embedded in an e-portfolio to support student dietetic education and assessment. *La Trobe University Teaching Week*. October 2019

**Bramley, A.L.**, Itsiopoulos, C., Thomas, C., McKenna, L. “An Australian first: The use of Entrustable Professional Activities embedded in an e-portfolio to support clinical dietetic education and assessment”. *8<sup>th</sup> International Clinical Skills Conference*, Prato, Italy, 2019

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### Under review

**Bramley, A.**, Forsyth, A, McKenna, L. Validity and educational impact of Entrustable Professional Activities for work-based assessment of entry-level dietetic students: Evaluation of a 3-year implementation study. Submitted to *Journal of the Academy of Nutrition and Dietetics*.

**Bramley, A.**, Forsyth, A, McKenna, L. Development and evaluation of Entrustable Professional Activities for work-based assessment in community and public health dietetics. Submitted to *Health and Social Care in the Community*.

### Interest in the thesis research

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E-portfolios and Entrustable Professional Activities to support competency-based education in dietetics. (Publication 1) featured in journal club review by Paul Ross (5.9.21) for <https://nursingeducationnetwork.net/tag/entrustable-professional-activities/>

### Other publications during candidature

Croxford, S., Stirling, E., McLeod, S., Biesiekierski, J., Murray, E., Ng, A., **Bramley, A.** & Forsyth, A. An exploratory study of industry perspectives to inform undergraduate nutrition employability initiatives. *Nutrition and Dietetics* (under review)

Ng, A., Reddy, A., Horvath, D., Larsen, A., Biesiekierski, J., Croxford, S., **Bramley A.**, McLeod, S., Stirling, E., Murray, E & Forsyth, A. undergraduate student perspectives on employability: A mixed methods exploration of nutrition student employability awareness, confidence, concerns and preferences. *Human Nutrition and Dietetics* (under review)

Brack, P., **Bramley, A.**, Downie, S., Gardner., M., Leo, J., Sturt, R., & Markham, D. (2021) Riding the waves: lessons learnt from Victoria's COVID-19 pandemic response for maintaining effective allied health student education and clinical placements. Online Early *Australian Health Review* doi.org/10.1071/AH21145

Watt, A., Ng, A. H., Sandison, A., Furlanos, S., & **Bramley, A.** (2021). Prevalence of disordered eating in adults with type 1 diabetes in an Australian metropolitan hospital. *Health & Social Care in the Community*. <https://doi.org/10.1111/hsc.13500>

Murray, E., McLeod, S., Biesiekierski, J., Ng, A., Croxford, S., Stirling, E., **Bramley, A.**, & Forsyth, A. (2020). Employability initiatives in undergraduate education and application to human nutrition: A scoping review. *Journal of Teaching and Learning for Graduate Employability*, 11(1), 63–80. <https://doi.org/10.21153/jtlge2020vol11no1art921>

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Radcliffe, J. E., Thomas, J., **Bramley, A. L.**, Kouris-Blazos, A., Radford, B. E., Scholey, A. B., Pipingas, A., Thomas, C. J., & Itsiopoulos, C. (2016). Controversies in omega-3 efficacy and novel concepts for application. *Journal of Nutrition & Intermediary Metabolism*, 5, 11–22. <https://doi.org/10.1016/j.jnim.2016.05.002>

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## Chapter 1 Introduction

---

In 2007 a new concept in health profession education, known as Entrustable Professional Activities (EPAs), emerged from medicine. EPAs are observable work-based activities performed by a competent health professional (Ten Cate, 2013). EPAs arose in response to challenges in implementing competency-based education, particularly in the context of work-based assessment common to all health professions education programs, where learners must demonstrate that they can apply professional knowledge and skills gained in the classroom into real-world situations.

This study was borne from personal experience of the doctoral candidate of challenges and frustrations of assessing dietetic students in the workplace using competency-based assessment. As a clinical dietitian, the candidate had taught into and been the workplace student supervisor under several dietetic education programs both in Australia and the United Kingdom. In Australia, despite having a national dietetics competency framework, each university had different assessment processes and forms which, from the perspective of a clinical supervisor, was inefficient and increased the cognitive load associated with each process. The use of multiple assessment processes is also a significant disincentive for practice providers from hosting students from more than one university which potentially limits placement capacity.

The transition to academia of the candidate in 2014 further highlighted shortcomings of the existing competency-based system. Competency-based assessment seemed challenging and fraught for all parties: students, supervisors and academics. Furthermore, the patient or client appeared absent in the process which is incongruent with the healthcare ethos of client-centred care. Additionally, from an academic perspective, traditional metrics used to evaluate subjects and teaching (marks, student satisfaction surveys) lacked sensitivity and specificity with regards to measuring the ability of students to perform the work expected of a graduate dietitian. Existing assessment processes did not provide a method to easily monitor student performance across the professional placement programme and did not provide information about how students developed skills in the workplace. From a workforce perspective, it is essential that students graduate with the knowledge and skills required, so the ability to measure this is crucial. Furthermore, existing methods did not provide means to measure or evaluate the impact of changes in teaching or curriculum on student outcomes.

At the time of inception of this research project, there were limited reports of EPA use in entry-level health professional education and no known examples in the literature of using EPAs to support the development and assessment of competency in dietetic education. Chapter 2 of this thesis is a narrative review that provides an overview of competency-based education and assessment strategies with a particular focus on the dietetic context. This chapter highlights that, although competency-based education is well established in dietetic education and that work-based placements are a fundamental part of the development of competence, there is no well accepted assessment tool to assess the ability of dietetic student competence in the work-based setting. A key finding of this chapter was that competency assessment can be supported using portfolios and that strategies to promote reflective practice can support skill development in learners. The main aim of this thesis was to develop, implement and evaluate a work-based assessment tool using an e-portfolio structure featuring embedded EPAs and student self-assessment for dietetic education with the overall goal of improving the utility of assessment methods.

This chapter provides a brief definition of some of the key concepts, terms and definitions in health professions competency-based education. An overview of the dietetic course, the professional placement structure and details of the research participants is provided. A brief summary of each chapter including contribution to the aim of the thesis concludes the chapter.

## 1.1 Key concepts and definitions

A brief overview of some of the key terms that are used frequently within this thesis is provided below.

**Health professional:** A health professional is defined as a person with formal qualifications and training who provides health care, advice and services to a patient (Mosby, 2013). Health professionals include doctors, nurses, dentists and allied health practitioners such as physiotherapists, dietitians, pharmacists amongst others. To be able to practise independently and treat patients, health professionals complete a course of education or training at a vocational training institute or university. Health professionals typically are regulated by government, industry or workforce regulatory bodies and/or may be eligible to be accredited for practice by self-regulating professional associations.

**Entry-level health professional:** A qualified health professional person who has entered the profession upon completion of formal training and fulfills the requirements of the regulatory body associated with that profession. They are capable of autonomous practice with the distant supervision of a more experienced member of the same profession. Some professions require a supervised practice year, such as an intern year, before being granted their full qualification (medicine and pharmacy) or may receive their qualification but be required to participate in a formal supervision programme to acquire full professional status (dietitians in Australia).

**Health professional education:** Health professional education is a broad term and can include the education and training required to become a health professional and be admitted to that profession or can encompass additional training leading to enhanced or specialised skills within a specific area of practice.

**Entry-level health professional education:** In the context of this thesis, entry-level health professional education has been chosen to mark the point along the journey of professional competence where health professionals can practise independently but with supervision by a more experienced professional on hand if required (Bramley & McKenna, 2021). The use of the term 'undergraduate training' has been deliberately avoided as training programs to allow entry to a profession may be undergraduate, typically a bachelor degree but may also be graduate entry masters or postgraduate diploma.

**Graduate health professional education** refers to additional formal education completed in order to specialise within a profession. For example, doctors to become medical specialists such as psychiatrists or gastroenterologists, or an additional qualification completed by a nurse to become a nurse practitioner. Additional education could take the course of professional development, for example, a dietitian or exercise physiologist completing an accredited motivational interviewing course to enhance their consultations with patients managing chronic disease.

### **Competency-based education**

The language surrounding the terms 'competence' and 'competency' have caused much confusion in health professional education. Unfortunately, competence and competencies can sometimes be used interchangeably blurring and confusing their meaning. In this thesis, the following definitions are used:

**Competence:** Competence is a state of being or the ability to perform or do something successfully. Competence is multidimensional and dynamic and depends on the setting of practice (Ten Cate & Scheele, 2007; Ten Cate et al., 2010)

**Competencies:** Competencies are statements that describe the integration of knowledge, skills, values and attitudes of a professional within a discipline (Pijl-Zieber et al., 2014).

**Competency frameworks:** A competency framework is an organised collection of related competency statements that articulates the knowledge, skills and attitudes of a profession and describes successful performance. These can be used by a variety of stakeholders including workforce and professional regulators, educators, professionals (within the discipline the framework relates to and other professions) and the public to define practice and professional attributes and expectations (Mills et al., 2020).

**Competency-based assessment:** This relates to the assessment of performance against a competency standard. It can be interpreted in a binary way where a person's performance meets the defined standard and is competent, or does not and is not competent (Rowe, 1995). An alternative is a scale of competency where a person moves from novice to proficient with competent being the middle point aligning with performance at a defined level of proficiency (Dreyfus, 1986). Both interpretations require multiple observations of performance and are subjective in nature.

**Work-based assessment:** Assessment of professional practice through participation in the workplace of the practising professional (Govaerts & Van der Vleuten, 2013). Assessment can occur through observation of performance and collection of evidence by the learner to demonstrate achievement of the learning outcomes. Assessment can be qualitative through the use of narrative description of the performance, or quantitative through application of a tool that generates a score typically anchored to an agreed level of proficiency.

**Professional placement:** A professional placement, also referred to as work-integrated learning (WIL), clinical placement or field work is a form of education that occurs in the workplace. Professional placements feature in all entry-level health professional education programmes and provide essential experience for students to develop clinical skills and a greater understanding of the health system (Brack et al., 2021). The term 'clinical placement' has been avoided in this thesis as dietetic students have professional placements in other settings in addition to those in clinical settings.

**Portfolio and e-portfolio:** A collection of items curated in a fashion that enables a student to demonstrate they perform at the required level against competency standards. The items can be diverse in nature and may include documentation, case studies, learning artifacts, observational checklists, narrative feedback or performance reports or other learning artifacts that have been deliberately assembled to provide evidence that the student or learner meets competency standards. A portfolio is traditionally paper-based or hard copy while an e-portfolio is an electronic equivalent. Portfolios can be unstructured where it is up to the learner to decide on the content and the format or structure (Tochel et al., 2009).

**Entrustable Professional Activities:** Entrustable professional activities are observable work-based activities performed by a competent health professional. They are typically unique to a single profession (although there may be similarities in EPAs of different professions) and describe observable work that is done in practice. To be able to perform an EPA successfully the professional must possess the knowledge, skill and attributes required to successfully execute the activity, thus EPAs allow demonstration of multiple competencies. A matrix is typically used to explicitly link EPAs to the relevant competency framework (Schumacher et al., 2021; Ten Cate, 2013).

**Entrustment/ Entrusted** is the assignment of responsibility of a learner to perform an activity in unsupervised practice (Schumacher et al., 2021).

**Entrustment scale:** An entrustment scale is a behaviourally anchored ordinal scale that recommends or observes the level of supervision required for a learner to perform an activity to the accepted standard (Schumacher et al., 2021).

**Milestones:** Milestones describe a significant point in development of the learning trajectory and help provide an understanding of expectations of the learner at a defined point in time. They typically describe what the expected performance of a student or learner is at a given point in time (Holmboe et al., 2016).

**Reflective practice** is a conscious and purposeful examination of past experiences, thoughts and actions with the aim of understanding and improving practice (Reflective toolkit, 2020).

**Student self-assessment:** This is defined broadly as the involvement of a student in providing a judgement of their own performance compared to an identified standard. Self-assessment can be useful for students to identify areas of strength but also areas of weakness. This has two important functions; firstly, to help self-regulate and prevent practice in an area that the person has limited competence in and secondly, to set learning goals (Eva & Regehr, 2005).

**Formative and summative feedback:** Formative feedback is performance-based feedback provided to learners to help highlight gaps between current and expected practice (Ramani et al., 2019). Summative feedback is performance-based feedback provided at the end of a unit of study and practice and is often known as summative assessment. In the context of this thesis, summative feedback provides a judgement of a learner's ability compared to the expected standard.

**Action research:** From an educational perspective, action research is a method of enquiry conducted by educators in their own environments in order to advance practice and improve learning by students (Efron & Ravid, 2019). Action research is cyclical in nature and involves several steps including designing the study, collecting data, analysing data, communicating outcomes and taking action as a result of the study (Stringer & Genat, 2004). Action research aims to address a local issue in a particular context, but results can have broader applicability.

**Programmatic assessment** is an assessment strategy in competency-based education where multiple pieces of evidence or units of assessment are drawn together to provide a judgement of a learner's competence. Learning and assessment are connected and build upon each other to enable an overall judgement of competence defined by competency standards (Dart et al., 2021; Van der Vleuten, 2016).

**Supervisor:** The term 'supervisor' in the context of this thesis refers to practising clinicians charged with the oversight of health professional learners in work-based settings. There are many synonyms for supervisor namely clinical educator, preceptor, clinical teacher to name a few. Supervisors observe and coach learners performing authentic activities in the workplace during professional placements. Supervisors provide feedback to learners about their performance compared to the expected standard and may be called on to make assessments or judgements about a student's performance (Schumacher et al., 2021).

## 1.2 Research context

The motivation for conducting this research was prompted by the experience of the candidate and feedback from other stakeholders, namely students and supervisors, regarding dissatisfaction with the existing assessment processes for dietetic students during work-based assessment. To provide context, an overview of the dietetic course structure including the professional placement program is provided below.

### **1.2.1 La Trobe University dietetic course and professional placement structure**

La Trobe University is a public university based in Melbourne, Victoria, Australia with a strong tradition of allied health and nursing education. The dietetics program at the University had its first intake of students in 2011 with students progressing to supervised professional placements and competency assessment in 2013. Students participate in 111 days of supervised practice consisting of three clinical placements, a food service management placement and two project placements, one in food service and one in community and public health. Table 1.1 presents the professional placement structure, setting and length and timing of work-based assessments. At the end of the study program, students are required to fulfil the academic requirements of the degree as well as demonstrate satisfactory performance against the National Competency Standards for Dietitians in Australia (DAA, 2015).

**Table 1.1 Overview of professional placement structure in the dietetic education program at La Trobe University**

<b>Domain</b>	<b>Placement Name</b>	<b>Work setting</b>	<b>Length (days)</b>	<b>Assessment point</b>
Clinical / Individual Case Management (ICM)	Placement A	Acute or subacute hospital	16	Day 8 (formative) and Day 16 (summative)
	Placement B	Acute or subacute hospital	20	Days 10-15 (formative) Day 20 (summative)
	Placement C	Acute or subacute hospital	25	Days 10-15 (formative) Day 25 (summative)
Food Service Management (FSM)	Food service activities	Acute hospital	10	Activities marked with score of >50% required to demonstrate competence
	Food service project	Acute or subacute hospital or food service facility	15	Qualitative feedback fed into overall assessment of linked competencies
Community and Public Health (CPH)	Community and public health project	Community or public health organisation	25	Qualitative feedback fed into overall assessment of linked competencies

The initial approach to work-based practice assessment was the creation of a structured e-portfolio for each domain of practice to be used during the professional placements using PebblePad® portfolio software. The lead academic in each domain of practice (food service management, community and public health and clinical) mapped each placement to individual competency standards (DAA, 2015). In community and public health domains and food service management domains, competency-based assessment was conducted by university academics incorporating feedback from work-based supervisors and written and oral assessment submitted as part of course work at the end of the subject. In the clinical dietetics domain, competency-based assessment of student performance on mapped competencies was performed by work-based assessors (practising dietitians responsible for supervising the work-based placement). The three clinical placements had both formative and summative assessments embedded in the e-portfolio and the food service and community placements contained summative assessment only. Students were able to upload or attach evidence of competency or other learning artefacts. Other forms of assessment such as assignments, oral presentations, reflections and examinations were also triangulated in connection with placement educator feedback to allow assessment of overall competence against the national standards.

Factors considered in the design of the e-portfolio were the inclusion of student self-assessment to help student engagement and facilitate reflection on current level of performance. Specific prompts were built to enable students to develop learning goals to help advance their skills. In the clinical placements, competencies mapped to the placement were assessed using a four-point scale of; 'not yet demonstrated', 'below expected standard', 'meets expected standard' and 'exceeded expected standard'. By the end of the clinical placement program, students were required to be assessed at a performance level of 'meets expected standard' for all competencies linked to the placement in order to pass the course. The community and food service e-portfolio were more simplistic in design with qualitative supervisor feedback sections only and fewer competencies mapped to the placement.

The original clinical e-portfolio was designed to incorporate some of the benefits described in the literature such as student self-assessment, clearly defined learning outcomes and areas for reflective practice and goal setting. There was, however, considerable negative feedback from students and supervisors relating partially to some technical features such as too much scrolling, difficult navigation and lack of IT infrastructure and access reported by placement educators. Students and placement educators also reported confusion with competency-based assessment

particularly in the first clinical placement. These issues are consistent with those reported elsewhere in the literature (Garrett et al., 2013; Pincombe et al., 2010; Porter et al., 2015; Scholes et al., 2004).

In response to this feedback, a format of assessment using the EPA model was trialled in the first clinical placement. As EPAs translate competencies into observable workplace activities, it was thought that this methodology might address confusion from students about what was required in their first clinical placement. As clinical domain leader, the candidate devised a set of EPAs for use in clinical placement assessment and sought feedback from experienced placement educators and senior academic staff. Based on positive feedback, these were introduced into the first clinical placement in 2015 with traditional competency-based assessment being continued in the second and third clinical placement.

An opportunity arose in 2016 to further re-examine the competency-based assessment processes used in the La Trobe dietetics program with the revision of the National Competency Standards for Dietitians in Australia (DAA, 2015). The revised standards varied considerably from the existing standards, with fewer (4 domains compared to 9) but broader standards, decreased elements associated with each domain and a range of actions to describe each element. The revised standards incorporated expectations of dietitians in traditional and emerging areas of dietetic practice. Coincidentally, this coincided with a planned upgrade to the PebblePad® e-portfolio software program allowing for increased features and improved usability.

From this opportunity, this research program was developed to address a gap in the literature regarding work-based assessment in dietetic education. As will be discussed in Chapter 2, there are few published performance evaluation instruments for work-based assessment of student dietetic practice, or they are limited to single institutions in specific contexts. There are mounting reports of shortcomings of current assessment methods in meeting the needs of students, educators and the profession more generally (Bacon et al., 2015; Begley et al., 2019; Palermo et al., 2018). There was a pressing local need for innovation to design a new tool that met the needs of all stakeholders (students, busy clinicians tasked with high stakes assessment, and educators tasked with assessing competence) who also required a method to generate and collect educational data to inform evidence-based education. This data was lacking and is essential in health professions education to transform a historical time-based model to an outcome-based model of education required to produce clinicians equipped to meet the needs of an expanding healthcare landscape.

### 1.3 Aims and scope of the thesis

The main aim of this thesis was to develop, implement and evaluate a work-based assessment tool using an e-portfolio structure featuring embedded EPAs and student self-assessment for dietetic education with the overall goal of improving the utility of assessment methods. To achieve this aim and to address known gaps in knowledge a narrative literature review, a scoping review and three research studies were conducted.

**Chapter 2** is a narrative literature review that describes current knowledge in competency frameworks, competency-based assessment and assessment methods in health professional education with a specific focus on dietetics. This review aimed to understand current practices and identify gaps in existing knowledge.

**Chapter 3** is a scoping review which mapped available evidence of EPA use in entry-level healthcare education in order to understand how and in what contexts EPAs are being used.

**Chapter 4** describes the conceptual frameworks used to evaluate utility of the EPA work-based assessment tools. An overview of action research and the justification for this as the predominant methodology is provided.

**Chapter 5** is a study describing exploratory formative research to explore students' and educators' perceptions of work-based assessment, use of EPAs as an assessment strategy in clinical dietetic professional placements and evaluate utility of the current e-portfolio, specifically the inclusion of student self-assessment and reflection.

**Chapter 6 A** is an implementation study that aimed to evaluate the utility of an EPA based work-based assessment tool for use in the clinical dietetic setting. This involved a time-series action research design where feedback was sought from three cohorts of students and their supervisors at the end of the academic year. This chapter reports on pre-testing, pilot and implementation stages and evaluates the feasibility, face and context validity and acceptability aspects of utility.

**Chapter 6 B** is an implementation study that aimed to evaluate the utility of an EPA-based work-based assessment tool for use in community and public health dietetics settings. This involved the same methods reported in Chapters 5 and 6 A, but in the community and public health dietetics context. Chapter 6 B reports on the exploratory pre-testing, pilot and implementation

stages of the study and evaluated the feasibility, face and context validity and acceptability aspects of utility.

**Chapter 7** is an evaluation study that aimed to strengthen utility by determining construct validity through testing the hypothesis that dietetic student performance using the EPA-based work-based assessment increases over time and determined the educational impact of EPAs for dietetic students and teachers.

**Chapter 8** summarises the thesis and reports on the key findings of chapters 3, 5, 6 and 7. This chapter discusses the strengths and limitations of the program of research and identifies areas for future research focus.

All manuscripts included in this thesis are presented in the manner they were published in their respective journals. The candidate is the lead author on all included journal publications and was responsible for the data collection, analysis and manuscript creation and submission. Co-authors contributed through discussion of ideas and revisions of the manuscripts prior to submission. The book chapter included with Chapter 2 was jointly authored by the candidate and her PhD supervisor Lisa McKenna who authored the first two sub-sections with the remainder of the chapter being written by the candidate.

## Chapter 2 Narrative literature review

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This thesis explores the development and use of Entrustable Professional Activities in an entry-level dietetic education program in an Australian university setting. The peak body for dietetics in Australia, known originally as the Dietitians Association of Australia (DAA) and more recently as Dietitians Australia (DA), developed the first competency standards for entry-level or graduate dietitians in 1993 with several revisions since (DAA, 1993; DAA, 2009; DAA, 2015; DA, 2021). Australian dietetic education programs have been required to demonstrate that their graduates meet these national competency standards upon graduation. Specific methods of assessment of competence have not been prescribed in the Australian dietetic context and there is no national licensing examination or equivalent. Each education institution has developed their own processes to assess students against the competency standards using methods of their choice.

The following literature review provides a summary of the development and use of competency frameworks in healthcare broadly and provides a critical overview of different methods used to assess knowledge, skills and practice in healthcare students. Included is a discussion of assessment challenges and the role of assessment in assisting student learning and development, as well as determining if students are safe to practise independently. As the focus of this thesis is the development, implementation and evaluation of a novel assessment method emerging in health care, Entrustable Professional Activities, an overview is provided of the definition, evolution and use of EPAs in the form of a chapter published in a textbook. A detailed exploration of EPA use is provided in a following scoping review (Chapter 3).

Throughout the review, examples from different health professions are critically discussed with a detailed discussion of published methods and practices used in dietetics both in Australia and internationally. This review provides context and background regarding competency-based frameworks, competency-based assessment and work-based assessment practices and the known benefits and shortcomings that have seen the development of EPAs in response.

### **Methods**

A literature review of competency-based assessment was conducted using a similar approach to that described by McGaghie et al. (2014) in their critical review of mastery learning. This approach aims to summarise knowledge that is well established and highlight gaps in understanding and areas of debate. This review aims to identify key literature in the field of competency-based education and assessment and qualitatively compare and contrast differing

viewpoints. Multiple databases (MEDLINE, EMBASE, Web of Science) have been searched using terms including “competency frameworks”, “competency-based assessment”, “competency-based education”, “work-based assessment” and “entrustable professional activities”. Publication reference lists were also explored for additional studies.

## 2.1 Competency-based frameworks in healthcare

Healthcare and the demands of consumers are changing rapidly and becoming increasingly complex. Knowledge and skills in healthcare are constantly expanding and it is no longer possible in healthcare education to deliver a curriculum or entry-level education programme that covers the complete body of knowledge that a graduate will require for practice. In order to educate healthcare professionals who are equipped to deliver safe and effective care at the end of an educational program and in the future, competency-based frameworks have been proposed as a model to shape education and training across many healthcare professions (Carraccio & Englander, 2013).

Competency-based frameworks are used to define the current and emerging practice of a professional. More recent examples of competency-based frameworks extend from describing what a profession does to also include the values and attributes of practitioners. They describe the knowledge and skill base intrinsic to the profession and additionally describe how the profession interfaces with individuals, broader communities, members of the interdisciplinary team and the wider work environment. To be an effective healthcare practitioner, essential knowledge and technical skills are combined with the ability to apply them using communication and interpersonal skills. As knowledge and technology in healthcare are rapidly increasing and expanding, the ability to engage with self-directed learning, professional development and evaluate new evidence are also important (Carraccio & Englander, 2013).

A key example of a competency-based framework is the Canadian Medical Education Directives for Specialists (CanMEDS) framework. This framework describes seven competency domains of physicians: medical expert, collaborator, communicator, professional, scholar, health advocate, and leader (Royal College of Physicians and Surgeons Canada, 2015). The CanMEDS project was begun in the early 1990s in response to consumer driven healthcare and consumer demands for accountability and professionalism in physicians (Frank & Danoff, 2007). Other factors such as increased consumer access to information via the Internet, advances in technology and rapidly

expanding medical knowledge were key drivers behind the need for the project (Frank & Danoff, 2007). The methodology behind the creation of the framework consisted of the formation of working groups and creation of physician roles. The CanMEDS document is outcomes-oriented and describes the outcomes of a medical training programme or the minimum abilities that physicians must possess to be able to effectively serve their communities (Frank & Danoff, 2007). The initial framework was devised in 1996 and then revised and updated in 2005 (Royal College of Physicians and Surgeons Canada, 2015).

In Australia, the competency movement gained traction in the 1990s led in part by government policy. Work by the National Office of Overseas Skills Recognition (NOOSR) saw many registered and non-registered professions develop competency standards (Gonczi, 1994). Competency standards were seen to be advantageous as they provided a broad description of the professional attributes which allowed members of the public to understand the scope of practice of the profession and to help professional bodies regulate the quality of services provided by members. They provided guidance to students and educators about educational standards and provided a framework to recognise the qualifications of overseas trained professionals. Generally, the standards were organised into units of competence that described or represented a work function or role. The larger units were then divided into smaller sub-elements with attached performance criteria describing the standard of work required to judge someone as having met the competency standard (Gonczi, 1994).

### **2.1.1 Purposed advantages of competency frameworks**

A strength of competency frameworks is that they can be scaled up or further defined to reflect specialisations or advanced practice within a profession. A key example of this is the American Association of Colleges of Nursing which describes three main levels of competencies or outcomes that are associated with different levels of education: Baccalaureate, Masters and Doctoral (AACN, 2006, AACN 2008, AACN 2011). Within the AACN framework, competencies are termed 'essentials'. The nine Essentials of the baccalaureate degree describe the expected outcomes of completing such a course and are aligned with the role expectation of a generalist nurse responsible for individual patient care. The Essentials of Masters Education in Nursing (AACN, 2011) align with higher level skills such as leadership and management skills or a broader organisation or systems approach to healthcare delivery. The Essentials of Doctoral Education for Advanced Nursing Practice (AACN, 2006) align with advanced scope of practice and specialist roles that require a high level of autonomy and require advanced levels of knowledge and skills in a specialised area of practice.

Although the CanMEDS and AACN frameworks describe different professions or healthcare roles, there are similarities between how they are structured and what is included in the descriptions. Both models seek to broadly describe the knowledge, skills and attributes required of a competent professional. Both seek to describe the vision of the profession and for educational delivery. If comparison is made between the graduate entry level baccalaureate essentials and the CanMEDS framework, both include an element of foundational knowledge of the theory that underpins the profession: CanMEDS “Medical Expert” and AACN Baccalaureate Essentials “Liberal Education of General Practice”. Both include an aspect of acquiring the skills to be self-directed lifelong learners that operate in an environment of expanding knowledge: CanMEDS “Scholar” and AACN Essential III Scholarship for evidence-based practice. In addition, both include aspects of communication, professionalism and the ability to work in a team: CanMEDS Communicator, Professional, Collaborator and AACN Essential VI Interprofessional Communication and Collaboration and Essential VIII Professionalism and Professional Values.

### **2.1.2 Criticisms of competency frameworks**

Flexner first identified competencies as the “minimum set of scientifically based knowledge and skills, needed to deliver health care” (World Health Organisation (WHO), 2013 pg. 23). However, a key criticism of competency frameworks is that they are reductionist and do not promote expertise (Leung, 2002; Ten Cate & Scheele, 2007). It has also been suggested that some domains are overemphasised at the expense of others, and that increased administrative burden associated with documenting proof may be an unintended negative outcome with no corresponding beneficial effects (Leung, 2002). Further discussion of criticism and challenges of implementing competency-based education will be discussed in sections 2.2 and 2.3.

As knowledge expands and community expectations change, the curriculum needs to change with it (Frank et al., 2010) which may be time consuming and difficult to achieve in practice. “In a rapidly changing environment, competencies quickly become outdated and therefore there is a need to adapt curricula” (WHO, 2013 pg. 36). It can be challenging and resource intensive to update or change university curricula. Identifying new community needs and developing and defining related competencies to address them can also be challenging (WHO, 2013).

The Dietitians Association of Australia has long used a competency-based framework to define the current and emerging practice of dietitians (DAA, 2015). Other international dietetic bodies have adopted similar approaches for example USA, New Zealand and UK (Academy of Nutrition and Dietetics, 2020; Dietitians Board New Zealand, 2017; Health and Care Professions Council, 2018). As with CanMEDS, these extend beyond knowledge and skills to include other domains

such as critical thinking, evidence-based practice, professionalism, nutrition advocacy and influencing food supply. There have been several revisions of the competency standards for Dietitians in Australia with a major review in 2014 driven by expansion of the profession into new domains of practice, such as the food industry, and non-traditional healthcare settings such as private practice (Ash et al., 2019). A further minor revision occurred in 2021 after completion of the research described in this thesis.

Criticisms of competency frameworks often cite confusion and debate regarding language, particularly in the definition of the terms 'competence' and 'competency'. This is apparent when constructing educational programs aimed at producing graduates who meet the standards described in the competency framework, in other words, competency-based education. The definition of competencies has been discussed widely in health professional education and practice (Epstein & Hundert, 2002, Gonczi et al., 1994; Redfern et al., 2002). Albanese et al. (2008) describe confusion between the terms 'competence', 'competency' and 'competent'. Grant (2019) defines competence as a specific measurable entity (knowledge, skill, behaviour) that the learner should display at the end of the program; however, cautions against designing a teaching programme aimed solely at achieving competencies. Achieving all the individual competencies does not automatically translate into performance as a whole and performance requires deliberate practice and skill integration (Grant, 2019). Ash and Phillips (2000) explored the concepts of competence and competency in the context of dietetics and this will be discussed in detail further on. A comprehensive review by McMullan et al. (2003) describes three approaches to theorising competence and outlines different assessment strategies. The following table outlines the differing approaches to viewing competence and competency (McMullan et al., 2003).

**Table 2.1 Summary of the main approaches to competence and its assessment (adapted from McMullan et al., 2003)**

Approach	Origins	Focus	Terminology	Definitions	Assessment	Measurement	Suggested advantages	Criticisms
Behavioural	UK	Job	Competence Competencies	Performance, ability to integrate cognitive, affective and psychomotor skills	Action/behaviour, Outcome, Subjective	Statement of competence broken down into units of competence (5-20) made up of performance criteria (4-5)	Simple, objective levels of competence are distinguishable. Successful performance indicates underlying knowledge exists so no need to assess this separately	Fragmented and non-transferable. Ignores context. Does not measure cognitive skills or critical thinking
Generic	USA	Person	Competency Competencies	Broad abilities. Underlying attributes associated with expert performance	Capability, individual characteristics and qualities	A narrative description of competency with underlying behavioural indicators (3-6)	Assessment incorporates underlying knowledge and skills	Assessment is difficult. Assumes competence is transferable
Holistic	Australia	Attributes and context		Dynamic, constantly changing. Knowledge, attitudes, values and skills	Assessment of inputs, use of broad evidence and multiple inputs	Difficult to measure due to context	Incorporates reflective practice, ethics and context	Hard to assess

Ten Cate and Sheele (2007) argue that the confusion between competence and competency occurs particularly in translating a competency framework into a curriculum and assessment programme where competencies start as broad general statements about a professional but are reduced to lists of skills or activities when attempts are made at assessment. Furthermore, Ten Cate (2017) argues that competency frameworks describe the various roles a professional plays or educational outcomes and does not specify how an educational program should achieve the outcomes, how long it should take to achieve these educational outcomes or what assessment methods should be used. Furthermore, competency frameworks may describe the broad attributes and roles of a professional but these may not describe the day-to-day practice of the profession, resulting in a disconnect for students with regards to education and assessment (Palermo et al., 2018). A detailed discussion of competency-based education is provided below in Section 2.2.

## 2.2 Competency-based education and competency-based assessment

Competency frameworks define broad aspects or roles of the profession and are useful to professionals, consumers, regulators and educators. Competency-based education (CBE) is an approach to provide learning and training for students to meet competency standards described in a competency framework. CBE is an educational approach where the learning outcome is stated, and the standards of performance are defined. Frank et al. (2010) conducted a systematic review to help develop a definition of competency-based education in medicine and proposed the following:

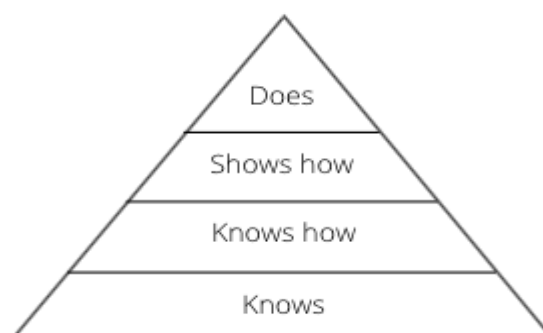
*“Competency-based education (CBE) is an approach to preparing physicians for practice that is fundamentally oriented to graduate outcome abilities and organized around competencies derived from an analysis of societal and patient needs. It deemphasizes time-based training and promises greater accountability, flexibility, and learner centredness.” (Frank et al., 2010 pg. 636)*

Morcke et al. (2013) provide a useful exploration of the origins and theoretical basis for CBE. They describe the origins of CBE in the 1950s through Bloom’s works on the taxonomy of learning and endorsement of mastery learning (Bloom 1956; 1968). Morcke et al. describe CBE emerging from behaviourist psychology and having several cycles of advocacy, criticism and

revival before gaining continued popularity in health care education. This popularity coincided with the move towards competency frameworks that describe the professional produced by an education, rather than the process or system of education (Ash et al., 2019; Morcke et al., 2013).

As with competency frameworks, CBE evolved to solve a discrepancy between the curriculum and functional requirements of a profession in the workplace (McGaghie, 1978). The intended outcome of CBE is to prepare a health professional who can practise their discipline or profession at a defined level of proficiency (Ten Cate, 2017), with the competency-based framework informing the scope of practice and defining proficiency. The learning outcomes that should be achieved at the completion of the education program are clearly defined from the beginning. The learner, upon successful completion of the program, must be able to demonstrate all learning outcomes.

Assessment of competence or competency-based assessment is essential to determine if the education or training program is fulfilling its intentions. In addition to providing summative assessment about whether standards have been achieved, competency-based assessment or assessment of performance against competency standards throughout the educational program are useful for students and educators alike. This strategy provides formative assessment for learning as well as assessment of learning. This is a key difference from traditional education programmes where assessment is predominantly summative. Miller suggests that there are four levels at which a student can be assessed (Gonczi, 1994; Miller, 1990). Assessing competence helps provide insight into where the learner sits on Miller's pyramid of competence (Miller, 1990).



**Figure 2.1 Miller's pyramid of competence (Miller, 1990)**

In this model, the foundation levels of assessment 'knows' represent an assessment of knowledge. The second level is an assessment of knowledge with some application to a problem or a description of a solution, 'knows how'. The third level extends from theory or knowledge and involves application in practice: 'shows how'. The final or highest level 'does' extends to action (Epstein & Hundert, 2002; Miller, 1990). The 'knows' and 'knows how' reflect knowledge and basic skill development often acquired in the foundation levels of health profession education and correspond roughly with the first three levels of Bloom's Taxonomy of Learning; knowledge, comprehension and application (Bloom, 1956; Miller, 1990). In Miller's (1990) model, the assessment of 'knows' and 'knows how' often takes place in the university setting and is often assessed with tests, examinations and other written assessments. There is potential for these assessments to be standardised and objective. The higher level of 'shows how' may be assessed using standardised situation using humans or simulations such as Objective Structured Clinical Exams (OSCE) where the environment is tightly controlled (Epstein & Hundert, 2002).

The final level of 'does' is usually assessed in a supervised placement setting or in the 'real world' and comes with challenges. Subjectivity and inter-assessor variance are key challenges in assessment and variation of test conditions are challenges when assessments occur in the real world (Mitchell et al., 2009). Defining the level of acceptable performance of 'does' is a key concept in competency-based assessment. A model that has been taken up by many professions that have adopted competency-based frameworks is the Dreyfus model of novice to expert (Dreyfus, 1986). Benner (1992) developed a similar staging approach to clinical competence and the model was subsequently adapted to medicine by Carraccio et al. (2008) as demonstrated in Table 2.2 (Benner, 1992; Carraccio et al., 2008).

**Table 2.2 Stages of skill acquisition and performance**

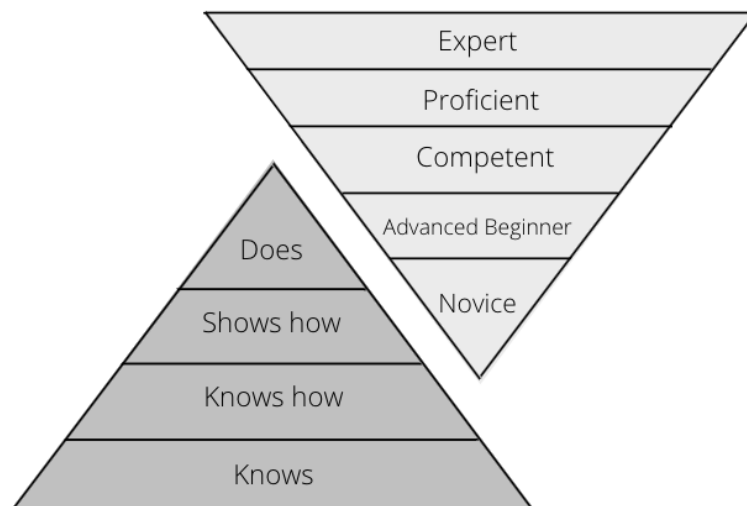
<b>Skill level</b>	<b>Components</b>	<b>Perspective</b>	<b>Practice ability</b>
Novice	Context free and rule based	Looks for cause and effect	Unable to prioritise and see the whole picture
Advanced beginner	Some context and application of flexible rules	Able to use analytic reasoning and pattern recognition	Can distinguish between general and specific aspects of a problem
Competent	Planning and assessment of activity and hierarchical view of prioritising of decisions	Emotionally involved And clinical reasoning has moved beyond analytic problem solving. Common clinical patterns identified.	Can see the big picture. May resort to prior levels when faced with new or complex situations
Proficient	Less detached conscious planning able to anticipate things based on vast prior experience	Able to problem solve and recognise clinical patterns easily	Can see the big picture and live with ambiguity
Expert	Intuitive response to each situation	Combines thought, feeling, and actions	Able to notice the unexpected
Master	Highly emotionally engaged and all senses used to predict, assess, solve problems	Highly reflective	Deep emotional engagement but may appear unconscious of actions

*Adapted from Dreyfus (1986) and Carraccio (2008)*

There are some differences in interpretation of the model, with Benner describing the level of competent being reached with two to three years of practice and others describing competent as entry-level practice (Ash & Phillips, 2000; Benner, 1992; Gilmore et al., 1997). There is consensus, however, that to progress from advanced beginner to competent requires supervised practice in a real life, or work-based setting. Several authors propose that the skill level of competence is in line with the community's expectation of a professional practitioner who is

given some level of autonomy in the workplace (Frank, et al., 2010; Ten Cate et al., 2010). Epstein and Hundert (2002) conducted a systematic review with the aims of defining professional competence and reviewing current means of assessing professional competence. As part of this process the authors identified heterogeneity of interventions, complexity of outcomes and an overall lack of randomised or longitudinal study design. The resulting study generated a definition of professional competence 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”* (Epstein & Hundert, 2002 p 226).

Epstein and Hundert’s systematic review identified very few validated strategies to assess actual clinical practice associated with Miller’s “does” (Epstein & Hundert, 2002). Figure 2.2 describes the overlap between Miller’s level of assessment and the Dreyfus model of competency. Assessing the “does” requires defined standards of performance, yet competence can be situational with acceptable standard of performance in one situation not being transferable to another.



**Figure 2.2 Relationship between two well-known learning models: Miller’s pyramid and Dreyfus’ model of competency development**

The Dreyfus model has been further expanded and adapted by several authors to include procedural skills. A critical review by Sawyer (2015) referred to an extension of Dreyfus’ model into the procedural skill realm and extended a prior model developed by Kovacs (1997) of ‘Learn,

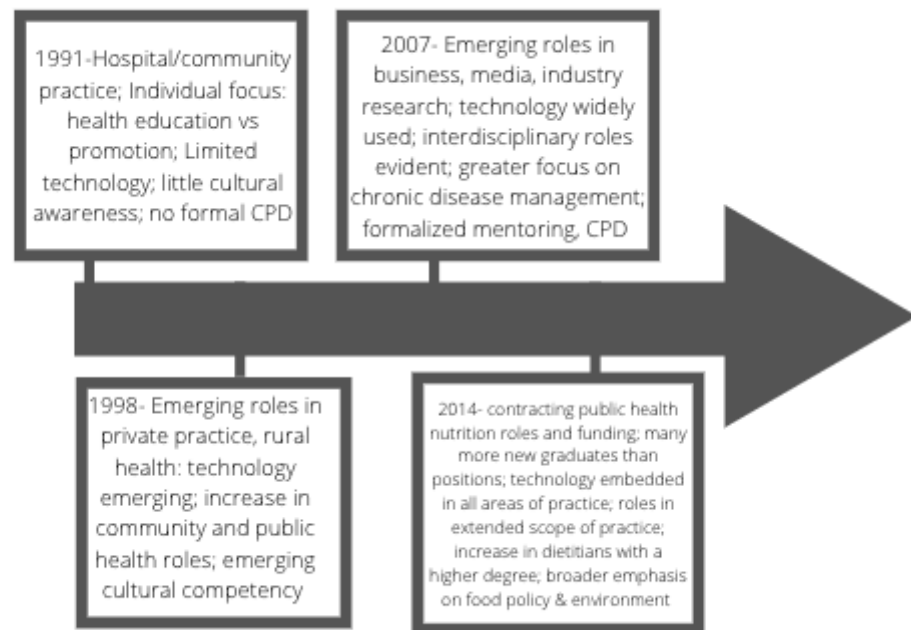
See, Practice, Do' into an updated evidence-based pedagogical framework for procedural skills training 'Learn, See, Practice, Do, Maintain'. This paper describes the educational context of "doing" in the realm of using real patients in clinical settings. Sawyer (2015) asserts that from a competency-based perspective, and for patient safety, there is need for much practice in simulated settings before a student can perform the skill or procedure in a real-life setting and that self-reflection and feedback from assessors is needed to progress up the model.

An appealing feature of CBE is that the outcome is standardised. Standardisation helps define what is expected at the end of a course of study and allows institutions and individuals to be held accountable to those standards (Irby et al., 2010). This is helpful from a patient safety point of view as it describes what standard is required to deliver safe practice (Irby et al., 2010). Such standardisation, however, has been criticised by those who argue that competency-based education is reductionist and aims to produce performance outcomes that are simply good enough and do not promote excellence (Menezes et al., 2018; Talbot, 2004). Other critics of CBE note that for learners to meet outcomes, regular feedback is required and clear definitions and standards of practice that are explicit to learners and teachers are essential (Dauphinee et al., 2019). These aspects may be resource intensive which may impact feasibility and may result in competency-based assessment adding to, rather than replacing and improving old processes (Hall et al., 2018; Hawkins et al., 2015).

A critical review of CBE by Morcke et al. (2013) found that although CBE had been widely adopted, there was little empirical evidence that CBE provided benefit. Their systematic review focused on CBE in medicine and found that there was little substantial published research, particularly in entry-level medical education, of the effectiveness of CBE on student learning or teaching (Morcke et al., 2013). A potential interpretation of this study is that this is not evidence that CBE is ineffective, but rather that CBE is complex and often included as part of a suite of curriculum interventions making it difficult to determine the independent contribution of CBE on student outcomes. A similar assertion is made by Epstein and Hundert (2002).

A challenge in CBE, where the outcome of the education program is defined, is ensuring that the outcome is in step with the requirements of the profession and expectations of the community. This outcome can potentially be a moving target as the profession evolves. A recent qualitative study by Ash et al., (2019) highlights a challenge in CBE in that having a defined standard or outcome may potentially stifle innovation, particularly when the landscape of the profession is changing. This qualitative study pooled data obtained from interviews with recent graduates conducted prior to the development and subsequent review of the national dietetics

competency standards in 1991 (n=26), 1998 (n=23) and 2007 (n=19) and 2014 (n=7) with the 2014 data including experienced practitioners, recent graduates and employers. The study also described the evolution and broadening of dietetic practice (Figure 2.3).



**Figure 2.3 The evolution of Dietetic Competency Standards as practice evolves (adapted from Ash et al., 2019)**

Ash et al. (2019) demonstrate that new competencies, such as leadership and entrepreneurship, have emerged in response to changing and expanding roles of dietetic practice (Figure 3). They describe the links between the competency standards that characterise the profession and credentialing of practitioners and accreditation standards used to ensure educational programs will produce graduates who meet the competency standards. The Australian Dietetic Accreditation Standards mandate the number of days of supervised professional placement; this is at odds with the philosophy of true CBE which is not time-dependent but outcome-focused only (Ash et al., 2019). The authors suggest that while CBE can maintain standards of practice within a profession, they can potentially limit innovation in curriculum and teaching (Ash et al., 2019).

A criticism of CBE is that it has limited applicability to more complex aspects of clinical performance or in situations where competence cannot be reduced to behaviours such as personal and professional attributes (Morcke et al., 2013). Similarly, where there is diversity of graduate entry practice roles or lack of a shared mental model between assessors of what entry to practice looks like, competency-based assessment can be difficult (Begley et al., 2019). A recent article by Menezes et al. (2018) further describes the challenges of CBE in areas of medicine that are less procedural, such as psychiatry, where highly valued complex attributes of compassion and humanism are not able to be broken down into observable behaviours (Menezes et al., 2018). Various strategies to address some of these assessment challenges are described in the next section.

## 2.3 Assessment strategies in competency-based education

Competency frameworks break down overall competence into smaller domains. Consequently, a resulting educational attention has been focused on how best to assess each domain and developing valid and reliable assessment methods. The focus of this thesis is on work-based assessment strategies, but it is useful to have an overview of some key methods used in assessment.

Assessment strategies of “knows” and “knows how” are often written and take the form of multiple-choice examinations or tests. From an institutional perspective, examinations and tests are highly efficient and can be scaled up for large student cohorts and are useful methods to assess knowledge. Furthermore, exams and multiple-choice tests can be extended to allow assessment of other aspects of competence such as critical thinking and reasoning. The drawback of these methods is they do not assess skill performance or practical application of knowledge in a real-world situation (Van der Vleuten, 1996) and they may be too narrow to obtain a complete view of competence (Gonczi, 1994). There are further practical issues, such as cheating and unfavourable learning strategies such as cramming and surface learning, rather than deep learning which may have implications for long-term retention of knowledge (Struyven et al., 2005).

### 2.3.1 Objective Structured Clinical Exams

A frequently used tool for assessing clinical skills is the Objective Structured Clinical Examination (OSCE). The OSCE aims to simulate a real-world situation where knowledge and skills need to be

applied simultaneously to perform the examination. OSCEs are traditionally composed of a series of short stations that examine different skills that would be required for real life clinical practice. The method is a well-established method of assessment in medical education and is also widely used in nursing and allied health education programmes (Mitchell et al., 2009). Assessment often consists of two forms that may be combined: a marking sheet with numerous behavioural checklists or rating forms as well as a global assessment of how well the student performed the activity as a whole. Trained actors combined with other materials, such as high-fidelity mannequins, are used to simulate different clinical scenarios. A systematic review by Patricio et al. (2013) concluded that the OSCE is a feasible and valid tool to assess competencies in entry-level medical education.

Objective structured clinical examinations have been widely used to assess specific clinical skills in simulated contexts. This method reduces the variation that would occur if these skills were assessed in a real-life clinical situation and the use of checklists aims to decrease intra-assessor variation. Performance at one station may not predict performance at another station (Newble & Swanson, 1988). This has implications in the assessment of overall competency in that the OSCE will reliably and validly measure the ability of a student to perform a skill in a specific context but will not assess overall competence (Dijkstra et al., 2010; Hodges, 2003). A further criticism of the OSCE is the cost and time involved in conducting them and the challenge in finding multiple suitable assessors (Hawker et al., 2010). Furthermore, there is a tendency to combine format-similar assessments together for example, different stations of an OSCE, rather than format-dissimilar assessments together such as OSCE assessment of resuscitation combined with multiple choice test (Dijkstra et al., 2010).

A narrative review by Mitchell et al. (2009) critiques the OSCE in a nursing context and makes suggestions about its judicial use. They describe wide variety in the types of OSCEs implemented in nursing education ranging from 10-20 station OSCEs that aim to assess a range of skills including physical examination, history taking, communication and education skills. Further, they highlight some of the challenges with OSCEs discussed above and further describe how an OSCE aimed at assessing skill integration may contravene Benner's description of novice to expert (Benner, 1992). They conclude that an OSCE is a useful tool to evaluate technical, measurable aspects of clinical performance that are required to practise safely before students are exposed to these activities in real-life settings (Mitchell et al., 2009). As with Newble and Swanson (1998), Mitchell et al. (2009) caution the use of the OSCE to assess overall competence and recommend that OSCEs are more useful for formative assessment, rather than summative, and feed into an

overall assessment strategy that has a variety of assessment methods included (Mitchell et al., 2009).

### **2.3.2 Experience of OSCEs in dietetics and other allied health professions**

Several publications describe the use of OSCEs in a dietetic context. A study by Pender and de Looy (2004a) describes the results of a pilot study with a single cohort of entry-level pre-placement dietetic students in the UK. The authors report on the construction of a four-station OSCE aimed at testing a range of skills that dietetic students would need to employ during a supervised clinical placement. The OSCE included a patient interview station where a student must elicit information from a trained actor. The actor was specifically trained to respond to each student in a “standard” way. A pass mark of 50% was taken to represent competence in performing the prescribed skill (Pender & de Looy, 2004a). This OSCE aimed to test performance prior to entering clinical placement, thus targeted Miller’s “shows how” pyramid level. The authors assert the formative benefit of the OSCE as it enabled the identification of weaknesses or poor performance in a particular area that could potentially be strengthened before a clinical placement.

A later Australian study by Hawker et al. (2010) describes evaluation of an OSCE over multiple student cohorts at a single institution. The OSCE detailed in this study involved testing of four separate skills required for dietetic practice. As with the Pender and de Looy study (2004a), the OSCE was aimed at assessing “shows how” skill level and was conducted prior to the first clinical placement exposure. Skills evaluated in the OCSE were communication skills, evaluated through an interaction with a standard patient, dietary analysis skills and the ability to conduct the physical examination components required for nutrition assessment. Student experience was evaluated and the majority of students (93%) reported it was a valuable learning experience and helped preparation for placement.

Both of the above studies report on results of student cohorts on subsequent clinical placements and demonstrate that OSCE performance can be predictive of later performance in supervised clinical practice. Hawker et al. (2010) report a strong correlation ( $\beta=0.66$ ; 95% confidence interval=0.46–0.86;  $P<0.0001$ ) between OSCE and clinical placement scores. Similarly, in the UK experience, students who failed an OSCE station performed poorly on clinical placement (Pender & de Looy, 2004a). A study examining an eight station OSCE in physical therapy showed that OSCE scores were highly correlated to final grade (Gorman et al., 2010). A similar trend has been reported in medicine, suggesting the use of an OSCE as a “gateway” assessment to prevent students from entering clinical placement until they are likely to pass (Martin & Jolly, 2002). Such

an assessment has been posed as useful as clinical placements are finite, labour intensive and expensive resources (Hawker et al., 2010).

#### **2.3.4 The long-case assessment strategy**

Clinical Viva or long case usually consists of the examination of performance of a healthcare practitioner administering care or performing an assessment of a single patient. It has been argued that this is unreliable because of the limited sampling or content (Van der Vleuten, 1996). A strategy to overcome this drawback would be to increase the sampling using multiple tests over time but the time and resources required would increase and efficiency of assessment would be impacted. Further discussion on methods of work-based assessment in medicine are discussed further in later sections.

#### **2.3.5 Multimodal and programmatic assessment**

Several authors reject the notion of breaking down competency into domains or roles and suggest other strategies for competency assessment. Kaslow et al. (2007) describe principles and recommendations for assessment of competence. Although the context of Kaslow's paper is psychology, the principles and recommendations could be applied to health science professions more broadly. Kaslow et al. (2007) describe 15 principles and nine recommendations with the authors concluding that multimodal assessment strategies using more than one assessment format (written, oral, work-based) are required to assess competence. Furthermore, they suggest that reflective practice and self-assessment are key components of competence assessment that must be explicitly taught and practised deliberately. Lastly, they recommend the use of multi-informant assessment where data and evaluations are obtained from multiple perspectives or from different assessors. They argue that this method promotes a fair and well-rounded assessment and provides opportunity for development and learning (Kaslow et al., 2007). More will be discussed around self-assessment and reflection in section 2.4.

There are many other champions of multimodal assessment. Wolf (1989) and Gonczi (1994) both argue that as competence can only be inferred from performance, rather than directly observed, a wide range of assessment methods must be used to assess competence. Direct observation of performance is useful as it integrates the assessment of a broad range of competencies in a single act. Several factors limit the utility of direct observation, namely cost, subjectivity and inter assessor variation. Sufficient assessor training and the use of handbooks and other supporting materials can assist in overcoming inter-rater variability.

It has been argued, however, that subjectivity cannot and should not be completely avoided and that experts can interpret the same experience differently but equally validly based context and perspective (Gingerich, et al., 2014). The time-consuming nature of this style of assessment can also limit the number of scenarios or contexts in which the assessment can take place.

Furthermore, health professional practitioners must perform in a variety of settings and performance in one area may not be transferable to another. As discussed above, some areas of performance may be adequately assessed using traditional methods such as examinations or assignments, particularly where knowledge is being tested. Traditional assessment methods may be less expensive to administer, less subjective than other assessment methods and highly reliable. A disadvantage may be that they are too narrow to obtain a complete view of competence (Gonczi, 1994). As such, a mix of methods is required to assess competence and there is a need to triangulate assessment data collection to determine competence (Gonczi, 1994).

The model of competency-based frameworks described above in section 2.1, where broad competencies are broken down into sub-competencies with performance criteria nesting below, has been criticised for generating lists of smaller tasks to tick off (Lockyer et al., 2017). This process is termed 'atomisation' by Van der Vleuten and Schuwirth (2005) who reject the notion that achievement of smaller competencies can be reconstituted into the attainment of larger more complex ones. Epstein and Hundert (2002) similarly reject this notion and argue that professional competence is more than a demonstration of isolated competencies.

Van der Vleuten and Schuwirth (2005) propose a concept of programmatic assessment where overall attainment of competency standards is determined using multiple and mixed forms of assessment. Programmatic assessment helps provide a framework for competency-based assessment and focuses on holistic learning rather than assessment of isolated skills (Begley et al., 2019; Palermo, et al., 2017). Two additional educational concepts have emerged in response to criticism of competency-based frameworks. Entrustable Professional Activities (EPAs) are observable work-based activities performed by a professional discipline (Ten Cate & Scheele 2007; Ten Cate 2013), in which progressive levels of supervision and delegation lead to independent practice. Milestones are the use of narrative descriptions of behaviours for the levels of performance related to competencies (Lockyer et al., 2017; Nasca et al., 2012).

Schuwirth and Van der Vleuten further extend their argument for a more comprehensive assessment of competency in their 2011 critique of different methods of assessment. They argue

that a variety of instruments is needed to obtain a complete picture and careful selection of assessment methods is required (Schuwirth & Van der Vleuten, 2011). They discuss that there has been a misconception that assessment should be objective, and that objectivity leads to reliability. This, however, does not automatically translate to validity. For example, one multiple choice question might be objective, but it cannot be reliable if the sample size is too small. Conversely, expert opinion is not objective, but it can be reliable and valid if there are multiple experts and multiple pieces of work that are assessed. An example of this assessment challenge exists in an OSCE examination. A student may be able to technically perform a skill, but their communication or professionalism skills may be low, meaning that their overall performance is poor. Conversely, good communication skills and professionalism do not make up for a lack of knowledge and/or ability to perform a specific clinical skill. Construct validity and reliability do not show the whole picture of overall competence (Schuwirth & van der Vleuten, 2011).

An advantage of a programmatic approach is that it is learner- or student-centred and offers a holistic approach to competency development (Dart et al., 2021). The teaching and assessment program does not aim to rank and grade learners but to provide detailed, individual and rich information about what areas a student might be weaker in and develop a programme to help them improve. In this setting, feedback becomes critical so the learner can improve their performance (Shute, 2008). An example of programmatic assessment in nursing is described in a study by Imanipour and Jalili (2016). In this study, a programmatic approach was chosen for assessment of students in a critical care nursing rotation. Multiple methods of assessment were used including direct observation, oral examinations, clinical work sampling and global ratings. This method was shown to have high validity with the content validity ratio ranging between 1 and 0.87 for the four assessment methods. The approach was also shown to be reliable with the Cronbach's  $\alpha$  coefficient ranging between for the 0.90-0.95 for the whole assessment system when used in each critical care setting. Satisfaction with students and instructors was favourable with the mean satisfaction score (10-point scale with 10 being highly satisfied) being  $7.66 \pm 1.50$  and  $8.70 \pm 1.82$  for instructors and students, respectively. Importantly, 87.5% of instructors and 89.47% of the students reported that the approach described in the study had a positive educational impact on learning.

There are several potential difficulties of the programmatic approach in the time-consuming nature of providing this individualised and detailed assessment and feedback. As subjectivity is involved in assessment, the quality and expertise of the assessor is important (Schuwirth & Van der Vleuten, 2011). Assessor training is key, as assessors must have deep understandings of what

they are assessing, how the assessment activity relates to the competency framework and the timing and type of assessment they are doing (formative or summative). Collating assessment and determining judgement can be logistically challenging (Dijkstra et al., 2010). This is particularly so when multiple assessments are required with the input of many assessors.

## **2.4 Tools to develop and assess competence in professional placement settings: performance evaluation instruments, portfolios and self-assessment**

Several authors, such as Wolf (1989) and Gonczi (2013), assert that competence must be inferred by performance and cannot be directly observed. Proving competence, therefore, requires a collation of evidence that this competence exists and that performance against this standard has been achieved at the required level. Using this definition, performance will be judged by assessors based on evidence that an individual meets the standards. This approach may have advantages as it may be more valid, that is, comes closer to assessing the integration of knowledge and skills and the ability to perform them in context. Conversely, this style of assessment can be criticised for having high levels of subjectivity and high levels of interobserver variability (Garrett et al., 2013). The use of expert assessors and assessment occurring in a range of situations may be strategies to overcome these criticisms.

Standardised performance evaluation or assessment instruments such as OSCEs and the mini-CEX are one approach to incorporate expert judgement. Portfolios have emerged to address the challenge of collating, compiling and organising multiple assessments to demonstrate competence. Newer assessment strategies such as EPAs have also emerged. These approaches will be discussed in the following sections. A challenge lies in collating, compiling and organising multiple assessments to demonstrate competence.

### **2.4.1 Performance Evaluation Instruments**

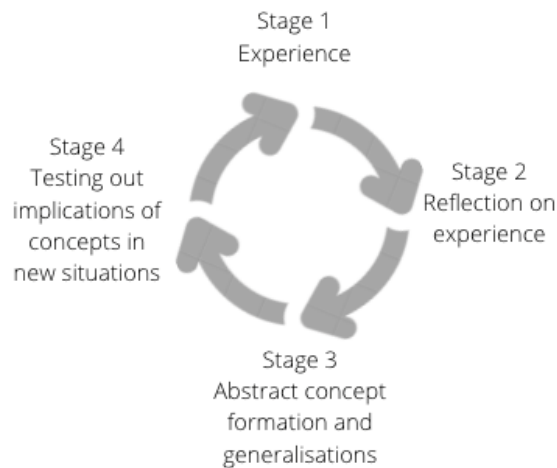
Performance evaluation instruments (PEI), also known as work-based assessment tools, are tools developed to assess students' performance in workplace settings. Detailed discussion of PEIs and application will follow in section 2.7; however, brief discussion will occur here. PEIs may be developed by a single institution and focus on a single specific work-based setting, such as surgical or a single medical student surgical rotation (Curran et al., 2018). Alternatively, they may be developed for multi-institution use at a national level, such as the Assessment of Physiotherapy Practice (Dalton et al., 2011). Performance evaluation instruments often aim to

increase inter-observer reliability and allow comparison of learner performance to defined standards (Dalton et al., 2009, Jamieson et al., 2019). Often multiple forms or assessments may be used to assess against competency standards necessitating methods to collate this evidence of learning to assess performance.

#### **2.4.2 Portfolios and e-portfolios**

The portfolio approach to assessment has evolved from identified complexities and has become widely adopted in many areas of practice since the 1990s (Emden et al., 2004). A portfolio is a tangible record of what someone has done and can be used to document learning, progress and achievement over time (Emden et al., 2004; McMullan et al., 2003). Mc Mullen et al. (2003) expand on this describing “a portfolio as a collection of evidence, usually in written form, of both the products and the processes of learning. It attests to achievement and personal and professional development, by providing critical analysis of its contents” (pg. 288).

A large project examining the literature regarding the use of portfolios to assess competence was published in 2003 (McMullan et al., 2003). From a theoretical standpoint, the portfolio approach lends itself to experiential learning with links to the theory of Kolb’s learning cycle (Kolb, 1984) (Figure 2.4). In this model, the student is an active learner rather than a passive receiver. The development of a portfolio where evidence of learning is collected helps the learner move through the stages of the cycle. The onus is on the student to develop the portfolio and think about what evidence they have that demonstrates that they meet the performance standards. To do this they must engage in reflective practice and take charge of their learning (Garrett et al., 2013). There has, however, been some voices citing lack of evidence that this actually occurs (Mitchell, 1994).



**Figure 2.4 Kolb's cycle of reflective practice (as interpreted by McMullen et al 2003 pg. 289)**

Although the creation of a portfolio aims to help link theory and practice, there have been many criticisms. A large qualitative study of nursing students and educators in the UK reported that the implementation of portfolios led to confusion in both students and assessors (Scholes et al., 2004). Despite extensive and labour-intensive training, nursing supervisors were unclear about how the assessment process worked and needed actual experience to confirm that the universities' expectations were being met (Scholes et al., 2004). This paper also highlighted dissatisfaction with the wording of the competencies, particularly if evaluated in the early part of a degree. They reported students needed to deconstruct the competencies to apply them to a clinical task and then reassemble them, with evidence of performance to meet the requirements of the portfolio. This was reported to be time-consuming and frustrating for students and assessors who felt that the time taken to do this detracted from time spent in clinical learning (Scholes et al., 2004).

A later study exploring the experience of nursing students (n=253) using a competency portfolio found that self-awareness and learning independence skills were enhanced by the portfolio, but that clinical skills were not adequately assessed by the portfolio assessment process (McMullan, 2006; 2008). They confirmed the findings of Scholes et al. (2004) that the assessment focus of the portfolio induced stress and potentially consumed time that could be used to practise clinical skills. Concerns regarding the honesty and validity of the self-directed portfolio were voiced as students would potentially filter the evidence included. McMullan (2008) asserts that both students and supervisors require training, clear assessment guidelines and support to maximise benefits from portfolios. An opportunity for feedback on the portfolio during development is important to address student concerns regarding the type of evidence to include.

A single centre study evaluating a portfolio used in clinical dietetic placement assessment showed that a portfolio could be an effective learning tool in a clinical setting (Volders et al., 2010). The portfolio evaluated was a paper-based structured portfolio containing feedback forms, self-directed activities, opportunities for reflections, and robust and comprehensive marking guides. The study reported that both students and supervisors found the portfolio valuable (92% and 100% respectively) as a learning tool in a clinical dietetic placement. This positive result may be due to the structured nature of the portfolio which helped guide learning and addresses student anxiety regarding what to include for assessment, as well as the support and training provided to all users.

Another evaluation of a portfolio in a dietetic context is reported by Brennan and Lennie (2010) from the UK. This larger multicentre study involved 114 students from 11 universities and reported that 92% of students found the portfolio a valuable learning experience, with 80% believing that the reflective practice components helped them monitor their strengths and weaknesses. However, there were concerns about workload with 76% of students describing portfolio preparation excessive and 67% of students expressing concerns about variations in assessments by different supervisors (Brennan & Lennie, 2010).

As the portfolio-based approach to competency-based assessment has become widely adopted due to its reported benefits, advances in technology have seen wide migration to, or adoption of, electronic or e-portfolios. Advantages of electronic systems are reported to include mobile access, incorporation of digital and multimedia learning artefacts and evidence and the ability to link theory and practices through matrices and hyperlinks. Better sharing of information, promotion of collaboration and removal of size/physical restrictions and data storage advantages are also suggested benefits (Garrett et al., 2013). There are many commercial software products available to support portfolio creation, such as PebblePad® and Mahara®, with many formats possible including bespoke creation of worksheets, reflection and other learning activities. Criticisms of e-portfolios include the potential for student focus to shift onto presentation, placing additional strain on students with the need to learn the technology, and lack of access/ICT infrastructure issue for supervisors or placement assessors, especially in hospitals (Garrett et al., 2013; Pincombe et al., 2010; Porter et al., 2015).

In their 2013 single centre study, Garrett et al. (2013) evaluated the use of an e-portfolio in an undergraduate nursing degree. They conducted a mixed methods approach to evaluation and reported on four broad themes emerging from focus groups (Garrett et al., 2013). Students and instructors reported positively on access and ease of use and found benefits from being able to

link skills, competencies and reflections easily. Negative sentiments were largely around frustration with the pedagogical competency-based assessment, rather than the e-portfolio per se, and some negative feelings around privacy and decreased reflexivity as instructors could access student reflections leading to self-censorship (Garrett et al., 2013). These concerns were reported to be similar in a case study evaluating e-portfolio use in social work students as were the benefits reported of integrating and reflecting on learning and development (Fitch et al., 2008). An additional benefit was the ability to use the e-portfolio to generate educational data that could help understand the student learning process. The design of their e-portfolio allowed for integration of learning artefacts as well as analysis of learning data collected by students. This increased faculty knowledge of where classroom teaching and placement-based learning activities were well aligned and where improvements could be made or were needed (Fitch et al., 2008). A common theme reported in all literature and across disciplines is the need for training and support to facilitate the navigation of technology for all users (students, supervisors and academics) (Garrett et al., 2013; Pincombe et al., 2010; Porter et al., 2015).

The use of e-portfolios for assessment of work-based placements addresses some of the challenges with assessment of competence; however, there is a need for thoughtful design and regard to function to ensure that student learning is enhanced, and potentially increased student workload is justified (Garrett et al., 2013; Scholes et al., 2004). There is a need for simplicity of design and appropriate training and integration throughout the curriculum rather than isolated use so that users become familiar and proficient with the technology. E-portfolios or portfolios in themselves do not solve all the problems with competency-based assessment such as subjectivity in assessment, intra-assessor variation or translation of competency descriptions into everyday practice but may help collate multisource evidence of performance and competency that can facilitate programmatic assessment (McMullan et al., 2003).

There is mounting evidence that portfolios and e-portfolios facilitate reflexivity, engagement and self-directed learning in students that are important skills during study and post-graduation (Brennan & Lennie, 2010; Pincombe et al., 2010). It has been further suggested that e-portfolios offer means to allow knowledge and skills transfer into different contexts which could then follow the learner as they transition to employment (Mitchell et al., 2021). A recent scoping review suggested that e-portfolios offered the ability for learners to demonstrate key skills and provide capacity for a more comprehensive assessment due to the ability to include a variety of evidence, however some disadvantages included inclusion of excessive information and challenges in establishing authenticity (Mitchell et al., 2021).

### **2.4.3 Student self-assessment**

Student self-assessment is one strategy that can be used to promote reflection and encourage the establishment of learning goals that can help students progress on the Dreyfus model of competency. Student self-assessment can identify strengths and weaknesses which is important not only for learning and reflective practice but for self-regulation (Eva & Regehr, 2005). There have however, been concerns that some learners may be unconsciously incompetent and unable to self-assess accurately (Colthart et al., 2008).

A large multicentred qualitative Australian study examining the assessment of competence during work-based placements in dietetics found that students valued and desired self-assessment (Palermo et al., 2018). The students reported a desire to have a voice in the assessment process but recognised that feedback and judgement from others (supervisors, peers, patients and other health professionals) was important in the assessment of competence. The students valued formative assessment and the authors noted that early years' assessment methods at university (marks and grades) were at odds with competency-based assessment that described a continuum of performance. The students also reported that the competency standards described the work of dietitians generally, but that they did not describe the daily practice of a dietitian (Palermo et al., 2018).

The use of Entrustable Professional Activities may offer a novel strategy to improve self-assessment. Two recent studies in medicine showed that when EPAs for used for assessment student self-assessments demonstrated consistency and agreement with supervisor assessments of student performance (Stahl et al., 2020; Valentine et al. 2019). EPAs describe observable activities of practising professionals and the accompanying entrustment scale describes the amount of supervisor input required for the student to perform the activity (Ten Cate, 2017). It may therefore be easier for students to judge their ability, primarily whether independence was granted or if the supervisor needed to provide hands-on support. EPAs are discussed in detail in section 2.6.

## **2.5 Assessment of student learning and performance during professional placements in health professions in Australia**

Competency-based education is outcome-focused and learner-centred rather than time dependent; however, curricula need to be structured to provide opportunity for learners to

meet the outcomes (competencies) by the end of the learning program (Frank et al., 2010; Lee et al., 2013). As described in section 2.2, there is a need for supervised practice in work-based settings to advance skill level from advanced beginner to competent. While there is consensus around the need for this in health professions education, the amount and type of work-based placements can vary significantly between each institution. In Australia, health professions may be regulated by independent bodies (i.e., Australian Health Practitioner Regulation Agency) for example medicine, nursing, physiotherapy or self-regulated such as dietetics and speech pathology. The educational framework associated with this regulation usually takes the form of accreditation where the discipline professional body develops standards to ensure that graduates of an accredited program will meet the standards defined by the profession which are usually presented in a competency-based framework.

Most educational programs offer a variety of work-based placements to allow students to experience a wide range of practice areas. This offers broad learning opportunities and addresses workforce needs for graduates to be flexible and able to work in different settings. It does, however, make learning and assessment complex, with learners receiving different feedback from multiple supervisors or instructors. This leads to a common and important criticism of competency-based assessment in that standards and expectations frequently differ between different assessors (Bacon et al., 2017).

A strategy to address this issue adopted by several allied health professions is the development of national assessment tools or Performance Evaluation Instruments (PEI), for example, the Assessment of Physiotherapy Practice. This tool is comprised of 20 performance indicators grouped into seven domains of practice (Professional behaviour, Communication, Assessment, Analysis and planning, Intervention, Evidence based practice and Risk management). The tool was developed in consultation with physiotherapy educators across Australia and New Zealand (Dalton et al., 2009). Each performance indicator (PI) has a rating scale from 0= infrequently/ rarely demonstrates performance indicators to 4= demonstrates most performance indicators to an excellent standard and each performance indicator has extensive examples of what is required for adequate performance (score of 2). The 20 PIs are used for formative feedback during placement and for summative feedback to feed into competency assessment. There is also a global rating scale for use as a summative assessment to allow for the educator to rate performance overall. Inter-rater variability concerns are addressed through comprehensive educator training manuals and student performance vignettes and the tool has been validated using a cross-sectional multicentre study including Rasch analysis (Dalton et al., 2011; Rasch,

1993). The tool and standards do not change as the student progresses through various placements and may be used in any workplace setting or through any stage of the lifespan. Physiotherapy practice remains consistent in all healthcare settings (acute, sub-acute, community and private practice) though the range of clients will vary (A. Hahne personal communication, Dec 2019), hence one tool can assess student competency development in any care setting.

Another allied health profession, speech pathology, has created a standard competency-based assessment tool known as COMPASS®. This tool is used to assess student performance on any placement and was developed and validated as a result of a four-year collaborative research program (Speech Pathology Australia, 2019.) As with physiotherapy, the practice of speech pathology remains consistent independent of setting although the type of patients may change. Australian nursing students are commonly assessed in the workplace and other authentic settings using the Australian Nursing Standards Assessment Tool (Australian Nursing Standards n.d.) As with other professions, these tools are based on the competency standards defined by the regulatory body, in this case the Nursing and Midwifery Board of Australia. As with other tools, extensive resource and training packages are easily available to guide assessors.

Work-based assessments in medicine have taken a different format. Traditionally, the long case examination has been used as a hurdle examination for final year students. This assessment is performed with a real patient with one hour taken for unobserved history and physical examination, 20 minutes devoted to the student preparing a presentation and 20 minutes of the student presenting and discussing the case with examiners (Burgess & Mellis, 2015). There is debate as to whether this method is better or worse than assessing skills using standardised patients (OSCEs) (Wass et al., 2001). Lack of time and teaching and assessment being conducted by busy clinicians are common reasons cited as barriers to assessment and feedback on a work-based placement (Henry & West, 2019). The method known as the mini clinical evaluation exercise (mini-CEX) developed by Norcini et al., (1995), is a formalised assessment process using an observed focused history or physical examination and is widely used in US, UK and Australian medical schools (Burgess & Mellis, 2015). To establish reliability, it is suggested that ten to eleven mini-CEX encounters are required and that teachers need training for effective assessment (Burgess & Mellis, 2015; Norcini & Burch, 2007).

It has been suggested that the utility of any assessment method, including work-based assessment, is influenced by several factors. Van der Vleuten (1996) and Van der Vleuten and Schuwirth (2005) argue that utility of assessment is comprised of reliability, validity,

acceptability, educational impact and cost (feasibility). They argue that for any assessment method there will always be trade-offs or compromises, but that if any one aspect of this utility “equation” is low then this will decrease utility overall. When choosing an assessment, including a range of assessment methods or types of assessment and including both qualitative and quantitative methods can be of benefit (Van der Vleuten & Schuwirth, 2005; Van der Vleuten, 1996).

## 2.6 Entrustable Professional Activities

Entrustable Professional Activities (EPAs) have emerged as an assessment strategy in medicine, driven by the void created by the lack of a common clinical assessment tools, the need for a more meaningful assessment scale for supervising clinicians than an abstract competency scale and the practical difficulties in translating competency frameworks into curriculum. The following is a peer-reviewed book chapter written by the candidate and her supervisor during PhD candidature. It provides an overview of EPAs, how they address some of the criticisms of CBE and how they promote learning and assessment of professional competence in the work-based setting.



# Entrustable Professional Activities: Focus on Assessment Methods

Andrea Bramley and Lisa McKenna

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## Abstract

This chapter describes the evolution and application of Entrustable Professional Activities (EPAs) an emerging concept in healthcare professional education and clinical assessment. Entrustable Professional Activities are observable actions that define the work of a health care professional in a vocational context. They describe the duties or tasks that a competent health professional can do independently and are linked, usually in a matrix, to professional competency standards. As EPAs are defined and observable, they offer an additional and practical means of assessment of clinical skills in a workplace setting and are a valuable addition to other methods of clinical skill assessment such as Objective Structured Clinical Examinations (OSCEs) and simulations. EPAs have emerged from medicine and

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their use is expanding to other disciplines such as nursing, medical specialties and allied health professions such as dietetics and pharmacy. In this chapter, strategies for defining, describing and assessing EPAs are presented. Inherent in EPAs is the concept of trust which can be used as a framework to develop an educational alliance between learner and supervisor. The degree of independence or the level of trust a supervisor might have in a trainee can fluctuate in a dynamic clinical environment with trust being inversely related to clinical risk. Furthermore, the level of trust given to a trainee will be influenced by the behavior of the trainee or the intrinsic propensity to trust present within a supervisor. Being a key concept in EPAs, this chapter concludes by exploring the concept of trust and how this can enhance clinical supervision skills through exploring two case studies.

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**Keywords**

Clinical assessment · Competency · Competency-based assessment · Entrustable professional activities · EPAs · Trust

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**Introduction**

The use of competency-based education has been a predominant feature of health professional education for many decades. Many professions have mandated achievement of competency standards to regulate professional practice and as pre-requisite for initial registration in the specific field. While they have been a mainstay in health professions education, competency-based approaches have been critiqued as being difficult to measure and assess, having lack of shared understanding of performance expectations with focus on attributes, rather than technical skills performance (Pilj-Zieber et al. 2014; ten Cate 2013a). It is from this basis that the concept of entrustable professional activities (EPAs) emerged (ten Cate 2013a).

This chapter examines the rapidly evolving use of EPAs in health professional education. It outlines the evolution of EPAs and their relationship to competency development and examines how they have been used in health professions to the present time, including their application to clinical practice, learning and assessment. The chapter concludes with two case studies demonstrating how EPAs can be used in clinical practice contexts.

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**What is an EPA?**

An EPA is essentially a professional task or responsibility entrusted to an individual to perform their role independently. In the case of the learner in a health profession, an EPA is entrusted to them by a clinical teacher or supervisor when they are deemed able to take on the associated responsibility (Ross 2015; Ten Cate and Scheele 2007). Hence, the concept of “trust” is inherent in EPAs and underpins their application in practice. Trust is a key component in the work of health professionals and underpins

the delivery of safe, quality and effective care delivery. People receiving care must be able to trust the health professional, while health professionals must be able to trust each other, both inter- and intra-professionally in delivering effective, quality care (ten Cate 2013b). Hence, EPAs align well with health professional practice and responsibility and allow students in the disciplines to develop their associated necessary attributes.

It is necessary to explore how EPAs are different to competencies that have been previously used for many decades across health disciplines to assess professional practice. According to ten Cate (2013b), EPAs provide a mechanism by which competencies can be transferred into clinical practice. He views competencies as descriptors of the professional, while EPAs serve to describe the work performed by the professional. As a result, one EPA could incorporate a number of different competencies. For example, the EPA of “Developing and implementing a patient management plan” requires the performer to demonstrate performance in several CanMEDS roles; Medical expert, Communicator, Collaborator, Scholar and Health advocate (ten Cate et al. 2010, p. 672). Competencies, by their nature, encompass a broad scope of knowledge, skills and attitudes (Frank et al. 2010). On the other hand, EPAs constitute task lists required in particular contexts that can be readily observed. According to Moon et al. (2018), EPAs are developed for “tasks or responsibilities that are observable, executable, and measurable in process and outcome” (p. 1597a).

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## Evolution of EPAs in Health Care

Entrustable professional activities first emerged in 2005 (ten Cate 2005) in undergraduate medicine as a response to challenges encountered in implementing a competency framework into a curriculum (ten Cate and Scheele 2007). Prior to that time, education had been largely competency-based following broad introduction across many fields internationally in the 1990s. As introduced above, competency-based education focuses on individual elements of the health professional’s knowledge, skills and attitudes. While important in development of the professional, competencies are general and do not describe the tasks that a particular professional needs to be able to do. Educational assessment strategies such as simulations and OSCEs are useful to assess clinical skills in an academic environment but may be resource intensive and pose logistical challenges (ten Cate and Scheele 2007). Hence, the gap between competencies and practice and the challenge of clinical skills assessment led to the development of EPAs (ten Cate 2018).

EPAs originally emerged from the United States where, in 2012, the Alliance for Academic Internal Medicine (AAIM) Educational Redesign Committee released a set of 16 proposed EPAs that all graduating internal medicine residents needed to be able to perform. In 2013, the Association of American Medical Colleges (AAMC) in the United States subsequently constituted a panel with a view to developing a set of fundamental behaviors that could be required of medical graduates, drive development of future medical curricula and guide the assessment of competence (Angus et al. 2017).

From our observations, EPAs are now being applied across a range of different health professions and are expanding from pockets of early adoption. There are now many increasing examples of the creation and use of EPAs outside of medicine including examples from pharmacy, dentistry, dietetics and nutrition and nursing. Wright and Capra (2017) describe the process of the development of EPAs in nutrition and dietetics education. In this example, academics and clinical educators used an iterative process to define 10 EPAs with each consisting of between 12 and 21 tasks or elements. Students reviewed the new methodology positively and reported a higher recognition of learning and skill development compared to previously used competency-based methods. An Australian national working party of dietetic academics and clinical educators has since been established to develop national consensus and further define milestones (Community of Practice for Dietetic Educators 2018). Beyond dietetics, Van Houwelingen et al. (2016) describe development of EPAs for the area of telehealth nursing, a specific area of nursing practice. Several authors also describe EPAs being developed for nurse practitioners (Foret Giddens et al. 2014; Bargagliotti and Davenport 2017; Hoyt et al. 2017). Significant work has also taken place in pharmacy practice in the USA, where Haines et al. (2017) describe the development of EPA for graduate pharmacists and suggest that there is potential for EPAs to be customized to different workplace settings or used to define and develop advanced practice roles (Pittenger et al. 2016).

EPAs can be used to describe entry level expectations, but they can also be layered to inform curricula for postgraduate specializations. Postgraduate training programs are time-based, and the development of EPAs can potentially inform the curriculum in different years of training programs. An example of this approach has been adopted by the Australian and New Zealand College of Psychiatry across each year of training in the psychiatry program (Boyce et al. 2011). The paper by Boyce et al. describes the approach of developing four EPAs for the first year of training with plans to develop specific EPAs for various rotations in subsequent years (Aimer et al. 2016). Other examples of EPAs in medical specialties include radiology (Ryan et al. 2017), gastroenterology (Rose et al. 2014), pathology (Powell and Wallschlaeger 2017), neonatology (Parker et al. 2017) and palliative medicine (Myers et al. 2015), just to name a few.

More recently, EPAs have been described as being developed for academic faculty development. Iqbal et al. (2018) conducted a review of EPA use in the education of health professional educators, finding only nine studies. Of these, only two demonstrated using EPAs in their training programs, one in a Master of Health Professions Education program in the United States, and the other in a Fundamental Teaching Activities program in Canada. Hence, while their use is not necessarily widespread as yet, it is expanding into new contexts.

## Application of EPAs in Health Professional Education

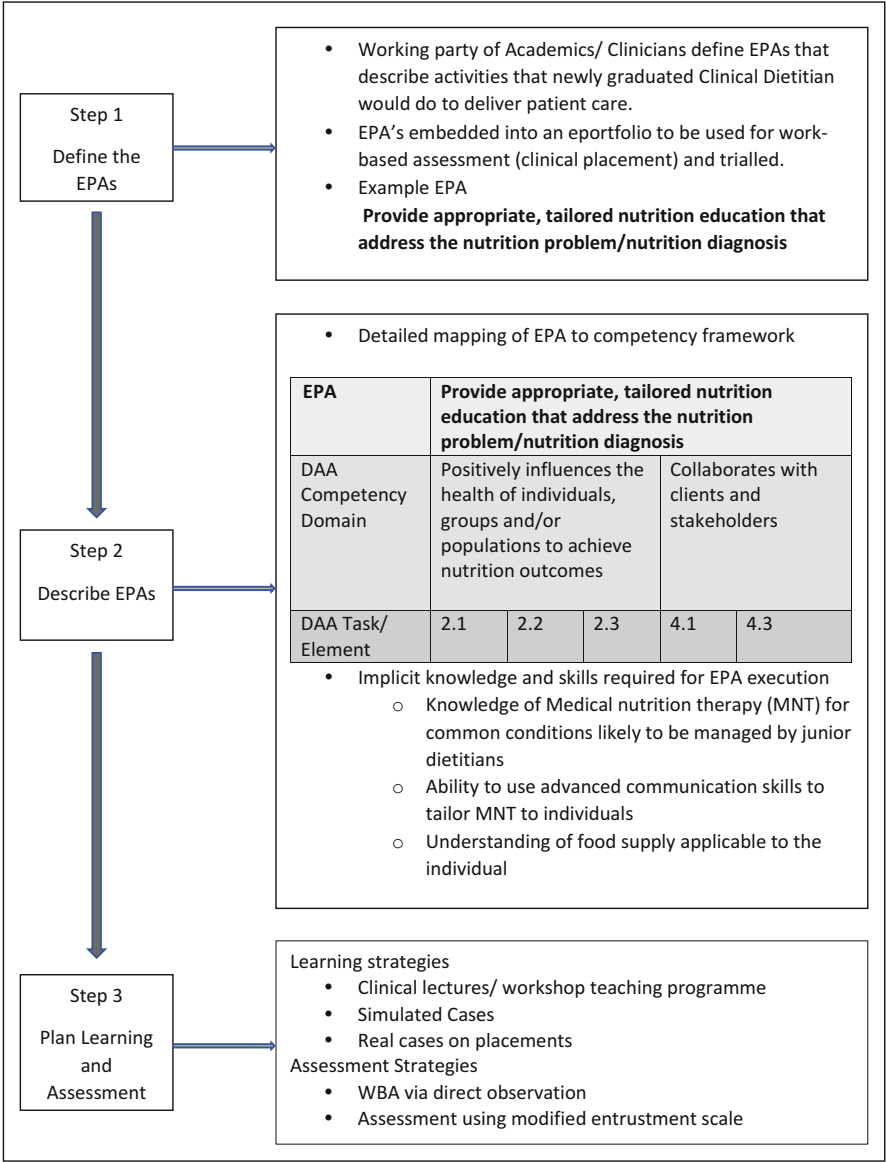
EPAs present a practical and feasible method for providing assessment in a dynamic clinical environment by practicing clinicians who may not be educators or academics (Englander and Carraccio 2014). As EPAs describe the expected skills and work activities of the health professional, the development of a mutual understanding of expectations of the trainee/student and the assessor/supervisor is fostered. When an entrustment decision is made, the student is deemed able to perform the activity independently. The entrustment scale clearly describes student progress from dependence to independence promoting shared understandings of the expected level of performance. The learner is able to progress from observation to execution with decreasing levels of supervisor intervention until a level of mastery is reached where the learner then had the capacity to supervise more junior colleagues (ten Cate 2013b).

The Association of American Medical Colleges (AAMC) defined 13 essential EPAs that a graduate of a medical training program should be able to perform on the first day of their internship without supervision. This project was initially motivated by patient safety concerns, as it was known that the skills of new medical residents could be variable, and they were expected to perform a high range of tasks independently from the first day of their residency. The EPAs and an extensive toolkit with supporting materials are available online and the process of development has been published (Englander et al. 2016). The title of the EPAs, Core Entrustable Professional Activities for Entering Residency, is framed in a vocational manner and is relevant to undergraduate and graduate training pathways.

Several methods for developing EPAs and embedding them in curricula have been reported in the literature. A three-step process is described by Mulder et al. (2010) and is illustrated using an example from the Dietetic Program at La Trobe University Australia (Fig. 1):

- Step 1 Select the EPAs
- Step 2 Describe the EPAs
- Step 3 Plan learning and assessment

Although this may seem quite straightforward, there are challenges associated with each step. The authors suggest starting from clinical practice and focusing on the desired outcomes of the health education training program (Mulder et al. 2010). Implicit in this step is that the profession is well defined with a clear scope of practice. Several methods have been described in the literature including the use of a working party consisting of clinicians, program directors, educators and health service researchers (Chang et al. 2013) or through the use of a Delphi approach (Hauer et al. 2013) sourcing input from educators and recent graduates. Although wide consultation is recommended, there may still be lack of buy-in by those who feel that EPA may not cover all aspects of the profession, or who feel that the EPAs reduce practice to a list of tasks. The number and range of EPAs may vary across disciplines and there is contention between EPAs being over-arching or specific to an



**Fig. 1** Development and implementation of a Dietetics EPA using methodology described by Mulder et al. (2010)

area of practice (Chang et al. 2013). The range and number of EPAs varies, with Warm et al. (2014) noting that numbers of EPAs can range from five to 25, citing examples from internal medicine, psychiatry and pediatrics.

The second step of the process, describing the EPA is important to ensure clear links to competency frameworks and that there is sufficient information provided to students, academics and clinical educators or supervisors to be able to use them. It is also important that all domains of competence are covered by the developed EPAs. It may also be important to define those competencies that are essential to the individual EPA and those that would enhance proficiency or involve advanced practice. The use of milestones to describe behavioral performance of an EPA may also be advantageous with a clear description of a novice learner who would need a large amount of direct supervision and one of an independent learner who would not need the supervisor to be physically present in the room to perform the activity independently to the required standard (Englander et al. 2016; Haines et al. 2017). This is an important factor in building a shared vision of a work-ready professional between students, clinical supervisors and educators and communicates the desired learning outcomes.

The third step is not without challenge as well. Designing learning, such as providing opportunities to practice and develop skills, as well as the assessment of performance in the clinical setting, can be challenging and require careful planning and thought. In clinical placements or experiential learning, the types of learning opportunities or rotations need to be considered. Similarly, in the classroom, considered thought and planning are required to develop learning and assessment resources. Thompson et al. (2017) describe the process of developing five high fidelity case study simulations to inform assessment of the American Medical Colleges EPA 10, “Recognize a Patient Requiring Urgent or Emergent Care and Initiate Evaluation and Management” (Englander et al. 2014). Thompson et al. (2017) propose the simulation model to address concerns regarding patient safety and lack of real-world opportunity for students to practice and demonstrate this EPA which requires a deteriorating patient requiring emergency care.

An additional possible pitfall is the potential to formulate large lists of EPAs that may frustrate students and teachers, however if EPAs are too broad, they may lose their impact in assessment. Potential to mitigate these challenges may be through the use of the Observable Practice Activity (OPA), a smaller process or outcome-based examples of practice that can be viewed as a series of nesting dolls that fit into a bigger EPA (Warm et al. 2014). Warm et al. (2014, p. 1178) provide an example of an OPA, “minimize unfamiliar terms during patient encounters” that is mapped to the broader competency of communication skills. The specific description of the observable skill provides explicit instruction to both the learner and the teacher as to what is required in a specific work-based context.

As EPAs are vocationally oriented and immediately relatable in the workplace, inexperienced assessors are likely to be comfortable understanding and using them as they will be activities that they would perform as part of their current work. Peters et al. (2017) in describe their use of EPAs in medicine as a tool to develop learning goals that are explicit to students. As the concept of trust is central to EPAs, the use of student self-assessment regarding performance on an EPA can aid the supervisor to facilitate a conversation about why more supervision might be required in the case of an overconfident student and what might facilitate independence in an

underconfident student. EPAs can be used for formative assessment, as well as summative assessment, and lend themselves to a longitudinal framework where, with continuing practice and feedback, the learner should progress up the scale of entrustment. O’Leary et al. (2016) describe a slightly different process with supervised learning events being used for formative assessment and EPAs for summative assessment in psychiatry. A challenge in using EPAs for assessment is that observation is required to inform entrustment but there may be little guidance as to how, when and who makes the observations and provides feedback (Tully et al. 2016). Similarly, Touchie et al. (2014) describe that differences in the level of supervision expected by subject matter experts was higher than that actually received by first year medical residents in their study. In addition to direct observation, feedback from other sources such as other health professionals or capturing the patient’s perspective (Chang et al. 2013) should potentially be included when assessing an EPA.

## **EPAs and Training Improvement**

There may be an important role for EPAs to drive improvements and inform the development of healthcare professional training programs in continual adaptation to meet ever-changing needs of the healthcare system. As Entrustable Professional Activities describe the work, an independent competent practitioner is expected to be able to do, any gaps in performance that students or recent graduates show can potentially be measured, analyzed and can help guide future curriculum and assessment design (Angus et al. 2017). EPAs also offer potential to guide expanding the professions and help with defining advanced practice roles, particularly in nursing and allied health.

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## **EPAs and the Clinical Education Relationship**

Intrinsic to the concept of EPAs is the concept of trust. Trust is important in healthcare and a key component of the relationship between patients and their clinicians, and between members of the multidisciplinary team. Patients “trust” that the person caring or treating them knows what they are doing, they can execute the clinical activity with competence and that the activity has a purpose or and desired effect. Healthcare workers understand the concept of trust, and this can be extended to enhance the relationship between the trainee and supervisor, potentially improving the learning environment (Damodaran et al. 2017).

As a result of the nature of the clinical learning environment, clinical education, supervision and assessment will always have an aspect of subjectivity, and therefore the potential for bias. Trust is separate to feelings of liking or disliking that may bias assessment and could be used to describe behaviors, rather than personal qualities, thereby decreasing some of the emotion that inevitably comes with being assessed or judged. The five-point entrustment scale rates students’ performance on how much support is required by the supervisor to perform the task independently (ten Cate

2013b). Discussions around performance can be linked back to what is required to enable more trust and therefore, independence.

The use of EPAs can help students to identify areas of knowledge or skill deficiency and plan and develop targeted learning goals to increase independence. As EPAs are linked to multiple competencies, it is possible that a student may not yet possess one of the competencies that is required to perform the EPA independently. If a problem area can be identified and targeted, then detailed learning goals can be identified to bridge the gap. Furthermore, as EPAs are workplace specific, they can be useful for educators to provide orientation or training specific to that workplace context to enable autonomy (Carraccio et al. 2016).

How much autonomy or independence is granted to a learner is also dependent on the risk of the situation. Risk can be influenced by condition of the patient, nature of the clinical situation or factors in the clinical environment. These are extrinsic to the learner and can help learners to understand why they may be granted independence to perform an EPA in a certain situation, but not in another. It is also important for supervisors to understand attainment of an EPA does not equal a fully developed health practitioner and that all students and graduates will continue to need feedback, particularly when starting a new practice area or in a healthcare setting that they are not experienced with (Haines et al. 2017). How much direct supervision a student receives depends of the amount of risk, the learning context and level of trust established in the relationship (Babbott 2010; Sterkenburg et al. 2010)

In addition to level of risk, the degree of trust in a learner can be influenced by the supervisor's style, with some people having a higher propensity to trust than others, a perceived or real gap in the knowledge or skill a student demonstrates or the professional behavior of the student (Damodaran et al. 2017). It is useful for supervisors to reflect on what student factors increase trust and to be able to explain these to students. For example, is it the ability of students to recall theory when questioned, is it the student using a standardized patient handover tool, or do they need to have a certain level of direct supervision or observation before they are sufficiently prepared to allow the student to be independent? The aim of clinical education is to progress the level of trust in the relationship to an agreed point, often to the point of post hoc or indirect supervision. Through a shared understanding of factors impacting trust, a space is created where students and educators can have meaningful conversation about how to increase trust and therefore achieve independence (Choo et al. 2014). From a student perspective, some students may thrive with close supervision and find this reassuring while others could find high levels of observation to undermine their confidence or increase anxiety. Discussing supervision and teaching styles can help students and supervisors connect and form an educational relationship with the objective of progressing the level of student independence. The following case studies examine how trust within the clinical education relationship might play out.

## Case Study 1

A dietetics student is placed in a diabetes nutrition clinic with a new supervisor who has not supervised the student before. The handover from another supervisor is that this student has performed with autonomy all required aspects of a similar Type 2 diabetes focused nutrition clinic. A referral is received to see a 65-year-old gentleman with newly diagnosed Type 1 diabetes mellitus. The student has not assessed or provided education for a person with Type 1 DM before but feels confident to do so. Despite the slightly usual presentation of the referral, 65 years old is uncommon but not unheard of for a new diagnosis of Type 1 diabetes mellitus, the supervisor decides to allow the student to conduct the session and step in only as required.

During the appointment it becomes quickly apparent that the diabetes has been triggered by an immunotherapy regimen to treat cancer that was not apparent in the referral. In addition to the diabetes, the patient has underlying disease-related malnutrition and significant gastrointestinal side effects that will impact on nutrition management. The supervisor takes over and completes the consultation.

Following the consultation, the student expresses frustration and disappointment that they were not able to complete the consultation. Using the concepts of trust and clinical risk, the supervisor explains that the risks were much higher than initially assessed and that this reason (combined with the time pressures of an outpatient clinic) rather than the student's performance caused the decreased level of student autonomy. The supervisor reinforces that she would still trust the student to see less complex patients with post hoc supervision.

## Case Study 2

A nursing student is deemed at risk of failing a clinical placement due to aspects of professional behavior. When observed with patients the student easily builds rapport, has excellent communication skills and implements appropriate interventions but often but not always rushes or skims over patient assessment and spends a lot of time talking to the multidisciplinary team socially.

During a formative assessment the clinical educator uses the framework of trust to provide feedback to the student. She explains that the student's inconsistency in approach to patient assessment decrease the trust that the supervisor has in the student's ability to correctly assess patients if presented with a new clinical condition or in a different healthcare setting. While the interventions have all been appropriate, the supervisor explains that if the clinical risk of the situation escalated, the supervisor would not have the confidence to trust the student to work independently in this situation. Similarly, conducting large amounts of social discussion with staff decreases the level of trust the supervisor has in the student coping with an increased workload. If the student had finished their work, then a behavior that would improve the trust between the student and supervisor would be for the student to contact the supervisor to provide handover and assign new work or learning activities.

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## Conclusion

The use of EPAs has potential to enhance practice-based education in all healthcare professions and is increasing. As they describe the work of professionals, EPAs help operationalize competency frameworks that may seem vague or abstract to clinicians responsible for providing clinical supervision and training. Although the process of creating, defining and assessing EPAs is not without challenges the potential benefits make them worth pursuing. A key reason why EPAs are worthwhile lies in the additional vocational assessment opportunities that will help inform programmatic assessment. EPAs and the trust framework create opportunities for feedback, and therefore improvement both for students individually and potentially for training programs. For students, using EPAs can help drive a targeted learning plan that is linked towards increasing independence. A trust framework can enhance the student/supervisor relationship and help move towards an environment of assessment for learning, as well as providing opportunities in assessment of learning. EPAs can help define professions and help build shared understandings of what entry level, and possibly graduate, practitioners should be able to do. For training programs, any performance gaps can be used to help improve student training and inform the curriculum to meet the workplace needs.

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## Cross-References

- ▶ [Conversations to Support Learning in Health Professions Education](#)
- ▶ [Engaging Clinical Educators: An Experience from Nutrition and Dietetics](#)
- ▶ [Evaluative Judgement](#)
- ▶ [Feedback and Supervision in Health Professions Education](#)
- ▶ [Focus on Assessment Methods: The Objective Structured Clinical Examination](#)
- ▶ [Focus on Assessment Methods: Work-Place Based Assessment](#)
- ▶ [Focus on Theory: Experiential Learning](#)
- ▶ [Focus on Theory: Workplace Learning Theories](#)
- ▶ [Identifying and Managing Underperformance in Students/Trainees](#)
- ▶ [Measuring Performance: Current Practices in Health Professions Education](#)
- ▶ [Programmatic Assessment in Health Professions Education](#)
- ▶ [The Emergence of Competency-Based Health Professions Education](#)

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## 2.7 Competency frameworks and competency-based education and assessment in a dietetic context

### 2.7.1 Dietetic competency in Australia

The profession of dietetics in Australia adopted competency standards and competency-based education in the early 1990s. Prior to this, an apprenticeship model was used where dietetic competence was assumed once a specified amount of time in supervised professional placement was completed (Ash et al., 2019). The trigger for the development of competency standards in Australian dietetics was in part driven by the National Office of Overseas Skills Recognition (NOOSR) requiring professions to ensure that entrants from overseas were assessed on their ability to perform in a given professional role, rather than just possessing a qualification (Ash & Phillips, 2000). The initial competency standards were developed in 1993 with reviews in 1998, 2007 and 2015. These competency standards were developed in the context of the Dreyfus (1986) model which placed competence or entry level performance in the middle of a learning curve (Ash & Phillips, 2000).

The method of original design was through the formation of a taskforce of experts to create the competency standards. These standards were then validated via interviews with key stakeholders such as members of the profession, dietetic education programmes, unions and registration boards (Ash & Phillips, 2000). The standards consisted of eight domains related to different work roles of dietitians; clinical, food service and community and public health with each domain being further divided into components (units, elements, performance criteria, range of variable, evidence guides (Ash & Phillips, 2000). Revisions in 1998 and 2007 saw increased competencies to reflect evolving practice of dietetics (Ash et al., 2019). The competency standards were further revised in 2014; the units of work were removed with the number of competency standards with themes of leadership, advocacy, entrepreneurship and business management being grouped under a broader term of professionalism (Ash et al., 2019: DAA, 2015).

### **2.7.2 International context**

Dietetic programs outside of Australia have also adopted competency-based approaches including the United States of America (USA) and the United Kingdom (UK). These countries have been highlighted for discussion as the professional scope of work of dietitians in these countries is similar to the Australian context. Furthermore, these countries have similar education and training requirements, though there are some notable differences that will be discussed.

In the UK context, dietitians are registered to practise by the Health and Care Professions Council and practice under the Standards of Proficiency for Dietitians (HCPC, 2018). There are 15 standards of proficiency with detailed subpoints under each standard and broadly specify the knowledge and skills required to practice as a dietitian, ethical and legal requirements in a UK context, communication, teamwork and reflective practice requirements.

The Academy of Nutrition and Dietetics oversees the profession of dietetics in the USA. The competency framework in the USA is arranged into two parts, Standards of Practice (SOP) and Standards of Professional Performance (SOPP) (Andersen et al., 2018). There are four SOP with direct links to the nutrition care process (nutrition assessment, nutrition diagnosis, nutrition intervention/ planning of care and nutrition monitoring and evaluation and the remaining two relate to communication and management. Each standard has detailed performance indicators as examples of outcomes that can be used to evaluate practice. As with the SOP, each SOPP has a performance indicator and examples of outcomes. The intention behind these documents, rather than to regulate the profession, is to foster self-evaluation and to promote competent practice (Andersen et al., 2018). In addition, there are focus area SOP and SOPP that identify competence outcomes in specific areas of practice.

### **2.7.3 Curriculum and assessment strategies in dietetic education**

Australian, UK and USA dietetic competency frameworks have similarities, as do education and curriculum documents that provide guidance to universities and training institutions regarding curriculum. All carry the expectation of foundational knowledge in human biology, chemistry, physiology, biochemistry and nutrition science and all explicitly state the need for supervised practice to allow the evaluation of the application of this knowledge in practice. It is assumed the shift along the scale from novice to competent will occur in the final years of education and that supervised practice in professional placements is essential for this transformation (Chambers et al., 1996). Although competency-based education in its true form is not dependent on time, there remains a specified number of placement days, but it is unclear how this number

has been determined (Ash et al., 2019; Bacon et al., 2015) and marked differences exist internationally despite similarities in educational outcomes.

The British Dietetic Association has a Curriculum Framework for pre-registration education and training for dietitians to provide guidance for institutions regarding the curriculum and practice placement component of the training program (British Dietetic Association, 2021). This framework contains a requirement for students to complete not less than 1000 hours of practice learning and the majority of this should occur in practice placements. They further specify that one placement must be not less than 350 hours long and be undertaken on a continuous full-time basis. To practise as a Registered Dietitian Nutritionist in the US practitioners are required to complete a bachelor degree or higher from a course registered with the Accreditation Council for Education and Nutrition and Dietetics (ACEND), complete a 6 to 12 month supervised practice program in a healthcare facility and pass a national exam (Academy of Nutrition and Dietetics, 2020). The amount of supervised practice expected within the education program is summarised in Table 2.3.

**Table 2.3 Comparison of practice component of dietetic education programs in three countries**

Country	Practice/ Practicum required	Additional comments
Australia	100 days (700 hours, 20 weeks)	Must provide opportunity for students to meet the national competency standards including Medical Nutrition Therapy
UK	1000 hours (28 weeks)	Must include some placement hours early in the training program. 350 hours of placement must be continuous and full time
USA	6-12 months (910-1800 hours, 26-52 weeks)	

It is unclear why there is such a difference regarding the required amount of supervised professional practice. There are slight differences in the healthcare systems between each country, but the scope of practice and expectations of performance are similar. The specification of the type of training required is at odds with competency-based education which is outcome based but does not specify the education means to achieve these outcomes. The prescription of days may be partially historical, as the dietetics profession like other professions has evolved from an apprenticeship model where skills and autonomy were developed slowly with close supervision. From a learning and assessment perspective it would be difficult to evaluate student performance at the Miller “does” level in a setting other than in a setting where the professional would practise. What is less transparent is why there is such a disparity in the number of practice days/supervision hours specified when the work practices and competency frameworks are similar.

#### **2.7.4 Supervised placement settings: what types of work-based placements are best for learning**

Competency-based frameworks not only describe the ‘does’ in Miller’s pyramid but extend this further into articulating the personal and professional attributes of the practitioner. When translating the Dreyfus (1986) model of skill acquisition into medical education, Carraccio et al. (2008) argue that moving from advanced beginner to competent requires sufficient breadth and depth of patient encounters to be able to develop sufficient experience or memory log of clinical situations required to progress to the next skill level. Assessment of ‘does’, defining an

acceptable level of practice and defining the work context are all challenging from a theoretical and practical viewpoint. This depth and diversity are necessary to move along the scale; however, in practice this can be difficult to achieve. What is not known is how many learning encounters and of what type are required.

In dietetics, the notion of context is discussed by Ash and Phillips (2000) who assert that “assessment of competence ideally takes place in the workplace and that satisfactory performance in one or a limited range of contexts may not be transferable to another context” (pg. 149). There are many variables in this statement and it is not clear what constitutes a sufficient range of contexts. Furthermore, the diversity of practice roles in dietetics presents a particular challenge in implementing competency standards into the curriculum (Chambers et al., 1996) and in assessment (Jamieson et al., 2019).

It is widely accepted that assessment of “does” occurs in a supervised work-placement context; however, from a practical perspective, challenges exist due limited and diverse heterogeneous experiences. Professional placements have traditionally occurred in acute health settings of large hospitals. Although hospitals may be convenient places to teach given the high density of patients and potential supervisors, they may not be the best learning environment (Bacon et al., 2015). Carraccio et al. (2008) suggests that the strategy of exposing students to different clinical scenarios should move from common to uncommon, but this can be challenging in a hospital with complex patients who can quickly be overwhelmed or whose admission may not be aligned with the student placement or rotation. This challenge has been reinforced by a recent study by Palermo et al. (2018) that explored dietetic students’ construction of competence (Palermo et al., 2018). This qualitative research captured two thirds of established dietetic education programmes in Australia representing 22% of total Australian dietetics graduates. The main results indicated that as there is a large focus on workplace assessments in acute health care facilities, students’ placement experiences may not support workforce needs. Additionally, current assessment practices may not be conducive to the development of competence. Students reported that the different placement types felt very siloed and disconnected to overall competence. Students also reported a desire to be more involved in assessment and have a voice but acknowledged there needed to be a balance between student and supervisor lead assessment of performance on placement.

An earlier study by Bacon et al. (2015), aiming to evaluate the use of aged care and ambulatory/ outpatient settings for dietetic student professional placements, found that these settings could be conducive to developing dietetic competencies more traditionally associated with a hospital

setting. This study found that these non-traditional placements may in fact be better settings to develop competencies related to nutrition counselling and behaviour change (outpatient setting) and assessment of malnutrition (aged care). In this study, one of the challenges reported with the outpatient setting was the need to conduct both the assessment and education component of the consultation in the one consultation. This makes it harder for students to plan and prepare and could potentially overwhelm novice or advanced beginner students. There has been similar concern in other professions, such as medicine, that non-traditional placements may not be best suited to entry-level students. This resistance has been challenged with a systematic review finding exposure of entry-level medical students to non-traditional (rural and community) placements had benefit and could enhance student learning (Crampton et al., 2013).

#### **2.7.5 Supervised placements: what amount of supervised placement is required to develop competence?**

As described above in Table 2.4, the amount of required supervised practice for dietetic education in Australia, USA and UK differ despite similar educational outcomes and professional practice. The reasons for this are likely to be multifactorial and include both historical and pragmatic reasons, such as the availability of placements. There are few studies that examine the time required to develop dietetic competency and they focus on the development of individual case management or clinical dietetic skills and competence. One study from the UK (Pender & de Looy, 2004b) reported that 16-17 weeks of supervised practice was required for the development of competence, with competence defined by the authors as the ability for a student to practise in a hospital setting with a high level of skill performance.

A recent Malaysian study that evaluated the introduction of International Dietetics Nutrition Terminology (IDNT) and the Nutrition Care Process (NCP) in a university curriculum described the creation of a quantitative performance evaluation instrument (PEI) and its use to monitor student progress in supervised practice (Karupaiah et al., 2016). Students were provided with 12 weeks of supervised practice with the results of the PEI interrogated according to whether students had achieved a satisfactory level of performance at the end of the placement. A key finding was that students who reached acceptable levels of performance by the end of the placement (week 12) had largely achieved all of their learning outcomes by week 9 with performance plateauing after this point. Students who did not reach an acceptable level of performance by week 12 showed a decline in performance after week 9. This study is discussed in greater depth in the following section.

### **2.7.6 Assessment methods and tools in work-based placements**

A systematic review by Jamieson et al. (2019) evaluated the practices and outcomes of methods used to assess dietetics students. This review evaluated published works on student assessment across all hierarchies of Miller’s Pyramid in the area of dietetics (Jamieson et al., 2019). Twenty-three studies were identified that contained assessment at the “Does” level and 19 of these were conducted in clinical or hospital-based settings. Most of the studies reported developing a performance evaluation instrument (PEI) to assess students and the next most common assessment method was a portfolio. The following table provides an overview of the results.

**Table 2.4 Methods for assessing performance used in dietetic education**

<b>Paper</b>	<b>Assessment Type</b>	<b>Assessors</b>
Brennan & Lennie, (2010) UK	Portfolio	Trainee and WBA
Chambers & Hubbard, (1978) USA	Test	Not reported
Cochran & Spears, (1980) USA	PEI Modified Ingalsbe and Spears Critical Incident	Trainee and WBA
Daniels & Magarey, (2000) Australia	Written task	University
Earl, 1984 UK	Performance evaluation instrument- group presentation communication skills	Self
Farahat et al., (2015) USA	OSCE	University
Fiedler, et al., (1981) USA	PEI- The Counselling Checklist	Not reported
Gibson & Davidson, (2016) Australia	OSCE/PEI for clinical dietetics	University
Hawker et al., (2010) Australia	OSCE	University
Henry & Smith, (2010) USA	PEI in simulation	Simulated patients
Hipskind et al., (2013) USA	OSCE	WBA
Horacek et al., (2007) USA	PEI: Modified Dietitians Interviewing Rating Scale (university setting)	Self and university
Ingalsbe & Spears, (1979) USA	PEI-Clinical Performance Evaluation- hospital	University, WBA, self, peer
Isenring, (2014) Australia.	Quiz	University
Johnson & Hurley, (1976) USA	PEI during clinical placement	WBA, university and self
Karupaiah et al., (2016) Malaysia	PEI -University clinic and hospital (inpatient and outpatient)	WBA
Lake, (1980) Canada	PEI	WBA and self

<b>Paper</b>	<b>Assessment Type</b>	<b>Assessors</b>
Lambert, et al., (2010) UK	OSCE	University and WBA
Lennie & Juwah, (2010) UK	PEI- hospital unwritten assessment and written	Not reported
Litchfield , et al., (2002) USA	Examination	University
Lordly, (2007) Canada	Portfolio ( for recognition of prior learning)	University and WBA
Novascone, (1985) US	PEI- for clinical	WBA
Olive et al., (1985) US	PEI- includes clinical	Professional organisation
Palermo et al.,(2016) Australia	Written task (public health)	University and WBA
Pender & De Looy, (2004) UK	OSCE (Clinical)	University
Pender & de Looy, (2004) UK	PEI- clinical setting (written skills, interview skills, assessment skills, oral com skills)	WBA
Pope & Gines, (1986) USA	Examination	Professional organisation
Schumacher (2014) USA	PEI to assess critical thinking	University
Schwartz et al., (2015) USA	PEI to assess counselling and communication skills	University
Shanklin & Beach, (1980) USA	Examination	University
Tower & Vosburgh, (1976) USA	PEI- Oral communication, interpersonal relations, organisation of work, application of knowledge – clinical setting	WBA
Turner, et al., (2000) USA	PEI- structure, interview, data analysis, person centred care, intervention and monitoring, communicating plan, management 5-point performance scale	WBA
Volders et al., (2010) Australia	Portfolio- structured including feedback forms and self- reflection workplace including clinical and coursework	WBA, self and university

<b>Paper</b>	<b>Assessment Type</b>	<b>Assessors</b>
Wenberg & Ingersoll, (1965) USA	PEI	University
Wenberg et al.,(1969) USA	PEI	WBA and University
Whitehead et al., (2014) UK	PEI- verbal communication skills	WBA

*WBA Work Based Assessor OSCE Objective Structured Clinical Examination PEI Performance Evaluation Instrument*

*Adapted from Jamieson et al. (2019)*

Several of the studies referred to in Table 2.4 describe creation of performance evaluation tools, predominantly in clinical settings. As described in Table 2.3, international diversity with regards the length of supervised practice exists. The study by Karupaiah et al. (2016) from Malaysia, sought to address the issues of international diversity regarding the length of supervised practice and the lack of performance evaluation tools in the Nutrition Care Process. The authors report on the design of a Nutrition Care Process (NCP) based PEI. Using an action research methodology, they describe the process for designing, testing and validating the tool. Student performance was measured during two six-week clinical placements with assessment at weeks 1, 6, 9 and 12. The tool consisted of learning outcomes grouped under NCP subheadings with a Likert scale ranging from 1= Poor (performance clearly inadequate throughout) to 5 (excellent) and the mid-point 3 being satisfactory. The authors established face and content validity. Interrater reliability was established through concurrent evaluation of a student interaction with a patient by a university academic and a dietitian preceptor with reliability shown to be high. This study was able to stratify students into “progressors” and “regressors”. Progressors showed linear trends in achievement from baseline until 12 weeks whereas regressors showed peak performance in week 9 and then regressed. The tool was able to generate data that described the momentum of knowledge gain in each category with students achieving the highest scores in documentation, followed by nutrition diagnosis, nutrition intervention, nutrition assessment and lastly nutrition monitoring and evaluation. Although the development of a PEI and reporting on the trajectory of student progress addresses gaps in the literature, the authors do not report if satisfactory performance translated to the appropriate standard being obtained. An objective of this thesis is to address a research gap in the development of a PEI using the novel concept of EPAs with collection of educational data to support programmatic assessment.

Unlike speech pathology, nursing and other professions there is no national or standard work-based assessment tool or PEI used in dietetics in Australia or internationally. There are several potential reasons for this such as the diversity and expanding nature of dietetic roles. In dietetics there are many varied work roles and fields of practice ranging from clinical or hospital-based dietetics, private practice, food service management roles, and community and public health. The roles are diverse with new and emerging roles, such as food industry and nutrition communication, becoming evident (Begley et al., 2019). Even in well-established areas of practice, such as clinical dietetics and food service management, the role and performance expectations of a dietitian in these two areas are very different and a single tool would lack validity. Furthermore, although the number of days required in supervised practice is mandated

in dietetic course accreditation standards, the placement program can vary widely between different institutions. Due to this diversity, the portfolio approach has been the most widely adopted method for collating evidence of competence and evaluating students against the national competency standards. A shortcoming of the portfolio approach from an educational research perspective is that being learner centric, they do not necessarily provide insight into the type, number and contexts of assessments and experiences required to help learners progress up the Dreyfus (1986) pyramid on a cohort level. A recent scoping review additionally found that the time taken to review e-portfolios, inclusion of excessive information and challenges establishing authenticity could negatively impact the utility of portfolios (Mitchell et al., 2021).

There is consensus amongst the Australian dietetic education community that improvements can be made to the current methods of assessment. A multicentre qualitative study by Palermo et al. (2018) identified that current assessment processes and placement experiences may not reflect current standards or workforce needs and that there was a lack of shared understanding among the profession of an entry-level dietetic practitioner. Recent national work, commenced after the candidate's program of research, to address this has taken place with the development of EPAs and milestones to be used by academics, practice educators (student supervisors) and students to help inform assessment and develop shared understandings of entry-level competence. A national working group consisting of academics and educators drafted four EPAs with associated performance descriptions (milestones). These were then triangulated with advertised job descriptions of entry-level roles. These EPAs are broader than those used in medicine and other professions that have exclusively clinically focused initial work roles post-graduation (Begley et al., 2019). One other example of EPAs in dietetics, published after the commencement of the candidates is program of research, in dietetics described the development of EPAs and their use in a dietetic education program (Wright & Capra, 2017). This single centre study reported that EPAs were well accepted by practice educators and students found assessment clearer, suggesting the EPA model assists in the translation of competency frameworks into assessable workplace related activities.

## **2.8 Use of assessment data: The student, teacher and education community**

For the individual learner, a key outcome of competency-based assessment is to provide feedback to help them improve to reach, maintain or exceed the competency standards. Student strengths and areas for improvement should be easily identified. The importance of feedback for

learning has been well documented (Archer, 2010; Johnson et al., 2016; Lockyer et al., 2017; Sargeant et al., 2005). Despite this, “formalized processes that support the collection of specific feedback and its synthesis in a concise report are not the norm” (Hicks et al., 2018). For academics and practice educators, feedback on student performance is key to identifying students at risk of not meeting educational standards and offering remediation strategies. Equally, obtaining feedback on performance can aid in their own skill development as educators. Universities routinely measure academics’ performance using tools such as student feedback surveys; however, these are not necessarily aligned with translational outcomes such as clinical competence.

Feedback is equally important to educators. From an educational research perspective, many authors have commented on the lack of data in healthcare education. Burch et al. (2007) suggest a paucity of published data about the reliability of the medical specialist certification process and that such data is vital to improve practice (Burch et al., 2008). McGaghie et al. (2014) conducted a critical review of mastery learning, a type of competency-based education, and attempted to map the impact of simulation as an education strategy in the immediate term and further downstream in translational outcomes such as improved patient care. The authors comment that while there is a large body of evidence of the impact of mastery learning in fields other than healthcare, there has been slow adoption in healthcare education due in part to a lack of data. There is a need to improve the collection of data in healthcare education in order for education to be evidence driven, as lack of data will stifle innovation (McGaghie et al., 2014). Karupiah et al. (2016) also comment on the paucity of reports in the literature that measure clinical competencies in dietetic interns.

This research program and resulting thesis was inspired by a clear local need in the La Trobe University dietetics program to design a tool to assess students during their work-based assessment to contribute to overall assessment of competence. In addition to designing a system to support work-based assessment during supervised practice, a secondary objective of the program was to design a system that could provide educational data to inform evidence-based education. As such, one of the requirements of the revised assessment system was to enable easy and reliable data collection that could be used to analyse teaching and learning performance, provide detailed information on patterns of strengths and weaknesses in student cohorts to allow remediation and to measure outcomes of any changes in curriculum, teaching methods or other educational interventions on translation into clinical practice. Despite international similarities in scope of practice in dietetics, length of supervised practice varies

considerably from country to country and there is clear lack of educational evidence regarding the length of supervised practice required to ensure work ready graduates that meet competency standards. The resulting e-portfolio with embedded EPAs was designed with this in mind and the educational data generated across three cohorts of students is analysed and reported in this thesis.

## 2.9 Conclusion

The National Competency Standards for Dietitians in Australia, like other competency frameworks, suffer from assessment challenges with multiple assessment methods and formats required to assess if learners meet the standards at the end of their course of study and are safe to practice. Work-based assessment is a key component to assess Miller's performance level of 'does'. In dietetics, the amount and setting of workplace assessment varies internationally, despite similar educational outcomes and is based in tradition and expert opinion rather than evidence. Additionally, there is no widely accepted performance evaluation tool used for workplace assessment in dietetics. EPAs are a recent educational concept that has risen to address some of the shortcomings of competency-based education. The use of EPAs combined with other proven educational strategies, such as self-assessment and e-portfolios, offers potential to improve work-based assessment practice and increase understanding of how dietetic students develop competency in supervised professional practice. The next chapter explores the use of EPAs in entry-level health professional education with the aim of understanding the current state of play and identify opportunities to improve existing assessment practices.

## Chapter 3 Entrustable professional activities in entry-level health professional education: A scoping review

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### 3.1 Declaration of authorship: Chapter 3

Student's declaration:

The nature and extent of contributions to Chapter 3 are:

Name	Nature of Contribution	Contribution %
Andrea Bramley	Study concept and design, data base search, abstract screening, full text review, data extraction, manuscript preparation and revision for publication	70
Lisa McKenna	Study concept and design, full text review, revision of manuscript	30

### 3.2 Preface to Chapter 3

This article is presented in the exact format in which it was published in *Medical Education*. This scoping review mapped the evidence of EPA use in entry-level education and aimed to increase understanding of how EPAs are being used for assessment and education research purposes. This study provided an understanding of how different health professions were using EPAs and included development, implementation and evaluation studies.

### 3.3 Publication

## MEDICAL EDUCATION IN REVIEW

# Entrustable professional activities in entry-level health professional education: A scoping review

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**Abstract**

Entrustable professional activities (EPAs) are a recent enhancement to competency-based health professional education that describe the observable work done by a competent health professional. Through defining education outcomes in a work-based context, EPAs offer potential to identify skill gaps in individual or student cohorts and focus improvements. Entrustable professional activities have been pioneered and gained rapid acceptance in postgraduate medical education; however, less is known about their application and use in undergraduate or entry-level health professional education. The Joanna Briggs Institute scoping review methodology was used to explore how and in what context EPAs are being used in entry-level health professional education. Databases searched include CINAHL, EMBASE, MEDLINE, Web of Science and PsycINFO. A total of 748 abstracts were returned after duplicates removed, and 127 full-text articles were screened with 30 included for data extraction. Publications in this area have recently accelerated with disciplines of professions of medicine, pharmacy, dietetics and physician assistants reporting on EPA development, implementation and evaluation. EPA use has been reported in the United States, Canada, Europe Australia and Central America. Major motivation reported for EPA use is to improve patient safety by aligning performance and expectations and to improve student assessment. Several studies report on the use of EPAs to evaluate different curriculum models or identify curriculum gaps representing potential application in education research.

## 1 | INTRODUCTION

Health care is becoming increasingly complex, driving a need for health care graduates who are equipped and able to assess and manage complex problems in a variety of health care settings. One approach to define the qualities and abilities inherent in an effective practitioner that many professions have adopted is a competency-based framework. A well-known framework is the CanMEDS framework, developed by the Royal College of Physicians and Surgeons of

Canada that describes the abilities physicians require to practise effectively.<sup>1</sup> Similar competency frameworks exist in nursing and allied health in many countries such as dietetics,<sup>2</sup> nursing<sup>3</sup> and pharmacy<sup>4</sup> and are used to describe graduate or entry-level competencies or define specialist or postgraduate competencies.<sup>5,6</sup> Competency standards describe the scope of professional practice, independent of specific workplace context and articulate professional attributes, skills and knowledge of the individual practitioner.<sup>7-10</sup> The broad nature of competency frameworks allows application in the wide

variety of traditional, emerging health care and other work settings that a discipline may practise in.

A challenge faced by universities and other educational institutions when working with competency frameworks lies in assessment of performance, particularly in specific workplace settings. Health care students are required to acquire knowledge and skills in the classroom and then demonstrate the application and execution of these knowledge, skills and attributes in the real world under supervision of a qualified, practising clinician.<sup>11,12</sup> Practising clinicians charged with competency-based assessment may be hesitant to judge performance particularly if there is inconsistency in performance. Inter-assessor variations in expected level of performance may exist, as well as concern over the context that the competency is demonstrated.<sup>13,14</sup> A student may be competent in one context but unable to extrapolate this to other workplace settings.<sup>15</sup> Furthermore, given that competency frameworks are necessarily broad, it is unclear whether all competencies can be, and should be, demonstrated in all settings and that multiple data points are required for summative assessment.<sup>16</sup>

Different strategies are suggested in the literature to address challenges associated with implementing competency-based assessment. One approach is through programmatic assessment where a longitudinal view of learning and assessment in relation to learning outcomes is taken and assessment and feedback are designed for learning purposes, rather than finite judgement.<sup>16,17</sup> Overall competence is judged on a body of evidence rather than single tasks with inputs from multiple stakeholders.<sup>18</sup> Another concept to complement competency-based assessment is the creation of milestones that describe steps along the way that must be achieved in order to develop competence.<sup>19</sup>

Recently, the concept of entrustable professional activities (EPAs) has emerged as a practical strategy to aid the implementation of competency-based assessment in health professional education. The concept of EPAs was pioneered by ten Cate to allow the operationalisation of competency-based education.<sup>20-22</sup> Entrustable professional activities describe the work that is done by a competent professional, and the supervisor is able to rate the learner according to the level that they 'trust' them to perform the task or activity without direct supervision or observation.<sup>21,23</sup> They are directly linked to one or multiple competencies and assessment challenges as they describe the work that is performed by a competent professional in an observable workplace-oriented way.<sup>24,25</sup>

The EPA concept has been rapidly adopted in different specialities in postgraduate medical education including but not limited to psychiatry,<sup>26</sup> radiology,<sup>27</sup> gastroenterology,<sup>28</sup> pathology,<sup>29</sup> neonatology<sup>30</sup> and palliative medicine.<sup>31</sup> Several studies report high acceptability of EPAs by both academics and clinical supervisors, educators and preceptors which explains their rapid rise in popularity.<sup>32,33</sup> As the introduction of EPAs is still recent, less information exists about their uptake in undergraduate medicine and disciplines other than medicine. This scoping review was prompted by the first author's personal experience in working in assessing dietetics students against competency standards and challenges in defining student performance.

The increasing number of publications exploring EPAs in health professions education has triggered several literature reviews which the current review complements. There are two recent examples of systematic reviews focusing on EPAs in graduate medical education where EPAs were first pioneered. O'Dowd et al<sup>33</sup> and Pinilla et al<sup>34</sup> report on EPA use in graduate medical education and psychiatry, respectively. Scoping reviews are often conducted in areas of emerging research to identify and map available evidence<sup>35</sup> Meyer et al<sup>32</sup> explore the use of EPAs in the context of undergraduate medicine, and a 2019 publication by Shorey et al<sup>36</sup> reports on the use of EPAs in health care professions education, identifying a research gap in the use of EPAs in specific areas such as undergraduate health profession education.

Although EPAs have become popular across health professions including those outside medicine, the scope and extent of their use is unclear. The aim of this scoping review was to build on the work of previous reviews and map available evidence of EPA use in entry-level health care education to understand how EPAs are being used and in what contexts. As there are many pathways to becoming a qualified health professional and international differences exist, we define entry-level as the point at which a health practitioner would be allowed to practise independently with post hoc supervision, such as the year following medical internship, the year following graduation from a 3- to 4-year undergraduate allied health or nursing degree or upon completion of an 18-month to 24-month graduate entry Masters degree. In most professions, this would be immediately following initial registration. It has been reported that the EPA framework has additional potential to provide rich educational data that can aid understanding of curricular gaps and measure impact of educational interventions. This review was deliberately broad including research describing development, implementation and evaluation of EPAs in health care.

## 2 | METHODS

### 2.1 | Research question development and inclusion criteria

A scoping review methodology was chosen given the relatively recent emergence of EPAs in health care education. Scoping reviews differ from systematic reviews in that they aim to clarify definitions and concepts about a topic where systematic reviews seek to collate evidence that fits a defined question.<sup>35</sup> This review expands the focus to include allied health, pharmacy and nursing, but narrows the context to focus on entry-level education. The term 'entry-level' was chosen to define the point along the journey of professional competence where health professionals can practise independently but with supervision on hand if required.<sup>11,34,37</sup> The terms 'undergraduate' and 'postgraduate' were deliberately avoided as pharmacy and allied health disciplines often have educational pathways that may be postgraduate, but the educational outcome is to graduate students qualified for independent, yet supervised, practice which is congruent with the definition of entry-level.

The Joanna Briggs Institute methodology for scoping reviews<sup>35</sup> was followed to conduct this review with additional guidance from Cooper et al,<sup>38</sup> for manuscript preparation. Briefly, this process involves nine steps: (a) defining the objectives and question, (b) identifying the studies, (c) describing the approach to searching and selecting, (d) searching, (e) selecting, (f) extracting, (g) analysis, (h) presentation, and (i) summary and conclusions. Both authors defined the research question: How are EPAs being used in entry-level health professional education? An initial search of the Joanna Briggs Institute, Cochrane, CINAHL and PubMed databases determined that no studies existed that addressed this question. To our knowledge, there have been three other scoping reviews reporting on EPAs, but these focused specifically on undergraduate medical education,<sup>32</sup> development and implementation only,<sup>36</sup> or a specific area of medicine such as oral health.<sup>39</sup> The protocol for this review follows the Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for Scoping reviews (PRISMA-ScR)<sup>40</sup> and is described in Figure 1.

Both authors defined the eligibility criteria using the JBI<sup>35</sup> guidelines using the Population, Concept and Context Acronym. The *population* considered for inclusion were all health care students (medicine, nursing, allied health and pharmacy), the *concept* was EPAs, and their reported use in health care education and *context* was entry-level health care education. Due to the broad nature of scoping reviews, primary research, systematic reviews, meta-analyses and qualitative research were included. Supervised practice years, such as medical internships or pharmacy traineeships, were included as in scope. Studies where participants were postgraduation, but the aim of the study was to address research in entry-level training, were included. Conference abstracts, opinion pieces, narrative reviews and perspectives were excluded. As we were interested in EPAs themselves, studies that were not focused on EPAs were excluded, such as studies focusing on learning activities designed to teach an EPA.

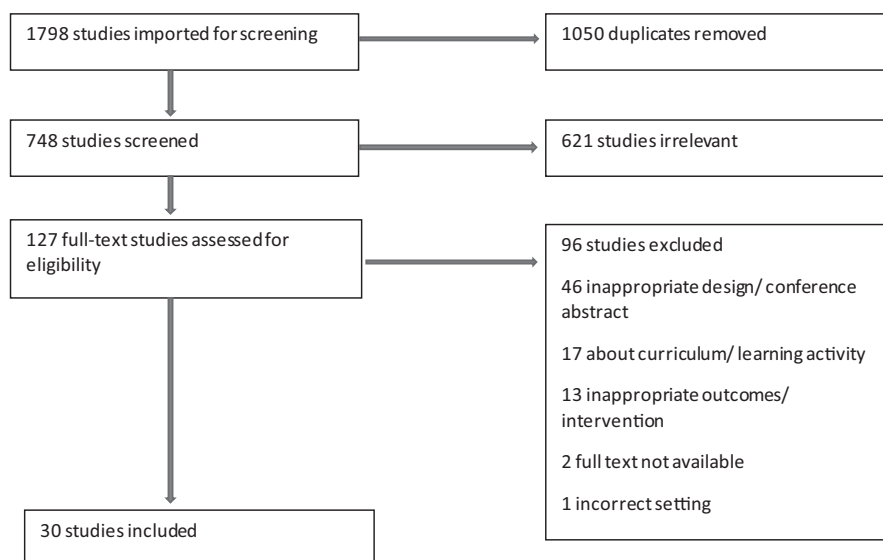
## 2.2 | Search strategy and study selection

An in-depth literature search was conducted in October 2019 and updated in February 2020 to identify all relevant literature. Major health databases were searched including CINAHL, EMBASE, MEDLINE, Web of Science and PsycINFO. The search strategy used the terms 'Entrustable profession\* activit\*' to retrieve title, abstract and publication details. No time limits were placed on the search strategy as EPAs are a recent concept. Only articles published in English were included. A professional librarian was consulted on search strategy and processes to ensure appropriateness. References were uploaded into Covidence to allow sorting and review.

After the removal of duplicates, titles and abstracts were initially screened by (removed for blind peer review) and articles clearly not meeting the inclusion criteria were removed. Both authors were responsible for full-text screening and article selection with any discrepancies resolved through discussion. Figure 1 presents the PRISMA flow chart.

## 2.3 | Data extraction and charting

Both authors designed the data extraction tool and (removed for blind peer review) piloted the data extraction with five studies. They then discussed the table and further refined it. Subsequently, two tables were created: the first (Table 1) broadly describes the studies through health care discipline, country of origin, aims of study, participants, type of study, main findings and limitations when interpreting the results and the second (Table 2) focuses specifically on the use of EPAs, describing the study methodology, context of EPA use, how EPAs are being used and educational outcomes. Author (removed for blind peer review) extracted the data and both authors discussed the results by email and face-to-face meetings.



**FIGURE 1** PRISMA-ScR flow chart of the article search and selection stages

**TABLE 1** General study characteristics

Author, year, country	Aim	Discipline/ subdiscipline	Type of study
Anderson et al (2019) (USA)	To explore medical students' understandings of an EPA of informed consent and their readiness to perform an informed consent discussion.	Medical students	Evaluation of entry-level skills using an EPA.
Begley et al (2019) (Australia)	To develop consensus on EPAs and milestones for entry to practise dietetics.	Entry-level dietetic students	Development of EPAs.
Bruce et al (2017) (USA)	To assess implementation of a procedural skill focused EPA during undergraduate training. To determine efficacy of CBME by evaluating experience and confidence of recent medical graduates in the Association of American Medical Colleges (AAMC) EPA 12- perform general procedures of a physician.	Medical interns	Implementation of an EPA. Evaluation of training using EPA.
Chen et al (2016). (USA)	To develop and appraise content validity evidence for EPAs for clerkship entry.	Medical Students	Development of EPAs.
Colbert-Getz et al (2019) (USA)	To map 13 core EPAs to pre-existing performance assessment tools used to assess medical students during clerkship.	Medical students	Pre-implementation of EPAs.
Croft et al (2019). (Australia)	To develop and pilot an EPA and entrustment assessment framework to evaluate readiness to practise in final-year pharmacy students.	Pharmacy	Development and Implementation of an EPA to describe and assess entry-level practice.
Cutrer et al (2019). (USA)	To explore applicability of two supervisory scales (Chen and Ottawa) in different intern rotations.	Medical interns	Evaluation of EPA assessment scales.
Curran et al (2018). (Canada)	To evaluate characteristics of a workplace assessment form for EPAs.	Medical students-surgical rotation	Evaluation of EPA work-based assessment tool.

Participants	Key findings	Study limitations
75 medical students (all years-response rate (RR) 86%) and 34 interns (RR 77%).	Medical students and new interns were not confident or competent in their ability to perform the core EPA of informed consent discussion. Need for an informed consent curriculum to prepare and assess students with regard to this EPA.	Single-centre study and single EPA evaluated. Study assessed knowledge of an EPA and recall of teaching/observation rather than direct ability to perform the activity.
58 academics and 43 practitioners.	Consensus achieved on four key EPAs of the profession.	National study with wide participation. EPAs quite broad and less in number than other professions.
28 interns (RR 33%).	Some procedural skills reported to be more important than others. Students reported higher confidence levels with procedural skills when formally evaluated during training. Many participants reported they were not evaluated on advanced skills during training.	Single centre and low participation rate. Participants drawn from all geographical areas of United States representing a wide sample. Recall and confidence assessed rather than performance of activity associated with the EPA. Single EPA assessed but multifaceted.
Development phase: student focus groups (n = 11) and preceptor interviews (n = 19) to develop EPAs. Refinement phase: mapping to competency domains and consultation with EPA expert. Validity phase: local and international workshop with pre-clerkship directors and curriculum committees.	Five EPAs for entry into clerkship developed.	Lengthy process. Low number of preceptors interviewed (19 from potential 70).
Physician assessor clinical performance evaluation forms from 2 student cohorts (n = 181) first and last rotation (n = 1032 complete performance evaluation forms).	Despite EPAs not currently being implemented in undergraduate assessment, assessors referred to activities represented by the EPAs on slightly more than half (60%) of clinical performance evaluation forms. Assessors may be familiar with graduate medical education frameworks where EPAs are common, and this may be influencing undergraduate medical education.	Single institution and results may not be applicable to other institutions who use different performance assessment tools. Results not analysed by type of clerkship and there may be differences by type of clerkship.
Eight practising pharmacists participated in structured interviews. 28 students participated in two simulations and assessed using EPA framework by 10 assessors.	EPAs can be used to assess students' readiness to practise. The EPA integrated several competency domains. A 5-point entrustment scale was developed and used in a simulation setting. 73% of entrustment ratings were level 2 or 3 with 3 being the expected level. 75% of students improved on their second simulation attempt following formative feedback.	Single-centre pilot study. Single EPA developed which may limit application to other areas.
Quantitative phase Medical interns during medicine and paediatric rotations (n = 35) and assessors (n = 94) Qualitative phase assessors (n = 8).	The two scales were not parallel or interchangeable and measured different aspects of the EPA landscape. Assessor qualitative comments were important for guiding student learning. Assessor preference depended on diverse factors and is situational.	Single institution study. Small sample size (qualitative phase).
Third-year medical students (n = 79), preceptors (n = 84) and clerkship directors (n = 4).	EPAs more frequently observed had higher entrustment with most EPA scores increasing over time. EPAs reflecting common tasks performed by students were more likely to be assessed. Medical students, preceptors and clerkship directors thought a binary scale of entrustment was not helpful. No significant difference was found in ratings between teaching sites.	Single medical school. Single disciplinary rotation—surgery.

(Continues)

TABLE 1 (Continued)

Author, year, country	Aim	Discipline/ subdiscipline	Type of study
Czeskleba et al (2019). (Germany)	To explore specialists' beliefs; could EPAs use in clerkship could lead to improvement in patient safety?	Medical students	Pre-implementation/exploratory
Englander et al (2016) (USA)	To define guiding principles to develop EPAs for entering residency, describe the process for development of core EPA and suggest next steps to validate and test EPAs.	Medical students	Development of EPAs.
Fazio et al (2018). (USA)	To describe the process of developing EPAs for internal medicine clerkships.	Medical students	Development of EPAs.
Haines et al (2016). (USA)	Report of 2015-2016 Academic Affairs Standing Committee.	Pharmacy	Development of EPAs.
Haines et al (2018) (USA)	To evaluate face validity of core EPAs for pharmacy graduates.	Pharmacy	Evaluation of EPAs
Hamui-Sutton et al (2017). (Mexico)	To describe methodology used to design educational tools to assess student competencies in undergraduate internship using EPAs.	Medicine	Development of EPAs
Hauer et al (2015). (USA)	To design EPAs as part of curriculum redesign and gather evidence of content validity.	Medicine	Development of EPAs
Holzhausen et al (2019). (Germany)	To define EPAs for entry into residency.	Medicine	Development

Participants	Key findings	Study limitations
Physician specialists-medical student supervisors (surgery n = 5 and internal medicine n = 6).	EPAs may increase safety by providing better content and organisational structure to the final-year clerkship.	Single institution medical school in Germany. Small number of participants (n = 8) Exploratory study to determine opinion.
Drafting panel of experts and stakeholders from across the education continuum. Reactor panel of medical educators, students, residents and other health professionals.	13 core EPAs identified describing work activities of entry-level doctors. Two milestones to support EPAs developed one representing a pre-entrustable or novice learner, one representing an entrusted learner. Key competencies linked to each milestone. Narrative descriptions of expected behaviours and clinical vignettes for both pre-entrustable and entrusted learner developed and shared.	Qualitative case report of single profession. National representation included in the panels.
Taskforce of undergraduate medical educators (n = 9), graduate medical educators (n = 4) and fellowship director (n = 1). Clerkship directors in Internal Medicine institution members participated in the survey (n = 123) with a total of 65 respondents included.	Six key EPAs emerged as important for assessment of competence in clerkship. A model for EPA assessment at undergraduate level was developed with an expanded lower level supervision scale being developed.	Participants limited to clerkship directors. Arbitrary consensus point in methodology may have expulsed some EPAs from final list.
To develop core EPAs that all pharmacists should be able to perform without direct supervision.	15 core EPA statements and 62 supporting tasks developed with levels of entrustability defined. The core EPAs were defined as essential activities and tasks that all new pharmacy graduates must be able to perform without direct supervision (level 3 on entrustment scale.)	Wide consultation and engagement with profession used to develop EPAs Case report of a single discipline in one country Implementation of EPAs to be determined by individual education providers.
Experienced pharmacy practitioners who supervised pharmacy students (preceptors) at one institution affiliated with the investigators.	Face validity of pharmacy EPAs established with participants agreeing that the 15 EPAs were pertinent to pharmacy practice and that pharmacists should be able to perform these activities regardless of practice setting (acute setting vs community).	Narrow sample of participants. Study participants limited to preceptors affiliated four educational institutions who had a special interest in education and may not represent all the profession. Private and public institutions represented across geographically diverse regions.
Medical interns and professors	A six-step strategy to build EPAs is described. EPAs were developed for Family medicine, Gynaecology and Obstetrics and Surgery	Single medical school Only three out of six rotations described. Incomplete Delphi method identified by the authors. Activities common to all rotations were eliminated and activities specific to each rotation were included: justification for this not made in method.
Medical educators n = 19	Six EPAs developed to capture work of physicians. EPAs mapped to competencies and milestones and assessment strategies developed. Evidence for content validity developed.	Single medical school and participants limited to educators. Content validity developed but further validity testing required.
Purposely selected physicians (n = 45) from faculty body with long-time clinical supervision experience and active involvement in the curriculum development process.	Consensus reached on 12 core EPAs grouped into five domains. Performance level of entry-level medical graduate was set at able to perform under distant supervision.	Potentially biased selection of participants. Recent graduates not included as participants which could have helped with content validation.

(Continues)

TABLE 1 (Continued)

Author, year, country	Aim	Discipline/ subdiscipline	Type of study
Klapheke et al (2017). (USA)	To evaluate if students could progress in core EPA attainment during psychiatry clerkship. To compare student self-assessment of performance and assessor ratings and identify any curriculum weaknesses.	Medicine (Psychiatry)	Implementation/evaluation of curriculum
Lounsbury et al (2019). (USA)	To use EPAs to assess if the number of patient encounters was linked to EPA score.	Pharmacy	Implementation/evaluation
Meyer et al (2019). (USA)	To understand the literature on EPAs using Ottawa Conference criteria for good assessment	Medicine	Scoping review
Murray et al (2019). (USA)	To report results of a pilot programme to create an educational model based on learner outcomes rather than time.	Medicine	Implementation/evaluation
Nayyar et al (2019). (Pakistan)	To use EPAs to define a competency-based framework in undergraduate radiology.	Medicine (radiology)	Development
Peters et al (2019). (Germany)	To report on development of an EPA-based assessment tool.	Medicine	Evaluation of EPA work-based assessment tool
Pinilla et al (2019) (Switzerland)	To summarise and evaluate available evidence in undergraduate and graduate medical education in psychiatry.	Psychiatry	Scoping review
Pittenger et al (2019). (USA)	To determine if pharmacy students believed EPAs were relevant to pharmacy practice and if they felt prepared to autonomously perform them.	Pharmacy	Evaluation
Rhodes et al (2019). (USA)	To report on the use of EPAs as an assessment tool for pharmacy students in early practice experiences.	Pharmacy	Implementation
Scott et al (2019). (USA)	To assess if practising pharmacists performed Core Patient Care Pharmacy EPAs in their daily pharmacy practice.	Pharmacy	Evaluation

Participants	Key findings	Study limitations
Third-year medical students (n = 88) (RR 75.9%)	Psychiatry clerkship can contribute to eight EPAs identified by the authors as assigned. Pre- and post-self-assessment ratings increased significantly from 0.7 to 0.9 units for each EPA. The largest increase was in EPA: Prioritise a differential diagnosis following a clinical encounter. There was poor concordance between post-clerkship student self-assessment and clerkship director rating with the latter being lower. All mean EPA scores were at expected level for 3rd-year medical students.	Single-centre study Reasonably large sample size and response rate. Single measure of self-assessment.
Final-year students completing advanced pharmacy practice experiences (n = 50).	Mean EPA scores increased over time with increased exposure to patients. However, there was no correlation between total number of patient encounters and EPA scores.	Data were self-reported by students. Only 50 or 31% of students completed full data collection that could be included in analysis. Other issues with data collection for patient encounters reported. Single-centre study may limit generalisability.
40 perspectives, 5 reviews and 26 prospective empirical studies.	36% of studies reported were progressive empirical studies with remainder being opinions or reviews. Conflation of concepts limited interpretation of results.	Limited to medicine, specifically undergraduate medicine.
Students from four medical schools who had preselected paediatrics as a chosen career (n = 13).	EPAs offered a shared assessment framework that could be utilised by different intuitions with different educational models. Electronic assessment data collection may aid scalability.	Pilot project with small number and non-random selection of participants.
45 radiologists invited to participate with (n = 32, n = 28 and n = 35) in three Delphi rounds respectively.	A set of 6 EPA linked to 87 competencies for radiology clerkship defined.	Study focused on content validity of EPAs in a specific area of undergraduate medical education.
Final-year medical students (n = 60) and supervisors (n = 87).	The EPA-based tool could assess workplace performance of students. Students rated their abilities to perform a task higher than supervisors.	Single institution which may limit applicability. Participants self-selected so may not be representative of entire cohort.
Qualitative and quantitative studies included including case reports.	EPAs effectively used for curriculum design in psychiatry. Most studies focused on EPA development or implementation (n = 14 70%). The quantity and quality of studies had increased from 2011 to 2018.	Limited to psychiatry. Body of published works in EPAs still small and may be biased towards publication of positive studies.
Random sample of final-year pharmacy students from four institutions (n = 423) in all years of study.	The core pharmacy EPAs were relevant to pharmacy practice in multiple settings. Students felt they required less supervision as they progressed through the curriculum.	Four institutions included in the study and large sample size. Cross-sectional opinion survey.
Pharmacy students and their supervisors n = 147.	14 EPA statements developed, and student performance assessed using a 5-point modified Bondy Scale. Students became more independent over time. EPAs may be reliable assessment tools for work-based student assessment.	Single-centre study. Single placement evaluated. Pilot study.
Pharmacists registered and living in North Dakota in 2017 (n = 107).	Patient Care EPAs were performed by 70% of pharmacists more than five times per week.	Self-report survey methodology used to determine frequency of use.

(Continues)

TABLE 1 (Continued)

Author, year, country	Aim	Discipline/ subdiscipline	Type of study
Touchie et al (2014). (Canada)	To define EPAs and determine agreement of supervision level between supervisors and students.	Medicine	Development and evaluation
Wiersma et al (2017). (Netherlands)	To evaluate use of EPAs to provide an individual and flexible competency-based programme.	Physician assistants	Evaluation
Wijnen-Meijer et al (2015). (Germany and the Netherlands)	To determine performance differences in entry-level graduates of two different medical school pedagogies.	Medicine	Evaluation of educational outcomes using EPAs.
Wright et al (2017). (Australia)	To translate a set of competency standards into EPAs for curriculum and assessment redesign.	Dietetics	Development and implementation

2.4 | Assessment of quality

Assessment of study quality is an optional component in scoping reviews and was omitted as the research question was to explore how EPAs are being used rather than to critique the quality of studies conducted in this area.

2.5 | Synthesis

Data extracted from the selected articles were transferred to two tables (Tables 1 and 2). As the aim of this scoping review was to explore EPA use in entry-level education across different health care professions, studies were described by discipline, country of origin, how EPAs were being used and potential educational outcomes reported in the studies. Methodological limitations and barriers to applicability were reported.

3 | RESULTS

In total, 1798 studies were identified during the initial search and imported for screening (Figure 1). Following the removal of duplicates, 748 studies were included for abstract screening, resulting in a further 127 studies progressing to full-text eligibility assessment. A total of 96 studies were excluded for the following reasons: inappropriate study design, perspective, opinion or

conference abstract (n = 46), focused on curriculum or learning activities rather than EPAs (n = 17), focused on inappropriate outcomes or intervention (n = 13), incorrect setting (n = 1) or full-text unavailable (n = 2). A total of 30 studies were included for data extraction.

3.1 | Characteristics of included articles

The general characteristics of studies reporting on EPA use in entry-level health professional education are detailed in Table 1. Studies included in this review were conducted in the United States of America (n = 17, 56.7%), Australia (n = 3, 10%), Germany (n = 3, 10%), Canada (n = 2, 6.7%), Netherlands (n = 1, 3.3%), Mexico (n = 1, 3.3%), Pakistan (n = 1, 3.3%) Switzerland (n = 1, 3.3%) and one multi-country study with participants from both Germany and the Netherlands (n = 1, 3.3%). Most included studies pertained to medicine (n = 20, 66.7%) followed by pharmacy (n = 7, 23%), dietetics (n = 2, 6.7%) and physician assistants (n = 1, 3%).

3.2 | Types of studies

Studies were categorised according to the phase of EPA use, that is development, implementation, evaluation of the EPAs, use of EPAs for educational evaluation purposes or review articles (Table 1). Study methodology details are reported in Table 2. Several studies

Participants	Key findings	Study limitations
Medical faculty (n = 8) Medical interns n = 48 (of 224) Supervising doctors n = 113 (of 250)	10 EPAs for interns were defined from an initial list of 25. For three EPAs, level of supervision that interns reported receiving was lower than expected by supervisors, especially at night.	EPAs were defined locally and ratified nationally. Low response rate from interns (21%) in survey. Potential for multiple interpretations of EPAs as minimal explanation of activities was provided to survey respondents.
Students enrolled in Utrecht physician assistant programme between 2010-2013 (n = 101).	Most students had between 6-7 EPAs and EPAs could be adjusted during the programme allowing individualisation. Over half of participants had EPA packages changed. The most common reason to vary the EPA was to increase the number of EPAs.	Single institution and local study which may limit broader application. Small, relatively new profession where students are employed within the medical specialty of their interest. May not be scalable to larger cohorts of students.
Undergraduate students near to graduation (n = 59)	EPAs were able to be used to evaluate graduate outcomes and how much supervision would be required for each EPA.	Small numbers and voluntary participation may bias sample. Many components other than curriculum may influence results.
Two experienced academics developed EPAs and face validity determined through expert review of four dietetics department directors and 10 clinical educators. 35 final-year students trialled the new EPA framework	A total of 14 EPAs were developed with 12-21 underlying tasks/elements. EPAs were positively received by expert reviewer and students reported the EPA assessment process to be easier to navigate than previous competency-based methods.	Single institution and small number of participants. Iterative process for developing EPAs and only results of implementation of 2 out of 14 EPAs reported.

report on multiple phases of EPA use, for example development and implementation.

A total of 12 studies reported on development of EPAs. There were several methods reported for development including a modified Delphi method,<sup>41-44</sup> development by academics or educators<sup>45-47</sup> and development via workshops with multiple stakeholders.<sup>48-51</sup> Some authors involved students as part of the development process,<sup>49</sup> whereas others mapped workforce data such as position descriptions and job advertisements.<sup>48</sup>

Of the development studies, several report on national work to define entry-level professional activities including dietetics,<sup>48</sup> pharmacy<sup>50</sup> and medicine in the United States.<sup>41</sup> Most studies report on single institution development with potential for use by other institutions.<sup>42,43,45-47,49</sup> Several studies report on EPA development for a specific subset of a discipline.<sup>42,44,52</sup>

Two studies report on work completed prior to EPA implementation. Colbert-Getz et al<sup>53</sup> mapped current physician assessment tools prior to planned EPA implementation, whereas Czeskleba et al<sup>54</sup> report on work to explore medical student supervisors' beliefs regarding EPAs. Two studies report on implementation of single EPAs<sup>45,55</sup> and five on the implementation of multiple EPAs.<sup>10,47,56-58</sup>

Multiple types of evaluation studies were found. Three studies reported evaluation of self-reported student skills in the ability to perform EPAs.<sup>55,59,60</sup> Several studies evaluated the use of EPA-based assessment tools. Cutrer et al<sup>61</sup> evaluated two different published EPA assessments scales. Curran et al<sup>62</sup> reported on an EPA work-based assessment tool as did Peters et al.<sup>63</sup> Scott et al<sup>64</sup> evaluated

EPAs by comparing them to self-reported work activities of practising pharmacists, and Haines et al<sup>65</sup> validation study evaluated EPAs by surveying pharmacists who supervised students. Pittenger et al<sup>60</sup> surveyed pharmacy students about perceptions of EPA relevance to practice.

Several studies reported on the use of EPAs to evaluate curriculum models or identify curriculum gaps. Murray et al<sup>58</sup> and Wiersma et al<sup>66</sup> both report on the use of EPAs to evaluate individual learning pathways. Klapheke et al<sup>56</sup> report on the ability of medical students to progress in EPAs in a psychiatric clerkship. A single study by Wijnen-Meijer et al<sup>67</sup> uses EPAs to evaluate education outcomes of two models of medical school training. Several studies use EPAs to deepen understandings of work-based experiences. Lounsbury et al<sup>57</sup> sought to increase understanding of pharmacy patient encounter numbers associated with increased trust on an EPA scale. Touchie et al<sup>51</sup> used an EPA framework to identify differences between expected level of supervision provided to medical interns and what occurs in practice. Pittenger et al<sup>60</sup> report on pharmacy students' perceptions of supervision required to perform EPAs as they progress through the curriculum. The educational outcomes reported by the studies in our review were diverse; however, the use of EPAs to help define readiness to practise was a common theme.

There were two review studies. Pinilla et al<sup>34</sup> conducted a review to establish the potential for EPAs to be used in curriculum design in psychiatry, whereas Meyer et al<sup>32</sup> conducted a systematic review on the use of EPAs in undergraduate medicine.

**TABLE 2** Specific educational context, study methods focus and outcomes

Authors	Study design/method	Context of EPA use
Anderson et al	Cross-sectional study. 15-item survey aligned to EPA guidelines developed and analysed quantitatively and qualitatively.	AAMC published core EPAs that all medical students should be able to perform at graduation. EPA 11 conducting an informed consent discussion. Study conducted in classrooms and workplace.
Begley et al	Iterative: Three-phase approach. Phase 1 National workshops. Phase 2 Survey to obtain consensus combined with job description analysis of entry-level jobs. Phase 3 Instrument refinement by academics.	No summative clinical supervision tool national tool or examination for entry existed. Ill-defined standards of assessment exist with EPAs developed to address this.
Bruce et al	Cross-sectional study. Online survey developed to assess intern demographics with 10 Likert scale questions evaluating procedural focused core EPA 12.	Perform general procedural skills of a physician is core EPA 12. Evaluation of experiences and confidence of interns from multiple different medical schools at a university hospital. Multiple medical schools represented in Intern population some had graduated from EPA informed curriculum, others from traditional curriculum.
Chen et al	Five-stage qualitative research, consultation and refinement process.	Pre-clerkship EPAs designed to nest into AAMC core EPAs.
Colbert-Getz et al	Qualitative review of all feedback comments in performance evaluation forms categorised into EPA topics and non-EPA topics. Frequency of comments both EPA and non-EPA calculated overall and by strength or improvement comments.	EPAs not currently implemented into current curriculum. Pre-implementation study to inform need to change assessment processes and forms.
Croft et al	Three-phase study 1. EPA development, convenience and snowball sampling of community pharmacists using semi-structured interviews and qualitative analysis of transcribed interviews. 2. EPAs, entrustment scale and performance indicators developed with additional consultation from non-pharmacist academics. 3. EPA piloted in final-year cohort of pharmacy students using two simulation activities.	Students approaching the end of a four-year pharmacy undergraduate degree and EPA model was used to assess students in a simulated pharmacy setting focused on medication dispensing in a transition to practise subject at university.
Curran et al	Mixed methods study. Work-based assessment form of 79 students collated. Quantitative reporting of EPA frequency and score over time reported. Online student and educator survey to evaluate assessment form. Focus group with clerkship directors.	Work-based assessment form developed for formative assessment. Nine EPAs linked to surgical rotation. Binary scale of pre-entrustable/entrustable used to rate student performance. Students are assessed weekly.
Cutrer et al	Mixed methods study. Quantitative evaluation of student performance of 4 EPAs. Students receive an average of 6 observations and both scales were used concurrently to assess students. Qualitative: Interviews with assessors who used both scales regarding thought processes and interpretation of the two scales.	Study school was a participant in the AAMC pilot of the core EPAs. This study focused on evaluating the two EPA assessment scales the Ottawa Co-activity scale and Chen Supervisory scale.
Czeskleba et al	Qualitative explorative study using focus groups.	In Germany, local clerkship students must 'follow the instructions of training personnel' but type and scope of activities are not specified.

How are EPAs being used/specific educational focus	Educational outcome
EPA and associated defined national performance standard used to identify gaps in curriculum and opportunities for teaching improvement by comparing interns and students' self-reported confidence in performing informed consent discussions.	EPA and associated performance standards could be used to conduct a needs assessment to identify gaps in curriculum and teaching methods.
EPAs developed to create shared understanding of entry-level competence in dietetics.	Multiple entry-level EPAs created that could be used to support competency-based assessment decisions and provide clarity of expected progression and endpoint assessment for dietetic training.
Evaluation of interns' self-reported experience and confidence to perform EPA 12: What procedural skills are interns confident in performing and what procedural skills are most important for interns to be able to perform?	Formal assessment of activities during medical skills was associated with increased confidence in performing the EPA.
EPAs developed to provide explicit guidance on appropriate medical student roles and activities in clerkships. Broader aim to demonstrate how pre-clerkship and clerkship student could engage in patient care activities.	EPAs developed to be implemented in a single institution but available for other institutions to use. EPAs designed to be adaptable to local needs and institution specific objectives.
Current practice somewhat aligned with EPAs and assessors familiar with EPAs as also involved in graduate medical education where EPA use is more common. Clerkship students most frequently assessed on activities aligned to EPA 1,2,5,6 and 9. Some EPAs (1 and 2) may need further division as they were frequently mentioned as a strength and weakness for more junior students.	Workplace assessors were becoming more familiar with EPAs generally. The most frequently mentioned EPA aligned activities were performing a physical examination, prioritising a differential diagnosis, documentation, oral presentation and collaborating as a member of the interprofessional team. Some EPAs may need alternative assessment strategies as students may not be exposed to these activities during clerkship.
EPA used to assess readiness to practise by assessing final-year pharmacy students' abilities to perform a pharmacy specific activity- medication dispensing in a simulated setting. Students assessed using a 5-point scale with level 3 entrustment describing acceptable standard of practice.	Single EPA developed and used to evaluate students' performance against discipline specific entrustment scale.
EPA used to track performance over time and provide formative feedback. Work-based assessment form rated as not effective in capturing student performance of acting as a learning tool.	Entrustment ratings increased over time. Use of a work-based assessment form promoted observation and feedback however more than a binary scale required to assess performance.
13 core EPAs had been implemented at this medical school. Two different rating scales had been developed to assess EPAs and study describes the experience of using each one.	The Ottawa scale may allow for more direct mapping of student engagement in professional activities but may underestimate ability. The Chen supervisory scale may predict readiness for independence but may overestimate actual experience.
Hypothesised that improvement in training would lead to improvement in patient safety.	Participants identified several perceived problems in the final-year clerkship including lack of structure. EPAs may improve structure of training and EPAs might make student performance levels clearer for both students and supervisors.

(Continues)

TABLE 2 (Continued)

Authors	Study design/method	Context of EPA use
Englander et al	Qualitative case report. Panel established and guiding principles formed. Literature review of medical school graduation requirements, programme directors' expectations of entering residents and tasks performed by new interns without direct supervision. Initial identification of 21 themes. Delphi process to narrow the list resulting in 13 EPAs. Reactor panel consisting of educators, students, residents and other health professionals to provide feedback on 13 EPAs. EPAs mapped to competencies both national and international domains of competency and linked to curriculum. Q sorting methodology used to reach final consensus.	Project prompted by an absence of clear expectations or outcomes of medical degrees and increasing concerns in the medical community that entering residents' performance was below expectations.
Fazio et al	Literature review of application of CBME in UME setting. Key learning outcomes defined by EPAs specific for internal medicine clerkship. Online survey distributed to all clerkship directors in internal medicine to rank EPAs.	AAMC core EPAs may be too general in defining expectations of specific rotations (clerkships) in medical school.
Haines et al	Qualitative case report describing creation of pharmacy EPAs. Four iterative rounds to identify core activities. First round brainstorm of potential EPAs. Second round limit statements generated by first round to specific assignable and observable by committee pairs. Statements grouped by themes and consolidated. Final round EPA classified as essential or supporting. Stakeholders consulted via face-to-face, webinars and written feedback sought via online survey. Final review by committee to establish final EPAs and entrustment scale.	Process informed by medical education reports. Development motivated by desire to improve patient care and increase student confidence as they enter practice.
Haines et al	Prospective study using anonymous online survey. Validated tool (QUEOA) was adapted to reflect pharmacy practice to develop 28-item survey.	Pharmacy EPAs published in 2017 and face validity not formally established.
Hamui-Sutton et al	Exploratory mixed method study involving focus groups to determine what activities interns carry out. Transcripts coded using grounded theory and results of teachers and students compared. Second phase the authors developed benchmarks regarding expected performance and activities condensed into EPAs. Narrative descriptors were created and EPAs further defined for each rotation through an iterative process. A Delphi technique to reach consensus regarding level of performance/development expected of students. EPAs not reaching consensus were discarded.	An interdisciplinary group of experts in medical education in Mexico working to operationalise CBE into the medical programme. EPAs (translated as Actividades Profesionales Confiables) offered a way to operate the pedagogical model used in medical schools within the Mexican Health System.
Hauer et al	Qualitative case report of EPA development in an undergraduate medical curriculum. Stepwise process for EPA development described. Standards for educational and psychological testing used to establish content validate EPAs.	A process for developing student-focused EPAs linked to institutional objectives is described. The medical school setting was undergoing curriculum reform at the time, and development of student-focused EPAs was used to help improve curriculum.
Holzhausen et al	Modified three round online Delphi consensus procedure with content validity index (CVI) of $\geq 80\%$ .	Recent curriculum reform in an undergraduate medical programme based in a large medical school in Berlin. The expectation of graduate outcome is that graduate students oversee adult patients on the ward with distant supervision.
Klapheke et al	Students invited to complete pre- and post-self-assessments of 8 EPAs using an electronic questionnaire. A 5-point scale of entrustment was used. Clerkship directors assessed each students' attainments of EPAs using existing assessments (preceptor evaluation, OSCE, case write ups, project and clinical log). Statistical analysis completed to compare pre-student assessment and post-student assessment and compared post-clerkship student self-assessment with clerkship director assessment.	Psychiatric clerkships are common in undergraduate medical training. Little is known about how students' progress with these general activities in a psychiatry clerkship rotation.

How are EPAs being used/specific educational focus	Educational outcome
View that EPAs would help define outcome of a medical degree thus narrowing the gap between expectations and performance and enhancing patient safety and improving care in early months of residency.	National set of core EPAs that offer a framework to fully transition to competency-based medical education. Implementation planned via several pilot medical schools.
EPAs may potentially serve as a framework for work-based assessments during medical school.	EPAs developed for internal medicine clerkship well aligned with core EPAs for entering residency and postgraduate internal medicine sub competencies. A model for implementation and assessment with a supervisory scale based on Chen supervisory scale developed.
EPAs to be used to provide clear description of what all pharmacy graduates should be able to do when entering practice and to support competency standards. The EPAs represent minimum baseline and help articulate what the curriculum is trying to achieve.	Colleges and schools could determine how they implement EPAs into their curricula.
EPAs were developed by the pharmacy profession to help colleges and schools prepare practice-ready graduates. The EPAs set roles, responsibilities of pharmacists regardless of setting.	The EPAs have been validated by the profession and describe roles and practice of a work-ready pharmacist.
EPAs and performance descriptions developed to provide useful benchmarks for supervision of clinical practice and formative assessment for medical interns.	As only activities nesting in specialties described; generalisation to other programmes with different rotations may be limited. Methods described to develop EPA may be of use more generally.
EPAs to be used to develop an assessment blueprint and feed into the curriculum vision.	The six EPAs are quite broad and occasionally encompass multiple AAMC core EPAs. A proposed next step was to further break down EPAs into smaller nesting units.
The curriculum reform saw implementation of a competency framework and there was a need for EPAs to define the overarching outcomes of the programme.	All 12 EPAs reached consensus with >80% CVI. Each EPA was given a title, specifications that listed smaller or nested EPAs and limitations, domains of competence and assessment sources.
Students and supervisors rated their performance against the EPA pre-psychiatric clerkship and post-psychiatric clerkship so the impact of clerkship on student development could be measured. EPAs were used to identify if any curriculum gaps existed.	Generic EPAs can be used to measure student progress in a specialty area. EPAs provide a format to compare student self-assessment and supervisor assessment and assessing progress before and after a clerkship can provide tailored feedback for students.

(Continues)

TABLE 2 (Continued)

Authors	Study design/method	Context of EPA use
Lounsbury et al	Cross-sectional study. Students' logs and self-assessments were compared. Correlations between number of patient encounters and self-reported EPA scores were investigated.	EPAs used by preceptors to assess student performance of clinical skills and abilities during midpoint and final Advanced Pharmacy Practice Experience. The number of hours students must spend in supervised practice but not number of patient encounters is defined.
Meyer et al	Scoping review and mapping to Ottawa criteria using self-designed charting tool.	EPAs rapidly adopted by graduate medical education and 13 core EPAs had been developed by the Association of American Medical Colleges (AAMC). The Ottawa Conference Criteria for good assessment describe features of a high-quality assessment including the ability to provide data to enhance and support education.
Murray et al	Qualitative case report of pilot project involving 13 students in four medical schools. Implementation of EPAs in each score described. Recommendations and lessons learnt described	Core EPAs for entering residency used as a common assessment framework and enabled comparison of different education processes. Two schools used a longitudinal integrated clerkship model and other schools used a combination of block clerkships and continuity clinic.
Nayyar et al	Eight EPAs, 129 competencies and assessment strategies identified and translated into an anonymous online survey. Three round Delphi study to achieve consensus.	Ability to order and interpret diagnostic radiology as key skill performed by junior doctors. Undergraduate radiology is included in all medical schools but lack of structured education and skill deficit in graduates described in literature.
Peters et al	Assessment tool developed by a working group using iterative process with reference to the literature. Tool pilot tested with three students and two supervisors. Tool applied to 60 students and their supervisors. Supervisors and students were blinded to each other's ratings. Framework by Van der Vleuten used to evaluate tool.	Twelve core end of undergraduate medical education EPAs were defined in a separate study (Holzhausen et al 2019) and 72 smaller nested EPAs developed. A 6-point scale based on the Chen scale (Chen et al, 2015) used to assess student performance.
Pinilla et al	Systematic review following PRISMA guidelines with studies assessed for quality using the Quality Assessment Tool for Studies with diverse design.	EPA use has been growing in medical education. Psychiatric training can contribute to understanding learning and teaching in particular communicative competencies, interprofessional work and clinical interviewing.
Pittenger et al	56 item cross-sectional survey distributed to a random sample of pharmacy students in four institutions. Survey modified from validated quality of Entrustable professional activities tool (Post et al 2016).	American Colleges of Pharmacy defined 15 EPAs for new pharmacy graduate. This work aimed to obtain a student perspective in a practice setting.
Rhodes et al	Cohort exploratory study. EPA statements developed by faculty members and mapped to core competencies. Criterion rating scale based on the Bondy scale developed. EPAs implemented in the first placement experience in the Pharma D course.	Supervised placements were part of the Pharma D programme of study that occurred from year 2 of a 3-year course. This study reported on application of EPA assessment of an early placement experience.
Scott et al	Cross-sectional survey to capture self-reported frequency of EPA performance by pharmacists practising in different settings.	Core pharmacy EPAs developed for entry-level pharmacy programmes. Prior to curriculum implementation and modification of assessment practices this study aimed to assess how frequently practising pharmacists performed EPAs in daily practice and if this varied by setting or experience level.
Touchie et al	Nominal group technique to develop and generate consensus of EPAs. Cross-sectional survey to assess participants' views.	Differences reported between expectation of clinical supervisors and what interns actually did had been reported. EPAs may help define activities and identify gaps between expectation and reality.
Wiersma et al	Retrospective cohort study to determine number of changes made to EPA packages and reasons for the change.	EPAs used to construct a bespoke competency-based education package for different speciality physician assistants.

How are EPAs being used/specific educational focus	Educational outcome
EPAs being used for formative and summative assessment of students during supervised placement. This study aimed to determine if the number of patient encounters, as opposed to time on placement, could be linked to progression on EPA assessment scale.	EPAs could be combined with patient logs understand the number of encounters linked to a higher entrustment rating obtained.
Differences between undergraduate and graduate medical education exist which may require caution in extrapolating use of EPA into undergraduate medical education.	Perspectives mapped more positively (83.7%) than empirical studies (76.7%) to the Ottawa criteria. Reproducibility did not appear to be a strength of EPAs in undergraduate medical education and conflation of terms limited analysis.
EPAs used as a common assessment framework in a pilot project to develop non-time-based education. Supervision level 3 a set as transition point from undergraduate to graduate.	Modified Chen supervisory EPA scale used to determine readiness or practice. Longitudinal tracking of student performance of each EPA across the final two years of medical school described.
EPAs proposed to improve teaching and curriculum in radiology in undergraduate medicine.	Set of EPAs and competencies defined as a step towards the implementation of competency- based approach to undergraduate radiology training.
EPAs being used to assess workplace performance of final-year medical students.	Work-based assessment tool using EPAs piloted. Tool offers potential to measure and evaluate level of performance of students in a work-based scenario with data used to inform curriculum. Students and supervisors could use the tool to jointly identify gaps between perceived and actual practice.
The main focus of selected articles was development of EPAs for different levels of psychiatry training. The authors identified six UME papers.	Lack of empirical controlled studies in this area prevented meta-analysis of educational outcomes.
National EPAs created and implemented by pharmacy schools in America. This study evaluated if students perceived the EPAs as relevant and if their confidence increased over time.	Students increased in confidence with all EPAs as they progressed through the course. All EPAs rated as relevant but identified as less confident with certain EPAs.
EPAs and 5-point entrustment scale used for midpoint and final assessment of a 2-month supervised pharmacy placement. Student self-assessment and supervisor assessment were a feature of the assessment tool.	Some differences in supervision scores identified in the community setting versus health system setting. Difficulty in interpreting an increase score as a true improvement of skills or an increase in trust due to a more mature relationship between student and supervisor.
EPAs incorporated into curriculum and assessment practices and this study provided confirmation that EPAs were performed by preceptors.	EPAs had the potential as a useful means to assess outcomes in pharmacy education and practice.
EPAs being used to define work of a graduate entry doctor and help graduate doctors and their supervisors develop shared understandings of level of supervision required.	EPAs may be used to guide curriculum and better align expectations of interns and supervisors regarding independent performance.
EPAs defined at the beginning of the Master of Physician Assistant and tailored to meet needs of a workplace, needs of a specific student whilst meeting requirements of the degree.	EPAs can be used as a model to meet multiple needs (workplace, student, school) simultaneously and may be flexible. Application may be limited in other professions but may offer a model to individualise a programme.

(Continues)

TABLE 2 (Continued)

Authors	Study design/method	Context of EPA use
Wijnen-Meijer et al	Three-phase authentic assessment using five simulated patients.	Different approaches to medical training existed yet graduate outcomes were expected to be the same.
Wright et al	EPAs developed by academics and face validity established by expert review. Sample of student reflective pieces compared pre- and post-EPA implementation analysed by two content experts to determine utility, as well as anecdotal student feedback during implementation process.	Development of EPAs was prompted but the need to revise curriculum and assessment to address revised national competency standards in dietetics in Australia.

### 3.3 | Context of EPA use

Table 2 provides a summary of EPA use and educational outcomes. A frequently reported impetus in several studies was the use of EPAs to define educational outcomes or define expectations of performance. Englander et al<sup>41</sup> report on development of national EPAs as part of the Association American Medical Colleges' efforts to respond to increasing concerns in the medical community that entry-level doctors' performance was below expectation. Studies reporting on similar initiatives in medicine come from Canada<sup>51</sup> and Germany.<sup>43,54</sup> Others report on the need to help define the work of a profession to help improve competency-based assessment processes,<sup>43,47-50,52</sup> whereas others report defining performance of EPAs as an educational endpoint may allow for non-time-limited training programmes.<sup>58,66</sup> Other studies report on implementation or evaluation of one or more national EPAs or development of work-based assessment tools as part of EPA evaluation.<sup>59,60,65</sup>

### 3.4 | Publication years

No time limits were used for the search as EPAs are a recent concept. The first study identified for inclusion was published in 2014 with publications steadily increasing to 2018 and markedly after that.

## 4 | DISCUSSION

The aim of this scoping review was to report on how, and in what contexts, EPAs are being used in entry-level health professional education. Our study extends previous reviews in health professions education by focusing specifically on entry-level education but expanding the scope beyond medicine to map the evidence regarding EPAs in these emerging areas and identifying areas where there is still more to know. The use of EPAs in this area is clearly gaining momentum as indicated by the rapid increase in number of included publications, increasing from one in 2014 to 15 publications in 2019. Meyer et al<sup>32</sup> report on a similar trend in their scoping review as do other reviews published on this topic.<sup>33,36</sup> Although a large number of studies were returned with our initial search, the majority of these were opinions/perspectives indicating that reports of empirical research are more recent. The breadth of studies included in this

review supports the assertion that this field of research in entry-level education is only recently progressing beyond development studies to implementation, evaluation and synthesis studies.

Although graduate medical education has predominated in the uptake of EPAs,<sup>33</sup> it is clear from this review that EPAs are gaining popularity in other professions and in entry-level medicine. The review identified several reports of EPA use in pharmacy in multiple countries, in physician assistant courses in the Netherlands and dietetics in Australia. The major context reported to be driving EPA use is a need to describe educational outcomes through a lens of defining practice of a profession. The potential benefits of this are numerous. Several papers included in this study reported mismatches between expected and actual performance of entry-level graduates.<sup>41,43,44,51</sup> A performance gap potentiates patient safety risks if a worker entrusted with the care of a patient is not able to perform at the expected level or receives insufficient supervision. Another commonly reported motivation for developing EPAs is to improve assessment processes, particularly in workplace settings.<sup>47,48,63</sup> EPAs offer potential to create clear requirements that can be understood by all parties (students, teachers and assessors) of what a student should be able to do and with what level of supervisor support with most studies defining the level of performance of an entry-level student being able to practise with reactive supervision. If there is discrepancy between actual and expected practice, then students and supervisors can work together to identify gaps and develop individual plans to improve practice towards desired degree of independence. A single study reports on the use of two different published EPA assessment scales and concludes that qualitative comments are an important part of feedback to help guide learning.<sup>61</sup> Given the recent expansion of EPAs from graduate medical education into other professions, it is unsurprising the development of EPAs represents the majority of reports included in this review ( $n = 12$ ). Many of the reports pertained to single institutions where local drivers, such as curriculum reform, were identified.<sup>41,48,50</sup> Other studies have identified a gap in research of the best method for EPA development<sup>33</sup> and this gap is replicated in entry-level health professional education, as our review failed to identify a predominant method for development. Use of expert working parties, consensus building using Delphi or other consensus building methods was common; however, very few studies reported involving students in development. Multiple methods of validating EPAs were reported including cross-sectional surveys to determine that working professionals included

How are EPAs being used/specific educational focus	Educational outcome
EPAs used to assess student performance. Differences used to compare outcomes of two different styles of medical training.	EPAs can be used evaluate different curricular models. Offer potential to ensure that course of study is training work-ready graduates.
To modify curriculum and drive authentic assessment.	EPAs offered a method for operationalising competency standards in a workplace-driven curriculum. EPA used to guide assessment through entire curriculum.

EPAs in their work activities,<sup>50,64</sup> cross-checking of entry-level job descriptions and advertisements,<sup>48</sup> and student appraisal.<sup>60</sup>

Student-focused learning has been a reported benefit of competency-based education.<sup>7</sup> Importantly, EPAs do not replace competency-based education but enhance it through providing means of operationalising competencies in the workplace.<sup>21,22</sup> Englander et al note that EPAs allow learners to demonstrate in practice the integration of multiple competencies at the point of delivering care. For example, the EPA 'gather a history and perform a physical examination' is linked to multiple competencies in the physician competency reference set.<sup>41,68</sup> By translating competencies into observable and assessable activities, EPAs offer the additional potential to individualise learning. Murray et al<sup>58</sup> report on a pilot programme where students were allowed to progress from undergraduate to graduate based on performance, rather than time as in traditional health professional education. Wiersma et al<sup>66</sup> report on bespoke creation of EPAs to provide an individual and flexible competency-based physician assistant education programme. These provide evidence of the potential of EPAs to remove the time-based nature of education programmes; however, both reports pertain to small cohorts in specialised areas and may not be scalable. This potential for EPAs to offer a solution here should be priority for future exploration.

Another advantage of EPAs is the potential to advance educational research.<sup>69</sup> By defining work-ready practice of an entry-level student and using this as part of assessment practice, it is possible to identify strengths or gaps in curricula, as suggested by Anderson et al.<sup>59</sup> EPAs also offer a method for tracking student performance over time to help increase understanding of how student skills develop.<sup>62</sup> Several papers reported challenges in measuring the impact of curriculum reform; however, EPAs offer the potential to identify curriculum gaps by comparing actual and expected student performance. Lounsbury et al<sup>57</sup> interrogated student patient logs to understand the type and number of patient encounters required to reach an entrustable level of performance. Wijnen-Maijer et al<sup>67</sup> reported on the use of an EPA-based simulation assessment that attempted to compare a traditional style of medical education and newer pedagogy. Bruce et al<sup>55</sup> interrogated the confidence of interns drawn from multiple medical schools to perform procedural skills. Educational research facilitated by EPAs will help increase understanding of strengths and weaknesses of different curriculum models, and the findings from this review suggest that this should be a direction of future research.

Several studies reported in this review highlighted potential limitations of EPAs. Assessment on an EPA scale may reflect an increase in trust, rather than increase in skill.<sup>10</sup> Furthermore, it may not be possible to assess all EPAs; hence in some specific rotations, additional assessment strategies may be required.<sup>52,62</sup> Multiple studies report that entry-level EPAs may be too broad or general for early in the student journey and smaller, targeted EPAs may be required for junior students.<sup>48,49,52</sup> A common strategy to address this is to divide EPAs into smaller tasks or elements.<sup>43,46,47,49</sup> However, one study reported on an early placement experience with entry-level EPAs and was able to demonstrate utility when the expected level of performance was defined as 'marginal', that is requiring continual assistance.<sup>10</sup> More research is required to achieve a deeper understanding of the best approaches to adopt in entry-level education.

The aim of this scoping review was deliberately broad; however, a challenge found when identifying studies for inclusion was the diverse nature of health professional education and imprecise definition of entry-level. Some professions, such as medicine and pharmacy, include a supervised work-based year following university-based training before practitioners can register. This made identifying articles for inclusion challenging. A decision was also made to exclude advanced practice areas of professions, such as nurse practitioners, though it could be argued that nurse practitioners being a distinct profession from nursing could be defined as every level. Charting and extracting data was made difficult by the diverse types of studies included, with many studies reporting on multiple phases of EPA use, that is development and implementation or implementation and evaluation. As EPA use is still in its infancy, many of the included studies had small participant numbers and were pilot studies or single-centre reports. Our results show that EPAs is a growing area of interest in health profession education and the pace of publications in the area is increasing. Therefore, it is possible that there may be studies published subsequent to our search that have not been included. As we only included English-language studies, we may have inadvertently excluded relevant reports in other languages.

## 5 | CONCLUSION

The use of EPAs is increasing in entry-level health professional education and increasingly being taken up by multiprofessional and

international educators. Common motivations for EPA use include the need to define the work of entry-level professionals to improve patient safety and help improve assessment particularly in the workplace. It is starting to emerge that EPAs offer potential for use in educational research and may offer a valuable tool to identify trends in student performance, measure changes to curriculum and identify curriculum gaps. With further research, this offers exciting potential to provide educational evidence to support the transition from time-based education towards competency or outcome-based education in all health professions. We identified that existing reports of EPAs in entry-level education are currently focused largely on a few disciplines and conducted in single institution studies. An area for future research is the use of EPAs in a wider range of health professions with a multi-institutional implementation and evaluation.

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## CONFLICT OF INTEREST

No conflict of interest has been declared by the author(s).

## AUTHOR CONTRIBUTIONS

All authors critically reviewed and edited the manuscript and approved the final copy and declare that the content has not been published elsewhere.

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### 3.4 Conclusion

The scoping review found that EPA use in entry-level health professional education was gaining rapid popularity in the USA, Canada, Europe, Australia and Central America in several disciplines included allied health. Motivations for EPA use included a desire to decrease the gap between expectations and student performance thus improving patient safety and improving work-based assessment practice. The review also found that EPAs offered a means to evaluate curricula, representing a potential application in education research. The findings of this chapter suggest EPAs offer potential to improve assessment practice in health profession education which will be discussed in the dietetic context in Chapter 5. The potential of EPAs to enhance education research will be further discussed in Chapter 7 where analysis of educational data generated through assessment using EPAs is explored.

## Chapter 4 Methodology and methods

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The main aim of this thesis was to develop, implement and evaluate a work-based assessment tool using an e-portfolio structure featuring embedded EPAs and student self-assessment for dietetic education with the overall goal of improving the utility of assessment methods. In order to achieve this, an assessment utility framework was used as the evaluation strategy and action research methodology was chosen to facilitate participant input into the design of the tool and allow multiple cycles of evaluation. This chapter provides an overview of the conceptual frameworks underpinning this research, an overview of study design and timelines, and concludes with a justification for the use of action research.

### 4.1 Conceptual frameworks informing this research

#### 4.1.1 Evaluation of utility

The conceptual framework employed in this programme of research was informed by van der Vleuten and Schuwirth, two leading researchers in health professions education who have published widely in the area of assessment of competence and assessment of performance. In an early paper, Van der Vleuten suggested that perfect assessment of professional competence was an illusion and that compromises between what is desirable and achievable would always occur (Van der Vleuten, 1996; Van der Vleuten & Schuwirth, 2005). Van der Vleuten summarised utility in an equation where the utility of an assessment method was a product of various factors that could be weighted or prioritised according to the assessment context (Van der Vleuten, 1996).

**Utility = Validity (V) x Reliability (R) x Educational Impact (E) x Cost (C) x Acceptability (A)**

While this was meant as a conceptual framework, rather than a predictive algorithm, it is useful to help visualise that overall utility depends on several factors and there will inevitably be trade-offs and compromises depending on the context (Van der Vleuten & Schuwirth, 2005). In a later paper, Schuwirth and Van der Vleuten explored these concepts more deeply and argued that until recently, assessment had traditionally been perceived through the lens of measurement, whereas a more modern approach was to view assessment through the lens of educational design (Schuwirth & Van der Vleuten, 2004).

The components described in the utility conceptual framework include validity, reliability, educational impact, cost and acceptability. Validity refers to whether the assessment method or

instrument actually measures what it intends to (Van der Vleuten & Schuwirth, 2005). Validity is a multifaceted concept with numerous sub-types, including content validity, construct and context validity. Briefly, content or face validity refers to whether the instrument measures the concept intended, construct validity is the ability of an instrument to measure a theoretical concept and if inferences can be drawn based on results of the measurement and context validity refers to the ability of an instrument to be applied in a real-world setting (Heale & Twycross, 2015; Holleman et al., 2020). Additionally, validity, in educational assessment can be direct such as face validity or indirect such as construct validity. Direct validity may be determined through mapping, quality control and expert judgement. Indirect validity may be inferred through statistical or other means such as determining if performance on an education item increases over time, or if experts perform better than novices. As such, Van der Vleuten and Schuwirth (2005) argue that evidence from multiple sources will be required to establish validity.

Reliability is the ability of a method or tool to produce the same results under similar circumstances (Heale & Twycross, 2015). Results of reliability analysis should be interpreted with regards to the type of data informing the decision and the consequence of the assessment decision. Van der Vleuten argues that although reliability improves with standardisation, it is not always necessary (or possible) to standardise tests and that increased sampling can increase reliability (Van der Vleuten, 1996).

Educational impact refers to the impact of the assessment on learning. Students, rightly or wrongly, are motivated by assessment and Schuwirth and Van der Vleuten (2004) argue that this should be harnessed. Assessment drives learning through several means and can be used by teachers selectively to influence study behaviour. For example, multiple choice questions might foster learning of facts where an objective structured clinical examination might support the learning of communication or procedural skills. Educational impact from a methodological perspective can be hard to measure and Van der Vleuten (1996) suggests that surveys and case studies are the most likely methods. A key shift in thinking in relation to this point is the concept of formative assessment or assessment for learning. This is in addition to the concept of summative assessment or assessment of learning (Van der Vleuten & Schuwirth, 2005).

Acceptability is the degree to which the method or tool is satisfactory to users (students and educators). The views, traditions and sentiments of those involved in assessment cannot be ignored (Van der Vleuten, 1996). Practising clinicians may have little awareness of educational research with regards to assessment, but they have personal experience of assessment so will

have opinions, evidence-based or not, as will students. If an assessment is not acceptable to stakeholders, then it will have low utility regardless of how valid or reliable it is.

Cost is a measure of the resources required to conduct the assessment and must always be considered. In this project, feasibility was used as a proxy concept for cost. At the time of commencement of the program of research reported in this thesis, the availability of information technology infrastructure and digital literacy and skills of the stakeholders were inconsistent. The ability of dietetic students and supervisors to access, navigate and effectively use the tool had to be considered to make the tool feasible.

As stated above, utility is a product of these factors, so if one of the factors is zero, the utility is therefore, zero. For example, an OSCE may have high validity and reliability but the cost to administer may be beyond the resources of the educational institution, meaning in that particular context the utility is low. Another example may be that a multiple-choice test may have scored highly against the factors of validity, reliability and cost but may have low educational impact in that students learn to pass the assessment but are unable to demonstrate the concepts in practice. The context of the assessment is critical. A previously mentioned, no assessment is perfect and assessment will always involve compromise (Van der Vleuten, 2016).

As already stated, while the above model of utility was not intended to be an algorithm to predict or calculate utility, it clearly illustrates that for assessments to have high utility there are many factors that should be considered or evaluated (Van der Vleuten & Schuwirth, 2005). The model was used to inform what aspects of the assessment tool would need to be evaluated to determine utility and appropriate research methods were chosen accordingly. As the context of assessment was supervised professional practice in the workplace, evaluation of acceptability, validity, educational impact and feasibility were prioritised over reliability as it has been argued that there is reduced need for reliability measures in an authentic learning setting (Van der Vleuten & Schuwirth, 2005).

As use of EPAs is a new concept and has not been used widely in dietetics, multiple evaluation strategies to determine validity and acceptability were included in the research program. Feasibility as a proxy for cost was evaluated as this was an essential factor for successful implementation. Lastly, educational impact was prioritised for inclusion in the evaluation strategy to address a knowledge gap regarding how dietetic students develop competence during supervised professional placements identified in Chapter 2. Ensuring a multimodal evaluation with research methods to measure all these components would enable a judgement

about overall utility. Additionally, published studies identified in the scoping review confirmed this strategy and provided suggestions as to how others had solved the problem of evaluation. Although published after this research programme had commenced, the scoping review identified a paper by Peters et al. (2019) that had used the van der Vleuten utility framework to determine utility of an assessment tool based on EPAs for entry-level medical training.

#### **4.1.2 Action research**

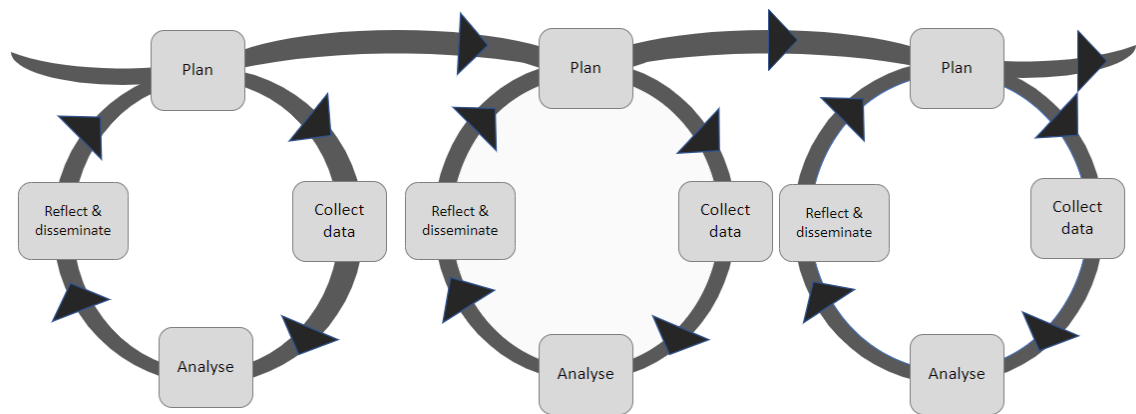
Action research is a form of enquiry “that enables practitioners in every job and in every walk of life to evaluate what they are doing and to find ways of doing it better” (McDonnell & McNiff, 2016 pg. 17). It is a style of research rather than a specific method and is participatory in nature; researchers work with participants rather than undertake research on them. Action research emerged in the 1940s and was pioneered by Kurt Lewin, a social scientist who worked with minority groups in the USA. He sought to understand and address problems of assimilation, segregation and discrimination and to help find a resolution for these issues through involving participants in the research (Stringer & Genat, 2004).

Action research is commonly used in healthcare to improve a local practice or system and address gaps between evidence and practice (Meyer, 2000). It provides a systematic approach to examine practice, reflect on what is or is not working, explore the impact of practice, examine and test ways of improvement and communicate to others the findings or outcomes. It is a scalable framework meaning that it can be used by an individual practitioner to improve their personal knowledge or practice or can be scaled up to allow groups to understand and improve their collective knowledge and practice (McDonnell & McNiff, 2016). McDonnell and McNiff (2016) explain that action research questions refer to what we do and often take the form of: “how do I...?”, “how do we...?” or “how does...?” (pg. 18). Action research often seeks to explain how theory can be linked or transformed to practice and determine what the real-world impacts of this translation are. Moch et al. (2016 pg. 3) define action research as: *“... a systematic research process that can be articulated by the researcher, involving data collection and analysis as well as reflection and discussion with coresearchers or others for the purpose of making change in a situation over time.”*

##### **4.1.2.1 Research frameworks**

In order to justify the use of an action research framework for this project, it is important to understand the similarities and differences of action research compared to other research frameworks.

Action research enables the researcher to act as a change agent. The researcher collaborates with participants to describe and understand the problem, what changes may be acceptable and how the changes will be measured or evaluated. The findings are brought back to the group for discussion and reflection and the next steps forward are created. These processes are often repeated in what is known as the action research cycle or helix depicted in Figure 4.1 (McDonnell & McNiff, 2016).



**Figure 4.1 Action research cycles**

Common research frameworks include positivist/experimental research and naturalistic/interpretive frameworks. Positivist/experimental research seeks to predict an outcome or test a hypothesis and often sets out to prove cause and effect or explain relationships between variables and typically employs quantitative research methods. Naturalistic/interpretive research uses qualitative research methods to explore or explain social or cultural issues (Stringer & Genat, 2004).

In positivist or experimental research, groups are compared, with one group receiving an intervention and another group receiving standard treatment or placebo and conditions are controlled. This method often seeks to reduce bias through random allocation of participants to each group and through study designs that cross over allowing both groups to experience treatment and placebo. A well-known example is the randomised double-blind control study design. This methodology can help provide evidence of cause and effect. Experimental research is largely conducted in physical and biological sciences.

In the real-world, it may not be feasible or ethical to achieve a random assignment to each group preventing the use randomised designs and necessitating other approaches. Correlational research is non-experimental research where the relationships between variables are explored but the variables are not manipulated. In quasi-experimental research, the independent variable is manipulated but participants are not randomly assigned to groups. Such study designs are often used in the field where it may not be ethical nor feasible to randomly assign participants to different groups (Stringer & Genat, 2004). Although correlational and quasi-experimental research provide means for real world investigation, the underlying intent of the research remains to measure and describe precise relationships between variables in a quantifiable manner.

Naturalistic research seeks to explore and explain relationships of different social and cultural aspects of human life (Stinger & Genat, 2004). Qualitative research methods are usually employed to conduct this research and used widely in education and social sciences. This type of research may take a phenomenological perspective where the study is conducted and interpreted through the experiences and perspectives of the participants (Liamputtong, 2012; Stringer & Genat, 2004). Phenomenology seeks to increase understanding of experiences describing the experiences of the participants in relation to a concept or phenomenon of interest (Liamputtong, 2012). Other research approaches include grounded theory- where the research aims to construct theory from the data, narrative analysis where participants stories are analysed and retold in a way that will make sense to a reader and ethnography (Liamputtong, 2012; Vaismoradi et al., 2013).

Action research differs from positive/ experimental or naturalistic/ interpretivist research in that it has a specific purpose, allows diverse methodology and includes a social construct (McNiff, 2016). The cyclical nature of action research allows both the participants and the researcher(s) to shape the research and act on findings (Figure 4.1). Through reflection, participants and researchers shape the direction of the studies based on their own interpretation or reflections of the results or outcomes.

A key feature of action research is that it allows the inclusion of multiple methods, making it an appropriate framework for this programme of research that aimed to design, implement and evaluate the utility of a novel assessment method. Both quantitative and qualitative data would be required combined with the use of an iterative process to refine the output of each cycle until the utility of the tool was satisfactory. While a variety of qualitative research methods are often used in action research, interpretive approaches are often chosen as the goal of interpretivist

research is to understand the perspective or lived experience of participants (McChesney & Aldridge, 2019). This is because action research is participatory in nature, seeks to understand the problem from multiple perspectives including that of the researcher, and seeks to identify interventions and measure improvements (Meyer, 2000; Stringer & Genat, 2004).

#### **4.1.2.2 Action research key concepts**

##### **Critical reflection**

Critical reflection is a key component of action research. Reflective practice was pioneered by Schoen and requires practitioners to step back and think about their actions and practice and how they relate to the outcomes, what was positive or negative and what actions would they keep or do differently if the situation arose again (Schoen, 1992). Reflective practice can be performed at an individual level or in peer or hierarchical groups and is often prompted by a set of questions in a reflective framework such as Gibbs (1988). Although widely used in healthcare, reflective practice is also used in other professional fields, such as education, to enable practitioners to examine, evaluate and improve their practice (Mathew et al., 2017).

The use of critical reflection in action research operates in a similar fashion to reflective practice used in a professional setting. It requires the researchers and/or participants to step back and consider the results, what factors contributed to the outcomes and why, and what the action should be as a result of the evaluation (McDonnell & McNiff, 2016). Critical reflection can be done with or without the project participants and can be used to generate research data, evaluate results and plan further action (McDonnell & McNiff, 2016).

A key benefit of critical reflection is that it allows action research to accommodate and adapt to unexpected findings or outcomes. This can generate new knowledge or lines of enquiry and thus, action research could be described as emergent and developmental and that each ending can potentially be a new beginning (McDonnell & McNiff, 2016). Critical reflection allows researchers to consider and evaluate multiple inputs simultaneously and incorporate continuously evolving views from the literature.

##### **Pragmatism**

Action research is often described as pragmatic in its approach. Shaw et al. (2010) describe pragmatism as a philosophy that focuses on practicality and real problems, is concerned with truths (plural) and the utility and satisfactoriness of solutions. A key voice in the concept of pragmatism in research was John Dewey who authored many works including "how we think"

and “Logic: The theory of enquiry” (Dewey, 1933; Dewey, 1938). Maddux and Donnett (2015) argue that pragmatic thought allows interchange of subjective “feeling” and objective measure. Maddux and Donnett (2015) go on to say that Dewey’s major contribution to pragmatism was to “analyse this interchange as a series of stages in which a difficulty is defined, a solution suggested, the reasons for this solution elaborated and the solution, most importantly, tested in action” (Maddux & Donnett, 2015 pg.72).

Taking a pragmatic viewpoint allows for multiple methods (qualitative and quantitative) to be combined to generate broader understandings of problems and solutions (Creswell, 2009). Supporters of this approach argue that this combination can address multiple concerns simultaneously and provide a better understanding than if each research approach is used in isolation (Shaw et al., 2010). A key feature of pragmatism in action research is that it is particularly concerned with consensus and agreement (Hammond, 2013). This is pertinent to this program of research as the work-based assessment tool had to be acceptable to users to have utility.

Pragmatism is intimately linked to reflective practice as beliefs must be interpreted to stimulate action and actions must be interpreted to generate beliefs. The implications for action research are that the experience or beliefs of the researcher have prompted the study and results of the actions need to be examined and evaluated to examine if the beliefs of the researcher have been altered (Morgan, 2014). Herr and Anderson (2015) argue that one way to test the validity of action research is the extent to which actions that occur lead to a resolution of the problem. When research participants are able to take effective action on issues under examination, this increases the credibility of the research (Stringer & Genat, 2004).

### **Positionality and democracy**

The participatory nature of action research prompts concern about the issue of positionality. This term refers to the position of researcher on a continuum from being insider concerned with, and reflecting on, their own practice or an outsider whose primary objective is to increase knowledge which can have both ethical and validity implications. Figure 4.2 describes the continuum and how researchers collaborate with participants (Herr & Anderson, 2015).



**Figure 4.2 Continuum of Positionality in Action Research (Adapted from Herr & Anderson, 2015 pg. 40)**

It is important for the researcher to consider positionality to be aware of power imbalances in a relationship that may result in bias or compromise the validity of results. In this thesis, the candidate identified at level 2 on the spectrum. Her position as an academic and practising dietitian bridged two different areas, namely education research and healthcare. The candidate was simultaneously an insider as an educational researcher aiming to improve the assessment process for students and clinical educators and also an insider as a practising clinical dietitian employed in a senior role in a major teaching hospital. The candidate's employment as a senior dietitian meant there was a vested interest in maintaining professional standards while training new clinicians to ensure the future workforce pipeline. The participants were insiders, students who were undergoing assessment and practising dietitians charged with assessing students on their professional placements. Academic colleagues and PhD supervisors were other insiders who had knowledge of assessment practices and processes including application in dietetic contexts.

A potential advantage of being an insider in this research study was the possession of intimate, detailed knowledge of the setting, subject and context of the research. Herr and Anderson (2015) argue that this has potential for greater impact on the setting with resulting change more likely. It is, however, important to be aware of potential for power imbalances in the relationships formed as part of the action research enquiry. Herein lies the concept of democracy in action research. As the researcher is a change agent, it is important that participants are seen as equals in the process, the results are disseminated to participants, and they are involved in the evaluation (Meyer, 2000).

In this program of research, multiple hierarchical relationships existed between the candidate and participants. Firstly, the candidate had academic responsibility for co-ordinating subjects that included some of the placements. This created a potential for power imbalance when conducting research with the students. Although less likely, the candidate additionally held the role of senior dietitian in the Victorian public healthcare system, so there was also potential for a similar power imbalance between her and dietetic supervisors due to the hierarchical nature of healthcare. In contrast, as a newcomer to educational research, the candidate had potentially less power in the relationship with the other academic collaborators with greater research and education experience. Herr and Anderson (2015) do not suggest that there is any ideal

positionality and that knowledge production as a result of action research can be valid regardless of one's position on the spectrum.

#### **4.1.2.3 Use of action research in health and education research**

Action research has become increasingly popular in both education and healthcare settings. As described above it has a specific intent, aims to address real world or practice problems and seeks to achieve improvement. McNiff (2013) states that this involves thinking carefully about the situation one is in, why it exists, and what the social, political or historical contexts are. The incorporation of reflective practice, with a focus on improvement, makes action research appealing to both health care and education settings. Action research allows health care professionals to compare current practice to published best practice and educators to evaluate if teaching methods, assessment or curricula are achieving the best learning outcomes for students.

Action research sits comfortably across health and education settings. A systematic review by Munn-Giddings et al. (2005), examining the uptake and designs of action research in nursing showed that 87% of action research studies, focused on organisation, professional development or education in nursing with the remainder focused on clinical research topics. Most studies (90%) included in the review used two or more methods, which alongside the reflective nature and improvement focus, may underlie the appeal of action research to clinicians whose daily practice requires triangulating information or data from multiple sources before forming conclusions. As mentioned above, the inclusion of insiders and outsiders, the participatory nature and repeated cycles of planning, action and reflection of the outcome of action research provide opportunity for collaboration between health care organisations and academic institutions. This collaboration leads to changes in all participatory parties and integrates research, action and education (Bush et al., 2017).

From an education research perspective, action research can integrate research and learning and provide a framework for learning through the researcher's relationship (often long-term) with the problem that is the focus of the research (Moch et al., 2016). Action research can involve the evaluation of a process being used or to measure and analyse a change over time, both of which occurred in this program of research. This integration of practice and learning helps provide evidence that can inform decisions regarding educational design, teaching and assessment methods (Moch et al., 2016). In the context of this thesis, an action research

framework allowed for a program of research to address multiple problems simultaneously, namely the lack of a well-accepted work-based assessment tool in dietetics, exploration of the use of EPAs, student self-assessment and e-portfolios to help develop dietetic competency and to address a lack of data regarding how dietetic students develop skills in the workplace setting.

#### **4.1.2.4 How is action research used to achieve improvement?**

Action research is systematic and participatory and creates improvement in that it calls on the researcher to act on their findings. Due to the participatory nature, these actions are typically local and address the problem or issue that stimulated the research, but there is potential for the outcomes or action to be generalisable to different populations or contexts (Stringer & Genat, 2004). The cyclical nature of action research, where the researcher acts as a change agent and participants are included in the research, helps generate trust and ensure that solutions will make sense to the participants, consider their needs, viewpoints and resources and considers the social context in which the problem and solutions exist. A strength of action research, and its appeal to health and education contexts, is that it can influence practice positively while simultaneously gathering data that can be shared with a wider audience (Meyer, 2000).

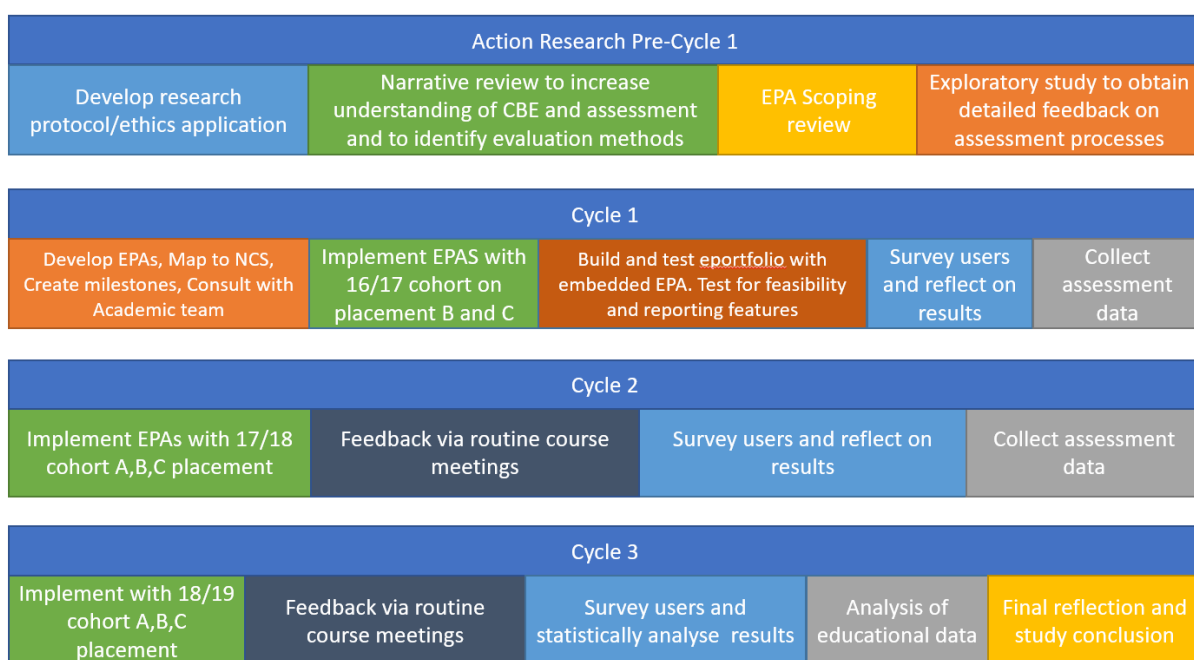
## **4.2 Project overview**

The program of research making up this thesis was divided up into several studies that are described below. The setting and participants have been described in Chapter 1 and are included in the publications in Chapters 5, 6a, 6b and 7. Each of these studies has been written up for publication, either published or submitted, and included in this thesis. Full descriptions of the methods used can be found within the publications. Table 4.1 describes each study and corresponding thesis chapter:

**Table 4.1 Overview of research studies and corresponding thesis chapter**

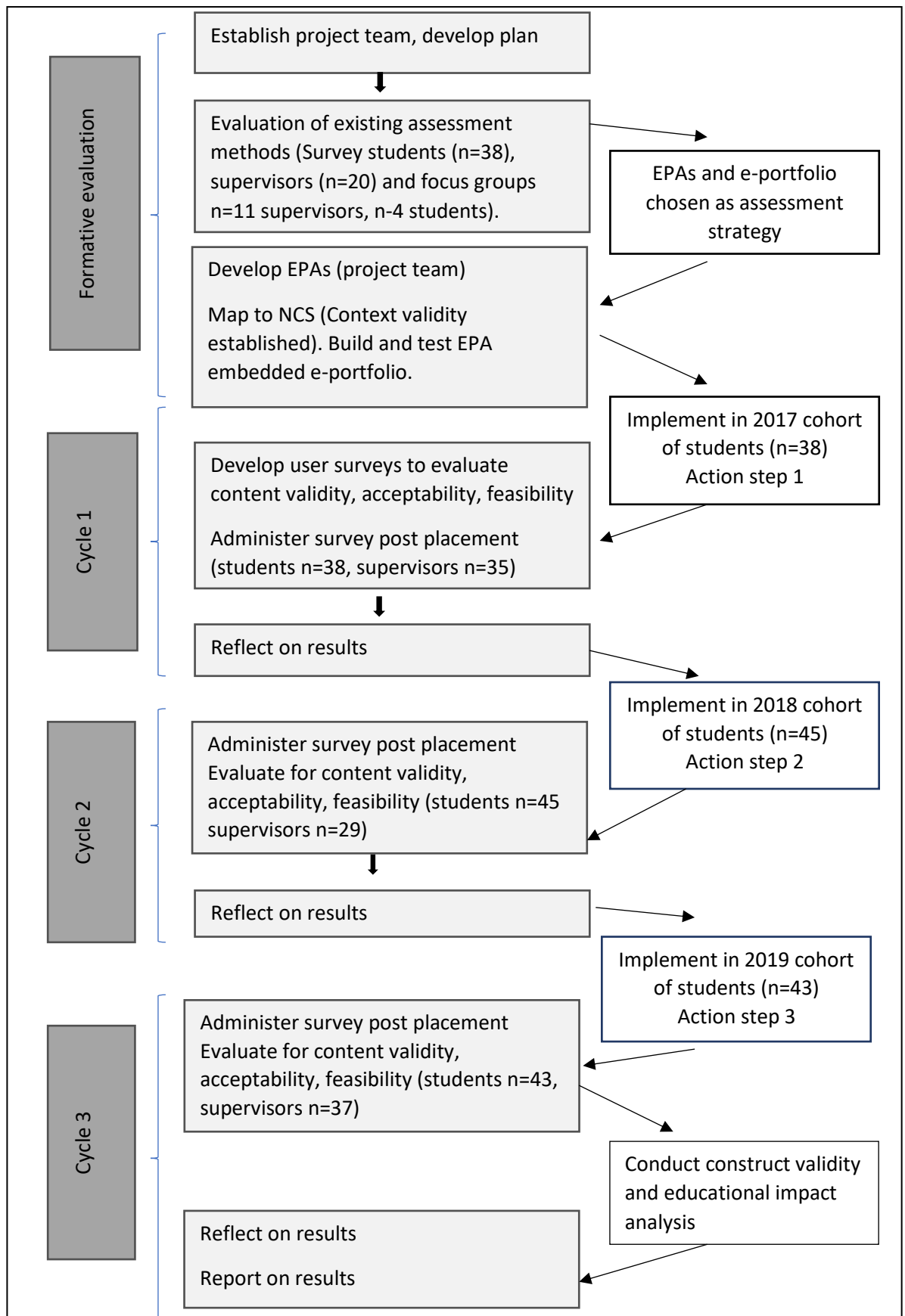
Study	Description	Thesis Chapter
1a	Formative exploratory study on users' assessment preferences in clinical dietetics	5
Study 1b	Formative exploratory study on users' assessment preference in community and public health dietetics	6b
Study 2a	Design, Implementation and Evaluation of novel work-based clinical assessment tool: an e-portfolio with embedded Entrustable Professional Activities for clinical dietetics	6a
Study 2b	Design, Implementation and Evaluation of novel work-based clinical assessment tool: an e-portfolio with embedded Entrustable Professional Activities for community and public health dietetics	6b
Study 3	Validity and educational impact of Entrustable Professional Activities for work-based assessment of entry-level dietetic students	7

Each study contributed towards several cycles of action research as shown in and an overview of the program of research is described in Figure 4.3. Action research pre-cycle 1 aimed to explore user perspectives of existing work-based assessment methods with concurrent evaluation of the literature on assessment methods broadly and EPAs specifically. Based on the outcomes of action research pre-cycle 1, the next cycle of action research aimed to develop separate EPAs for both clinical and community and public health e-portfolios, test them in a cohort of students and their supervisors and evaluate the results. Cycles 2 and 3 aimed to incorporate any changes required by the outcomes of Cycle 1 and further test the EPAs and e-portfolio to allow collection of sufficient data for analysis to determine utility. Studies 1a and 1b were conducted concurrently as part of action research pre-cycle 1. Studies 2a and 2b were conducted concurrently in action research cycles 1, 2 and 3. Study 3 used the data generated from cycles 1-3.

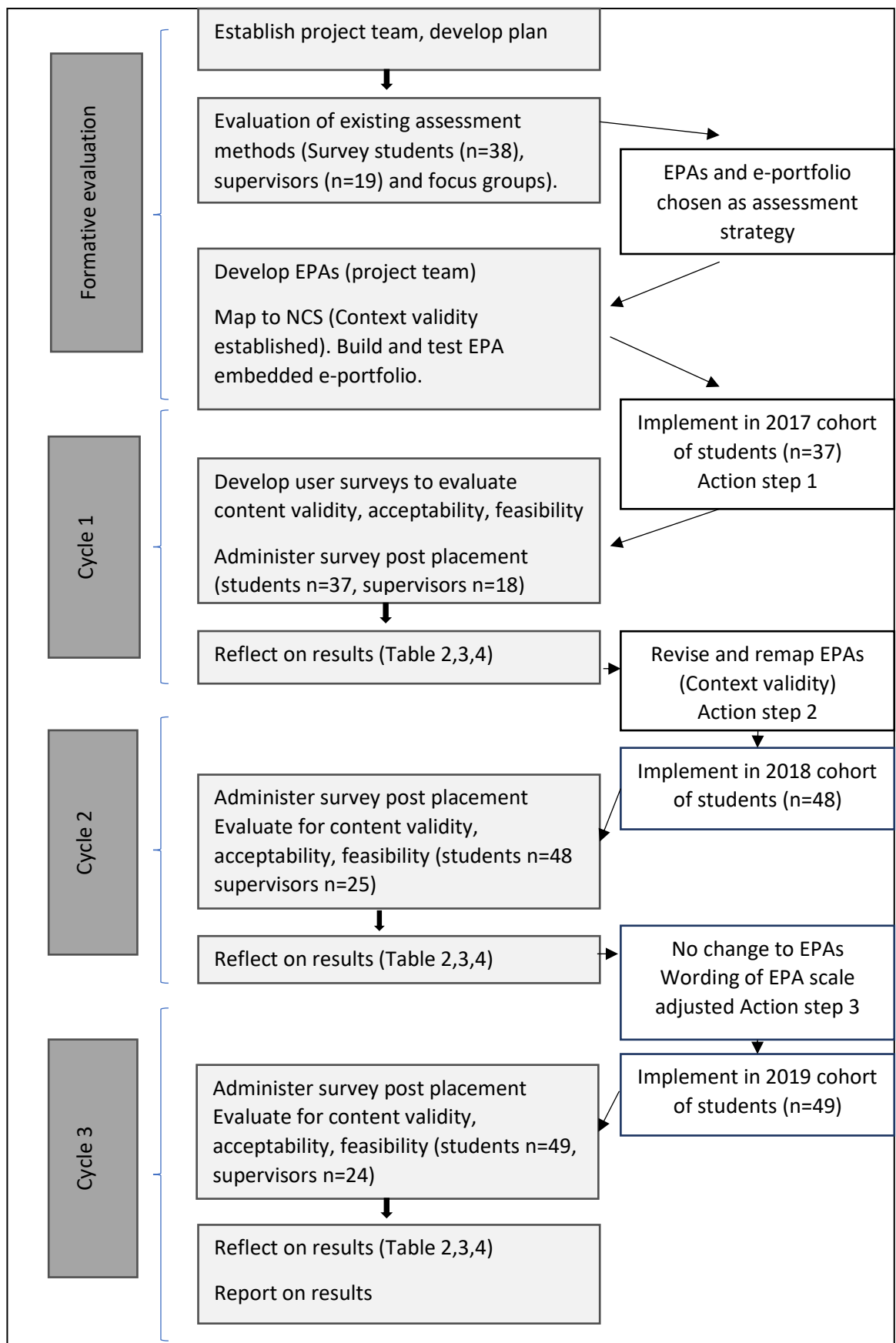


**Figure 4.3 Overview of action research cycles**

While detailed description of the methods for each study can be found in the corresponding chapters listed in Table 4.1. the following two figures illustrate the inputs and outputs of each action research cycle in clinical dietetics (Figure 4.4) and community and public health dietetics (Figure 4.5).



**Figure 4.4 Action Research Cycles used to develop, implement and evaluate the Clinical EPAs and e-portfolio**



**Figure 4.5 Action Research Cycles used to develop, implement and evaluate the Community and Public Health EPAs and e-portfolio**

### 4.3 Justification for action research use in this research project

Action research was selected as the methodological framework for this program of research because it allows a means to examine and improve practice in both health and education. It is recommended that when altering a curriculum or changing assessment methods a robust system for collecting information is implemented to allow a plan-do-study-action cycle to monitor the impact of change and adapt as required (Van der Vleuten, 2015). A systematic review by Waterman et al. (2001) found that action research is suited to developing innovative practices over a wide range of healthcare settings. In education research, action research offers potential to improve practice and generate evidence for what teaching can achieve beyond that of student satisfaction (Gibbs et al., 2017). A limitation/criticism of research in education is that it often has a narrow focus and pertains to single institutions or areas. Gibbs argues that the impact of action research studies pertaining to pedagogical innovation, curricular change or assessment studies can be increased by using multiple student cohorts as was performed in this program of research (Gibbs et al., 2017).

The nature of repeated cycles inherent in action research has the additional benefit of increasing the numbers of participants. The cohort of dietetic students at the participating institution was relatively small with a maximum of 55 students graduating per year. These small numbers, combined with the fact that this study would be conducted in a single institution, would potentially limit the generalisability of findings. Action research and the feature of repeated cycles results in the ability to include multiple cohorts of students which increases the number of participants, thus increasing confidence in the results. Hope and Waterman (2003) argue that the cyclical nature of action research provides a strong infrastructure for robust enquiry and promotes validity which was of benefit to the current study.

Action research offers a methodology to increase scientific knowledge where experimental and quasi-experimental methods may not be possible for logistic or ethical reasons (Stringer & Genat, 2004). In this study, it was impractical to implement a quasi-experimental study design to allow comparison between groups to the intervention of a new EPA-based assessment method. Furthermore, repeated cycles of action research offer a means for developing a solution for the immediate problem, which in this instance, was a need to improve current competency-based assessment methods. Action research also offered means to address a knowledge gap about how dietetic students progress during placements and develop to perform work-based activities at the standard of a work-ready graduate dietitian. Ellaway et al. (2014) highlight the potential

value of interrogating educational data to help deepen understandings of health professional education. Action research, with repeated cycles of evaluation and inclusion of the researcher as an active participant, provided the means to develop a tool that would be fit for purpose to collect educational data that will help inform benchmarks and milestones. Thoma et al. (2021) suggest that learning analytics will help deliver improvements to competency-based education of health professionals. Hence, the resulting outputs of this action research allowed collection of rich educational data to inform teaching and curriculum improvements and increased knowledge regarding dietetic student skill acquisition during supervised placements.

The participatory nature of action research was also key to the selection of this methodology. As a key focus of the project was to understand how work-based assessment processes impacted all stakeholders (students, supervisors, academics) with a view to improvement, a research framework that included participants and the researcher in the design was important. Action research allowed inclusion and collaboration of the researcher and participants in the methodology and was improvement or solution focused. Thus, the framework offered the potential for multiple needs to be satisfied. This supported the ability to design an assessment strategy that would meet the differing needs of students, supervisors and academic teaching staff but improve outcomes for all participants.

Another important reason to use a research framework that included participants was to ensure the resulting tool would be accepted by users and was feasible, key components of utility. As described in section 4.1, the utility framework proposed by Van der Vleuten suggests there is little point in developing a valid and rigorous assessment method if it is impractical or not accepted by assessors (Van der Vleuten, 1996). The candidate, having assessed dietetics students during clinical placements with repetitive and ill-fitting forms and portfolios, had personal experience of assessment where utility had been compromised. It was therefore imperative to understand the needs of dietetic students and supervisors in order to create an assessment process that was not only valid but had overall high utility.

As the assessment tool would be hosted in a web-based or e-portfolio format obtaining detailed user feedback on the tool functionality, it was vitally important to ensure acceptability and feasibility and thus utility. Action research allows for multiple rounds of user input and suits a project requiring iterative designs such as this. Common methods reported in the literature to obtain user feedback regarding function are surveys, focus groups and interviews (Zapata et al., 2015). Testing by real end-users generates empirical evidence regarding functionality and is often done with small subsets of users (Nielsen, 2021). This methodology was not possible in this

study as separating one subset of students for a different assessment method would have been impractical and would not have provided information about acceptability and utility in different settings. According to the framework described by Bush et al. (2017), non-academic partners (students and supervisors) were consulted, and the academic team members and educational designers were co-constructors. Although there is scope to increase the participation of stakeholders beyond consultation in action research, this is more time consuming and contains other challenges (Bush et al., 2017). In this program of research, increasing participation of dietetics supervisors beyond consultation would have resulted in increased workload of already time-poor clinicians resulting in potential project delays that would be incompatible with teaching schedules and the student academic calendar. However, Bush argues that there is still significant benefit to the outcomes and sustainability of the project, even when participation in action research is limited to consultation (Bush et al., 2017). In this project, consultation was vital to ensure the utility of the resulting tool.

A key paper by Whittaker et al. (2012) describing a development and evaluation process for m-health interventions also informed the methodology. This process describes a series of steps:

1. conceptualisation,
2. formative research to inform the design,
3. pretesting content,
4. pilot study,
5. pragmatic randomised controlled trial and
6. qualitative research to inform improvement or implementation.

This methodology has several similarities to the action research cycle, namely involving participants at several stages, reflecting on the results at each stage to determine the next course of action, conducting a pilot study before scaling up and repeating the cycle. The last step is a further point of reflection that gathers evidence and allows researchers to change the product (in this case the assessment format and process) to produce a result that will be well accepted and have high functionality.

The use of an action research framework also supports use of a variety of research methods. For an assessment to have high utility, many aspects must be measured and there is no one research method that can collect all the data required to determine utility (Van der Vleuten, 1996,

Schuwirth & Van der Vleuten, 2004). Furthermore, the participants would be called on to collaborate with the researcher on the solution. Involving participants in the design of a process they would be using is key in ensuring the acceptability and sustainability of the outcome (O'Dowd et al., 2019).

Throughout the project, when consulting the literature, it became apparent that many other studies aiming to develop either EPAs or work-based assessment tools used action research as a methodology. A study by Karupaiah et al. (2016) that focused on implementation of the Nutrition Care Process into a Malaysian dietetic education program used a participatory approach to their research process. Development and implementation of EPAs in pharmacy describe various stages and cycles of an action research framework (Haines et al., 2017; Pittenger et al., 2017; Rhodes et al., 2019). The development and implementation of EPAs in medicine in the United States are also consistent with an action research approach with development completed following wide consultation and EPAs being piloted in several colleges (Brown et al., 2017; Carraccio et al., 2017; Englander et al., 2016; Hauer et al., 2013b). Recently, the nursing profession has used a participatory design approach to develop EPAs for entry-level nursing students (Al-Moteri et al., 2021).

All of the above examples have the common theme that, according to Meyer (2000), align them with the definition of action research in that they attempt to identify a problem, seek a practical solution, systematically monitor outcomes and reflect on the process of change. The current project aligns with this definition and the participatory nature resulted in an outcome that is evidence-based, acceptable to participants and allowed the systematic monitoring that will add to the body of knowledge of how dietetic students develop competence in a work-based setting.

#### 4.4 Ethical considerations

The project was approved by the La Trobe University Human Research Ethics Committee (HREC) (Approval number S16-198). This ethics submission covered the exploratory mixed methods study reported in Chapter 5, and the two action research studies reported in chapters 6A and 6B. An ethics modification was obtained to extend the study to include analysis of de-identified educational data collected by the resulting tool created in the action research studies (Appendix 2). Evaluation surveys were distributed by anonymous weblink making responses unidentifiable.

Participants were informed of the intent of the project and how their data would be managed and agreed to participate in order to complete the survey.

In the pre-action research cycle, to encourage participation, a gift card of \$50 AUD was offered to participants via a random prize draw. To enter the draw an optional field was included at the end of the survey for participants to include their contact details should they wish to be considered for the prize. This field was omitted in later surveys as no further incentives were offered. Surveys were distributed at a time in the academic calendar when students had just completed placements to maximise response rates and decrease time burden on participants.

As the candidate was responsible for leading the focus groups, the researcher would be known to the dietetic student participants and clinical dietetic supervisor groups owing to the small community of dietetics in Melbourne, Australia. All participants were required to read participant information and sign consent forms prior to participating in the groups. To minimise bias from the hierarchical relationship in the case of the student focus group, the interview was timed to be held after all assessment tasks had been handed in, marked and returned to students.

All data were managed securely in accordance with the requirements of the HREC. Education data collected by the EPA based tool was downloaded from the e-portfolio and deidentified prior to analysis. Downloaded, deidentified data has been stored securely in password protected folders and reported in accordance with HREC guidelines.

## Chapter 5: E-portfolios and Entrustable Professional Activities to support competency-based education in Dietetics

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### 5.1 Declaration of authorship: Chapter 5

Student's declaration:

The nature and extent of contributions to Chapter 5 are:

Name	Nature of Contribution	Contribution %
Andrea Bramley	Study concept and design, ethics application, data collection, data analysis, manuscript preparation and revision for publication	70
Colleen J Thomas	Revision of Manuscript	7.5
Lisa McKenna	Revision of Manuscript	7.5
Catherine Itsiopoulos	Study design and revision of manuscript	15

### 5.2 Preface to Chapter 5

This article is presented in the exact format in which it was published in *Nursing and Health Sciences*. This study was exploratory in nature and aimed to collect detailed feedback from dietetic students and their supervisors on the existing and potential methods of assessment of placements. The focus of this publication is on perspectives in the clinical dietetic context. The views of dietetic students and their supervisors in the community and public health context were also explored but are reported in Chapter 6 Part B.



Aspects of this study were presented as an oral presentation at the following conferences

1. La Trobe PebblePad Workshop, Melbourne, August 2018
2. International Clinical Skills conference, Prato, May 2019
3. La Trobe University Teaching Week Conference, Melbourne, October 2019

### 5.3 Publication

RESEARCH ARTICLE

# E-portfolios and Entrustable Professional Activities to support competency-based education in dietetics

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## Abstract

The concept of Entrustable Professional Activities, recently pioneered in medical education, has emerged to support the implementation of competency-based education. Although competency-based frameworks are widely used in healthcare professional education to develop outcomes-based curricula, assessment of student competency in professional placement settings remains challenging. The novel concept of Entrustable Professional Activities together with established methods of competency assessment, namely e-portfolios and self-assessment, was implemented in the "[La Trobe University Dietetic program in 2015–2016. This study aimed to appraise the e-portfolio and evaluate the use of Entrustable Professional Activities to assess competence. A mixed-methods evaluation, using qualitative and quantitative surveys with follow-up structured consultations, was conducted with final year dietetics students and their supervisors. Dietetics students were comfortable with Entrustable Professional Activities and competency-based assessment, whereas supervisors preferred Entrustable Professional Activity based assessment. All stakeholders valued student self-assessment and the ongoing use of structured e-portfolios to develop and document competency. The use of structured e-portfolios, student self-assessment, and the emerging concept of Entrustable Professional Activities are useful tools to support dietetics student education in professional placement settings.

## KEYWORDS

competency-based assessment, competency-based education, dietetics, Entrustable Professional Activities, e-portfolio

## 1 | INTRODUCTION

The increasing complexity of healthcare has ramifications for the education of health professionals. To execute safe and effective practice, practitioners must possess comprehensive discipline-specific

knowledge and clinical, communication, reasoning, research, and management skills (Campion et al., 2011; Epstein & Hundert, 2002; Frank, 2005). Several health professions, including medicine, nursing, and allied fields, have developed competency frameworks describing the attributes, skills, and qualities of their discipline (Batt, Tavares, &

Williams, 2020; Frank, 2005). These frameworks define and communicate professional standards to the public, members of the profession, employers, and students, and help inform curriculum development in educational institutions (Dietitians Association of Australia, 2017; Nursing and Midwifery Board Australia, 2016; Seech Pathology Association of Australia, 2017). The Dietitians Association of Australia has developed National Competency Standards for Dietitians which define the breadth of skills and capabilities required for dietetic practice in Australia. These standards were established in 1993, with multiple revisions capturing the evolution of the profession (Ash & Phillips, 2000; Dietitians Association of Australia, 2009; Dietitians Association of Australia, 2017).

## 1.1 | Challenges in competency-based assessment

A challenge in implementing a competency-based framework into a university curriculum lies in assessment, as competencies describe professional behaviors and attributes rather than observable actions (ten Cate, 2013b). Health profession education involves periods of supervised practice in a work-based setting. In this dynamic environment student supervision and assessment is often the responsibility of practicing professionals known as clinical educators, preceptors, or from here on in, supervisors, who are usually non-academics. Competency-based assessment (CBA) can potentially lead to high stakes subjective judgment of performance, increasing student stress and anxiety and potentially detracting from appropriate patient-centered care (i.e. when students prioritize their need to demonstrate a competency above a patient's individual care needs indicated by the clinical situation; Bearman, Molloy, Ajjawi, & Keating, 2013). Furthermore, by definition, competency-based education is outcome based rather than time sensitive, yet placements in professional practice programs are a finite, time-limited resource (Englander et al., 2016; Frank et al., 2010). Assessment-focused students wanting to develop competence can be inclined to view each patient care interaction as an opportunity to demonstrate one or more of their competencies, irrespective of the fact that it may not be possible or appropriate to demonstrate all competencies in all patient groups or healthcare settings (Palermo et al., 2018). Students may ignore a "completed" competency in subsequent patient interactions or view each competency as a task to tick off rather than as part of a holistic description of a practitioner.

From an assessor's perspective, competency-based assessment is not straightforward. Standards of practice, and interpretation of competency standards, can vary between different clinical educators and there may be additional differences in expectations of student performance between supervisors and the university (Palermo et al., 2014). Furthermore, the definition of competent practice is context dependent and challenges exist in making judgments about students demonstrating inconsistent performance or extrapolating competence from one setting to another (Bearman et al., 2013; Boyd et al., 2018). This can contribute to a perception of conflicting feedback from different assessors and can negatively impact the student/supervisor

relationship, potentially inhibiting student competence development (Maher, Pelly, Swanepoel, Sutakowsky, & Hughes, 2015).

## 1.2 | Assessment strategies in CBA

Several strategies have been proposed to tackle assessment challenges in CBA, including the widely adopted strategy of paper or electronic portfolios (e-portfolios) to collate evidence of student learning and competency attainment (Green, Wyllie, & Jackson, 2014). Compared to other assessment methods such as examinations or assignments, it is argued that competency portfolios suit an outcome-based curriculum by allowing students to prove how they have met the competencies or requirements of the education program (Driessen, 2017). In this way, portfolios are student-centered as they facilitate individualization, accommodate individual learning needs, and promote student self-development and reflection (Cordier et al., 2016; Heeneman, Driessen, Durning, & Torre, 2019). Portfolios may be unstructured or structured with forms and templates and include a variety of evidence or learning artifacts ranging from observation records, verified personal references/statements of attainment, and self-reflections on practice (Bevitt, Isbel, & Bacon, 2016; Cordier et al., 2016). Portfolios can facilitate the development of learning goals and reflective practice, crucial attributes of an effective practitioner post training (Garrett, MacPhee, & Jackson, 2013; Heeneman et al., 2019; Volders, Tweedie, & Anderson, 2010). Challenges of a portfolio-based approach include the considerable time requirement for development and assessment and the logistical challenges of submitting potentially large documents for assessment. E-portfolios utilizing electronic formats to collect and collate evidence of student learning for assessment overcome some of the logistical challenges, but do not address challenges related to subjectivity or intra-assessor variation in the interpretation of performance standards associated with CBA (Berendonk, Stalmeijer, & Schuwirth, 2013; Cordier et al., 2016).

An emerging strategy to address challenges in CBA is the concept of Entrustable Professional Activities (EPAs). EPAs are statements describing work that is done by a competent professional in a specific context (ten Cate, 2013a; ten Cate & Scheele, 2007). EPAs are linked to multiple competencies, usually in a matrix, and allow learners to demonstrate performance with regard to several competencies simultaneously and holistically, driven by the needs of the patient interaction. This reduces temptation to tick off competencies and places the patient's care needs in the center of the interaction. Student performance is assessed by how much support is required by the supervisor to execute the activity at a defined standard. When a learner has attained the EPA, they are trusted to perform independently with post hoc or distant supervision. EPAs are becoming increasingly adopted by European and American medical schools and are gaining acceptance in disciplines outside medicine, including nursing and pharmacy (Giddens et al., 2014; Haines et al., 2017; Surjadi, Stringari-Murray, & Saxe, 2019). The appeal of EPAs to entry level medicine, nursing, and allied health professions lies in overcoming some challenges associated with CBA as EPAs describe familiar, observable, work-based

activities that a new graduate could be expected to do without direct supervision (Chen, van den Broek, & ten Cate, 2015).

In 2013, the four-year double degree Bachelor of Applied Science/Masters of Dietetics program at "[La Trobe]" University implemented CBA, informed by the Dreyfus model (Dreyfus, 2004). The final year of the program consists predominantly of a practicum component with students completing >110 days of supervised placement across the practice area of dietetics. Three separate structured e-portfolios were developed in Pebblepad e-portfolio software for each of the three practice areas of dietetics, namely, Clinical, Food Service Management, and Community and Public Health Nutrition, for CBA of students completing professional placements. Included in the practicum program are three clinical placements of 4–5 weeks duration termed Placements A, B, and C. Students are expected to be assessed as ready for unsupervised practice against the competencies mapped to clinical dietetics by the end of their final placement (C) in order to graduate. A feature of the clinical e-portfolio was embedded student self-assessment fields requiring students to evaluate their performance and attainment of competency. In response to user feedback that the e-portfolio was lengthy and unwieldy, and assessment against competency standards was too abstract and impractical, assessment using EPAs were trialed in the first placement (A, Clinical). An experienced clinical dietitian and academic developed EPAs and a supporting competency matrix (Supplementary Material 1) specific to clinical dietetics. At the time, there was no reported literature regarding EPA use in dietetics, therefore implementation was limited to a single placement (A) as a pilot. In the second (B) and final (C) placements students continued to be assessed using existing CBA methods. Since this pilot study there has been one published example of EPAs in dietetic education (Wright & Capra, 2017), suggesting our institution may be among the first to adopt this novel assessment approach and highlighting a gap in the evidence base for the use of EPAs outside medicine.

### 1.3 | Aim

The aim of this study was to conduct exploratory formative research to inform future assessment practices within the education program. The objectives were to explore student and supervisor perceptions of assessment, the use of EPAs as an assessment strategy in professional placements, and to evaluate the utility and acceptability of the current e-portfolio, specifically the inclusion of student self-assessment and reflection.

## 2 | METHODS

### 2.1 | Study design

This exploratory mixed methods study was conducted between August and November 2016 with final year dietetics students and their clinical placement supervisors from large metropolitan teaching

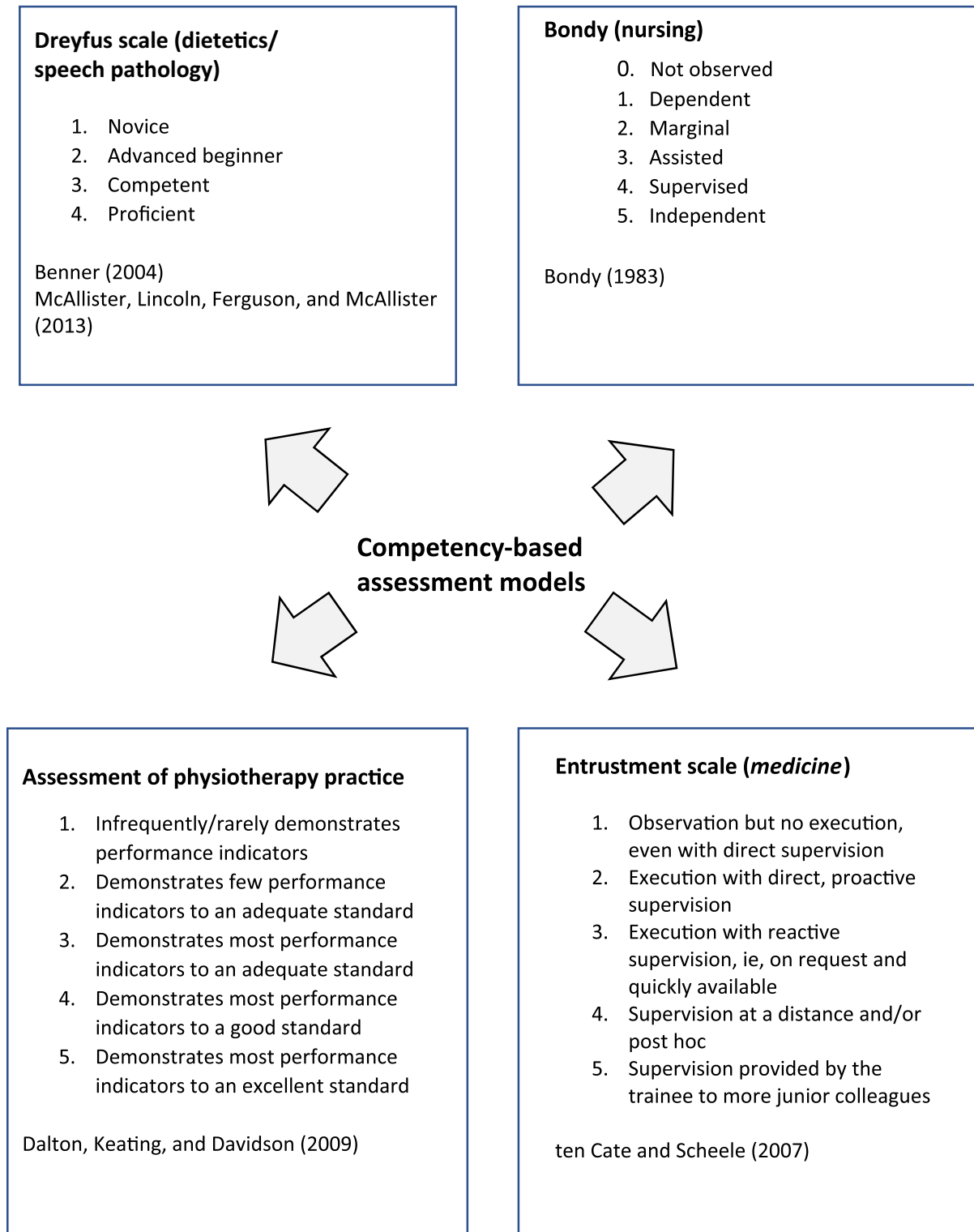
hospitals, metropolitan private hospitals, and rural public hospitals (Schifferdecker & Reed, 2009). The lead author, a clinical dietitian and member of the teaching faculty with over 15 years' experience including clinical placement assessment, quantitative research, and project evaluation, led the project. The project team consisted of senior dietetic faculty members experienced in qualitative, quantitative, and mixed methods research, who contributed to survey and consultation question design and to the interpretation of results. Statistical support was provided by a university statistician. A two-stage mixed methods approach was developed to obtain broad feedback on assessment methods (EPAs and CBA), inclusion of student self-assessment and user satisfaction by means of surveys, with scope for expanded discussion on issues such as preferred assessment scales and technical issues such as e-portfolio navigation provided by follow up stakeholder consultations (Garrett et al., 2013; Johnson & Onwuegbuzie, 2004; Schifferdecker & Reed, 2009). Ethics approval was obtained by the "[Removed for blind peer review]" La Trobe University Human Research Ethics Committee (#S16-198).

### 2.2 | Data collection

All final year students ( $n = 38$ ; comprising 37 females and 1 male) and their supervisors ( $n = 20$ ; comprising 19 females and 1 male) were invited to complete separate electronic surveys, distributed via anonymous web link, to provide initial quantitative and qualitative feedback. The surveys consisted of 24 questions with 5-point Likert scale responses, three qualitative response sections, and three demographic questions. Topics evaluated included e-portfolio usability, structure, functionality, infrastructure, assessment methods, frequency and timing, the effectiveness of EPAs for assessment, the effectiveness of CBA compared to EPA, preferred methods of rating performance, and the efficacy of student self-assessment and reflection. Areas for free-text responses were included to obtain additional qualitative feedback regarding self-assessment, assessment methods, and other comments. The project lead developed the survey (Supplementary Material 2), with face validity established through consultation with the project team and experienced dietetic academics outside the team. Prior to distribution the survey was pilot tested with other academic staff members familiar with placement assessment. Surveys sent to students and supervisors were similar to enable comparisons between groups. Participation in the surveys was opened just prior to graduation in the last week of the final clinical placement (C) and remained open for three weeks, with a reminder sent via email one week before closing. Anonymous survey results were collated and distributed to the research team to inform development of discussion prompts for subsequent stakeholder consultations. The e-portfolios and assessment approaches used in the entire practicum (Clinical, Food Service Management, and Community/Public Health placements) were evaluated as part of this study, however, only the results of the assessment methods and e-portfolio evaluations from Placement A (Clinical) are presented in this paper.

Building from the survey results, a series of discussion prompts were developed to structure the student and supervisor stakeholder consultations. Face validity was established via consultation with senior academics with qualitative research experience. Questions were designed to capture views regarding the timing and frequency of

assessment, expectations regarding assessment time commitment, documentation, and e-portfolio structure and utility (Supplementary Material 3). Different placement assessment practices used by dietetics and other health professions, including assessment rating scales (Figure 1) were discussed, along with case examples of



**FIGURE 1** Assessment scales commonly used in competency-based assessments in healthcare professions

implementation in related health professions (ten Cate, 2013b; Dalton, Davidson, & Alexander, 2009; Bondy, 1983; McAllister, Lincoln, Ferguson, & McAllister, 2013; Benner, 2004). Stakeholders were probed about the practicalities of CBA and EPAs for assessment.

A convenience sample of eleven clinical supervisors who had supervised students in the preceding 12 months from the largest clinical placement sites were recruited to participate in the stakeholder consultations. The project lead facilitated discussions and participant responses were audio-recorded and transcribed. All final-year students were invited to participate in stakeholder consultation groups, with four students recruited. Due to the lower than expected student response rate, study methods were revised to include evaluation of the Clinical, Food Service Management, and Community/Public Health e-portfolios in the single consultation group, contrary to the original intention of evaluating each portfolio separately.

### 2.3 | Data analysis

Survey results were analyzed using statistical software (SPSS, IBM version 23). Comparative statistics (means and standard deviation) were used to describe the results for the Likert responses. The authors adhered to the Good Reporting of a Mixed Methods Study (GRAMMS) checklist (O'cathain, Murphy, & Nicholl, 2008).

## 3 | RESULTS

### 3.1 | Survey results

A total of seven students and eight supervisors returned the clinical survey, representing an 18% and 40% response rate, respectively. All were female. The average number of years of dietetic experience for supervisors was  $10 \pm 6$  years, with  $7 \pm 5$  years of student supervision. The results are summarized in Table 1. Owing to the small sample size and low number of completed surveys, statistical analysis was limited to descriptive analysis only. Both students and supervisors reported that student self-assessment enhanced learning, with mean response scores of 3.29 and 3.50 out of a maximum of 5, respectively. This finding was confirmed by additional anonymous qualitative survey responses from students, such as "I'm a strong advocator for self-assessment. It allows me to judge my competency level at that current moment, what I need to work on and where I need to be by the end of the placement," and anonymous comments from supervisors: "It makes the student reflect on their own performance and experience prior to doing the final/mid-way assessment."

Both students and supervisors evaluated the use of EPAs positively and reported they helped students take charge of their own learning. Supervisors indicated a lack of confidence assessing students using CBA with the current rating scale and this was confirmed by students' responses to the matching question. Overall satisfaction with the e-portfolio was significantly different between students and supervisors, with the mean overall satisfaction score

for supervisors being 1.88 out of 5, indicating a high level of dissatisfaction compared to students (3.57 out of 5). Students and supervisors reported the time required to complete the CBA-based Placement B and C portfolio sections was excessive. Students reported a preference for a structured paper portfolio, with 57% indicating this as their preference, 29% preferred a structured e-portfolio and 14% indicated preference for an unstructured e-portfolio. Among supervisors, 50% indicated a preference for a structured e-portfolio, with 25% preferring an unstructured e-portfolio, and 12.5% indicating preference for a structured or unstructured paper portfolio. Supervisors reported barriers to access, with 25% reporting their workplace had insufficient information technology infrastructure. One supervisor commented: "A hardcopy would allow for a more private assessment as given all our computers are in a public space, privacy can be difficult."

### 3.2 | Stakeholder consultation results

Four students attended a stakeholder consultation and reported a preference for EPAs compared to CBA: "I think it was clearer. I think it was more obvious what you needed to do," (P4) and "less open to interpretation by your supervisor" (P3). Additionally, students reported variations in supervisor expectations regarding competency assessment: "There was different ideas as well... some people said that their supervisors were expecting them to show every single competency with the patient, whereas at my placement... we just had to show them throughout your placement" (P3). Students expressed a preference for a Bondy (1983) scale or Entrustment approach compared with the current Dreyfus (2004) model or other methods (refer to Figure 1), as this would be less subjective and clearer for supervisors: "I think it would be easier for supervisors as well ...Did I step in much there?"(P3). The inclusion of formative assessment and goal setting was valued: "I found that really beneficial doing the weekly reviews....it made you...have a look at...where you're tracking, what you should be working on" (P2).

Consistent with survey results, supervisor stakeholder consultations revealed a preference for EPAs compared to CBA: "that works well for the students as well because quite often those competencies, they really struggle to understand how that translates to practice... Whereas in the skill descriptors (EPAs) it's very transparent to the student, it's very transparent to the supervisor exactly the tasks they need to be able to do" (2P1). Supervisors expressed preference for a Bondy or Entrustment-based assessment scale: "I like it ...it's quite practical with, you know, are you observing them, are they doing it assisted or unassisted and you can give them feedback" (1P3). In contrast to general dissatisfaction with the e-portfolio reported in the survey, supervisors were in support of an e-portfolio: "sticking to the electronic format if we can get away from printing out reams of paper that's probably the ideal thing" (2P1). Comments were made expressing the need to improve e-portfolio navigation and all groups suggested that planned improvements in hospital electronic infrastructure would overcome access issues.

**TABLE 1** Supervisor and student experience of e-portfolios and assessment during individual case management professional placement

Survey question	Student Mean ( $\pm$ sd)	Supervisor Mean ( $\pm$ sd)
I liked the fact that I was assessed against EPAs rather than directly against the graduate entry competencies	4.00 (0.82)	3.38 (1.061)
The EPAs helped me identify my strengths and weaknesses.	3.71(0.95)	3.25 (1.17)
The EPAs helped me understand what I/my students needed to achieve on placement	4.29 (0.49)	3.38 (1.07)
The EPAs helped me/my student take charge of my /their own learning needs	4.00 (0.58)	3.13 (1.13)
The EPAs accurately assessed my/my students Performance on placement	3.29 (0.76)	3.13 (0.91)
My supervisors appeared/I was comfortable with Interpreting the skill descriptors and rating my performance	3.43 (0.98)	3.50 (0.76)
My supervisors appeared comfortable with using the Placement A† section of the e-portfolio	2.71 (0.95)	3.38 (0.74)
I liked the fact that I was assessed against entry level competencies rather than against EPAs	4.14 (0.64)	2.50 (0.93)
The competencies helped me identify my Strengths and weaknesses.	3.86 (0.90)	3.13 (0.84)
The competencies helped me understand what I Needed to achieve on placement	4.29 (0.49)	2.88 (1.13)
The competencies accurately assessed my Performance on placement	3.43 (0.98)	2.63 (1.06)
The competencies helped me take charge of my Own learning needs	3.71 (0.95)	2.38 (1.06)
My supervisors appeared/I was comfortable with Interpreting the competencies and rating my performance	3.00 (1.00)	2.63 (0.74)
My supervisors appeared/I was comfortable with using the e-portfolio	2.71 (1.11)	3.50 (0.76)
Self-assessment enhanced my/my student's learning?	3.29 (0.76)	3.50 (0.76)
The amount of time taken for me to complete The Placement A section of the e-portfolio was reasonable	Reasonable 4/7 Too much 3/7	Reasonable 4/8 Too much (4/8)
The amount of time taken for me to complete the Placement B and C sections of the e-portfolio was reasonable	Reasonable 1/7 Too much 6/7	Reasonable (1/8) Too much (7/8)
Overall I would describe my experience using the Pebblepad® e-portfolio as positive	3.57 (0.54)	1.88 (0.84)

Note: Surveys were constructed using a Likert scale with a range of 1–5, 1 = *highly dissatisfied* to 5 = *highly satisfied*. A total of 7 students and 8 supervisors completed the survey, representing a response rate of 18% and 40%, respectively. †EPAs were used for assessment in Placement A, whereas competency statements were used in Placements B and C. EPA, Entrustable Professional Activity; Placement A, first clinical placement; Placement B, second clinical placement; Placement C, final clinical placement.

## 4 | DISCUSSION

This is the first study, to our knowledge, to evaluate implementation of EPAs in dietetic education and the second description of the use of EPAs in a dietetic context (Wright & Capra, 2017). Our results suggest EPAs were well accepted by this cohort of final year dietetic students and preferred by supervisors when compared to CBA. Continued use of e-portfolios to record competency development was supported by both students and supervisors with opportunities to improve structure, usability, and access identified. All participants reported self-assessment was valuable to develop personalized learning goals and should be retained.

Advantages and limitations of e-portfolios have been well documented, and our study results are consistent with other reports

(Garrett et al., 2013). Advantages such as multi-user access, environmental sustainability, and ability to promote student self-assessment and reflection through portfolio design were confirmed, but disadvantages such as navigation issues, training requirements, and usability were also reported. Students rated their overall satisfaction of the e-portfolio significantly higher than supervisors possibly due to in-class training and familiarity with Pebblepad through repeated use. Although training materials were provided for supervisors, they may have lower proficiency compared to students due to infrequent use and limited face-to-face training. Limitations in workplace technology, infrastructure, and access to computers may be further factors accounting for decreased supervisor acceptance. Despite poor overall experience being reported, supervisors indicated via survey a

preference for a structured e-portfolio workbook over other options, with this theme repeated in the consultations suggesting support for continued use of an e-portfolio, albeit with improvements.

A benefit of assessment using a portfolio, independent of format, is that learning is student-centered (Weddle, Himburg, Collins, & Lewis, 2002). Students are required to collect evidence of learning and justify competency, promoting engagement and active participation in learning. Our results indicate that student self-assessment is valued by both students and supervisors, though some variation in student engagement was reported. An enhancement possible in e-portfolios, including ours, is that supervisor access can be prevented until students have engaged in self-assessment, thereby increasing student responsibility for learning and compelling students to develop personal learning goals (Tochel et al., 2009).

Our existing e-portfolio used a 4-point scale from 1 = *not yet demonstrated* to 4 = *exceeds expected standard*, based on the Dreyfus model of skill acquisition. A qualitative description of a student at “pass” level was provided to guide supervisor judgment. Discussion in our stakeholder consultation groups regarding assessment scales used in CBA (Figure 1) indicated support for a modified Bondy/Entrustment assessment scale with respondents suggesting decreased subjectivity, a frustration expressed by students with our current scale. Although other disciplines such as physiotherapy (Dalton et al., 2009) and speech pathology (McAllister et al., 2013) use a Dreyfus model, national adoption, large amounts of supporting materials and training manuals may reduce subjectivity and inter-assessor variation. Dietetic supervisors, via survey response, highlighted concern with the Dreyfus model: “I found that with competent/not competent it can be really difficult for students, so when you're going through (formative assessment) for instance and you put in not competent... the student's actually developing and progressing.” Other words of support for the Bondy/Entrustment scale were reported in the surveys: “it matches what we are actually doing on the ground...better than novice, advanced beginner, competent.”

Our findings indicate preference amongst supervisors for the use of EPAs compared to CBAs, with students confirming supervisors were more comfortable assessing using EPAs. Taken in conjunction with preference for the Bondy/Entrustment assessment scale, these results highlight a need for professional placement assessment to be easily understood by assessors, comprehensive and as objective as possible, with subjectivity commonly reported as a criticism of CBA. To guide assessors, the 2015 National Competency Standards for Dietitians contained additional observable measurable actions, examples of strategies used to build competence and guidance on entry level requirements (Dietitians Association of Australia, 2017). However, it does not yet approach the level of support provided by professions with national standardized tools for placement assessment (Dalton et al., 2009; McAllister et al., 2013). Work is underway in the dietetics profession to expand resources to assist implementation of CBA in the curriculum, including the development of profession-wide EPAs and milestones (Begley, Bird, & Palermo, 2020).

Our results are consistent with other literature reporting EPAs being highly acceptable to clinician educators charged with

assessment, as EPAs describe observable actions that students must be able to perform independently to provide safe and effective care in a specific setting (Gerhard-Szep et al., 2016; Lohenry et al., 2017). In the workplace, attainment of EPAs provides evidence to answer the fundamental supervisor question “Is this student safe for independent practice?” Our results support the utility of EPAs in practice-based learning as EPAs are clear, specific, and describe observable actions applicable to the workplace as opposed to CBA which can be broad, less explicit, and describe attributes of a person. Uptake of EPAs in undergraduate and post-graduate medicine has been rapid and adoption outside medicine is growing (Englander et al., 2016; Jurd et al., 2015; Lomis et al., 2017; Pittenger et al., 2017; Wright & Capra, 2017). EPAs provide a practical and valid way of implementing a competency framework and this study supports implementation in an entry level dietetic curriculum. Although this study is limited to a single cohort of final year dietetic students and their supervisors, these results may be applicable to other dietetic or health disciplines reviewing assessment practices in a competency-based curriculum.

Although our results suggest preference for using EPAs, particularly amongst supervisors, this could be interpreted as a criticism of CBA rather than true support of the EPA model of assessment. There has been criticism of CBA in health professional education (Pijl-Zieber, Barton, Konkin, Awosoga, & Caine, 2014; ten Cate, 2013a) and the initial development and inclusion of EPAs in our portfolio was triggered by consistent supervisor feedback obtained via regular course advisory meetings that CBA was too long, abstract, and confusing for students and supervisors. In response to this feedback, we developed and implemented EPAs in the first of three clinical placements and provided additional tutorials regarding CBA for students prior to their final clinical placement to increase understanding of CBA and placement requirements. The impact of this training is evident as survey results demonstrate a difference in EPA acceptance compared to CBA, indicating that students were more comfortable with the CBA compared to their supervisors.

## 4.1 | Limitations

There are several limitations to our study. This was an exploratory study that was limited to a single cohort of students and their supervisors at a single institution, therefore results must be interpreted with caution. Larger, longitudinal studies across multiple student cohorts are required to explore the feasibility and utility of EPAs as an assessment, and these are planned. Furthermore, this study was conducted in a single profession in an Australian context that may limit generalizability to other countries. Nevertheless, numerous countries have competency standards for dietitians and require supervised practice (Palermo et al., 2016), and the novel concept of EPAs presents a way of operationalizing competency frameworks into work-based assessments (Shorey, Lau, Lau, & Ang, 2019).

As the surveys were anonymous it not known if survey respondents were represented in the stakeholder consultations. Poor engagement from students was evident by the low student response

rate despite incentives to participate. As the study was timed with the end of final year, students were fatigued, preparing for final exams, and may have been disinclined to participate in research which did not benefit them directly. The response rate amongst supervisors was higher indicating greater engagement, and similarly the number of supervisors recruited for stakeholder consultations was high, increasing the confidence of our results. The lead author who was responsible for data collection was a member of the teaching staff and a professional colleague to the supervisor participants. This may be a risk for social desirability bias and is a potential limitation.

## 4.2 | Conclusion

Our study adds to the body of knowledge regarding assessment of dietetics students on clinical placements and may be applicable to other health professions. To our knowledge there is only one other example of EPAs in dietetic education (Wright & Capra, 2017). The results of this exploratory study suggest incorporation of EPAs into a competency-based curriculum in dietetics is well accepted by users although larger studies are required to determine feasibility and educational efficacy. EPAs assist students and supervisors to have shared understandings of performance expectations of a competent student. Based on the results of this study, EPAs, student self-assessment, and a modified Bondy/Entrustment assessment scale model have been embedded in a revised e-portfolio. This novel EPA-driven e-portfolio will be piloted and evaluated for efficacy in student competency development in future studies across multiple cohorts. The model has broader applicability across education in other health professions and in settings outside Australia that include competency frameworks and supervised clinical placements as part of their curriculum.

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## AUTHOR CONTRIBUTIONS

Study design: A.B. and C.I.

Data collection: A.B.

Data analysis: A.B.

Manuscript writing and revisions for important intellectual content: A.B., C.I., C.J.T., and L.M.

## AUTHORSHIP STATEMENT

All authors critically reviewed and edited the manuscript and approved the final copy and declare that the content has not been published elsewhere.

## CONFLICT OF INTERESTS

No conflict of interest has been declared by the authors.

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## Appendix 1. Entrustable Professional Activities Competency Matrix

During the 16-day clinical placement A, it is expected that students are able to demonstrate the following skills. Skills are graded 1-4 with 1 = Not yet demonstrated, 2 = Below expected standard, 3 = expected standard, 4= Above expected standard.

	DAA competency#	1	2	3	4
<b>Data collection</b>					
Independently collects appropriate data from the medical file	3.2.1, 3.5.1, 4.2.1, 4.2.3				
Collects and correctly interprets relevant biochemistry (simple conditions)	3.5.1, 3.5.1, 4.2.1, 4.2.3				
Collects and correctly interprets relevant medications	3.5.1, 4.2.1, 4.2.3				
Collects and correctly interprets relevant anthropometry	3.4.1, 3.4.2, 3.5.1, 4.2.1, 4.2.2				
Collects and interprets correctly clinical information	3.5.1, 4.2.1, 4.2.3				
Collects and interprets relevant social, physical, environmental data	3.5.2, 4.2.1, 4.2.4				
Correctly estimates nutrition requirements using appropriate equations or evidenced based values	3.5.1				
Demonstrates understanding of and is able to use nutrition screening and assessment tools	4.1.1, 4.1.2				
<b>Interview skills</b>					
Greets patient appropriately	2.1.3, 2.3.1, 2.3.3				
Introduces self and others present	2.1.3				
Establishes rapport with patient	2.3.1, 2.3.3				
Understands and is able to explain to the patient the reason for Dietetic intervention/ referral	2.1.3, 2.1.4, 3.2.2				
Uses open and closed questions appropriately	2.3.2, 2.3.2				
Obtains/ confirms medical/ social / clinical history from patient as appropriate	3.2.2, 4.2.4, 2.3.2				
Conducts a diet history is linked to nutrition and medical problems and considers social background	4.2.4, 2.3.3				
Obtains accurate and complete dietary information using the most appropriate method	3.1.1, 3.1.2, 3.3.1, 4.2.4				
Is able to analyse dietary information qualitatively	3.3.2, 3.3.4, 4.2.4				
Is able to analyse dietary information quantitatively	3.3.2, 4.2.4				
Uses appropriate language throughout the interview	2.3.1, 2.3.2				
<b>Diagnosis/ Problem ID</b>					
Is able to identify major medical problems	3.6.1				
Is able to identify and prioritise major nutritional problems	3.4.2, 3.5.1, 3.5.3, 3.6.1, 4.3.1, 4.3.2, 4.2.3				
Is able to develop a nutritional diagnosis	3.5.1, 3.5.3				
<b>Nutrition Management</b>					
Is able to suggest a basic plan of management	4.4.1, 4.4.3, 4.4.4, 4.4.5				
Is able to document nutrition assessment data (draft nutrition assessment/ medical note)	3.6.2, 4.8.1				
Is able to suggest appropriate plan for follow up	4.1.3, 4.4.2, 4.4.5				
<b>Time Management</b>					

Manages own time effectively	8.1.1				
Assessing 1-3 patients per week	8.1.1				
<b>Professional behaviour</b>					
Communicates appropriately with Dietetic and other hospital staff	9.2.1, 9.2.3, 9.2.4				
Demonstrates respect and professionalism at all times ( professional language, punctuality and attitude)	9.2.1, 9.2.3, 9.2.4				
Is actively engaged with all learning opportunities provided by clinical sites	9.2.2, 9.2.3, 9.4.1, 9.4.2, 9.4.3				
Improves practice in responds to feedback provided by supervisors and own reflections	7.2, 9.2.2, 9.2.3				
Maintains patient confidentiality	9.2.1				
Maintains safe practice ( does not provide unsupervised advice)	9.1.1				
Follows procedure for absence and all relevant hospital procedures such as infection control.	9.1.1				
Is able to use hospital communications facilities appropriately	8.1.4				

#Dietitians Association of Australia. National Competency Standards for Entry Level Dietitians. Canberra. 2009.

## Appendix 2. Individual Case Management E-portfolio Student and Supervisor evaluation survey

1. I received enough information to activate and use my / my student's clinical placement workbook  
*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*
2. When I needed help I used  
*Dietetics specific written instructions/ dietetics specific video instructions/ general PebblePad help/ Contacted subject co-ordinator via email/ lms discussion board/ other students/ did not need help*
3. It would be useful if e-portfolio and PebblePad were used in earlier, non placement subjects ( students only)  
*Strongly agree/ Agree/ Neither agree nor disagree/ Disagree/ Strongly disagree*
4. I found the 'about me' page useful to tell placements about me and my learning needs/ I found the 'about me' page useful to learn about my students and their learning needs  
*Strongly agree/ Agree/ Neither agree or disagree/ Disagree/ Strongly disagree*
5. I accessed the e-portfolio using a  
*Mac/ Pc/ iphone/ ipad/ other phone/other tablet device*
6. I completed the student section of my e-portfolio (students only)  
*Mostly at home/ Mostly during my placement/ Home and placement equally*
7. I liked the fact that I was assessed/ I assessed against EPAs rather than directly against the graduate entry competencies  
*Strongly agree/ Agree/ Neither agree nor disagree/ Disagree/Strongly disagree*
8. The EPAs helped me identify my / my student's strengths and weaknesses  
*Strongly agree/ Agree/ Neither agree nor disagree/ Disagree/Strongly disagree*
9. The EPAs helped me understand what I/ my student needed to achieve on placement  
*Strongly agree/ Agree/ Neither agree nor disagree/ Disagree/Strongly disagree*
10. The EPAs helped me/ my student take charge of my/ their own learning needs  
*Strongly agree/ Agree/ Neither agree nor disagree/ Disagree/Strongly disagree*
11. The EPAs accurately assessed my/my student's performance of placement  
*Strongly agree/ Agree/ Neither agree nor disagree/ Disagree/Strongly disagree*
12. The amount of time taken for me to complete the placement A section of the e portfolio was  
*Too much/ Reasonable/Too little*

- 13.** My supervisor appeared / I was comfortable with interpreting the EPAs and rating my/ my student's performance  
*Strongly agree/ Agree/ Neither agree nor disagree/ Disagree/Strongly disagree*
- 14.** My supervisor appeared / I was comfortable with using the Placement A section of the e-portfolio  
*Strongly agree/ Agree/ Neither agree nor disagree/ Disagree/Strongly disagree*
- 15.** I liked the fact that I was assessed / I assessed my student against entry level competencies rather than against EPAs  
*Strongly agree/ Agree/ Neither agree nor disagree/ Disagree/Strongly disagree*
- 16.** The competencies helped me identify my / my student's strengths and weaknesses.  
*Strongly agree/ Agree/ Neither agree nor disagree/ Disagree/Strongly disagree*
- 17.** The competencies helped me understand what I/ my student needed to achieve on placement  
*Strongly agree/ Agree/ Neither agree nor disagree/ Disagree/Strongly disagree*
- 18.** The competencies accurately assessed my / my student's performance on placement  
*Strongly agree/ Agree/ Neither agree nor disagree/ Disagree/Strongly disagree*
- 19.** The competencies helped me / my student take charge of my / their own learning needs  
*Strongly agree/ Agree/ Neither agree nor disagree/ Disagree/Strongly disagree*
- 20.** The amount of time taken for me to complete the Placement B and C section of the e-portfolio was  
*Too much/ Reasonable/Too little*
- 21.** My supervisor appeared/ I was comfortable with interpreting the competencies and rating my performance  
*Strongly agree/ Agree/ Neither agree nor disagree/ Disagree/Strongly disagree*
- 22.** My supervisor appeared/ I was comfortable with using the placement B and C section of the e-portfolio  
*Strongly agree/ Agree/ Neither agree nor disagree/ Disagree/Strongly disagree*
- 23.** At the end of each placement block as students you were required to self-assess your performance against each skill descriptor or competency. Did you find this process enhanced your learning?
- 24.** Please explain why self assessment does or does not enhance your learning and skill development?

**25.** Overall I would prefer a

*Structured hard copy, paper workbook/ Structured electronic workbook ( e-portfolio) /  
Unstructured hard copy, paper competency portfolio ( students can design their own to  
demonstrate how they demonstrate the competencies)/ Unstructured electronic competency  
portfolio ( students can design their own to demonstrate how they demonstrate the  
competencies)/ Other (please specify)*

**26.** What other ways do you think assessment on placement could have been better supported/  
Do you have any other comments? (free text)

**27.** My age is (freetext)

**28.** The course I am studying is (students only)

*{Blinded for Peer Review}*

**29.** Please specify how many years you have been supervising students ( Supervisors Only)  
Freetext

**30.** Overall I would describe my experience using the PebblePad e-portfolio

*Highly negative/ negative/ neutral. Positive/ highly positive*

### **Appendix 3. Stakeholder Consultation Question Prompts**

Our survey evaluation indicate the “about me page” was helpful, why do you think this was so?

The current DAA National Entry Level Competency Standards use a framework of a framework of novice, advance beginner, competent, other professions use a different scales of observing, highly assisted, assisted, independent etc? Explore themes regarding marking/ grading including discussion of Australian Physiotherapy and Speech Pathology professional Bodies

Student self- assessment was evaluated positively, how do you think this assists in learning?

In the current e-portfolio structure, students must self-assess prior to supervisors being able to document their assessment. What are the advantages and disadvantages of this approach?

Students are required to set goals with their supervisors weekly. Should these be uploaded/ attached as part of their portfolio?

One theme that came through was the length of time taken to complete the workbooks was too long, this was less so in Placement A compared to IPB/IPC

How much time per week would be reasonable to complete a formative assessment?

How much time is reasonable to complete a summative assessment?

#### Skill descriptors (EPAs) vs competency statements

Reflecting back on Placement A assessment, although the expectations are less, do you think skill descriptors/ EPAs expedite the assessment process compared to competencies?

Supervisors felt more confident in their assessment using skill descriptors rather than competencies, student feedback also suggested that expectations were not consistent between the university and placement sites. How could supervisor confidence be improved with regards to assessment?

What would be useful to supervisors to make assessment more transparent or expectations clearer?

Do you think that new supervisors need different levels of support with assessing competencies?

Some of the new competencies could potentially be assessed in multiple domains. Competencies regarding professional behaviour, proactive learning and reflective practice are examples of this. Given that supervisor’s typically only work in one domain of dietetics, how could supervisors assess in different domains.

#### Infrastructure and portfolio design

Although most supervisors were satisfied with using an electronic workbook, some felt that hospital IT infrastructure was not suitable, in particular the fact that computers are in open plan areas that could compromise privacy: what strategies might improve this process?

In Community and Public Health and food service supervisor feedback is taken into strongly into account, yet overall competency is assessed by the university by triangulating other assessment tasks and participation in class/ on line discussion. Do you think this approach would be useful in the CLINICAL placements subjects? What would be some of the considerations.

## 5.4 Conclusion

This study found that dietetic students were comfortable with EPAs or competency-based assessment where dietetic supervisors reported a preference for EPAs to be used for work-based assessment. Both dietetic students and supervisors showed support for the use of an entrustment scale to assess students compared to other scales such as the Dreyfus competency scale. EPAs assist students and supervisors to develop shared understandings of the performance expectations of a competent student. Based on the results of this study, an EPA-based e-portfolio that includes student self-assessment was designed, implemented and evaluated for both clinical and community and public health dietetics. The results of the implementation and evaluation studies will be reported in Chapter 6a, 6b and Chapter 7.

Chapter 6 A & B: Design, implementation and evaluation of novel work-based clinical assessment tool: an e-portfolio with embedded Entrustable Professional Activities

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## Chapter 6 A: Design, implementation and evaluation of novel work-based clinical assessment tool: An e-portfolio with embedded Entrustable Professional Activities

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### 6.1 Declaration of authorship: Chapter 6 A

Student's declaration:

The nature and extent of contributions to Chapter 6 A are:

Name	Nature of Contribution	Contribution %
Andrea Bramley	Study concept and design, ethics application, data collection, data analysis, manuscript preparation and revision for publication	80
Lisa McKenna	Advice on data analysis, advice on manuscript structure, revision of manuscript	10
Adrienne Forsyth	Advice on data analysis, advice on manuscript structure, revision of manuscript	10

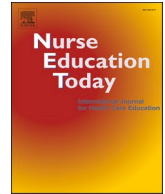
### 6.2 Preface to Chapter 6 A

A manuscript for this study has been accepted for publication in *Nurse Education Today* and is included in its published form. Following on from the formative study presented in the previous chapter, the objective was to design, implement and evaluate a work-based assessment tool using EPAs embedded in an e-portfolio for use in clinical dietetics. Specific aspects of utility were evaluated namely, content and context validity, acceptability and feasibility.

Aspects of this study were presented as an oral presentation at the following conferences

1. Dietitians Association of Australia, Melbourne, July, 2021

## 6.3 Publication



## Research article

# Design, implementation and evaluation of novel work-based clinical assessment tool: An e-portfolio with embedded Entrustable Professional Activities<sup>☆</sup>

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## ABSTRACT

**Background:** A new concept in work-based assessment, Entrustable Professional Activities (EPAs) describe key activities a work-ready practitioner can perform independently. EPAs are widely used in medicine to support competency-based education and are gaining acceptance in other professions such as nursing, pharmacy and dietetics. There is currently no widely accepted work-based assessment tool for student clinical placement assessment in dietetics and EPAs offer potential to address this gap.

**Objectives:** To design, implement and evaluate a work-based assessment tool using EPAs embedded in an e-portfolio for use in clinical dietetics.

**Setting:** An accredited dietetic training program in Australian university and affiliated metropolitan and rural hospitals.

**Participants:** Three consecutive cohorts of final year dietetic students ( $n = 126$ ) and their professional placement supervisors ( $n = 101$ ).

**Methods:** A working party consisting of dietetic academics with experience in clinical dietetics and education developed clinical dietetic EPAs and milestones that were mapped to the National Competency Standards for Dietitians in Australia. A design model incorporating multiple rounds of user feedback was used to create an e-portfolio with the EPAs embedded. Students and supervisors were invited to complete anonymous on-line surveys with Likert responses (1 = highly dissatisfied, 5 = highly satisfied) to evaluate the face validity, acceptability and feasibility of the tool.

**Results:** A total of 37 EPAs were developed with an accompanying four-point entrustment scale to measure performance. Evaluation survey response rates were high and ranged from 35 to 45% for students and 57–83% for supervisors across the study period. Both students and supervisors evaluated the tool positively with a mean overall satisfaction of  $4.12 \pm 0.69$  and  $4.03 \pm 0.68$ , respectively. Survey items evaluating face validity, feasibility and acceptability scored  $>3.75$  for both groups of users.

**Conclusions:** The EPA based e-portfolio demonstrated face validity, feasibility and acceptability and offers potential for a widely accepted tool for work-based assessment of clinical dietetic students.

## 1. Background

Entrustable Professional Activities (EPAs), having emerged from medicine over the last decade, are a relatively new approach to

assessment in health professional education (Ten Cate et al., 2017). Recent reports show EPA uptake has rapidly expanded from post-graduate medicine across multiple medical specialities to entry-level medicine, nursing, pharmacy and dietetics (Haines et al., 2016; Hoyt

<sup>☆</sup> This work was carried out at La Trobe University in the discipline of Dietetics and Human Nutrition with approval from the La Trobe University Human Research Ethics Committee (Application ID HEC S16-198).

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et al., 2017; Lau et al., 2020; Meyer et al., 2019; Shorey et al., 2019; Wright and Capra, 2017). The popularity of EPAs has been due in part to their ability to operationalise competency standards into work-based activities that can be observed (Dhaliwal et al., 2015). Common motivations reported for EPA development and implementation include the need to define the work of entry-level professionals to improve patient safety and improve work-based assessment (Lau et al., 2020; Bramley and McKenna, 2020; Englander et al., 2016; Meyer et al., 2019).

An educational framework commonly used to explain translation of knowledge into action is Miller's pyramid of competence (Miller, 1990). The first two levels of this four-level pyramid, 'knows' and 'knows how' describe acquisition of knowledge and understanding of application. The third level requires knowledge translation into action 'shows' and the fourth level requires consistent performance at the desired standard, 'does' (Epstein and Hundert, 2002). As EPAs clearly describe work that is done by a competent practitioner, such an approach lends itself to the assessment of the 'does' in Miller's pyramid. Entrustment scales that rate performance based on the amount of supervisor support required for students to perform the activity provides a way of documenting the student's progress from 'shows how' to 'does' (Rekman et al., 2016; ten Cate et al., 2021). Repeated assessment against the same activity provides opportunity for assessment for learning (formative feedback) and assessment of learning (summative feedback), both of which are important to students and educators, albeit for different reasons (Schuwirth and Van der Vleuten, 2011). Reflective practice is crucial for skills development and personal improvement in healthcare settings (Garrett et al., 2013). Student self-assessment against EPAs prompts reflection and focuses learning (Palermo et al., 2018).

Assessing Miller's (1990) 'does' in health professional education commonly occurs during supervised professional placements embedded into curricula to allow knowledge and skills application in practice (Carraccio et al., 2008). Dietetic programmes in Australia typically consist of a 4 year bachelor with honours or 18-24 month postgraduate degree. All training programs must include a minimum of 100 days of supervised practice in major areas of dietetic employment, namely individual case management (clinical), food service management and community and public health. Placement locations vary and may include acute or sub-acute healthcare facilities, public health, community health or other care settings. During their final year of study, student dietitians must demonstrate they meet the national competency standards for entry level dietitians, and this must be assessed by one or more suitably experienced Accredited Practising Dietitians. However, there is an absence of a national work-based assessment tool (Jamieson et al., 2019) and each accredited course has different patterns of professional placements and assessment methods to establish overall competency of students against the national standards. There is little published evidence about the attainment and assessment of dietetic competence in placements (Ash et al., 2019; Palermo et al., 2018).

Despite their promise, literature reviews on EPAs have identified opinion/perspective pieces or studies reporting the creation or development of EPAs dominate the literature and there remains relative lack of published empirical evidence regarding EPA use (Bramley and McKenna, 2020; Meyer et al., 2019; Shorey et al., 2019). This study aimed to examine a three-year program that involved expanding the use of EPAs for clinical dietetic work-based assessment in an accredited Australian dietetics program. Although EPAs had been used previously at La Trobe University, the release of revised competencies by Dietitians Australia necessitated a revision of existing EPAs and re-mapping to the new competencies (Dietitians Australia, 2015). In this paper, we report on the creation, implementation and evaluation of a work-based assessment tool using an e-portfolio structure featuring embedded EPAs and student self-assessment for use in clinical dietetics. We were informed by van der Vleuten and Schuwirth (2005) with regards to evaluation of the tool. Feasibility, validity and acceptability are reported here with construct validity and educational impact planned for future reports. Although part of this broader project, the development,

implementation, and evaluation of an EPA work-based assessment in community and public health dietetics will be reported separately.

## 2. Methods

This study was conducted between November 2016 and November 2019 with final year dietetics students from La Trobe University and their placement supervisors from affiliated metropolitan and rural hospitals in Australia. The study was approved by the HREC of La Trobe University (#S16-198).

### 2.1. Project team and methodology

The project team consisted of the lead author, an experienced senior clinical dietitian and academic and other facility members with expertise in dietetic education. The team was supported by educational designers and a statistician. Outcomes of the formative phase of the project have been published previously (Bramley et al., 2020) and concluded that EPAs embedded in an e-portfolio was preferred by users (students, supervisors and academics) for work-based assessment.

As the work-based assessment tool would be electronic, a project implementation methodology informed by mobile health development projects incorporating multiple samples of user feedback was selected (Fig. 1), (Whittaker et al., 2012). This involved a time-series design where feedback was sought from three cohorts of students and their supervisors at the end of the academic year. This Paper reports on pre-testing, pilot and implementation stages of the project to create a work-based assessment tool for clinical dietetics student placements.

### 2.2. EPA creation

The academics created EPAs using the three-step method described by Mulder et al., 2010.

- Step 1 Select the EPAs.
- Step 2 Describe the EPAs.
- Step 3 Plan learning and assessment.

Although other methods for EPA creation have been reported, such as the use of broad-based working parties (Chang et al., 2013) or Delphi approaches (Hauer et al., 2013), this method was chosen for its pragmatic design and ability to produce a rapid result (necessitated by a 10-week gap in the academic year to build and test a new e-portfolio). A predicted level of student performance was mapped to each placement to create milestones (Tekian et al., 2015). A four-point modified entrustment scale was incorporated as a fifth level described by Ten Cate (2013), teaching or supervising others, is beyond new graduate dietitian expectations.

Once created, EPAs were mapped to the dietetic competencies in a matrix and cross-checked against past placement experiences ensuring students would have opportunity to perform the EPAs on placement (See Supplementary Materials 1).

### 2.3. E-portfolio design

Informed by results of the exploratory study (Bramley et al., 2020) conducted in 2016, a new work-based assessment tool using an e-portfolio was designed and created using Pebblepad®. The new e-portfolio design incorporated features identified as important by all stakeholders (students, supervisors and academics) in the prior study:

1. The use of EPAs to measure student performance in a work-based setting
2. Incorporation of student self-assessment
3. Opportunity for formative and summative feedback (assessment for and of learning)

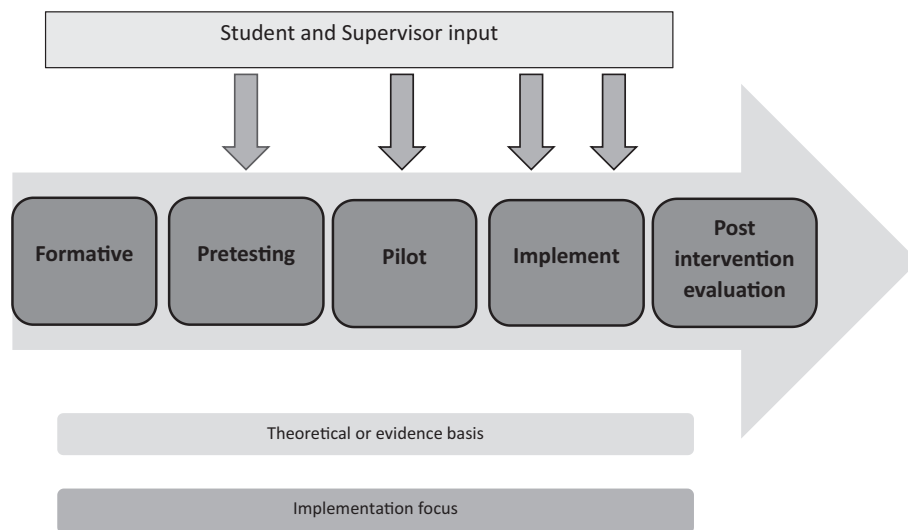


Fig. 1. Project methodology adapted from Whittaker et al. (2012).

4. Ability to generate educational data to inform teaching
5. Easy to navigate and use
6. A structure that reinforces the provision of dietetic care
7. An ability to allow communication of students' preferred learning styles in advance of placement

#### 2.4. Pilot of work-based assessment tool

The e-portfolio with embedded EPAs was tested for functionality and educational data reporting capability by the university team prior to field pilot testing. The redesigned EPA-based e-portfolio was piloted with the 2017 cohort of dietetic students and their clinical placement supervisors. Students were orientated to the portfolio via a 60 min group preplacement workshop. Each major clinical site received 60 min of group training on the new portfolio. The e-portfolio contained inbuilt written instructions regarding use EPAs to assess performance and a narrative description of what a "passing" student should be able to do at the end of each placement to create a shared mental model of expected performance level. No training was provided to supervisors after the pilot year.

#### 2.5. Work-based assessment tool evaluation

All of the 2017 cohort of final year dietetic students and their supervisors were invited to complete separate electronic surveys distributed by anonymous weblink distributed toward the end of the academic year after their final clinical placement. Surveys used in a previous study (Bramley et al., 2020) were modified with irrelevant questions removed and questions evaluating the specific design of the new e-portfolio added (see Supplementary Materials 2). Surveys consisted of 27 questions with five-point Likert scale responses, three demographic questions and four qualitative response questions. Topics evaluated included face validity and acceptability of EPAs and modified entrustment scale, structure, function and feasibility of the e-portfolio and the value of inclusion of student self-assessment. The simplified term of "skill descriptors" was used in place of Entrustable Professional Activity as respondents were non-academics and unlikely to be familiar with this recent academic terminology.

Surveys were sent to participants the week after final clinical placement completion with a reminder seven days following. After a low response rate was achieved in the formative study, this timing was selected to maximise response rate as students were not attending placement, but experiences were recent. Participation was voluntary and no incentives were provided. Results were examined by the project

lead and used to determine if modifications were required to e-portfolios or EPAs.

No changes were made to the clinical e-portfolio or EPAs in 2018. All students and supervisors were invited to participate in the anonymous evaluation surveys in 2018 and 2019 distributed after the final clinical placement, and no major changes were made following a review of survey results. In 2019, one minor change was made to the EPA scale wording with the highest level of performance revised to *Level 4 work ready*, rather than *independent and competent* as it was felt that in some areas of dietetic practice work is specialised therefore, students would not be expected to be "independent".

#### 2.6. Data analysis

Data were analysed using statistical software (SPSS, IBM version 25). Likert responses were converted to numerical scales with means and standard deviations to describe results. Mann-Whitney *U* tests were used to compare groups when appropriate with all data being non-parametric. Differences between means were considered significant if  $P < 0.05$ . The authors adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement when preparing the manuscript (von Elm et al., 2008).

### 3. Results

#### 3.1. Creation of EPAs for clinical dietetics, design and implementation of the work-based assessment tool

A total of 37 EPAs were developed and nested into subheadings (Data Collection, Diagnosis, Nutrition Management) that linked to the Nutrition Care Process (American Dietetic Association, 2008) or professional skills (communication skills, time management and professional behaviours). This design helped reinforce major skill areas required in clinical dietetics and improve navigation and usability of the e-portfolio.

A modified four-point entrustment scale was developed to assess student performance based on level supervisor support required to complete the activity (Chen et al., 2015). This scale ranged from "observing" where a student would watch a supervisor to "independent and competent" where the activity could be executed at a high enough standard without supervisor input. EPAs were mapped to competencies and milestones were created (Supplementary Materials 1 and Supplementary Materials 2).

EPAs were entered as two fields: one for student self-assessment and one for supervisor assessment. To allow formative and summative

feedback, students were assessed using the tool twice (mid-point and endpoint) on each of their three clinical placements. The same EPAs and entrustment scale were used for all work-based assessments. Supervisor fields were unlocked when the student self-assessment field had been completed. The e-portfolio contained a reporting feature allowing real-time tracking of student performance remotely and the export of assessment data to a CSV file enabling further analysis and feedback into the curriculum supporting programmatic assessment. Areas to upload informal feedback via a weekly paper supervision sheet were included as our pre-pilot survey results indicated a lack of IT infrastructure in the clinical setting. Additionally, upload fields for learning artifacts as evidence of achieving the EPAs were included. A free-text field for narrative feedback at mid-point and endpoint of each placement was included this has been identified in the literature to be important for promoting dialogue between student and supervisor and helping to contextualise current progress and set future learning goals (van der Schaaf et al., 2017). The intent of repeated application of the work-based assessment tool additionally aimed to increase familiarity with the technology addressing criticism from our previous study and reports in the literature that e-portfolios are difficult to use (Andrews and Cole, 2015; Garrett et al., 2013; Bramley et al., 2020).

### 3.2. Work-based assessment tool evaluation

Results of the voluntary anonymous evaluation surveys are presented in the following section. In total, 126 students and 101 supervisors were eligible to participate with surveys distributed to 38 students and 35 supervisors in 2017, 45 students and 29 supervisors in 2018 and 43 students and 37 supervisors in 2019. Only fully completed surveys were included for analysis. The demographics of each cohort of respondents is reported in Table 1.

Surveys were designed to evaluate face-validity, feasibility and acceptability of the work-based assessment tool. Table 2 reports on key survey items regarding face validity, Table 3 reports on key survey items regarding feasibility and Table 4 reports on key survey items regarding acceptability of the tool over the pilot (2017) and implementation (2018-2019) years. All results are reported as means and standard deviations. There were no significant intra-group differences for all survey item questions except for an item evaluating the adequacy of a four-point scale (Table 2) where a significant difference was detected between the 2017 and 2019 student cohorts ( $p < 0.046$ ). Responses of each group (students and supervisors) were pooled and means compared for significant difference reported as  $p$  values in Tables 2, 3 and 4.

Both students and supervisors reported a positive experience with the EPA based e-portfolio (students  $4.12 \pm 0.69$ , supervisors  $4.03 \pm 0.68$ ) and found the e-portfolio was effective to assess development on placement (students  $4.14 \pm 0.73$ , supervisors  $4.02 \pm 0.09$ ). Survey items evaluating face validity, feasibility and acceptability scored  $>3.75$  for both groups of users. Several significant differences were found between students and supervisors with students feeling more strongly that EPAs linked placement activities with competencies ( $p < 0.029$ ), identifying

strengths and weakness ( $p < 0.001$ ) and developing an understanding of what needed to be achieved on placement ( $p \leq 0.001$ ).

## 4. Discussion

This study is the first to our knowledge to report on development, implementation and longitudinal use of a work-based assessment tool utilising educational pedagogies of EPAs and self-assessment embedded in an e-portfolio in clinical dietetics. Our results suggest our tool was well accepted by three cohorts of dietetic students and their supervisors. The mean rating for students and supervisors regarding their experience of using the e-portfolio was positive. Face validity of the work-based assessment tool has been established with participants positively rating survey items related to this aspect. Importantly, both students and supervisors felt EPAs accurately assessed student performance on placement. Feasibility was confirmed by our results with items relating to this aspect scoring positively. The format, design and functionality of the e-portfolio were acceptable to all suggesting acceptability of EPAs, the inclusion of student self-assessment and overall e-portfolio design.

Importantly, both students and supervisors agreed on evaluation items with no differences between groups identified in most evaluation items. Evaluation scores remained stable over pilot and implementation years indicating longitudinal acceptance. Some significant differences between students and supervisors were found on items evaluating the function of EPAs to link activities performed on placement to assessment and helping to identify and focus learning needs. A recent study evaluating medical students' perspectives on EPAs found similar results with students appreciating the curriculum map provided by EPAs in describing placement outcomes (Martin et al., 2020). It should be noted, however, that pooled results were greater than four (agree) in both groups, suggesting statistical, but not practical, inter-group difference.

One between-group difference was detected comparing the 2017 to 2019 student cohort with regards to satisfaction with the four-point entrustment scale. A significant difference was found when comparing students and supervisors, with the latter more satisfied with a four-point scale. Compared to other evaluation items, the four-point performance rating scale was less well accepted by both groups with slight student preference being expressed for a five-point scale. This preference was also apparent with supervisors; however, decreased in later years of implementation suggesting increased acceptance with familiarity. The literature and practical considerations informed the decision to maintain a four-point scale for the implementation phase. Two well-known entrustment scales, the Ottawa Co-Activity scale (Gofton et al., 2012) and Chen supervisory scale (Chen et al., 2015) describe a highest performance rating, level 5, being able to teach others. This is not expected of a graduate dietitian and other reports of EPAs in entry-level health science report use of decreased item scales (Chen et al., 2015; Croft et al., 2020; Curran et al., 2018). From a practical perspective, the addition of an extra rating button would have resulted in significantly lengthening the tool which may have decreased ease of navigation. In contrast, while inclusion of self-assessment fields increased the tool's

**Table 1**  
Participant demographics.

	2017		2018		2019	
	Students ( $n = 17$ ) response rate 45%	Supervisors ( $n = 20$ ) response rate 57%	Students ( $n = 18$ ) response rate 40%	Supervisors ( $n = 24$ ) response rate 83%	Students ( $n = 15$ ) response rate 35%	Supervisors ( $n = 23$ ) response rate 62%
Age (mean $\pm$ SD years)	25.8 (5.64)	32.5 (4.99)	24 (4.32)	32.4 (5.83)	24.33 (3.15)	33.2 (6.12)
Supervision experience first time		1 (5.0%)		1 (4.2%)		1 (4.3%)
1-2 years		3 (15.0%)		5 (20.8%)		5 (21.7%)
3-4 years		4 (20.0%)		5 (20.8)		5 (21.7%)
5-10		6 (30.0%)		9 (37.5)		7 (41.2)
10+		6 (30.0%)		4 (16.7%)		5 (21.7)
Gender	2 male 15 female	1 male 19 female	0 male 2 female	2 male 22 female	1 male 14 female	0 male 23 female

**Table 2**

Face Validity of an e-portfolio with embedded EPAs and self-assessment during Individual Case Management Dietetic professional placement.

Survey item	Students mean ( $\pm$ SD)				Supervisors mean ( $\pm$ SD)				P value
	2017	2018	2019	Pooled	2017	2018	2019	Pooled	
The portfolio was effective to assess my development on placement	4.24 (0.44)	4.28 (0.58)	3.87 (1.06)	4.14 (0.73)	3.90 (0.79)	3.88 (0.90)	4.09 (0.73)	4.02 (0.09)	0.163
The skill descriptors accurately assessed performance of placement	4.29 (0.77)	3.83 (0.86)	3.73 (1.16)	3.96 (0.95)	3.85 (0.67)	3.67 (1.00)	3.74 (0.69)	3.78 (0.78)	0.11
The current 4-point scale adequately describes the range of performance on placement	3.53 (1.01)	2.67 (1.19)	2.60 (1.24)	2.94 (1.20)	3.55 (0.95)	3.33 (1.20)	3.3 (0.97)	3.43 (1.02)	0.035
I was comfortable with interpreting the skill descriptors and rating my/ my student's performance	4.29 (0.47)	4.44 (0.51)	4.20 (0.78)	3.80 (1.11)	4.00 (0.56)	3.79 (1.02)	4.12 (0.63)	4.02 (0.74)	0.132
The skill descriptors helped me link day to day activities on placement with the graduate entry dietetics competencies.	4.59 (0.62)	4.28 (0.83)	4.20 (0.78)	4.18 (0.75)	4.00 (0.56)	3.79 (0.83)	4.00 (0.60)	3.95 (0.67)	0.029

Survey responses of students and supervisors were pooled across the 3 years of the study and means were compared to identify inter-group differences. *P* values were calculated using Mann Whitney-U tests and considered significant if  $p < 0.05$ .

**Table 3**

Feasibility of an e-portfolio with embedded EPAs and self-assessment during Individual Case Management Dietetic professional placements.

Survey item	Students mean ( $\pm$ SD)				Supervisors mean ( $\pm$ SD)				P value
	2017	2018	2019	Pooled	2017	2018	2019	Pooled	
The skill descriptors helped me/ my student identify my strengths and weaknesses in individual case management.	4.59 (0.62)	4.28 (0.83)	4.20 (0.78)	4.36 (0.75)	3.80 (0.77)	3.96 (0.91)	4.00 (0.52)	3.98 (0.67)	0.001
The skill descriptors helped me understand what I needed to achieve on placement	4.53 (0.62)	4.56 (0.51)	4.47 (0.52)	4.52 (0.54)	3.80 (0.77)	4.00 (0.89)	4.09 (0.60)	4.02 (0.72)	<0.001
The skill descriptors helped me/ my student take charge of my learning needs	4.47 (0.51)	3.94 (0.87)	3.87 (0.99)	4.10 (0.84)	3.60 (0.68)	3.58 (0.97)	3.87 (0.76)	3.72 (0.8)	0.005
It was useful to document my performance on the e-portfolio twice on placement (mid-point and end of placement)	4.59 (0.51)	4.44 (0.78)	4.40 (0.51)	4.48 (0.61)	4.20 (0.77)	4.33 (0.70)	4.52 (0.51)	4.40 (0.61)	0.31
It is useful for me/ my student to self-assess my performance against skill descriptors prior to supervisor assessment	4.24 (0.56)	4.33 (0.67)	4.27 (0.80)	4.28 (0.67)	4.25 (0.72)	4.42 (0.65)	4.52 (0.51)	4.43 (0.61)	0.31
Self-assessment helped me track progress and develop a plan for improvement	4.12 (0.78)	4.17 (0.51)	4.20 (0.78)	4.16 (0.69)	3.95 (0.76)	4.04 (0.69)	4.04 (0.83)	4.02 (0.76)	0.23
I would prefer a 5-point scale	3.47 (1.23)	3.78 (1.00)	4.20 (1.08)	3.8 (1.13)	3.45 (0.99)	3.29 (0.96)	3.52 (1.04)	3.40 (0.98)	0.038

Survey responses of students and supervisors were pooled across the 3 years of the study and means were compared to identify inter-group differences. *P* values were calculated using Mann Whitney-U tests and considered significant if  $p < 0.05$ .

**Table 4**

Acceptability of an e-portfolio with embedded EPAs and self-assessment during Individual Case Management Dietetic professional placement.

Survey item	Students mean ( $\pm$ SD)				Supervisors mean ( $\pm$ SD)				P value
	2017	2018	2019	Pooled	2017	2018	2019	Pooled	
I was comfortable using the e-portfolio	4.29 (0.47)	4.44 (0.51)	4.20 (0.78)	4.32 (0.59)	3.90 (0.85)	4.13 (0.54)	4.30 (0.56)	4.15 (0.64)	0.074
I found the e-portfolio interface easy to use and navigate	4.06 (0.66)	4.17 (0.79)	3.20 (1.27)	3.84 (1.0)	3.85 (0.88)	4.13 (0.80)	4.22 (0.67)	4.11 (0.75)	0.248
Overall, I would describe my experience using the PebblePad® e-portfolio as positive	4.24 (0.6)	4.22 (0.65)	3.87 (0.74)	4.12 (0.69)	3.90 (0.85)	4.09 (0.61)	4.09 (0.60)	4.03 (0.68)	0.473
The amount of time taken for me to complete the student section of the e-portfolio was	100	100	93		90	83	87		
Reasonable (% respondents)			7		10	17	13		
Too much (% respondents)									
I like the fact that the same layout and assessment are used on each placement block	4.47 (0.51)	4.61 (0.50)	4.53 (0.52)	4.45 (0.50)	4.40 (0.50)	4.21 (0.51)	4.43 (0.59)	4.35 (0.54)	0.055

Survey responses of students and supervisors were pooled across the 3 years of the study and means were compared to identify inter-group differences. *P* values were calculated using Mann Whitney-U tests and considered significant if  $P < 0.05$ .

length, this feature was retained as it was supported by the literature and seen as valuable by both students and supervisors in the pilot year (Eva and Regehr, 2005).

There are several strengths to our study including the longitudinal nature that reports on implementation and evaluation over three cohorts of graduating students and their supervisors. The number of participants was limited by small numbers within the cohorts; however, response rates were high, particularly among supervisors. Lower response rates from students may be a result of the demands of coursework and lack of personal benefit from participating, given they had no further

placements. Student response rates of 35-45% were reasonable given these factors, but do decrease confidence in our results. The application of mobile health informed methodology of a pilot year to incorporate user feedback in design and functionality resulted in a work-based assessment tool that fits well for purpose and is effective. The EPA work-based assessment tool demonstrated validity, feasibility and acceptability among students and supervisors.

The number of EPAs we developed may be further critiqued as 37 EPAs could be viewed as excessive and not in keeping with the definition of an EPA (Ten Cate, 2013). A challenge with EPA use in entry-level

education is to enable EPAs to be specific enough to guide student improvement. The ability to conduct a nutrition assessment depends on many separate activities being performed correctly. If the EPA were defined as “conduct a nutrition assessment”, this would not be specific enough to guide students on how to improve; namely do they need to improve data collection or is interpretation incorrect? Others have solved this problem by listing separate items or behavior descriptors under each EPA (Lau et al., 2020; Peters et al., 2017) or developing observable practice activities that nest into a more generalised EPA (Warm et al., 2014). We found students and supervisors were satisfied with the length of time required to complete the tool suggesting that the number of EPAs was not excessive. Further research into the ideal number of EPAs for entry-level health professions education is needed to understand and balance the competing priorities of granularity and overall utility. There is potential to conduct item analysis with a view to decreasing the number of EPAs in our tool, although larger participant numbers would be required to adequately power such a study.

As with other reports of EPA use, this study is limited to a single discipline at a one institution which may limit impact. Furthermore, it is possible supervisors completed surveys more than once and this may be a source of bias. The method of creation and mapping of our EPAs could further be critiqued. Other professions report national working parties utilising consensus building methodology such as Q sorting or Delphi (Englander et al., 2016; Haines et al., 2016; Nayyar et al., 2019). Despite the small size of our working party that included less representation from practising clinicians, our EPAs appear to be well accepted given the high satisfaction with all users.

There has been a recent Australian effort to define EPAs nationally in dietetics, however this was published during the late implementation phase of this project so could not be incorporated (Begley et al., 2019). Furthermore, these EPAs are broad and context independent and thus would provide insufficient detail for formative student feedback during placement (Chen et al., 2015). The Australian dietetic EPAs help create a shared mental model of a work-ready graduate dietitian which is useful for assessment; however, the lack of a widely accepted work-based assessment tool remains. Our well accepted, feasible and valid EPA based e-portfolio offers potential to fill this gap with acceptability being critical for user “buy-in” (Carraccio and Englander, 2013). Use of an entrustment scale and narrative descriptors of real-world tasks assists clinicians charged with student assessment to make meaningful judgments that balance student learning and patient safety in a practical sense (Rekman et al., 2016). Supervisors were able to use and interpret the tool with minimal training which has positive implications for sustainability of the model and increases potential for uptake at other institutions (Rekman et al., 2016). Furthermore, the design of the tool allows automatic collection of educational data which offers potential to increase our understanding of how students are trusted to practice.

## 5. Conclusion

The findings support acceptability, face-validity and feasibility of utilising EPAs in a work-based assessment tool for clinical dietetic student placements. The tool supports reflective practice through student self-assessment and helps provide a curricular map linking work-based activities to competencies in a meaningful way that is understood by students and supervisors. Users found the tool effective to judge student performance as EPAs describe work that is done by practising clinicians. Minimal resources were required to implement and sustain correct use of the tool offering potential for use by others. Our EPA based assessment tool effectively supports student skill development on placement, assesses performance and provides evidence of achievement of competency standards in a work-based setting that can be incorporated in programmatic assessment.

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## CRedit authorship contribution statement

AB designed and led the study and prepared the manuscript with support from AF and LM. All authors critically reviewed and edited the manuscript and approved the final copy and declare that the content has not been published elsewhere.

## Declaration of competing interest

This project was funded by a Scholarship of Learning and Teaching Grant from La Trobe University. No conflict of interest is declared by the authors.

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## Supplementary Materials 1

### Clinical Dietetic Entrustable Professional Activities and Dietitians Australia National Competency Standards for Entry Level Dietitians matrix and milestones

			Expected level of performance level*		
		NCS	A	B	C
	<b>Data collection</b>				
1	Collects appropriate data from the medical file	2.1.1	3	3-4	4
2	Collects and correctly interprets relevant biochemistry	2.1.1	3	3-4	4
3	Collects and correctly interprets relevant anthropometry	2.1.1	3	4	4
4	Collects and interprets correctly clinical information and medications	2.1.1	3	3	4
5	Collects and interprets relevant social, physical, environmental data	1.5.3, 1.5.2	3	4	4
6	Correctly estimates nutrition requirements using appropriate equations or evidenced based values	2.1.1	3	4	4
7	Obtains accurate and complete dietary information using the most appropriate method that considers social background, is linked to nutrition and medical problems and can analyse dietary information qualitatively and quantitatively	2.1.14.1.4	3	4	4
8	Demonstrates an understanding of and is able to use nutrition screening and assessment tools	3.1.1, 3.1.2	3	4	4
	<b>Communication skills</b>				
9	Greets patient appropriately and introduces self and other present	4.1.2	3	4	4
10	Establishes rapport with patient	2.3.2, 4.1.2	3	3	4
11	Understands and is able to explain to the patient the reason for Dietetic intervention/ referral	4.1.1, 4.1.3,	3	3	4
12	Uses open and closed questions appropriately	2.3.2, 4.1.4	2	3	4
13	Obtains/ confirms medical/ social / clinical history from patient as appropriate	1.5.3, 2.1.1,	2	4	4
14	Uses appropriate verbal and non verbal communication strategies	2.3.2, 4.1.3, 4.1.4, 4.1.5	2	3	4
15	Interviews are conducted in a flexible yet logical sequence	2.1.1, 2.3.2, 4.1.4	2	3	4
16	Uses appropriate language throughout the interview and is able to translate technical information into practical advice/ information	2.3.2, 4.1.3, 4.1.4, 4.1.5	2	3	4
	<b>Diagnosis/ Problem ID ( one tab with nutrition management)</b>				

17	Identifies and understands major medical problems and impact on nutritional status or management	2.1.1	2	3	4
18	Is able to identify and prioritise major nutritional problems	2.1.2, 2.2.3	2-3	3	4
19	Is able to develop a nutritional diagnosis/ problem ID and verbalise clinical reasoning	2.1.2, 2.2.3, 3.1.1	2-3	3	4
	<b>Nutrition Management</b>				
20	Formulates and prioritises, tailored goals and objectives for nutrition management and can justify choices	2.1.3, 2.2.3, 2.2.5, 2.3.1, 3.1.3	2	3	4
21	Able to provide appropriate, tailored nutrition education that addresses the nutrition problems/ diagnosis	2.1.1, 2.1.4, 2.2.1, 2.2.5, 2.3.1, 2.3.3, 4.1.3, 4.1.4	2	3	4
22	Works in partnership with patient, carers and health care team to develop an appropriate plan	1.3.1, 2.1.3, 2.1.4, 2.3.3, 3.1.3, 4.1.2, 4.2.3, 4.3.2, 4.3.3	1	2-3	4
23	Follows up patients appropriately and adjusts care plan accordingly	1.3.2, 2.1.4,	1	2-3	4
24	Documents nutrition care in the medical record	1.2.3	2	3	4
25	Accesses the food service system to support nutrition care	1.4.4, 2.1.4, 2.2.4	2	3-4	4
	<b>Time Management</b>				
26	Manages own time effectively	1.1.7, 1.3.5, 1.4.1	2	3-4	4
27	Manages time with patients effectively	1.1.7, 1.4.1	2	3-4	4
28	Able to plan and prioritise workload	1.1.7, 1.3.5, 1.4.1	2	3	4
	<b>Professional behaviour</b>				
29	Communicates appropriately with Dietetic and other hospital staff	1.1.2, 4.1.1, 4.1.5, 4.3.1, 4.3.1	2-3	3-4	4

30	Demonstrates respect and professionalism at all times ( professional language, punctuality and attitude)	1.1.6,4.3.5	4	4	4
31	Is actively engaged with all learning opportunities provided by clinical sites	1.1.4	4	4	4
32	Improves practice in responds to feedback provided by supervisors and own reflections	1.3.3, 1.3.4, 1.5.1	3	4	4
33	Maintains patient confidentiality	1.2.1	4	4	4
34	Maintains safe practice ( does not provide unsupervised advice)	1.1.2, 1.1.5	4	4	4
35	Follows procedure for absence and all relevant hospital procedures such as infection control.	1.1.6	4	4	4
36	Is able to use hospital communications and data management facilities appropriately	1.2.3, 1.4.4	4	4	4
37	Is an active member of the health care team and advocates for nutrition care	4.3.1, 4.3.1, 4.3.5	2	3	4

\*A,B,C refers to the three clinical placements in the program

observing= 1 highly assisted= 2 3= minimal assistance 4=independent and competent

**Supplementary Materials 2. Clinical EPA work-based assessment tool Student and Supervisor evaluation survey**

1. The course I am studying is
2. My age is
3. My gender is
4. I received enough information to activate and use the IPB/IPC placement workbook  
*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*
5. I found the e-portfolio interface easy to use and navigate  
*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*
6. I found the 'about me' page useful to tell my supervisors about me and my learning needs  
*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*
7. The portfolio was effective to assess my development on placement  
*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*
8. I liked that I was assessed against skill descriptors rather than directly against competencies  
*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*
9. The skill descriptors helped me identify my strengths and weaknesses in individual case management.  
*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*
10. The skill descriptors helped me understand what I needed to achieve on placement  
*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*
11. The skill descriptors accurately assessed my performance of placement  
*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*
12. The skill descriptors helped me take charge of my learning needs  
*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*
13. I was comfortable with interpreting the skill descriptors and rating my performance  
*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*
14. My supervisor was comfortable with interpreting the skill descriptors and rating my performance

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

15. My supervisor appeared comfortable with using the e-portfolio

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

16. I was comfortable using the e-portfolio

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

17. The skill descriptors helped me link day to day activities on placement with the graduate entry dietetics competencies.

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

18. I would prefer to assess directly against the competencies rather than skill descriptors

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

19. The subheading sections are useful to help the structure and usability of the workbook

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

20. The subheadings sections help reinforce the Nutrition Care Process

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

21. Can you suggest any improvements to the subheadings sections

*Free text response*

22. It was useful to document my performance on the e-portfolio twice on placement ( mid point and end of placement)

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

23. The weekly feedback sheet was useful to provide feedback and keep me on track

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

24. The weekly feedback sheet was useful to help me develop improvement goals

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

25. I would prefer the weekly feedback sheet to be

*Paper only/ paper with upload option (current method)/ electronic only*

26. The current 4-point scale adequately describes the range of performance on placement

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

27. I would prefer a 5-point scale

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

28. I would prefer another description or performance rating ( please describe)

*Free text response*

29. A requirement for this placement was for students to be pro-active and drive their own placement learning. As such students are required to self-assess against each skill descriptor prior to meeting with their supervisor.

It is useful for me to self-assess my performance against skill descriptors prior to supervisor assessment

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

30. Self-assessment helped me track progress and develop a plan for improvement

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

31. Overall, I would describe my experience using the PebblePad® e-portfolio

*Highly negative/ negative/ neutral/ positive/ highly positive*

32. The amount of time taken for me to complete the student section of the e portfolio was

Too little/ reasonable / too much

33. I like the fact that the same layout and assessment are used on each placement block

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

34. I completed the student section of my e-portfolio

*Mostly at home/ mostly during placement/ combination of home and placement*

35. Are there any skills or aspects of placement that are not captured in the e-portfolio that you think should be?

*Free text response*

36. Are there any other thoughts you would like to share about the e-portfolio used in clinical placements including suggested improvements?

*Free text response*

## 6.4 Conclusion

This study is the first to report on the development of an EPA-based assessment tool for work-based assessment in clinical dietetics. A total of 37 EPAs were developed for clinical dietetics and mapped to the Nutrition Care Process and the National Competency Standards for Dietitians in Australia demonstrating context validity. The EPA based work-based assessment tool embedded in a e-portfolio with students demonstrated content validity, context validity, feasibility and acceptability in three cohorts of dietetic students and their supervisors. The inclusion of student self-assessment against the EPAs help support reflective practice. EPAs create a curricular map and link the work-based activities to competencies in a way that is meaningful to both dietetic students and supervisors. Examples and excerpts of the portfolio can be found in Appendix 1. Chapter 7 will further evaluate the tool by exploring construct validity, milestones and educational impact of EPA in clinical dietetics.

## Chapter 6 B: Development and evaluation of Entrustable Professional Activities for work-based assessment in community and public health dietetics

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### 6.5 Declaration of authorship: Chapter 6 B

Student's declaration:

The nature and extent of contributions to Chapter 6 B are

Name	Nature of Contribution	Contribution %
Andrea Bramley	Study concept and design, ethics application, data collection, data analysis, manuscript preparation and revision for publication	80
Lisa McKenna	Advice on data analysis, advice on manuscript structure, revision of manuscript	10
Adrienne Forsyth	Advice on data analysis, advice on manuscript structure, revision of manuscript	10

### 6.6 Preface to Chapter 6 B

This study has been submitted for publication in *Health and Social Care in the Community*. The study has undergone peer review with changes requested by the reviewers. An unmarked revised copy is included in its submitted form. The objective of this study was to design, implement and evaluate a work-based assessment tool using EPAs embedded in an e-portfolio for use in community and public health dietetic context. The study also reports on the findings of the exploratory study which was not published separately due to low participant numbers. As with Chapter 6 Part A, specific aspects of utility were evaluated namely, content and context validity, acceptability and feasibility.

## 6.7 Publication

## **Development and evaluation of Entrustable Professional Activities for work-based assessment in community and public health dietetics**

Entrustable Professional Activities (EPAs) is a recent concept that helps operationalise competency-based education. In this paper, we report on development of EPAs and incorporation into an e-portfolio for work-based assessment of final year dietetics students in a community and public health professional placement. We aimed to determine the utility of the EPAs for work-based assessment in this context. Using action research methodology, broad consultation with students and supervisors using anonymous surveys and focus groups on their beliefs and attitudes towards work-based assessment was conducted. Consequently, 40 EPAs with an accompanying four-point entrustment scale were developed and mapped to the National Competency Standards for Dietitians in Australia. The EPAs and assessment tool were piloted and evaluated via an anonymous on-line user survey across three cohorts of students (n= 133) and supervisors (n=67). Following mediocre pilot year evaluation results, EPAs were revised and reduced in number. While students positively evaluated the e-portfolio, their appraisal of the EPAs and entrustment scale was less positive compared to supervisors. Supervisor evaluation of the EPA-based e-portfolio supported validity, feasibility and acceptability of this novel assessment method in a community and public health setting. Assessment using EPAs, and the resulting educational data collected by the tool, offers potential for individual learners to identify areas needing development during placement, as well as potential to inform curriculum improvements and increase understanding of learning opportunities and outcomes for dietetic students in community and public health settings.

**Key words:** Entrustable Professional Activities, e-portfolio, work-based assessment, competency-based education, dietetic education

## **What is Known**

- Entrustable Professional Activities (EPAs) represent an enhancement to competency-based education by operationalising competency frameworks into observable activities
- EPAs are gaining popularity in health professional education for work-based assessment
- There are currently limited examples of EPA use in the community and public health setting of any profession

## **What this paper adds**

- Community and Public Health dietetic EPAs demonstrate utility for work-based assessment of entry level dietetic students
- EPA based assessment offers potential to increase understanding of how students develop competency and learning opportunities during supervised professional placements
- Student assessment using EPAs in community and public health settings can be valid, acceptable and feasible

## **1.0 Introduction**

Work-based placements are a fundamental feature of health professional entry-level degrees allowing students to demonstrate that they can translate knowledge, skills and attitudes into professional practice contexts (Carraccio et al., 2008). Use of entrustable professional activities (EPAs) is becoming an increasingly popular and accepted assessment strategy, helping operationalise competency-based education in work-based settings (Shorey et al., 2019). EPAs are units of observable work that a competent professional does as part of their health care role (Hauer et al., 2014; ten Cate, 2013). They have been extensively used in postgraduate medicine (Aimer et al., 2016; Rose et al., 2014), are emerging in international entry-level medicine (Meyer et al., 2019) and gaining increasing acceptance in entry-level nursing (Lau et al., 2020; Shorey et al., 2019), pharmacy

(Haines et al., 2017) and allied health professions, such as dietetics (Begley et al., 2019; Wright & Capra, 2017), with entry-level defined as being immediately prior to registration. To date, adoption of EPAs has predominantly occurred in inpatient health care settings, but there are early examples of use in community-based medicine and pharmacy (Bramley & McKenna, 2021, Chang et al., 2013; Russo et al., 2016; Valentine et al., 2019; Westein et al., 2019).

Dietetics courses in Australia include three main different practice areas with supervised work-based placements in each area (Dietitians Association of Australia, 2017). Clinical dietetics involves the provision of medical nutrition therapy for an individual and is typically based in a hospital setting. Food service dietetics involves the provision of dietetic interventions for populations dependent on a food supply for their nutrition intake such as hospitals, prisons or residential aged care. Community/public health dietetics involves provision of project-based health promotion or population/ program-based nutrition interventions delivered using the program management cycle in a community or public health organisation (Grier & Bryant, 2005). These placements allow the development of cultural competencies, preventative and public health experiences that may be difficult to obtain in other settings. Community and public health dietetic placements are used for assessment of students against the national competency standards for dietitians in Australia (Dietitians Australia, 2015); however, lack of a widely accepted work-based assessment tool for use in clinical dietetics has been noted (Jamieson et al., 2019) and there is little published literature regarding assessment of students in food service or community domains of dietetics (Palermo et al., 2018).

The dominant reported assessment strategy appears to be portfolio-based approaches where students collate evidence of learning and demonstration of competencies (Porter et al., 2015). An assessment challenge in community and public health dietetics is that students may have diverse placement experiences and typically incorporate project work (Bacon et al., 2018). Placement supervisor feedback tends to be formative with summative competency assessment performed by

university academics incorporating additional evidence linked to oral presentations, written project reports or student reflection on placement experiences (Palermo et al., 2015). It has been the authors' experience that students, who associate assessment with feedback, can become frustrated with perceived lack of assessment (Palermo et al., 2018). As EPAs describe work that is done by practising professionals, the use of EPAs offers potential to satisfy the need of students for feedback, promote reflection and link placements explicitly to competency development while the e-portfolio allows some flexibility for the collation of additional evidence of learning that meet the needs of academics charged with overall assessment of competency against the standards.

Although EPAs had been used previously in the clinical context at (removed for peer review) University, the release of revised entry-level competencies for graduate dietitians by Dietitians Australia (DA) provided opportunity to explore the use of EPAs as a work-based assessment strategy in community and public health (Dietitians Australia, 2017). At project commencement, there was no known use of EPAs to assess dietetics students in community or public health settings. However, there has been recent work in the dietetic community to develop a national set of EPAs (Begley et al., 2019). This work represents a considerable advance to create a shared mental model of a work-ready dietetic graduate, however these EPAs are phrased to be applicable to all areas of practice and may lack specificity to facilitate assessment in specific settings such as community and public health (Chen et., 2015).

Use of EPAs for work-based assessment is appealing as they link the work that is done by practising professionals to competencies and are readily understood by students and educators (Bramley & McKenna, 2020). Milestones are another concept used to enhance competency-based assessment and they help describe expected levels of performance at different time points (Carraccio et al., 2017; Tekian, et al., 2015). EPAs offer potential means to measure both dietetic student performance and community and public health educational experiences addressing a gap in published literature regarding the attainment of dietetic competence in this setting.

This study aimed to develop, implement and evaluate EPAs embedded in an e-portfolio for work-based assessment of dietetic students in the community and public health setting. We evaluated the utility of this assessment approach using the framework proposed by van der Vleuten (1996) and van der Vleuten and Schuwirth (2005) that describes utility as a product of validity, feasibility, reliability, cost and educational impact. The focus of this report is to describe the development, validity (content-and context validity) and feasibility of the community and public health dietetic EPAs and associated assessment tool. As a proxy for cost, we investigated acceptability and user experience of the tool. Evaluation of construct validity, educational impact and the development of milestones are planned for future investigation as a greater sample size is required.

## **2.0 Methods**

This study was conducted between November 2016 and November 2019 with final-year dietetics students from (removed for blind peer review) and their supervisors, practising dietitians from affiliated community and public health organisations in metropolitan and rural Australian locations. The development of community and public health dietetic EPAs was performed concurrently with development of clinical EPAs which has been reported separately (Removed for blind peer review). The study was approved by the HREC of “removed for blind peer review “university (#S16-198).

### **2.1 Placement program**

The community and public health placement at (removed for blind peer review) is a five-week/ 25-day full-time placement alternating with a five-week/ 25-day final clinical placement in the last semester of study. Students are expected to complete a project, or part of a project, that addresses a nutritional problem in the community where they are placed, in addition to observing and contributing to usual business of the placement site. Students have previously completed clinical and food service placements, but this is their first experience of community and public health dietetics.

### **2.2 Project team**

The project team consisted of the lead author, an experienced clinical dietitian and academic, and other faculty members with expertise in community and public health dietetics and dietetic education. The project team was supported by a university statistician and educational designers.

### **2.3 Methodology**

Van der Vlueten (1996) suggest there are several aspects that underpin utility including feasibility, acceptability and multiple types of validity. As different methods are required to measure each component of utility, an action research methodology, informed by mobile health development was chosen to allow different research methods and facilitate the input of users, essential to achieve feasibility and acceptability of an electronic tool (Whitaker et al., 2013). A recent systematic review examining EPAs found that most EPA development and implementation studies employed methodology that allowed for iterative revision (O'Dowd et al., 2019). Figure one depicts each action research cycle including inputs and outputs. A time series design was used to seek feedback as part of three action research cycles performed with four cohorts of dietetic students and their supervisors, as follows:

**Formative cycle** (2016) to determine learners' and teachers' perspectives and needs regarding work-based assessment to develop EPAs and the electronic assessment tool

**Action research cycle 1** Pilot cycle (2017) to field-test the EPAs for validity, acceptability and feasibility

**Action research cycle 2-3.** Implementation/ evaluation cycles (2018, 2019) to determine validity, acceptability and feasibility following revision of EPAs and tool post-pilot

### **2.4 Formative cycle**

The intent of the formative phase of the project was to determine user views regarding the current e-portfolio and explore alternative assessment options, such as EPAs, for assessment of community and public health placements. All final-year dietetics students (n=38) and their supervisors (n= 19)

were invited to complete electronic surveys distributed by anonymous web-link to provide qualitative and quantitative feedback. Surveys consisted of 13 questions (Likert scale, 1=highly dissatisfied/strongly disagree to 5=highly satisfied/strongly agree), four questions regarding experiences of using the e-portfolio, two qualitative responses and three demographic questions (Supplementary materials 1). Topics evaluated included frequency and timing of assessment, assessment methods and inclusion of student self-assessment. Surveys were designed by the lead author with face validity established through consultation with the project team and experienced dietetic academics outside the team. Prior to distribution, surveys were pilot tested for functionality within the project team and then distributed in the final week of placement. Surveys remained open for three weeks with a reminder sent one week prior to closing. Participants were incentivised to complete the survey through offer of a prize (\$50 gift-card) with anonymous results distributed to the project team to inform development of discussion points for subsequent focus groups (Supplementary materials 2). Focus groups aimed to obtain additional information regarding assessment methods, including use of EPAs and practicalities of assessment in the workplace. Evaluation of placement assessment methods for clinical and foodservice placements were performed concurrently and have been reported elsewhere (reference removed for blind peer review).

### **EPA development**

The method described by Mulder et al. (2010) was used to develop the EPAs for community and public health dietetics and for subsequent revisions. The Mulder method involves the use of experts in the field to select and describe the EPA with attention paid to how the learner will have opportunities to perform the EPA, receive feedback and be assessed. Other more common methods reported in the literature for developing EPAs include establishing broad working parties (Chang, et al., 2013) or Delphi approaches (Hauer, et al. 2014) were not possible due to the short implementation timelines owing to placement timing in the academic year. To address this potential

shortcoming, action research enabled practicing community and public health dietitians to have input into the EPAs. A four-point entrustment scale was chosen for consistency with the clinical EPAs; however, due to the breadth of potential experiences, an additional item of 'Not Assessed' was included should students not have an opportunity to execute that EPA. The EPAs were mapped to the National Competency Standards for dietitians in Australia in a matrix (Supplementary materials 3) to establish context validity.

### **E-portfolio design**

The e-portfolio was designed and created using Pebblepad® portfolio software. The new e-portfolio incorporated features identified as important by all stakeholders (students, supervisors and academics) in the formative study (reference removed for blind peer review):

1. EPAs and entrustment scale for work-based assessment
2. Fields for student self-assessment
3. Two assessment points (assessment for learning and of learning)
4. The ability to generate educational data to inform teaching
5. User-friendly navigation
6. The structure reinforces provision of dietetic care in community and public health
7. Opportunity to describe student learning preferences, interests and previous experience in advance of placement

### **2.5 Action Research cycle 1 Pilot of EPAs and e-portfolio**

Prior to pilot field testing, the e-portfolio with embedded EPAs was tested for functionality and educational data reporting capability by the lead author. The new EPA-based e-portfolio was piloted with the 2017 student cohort (n=37) and their community and public health placement supervisors (n=18). Students were orientated to the e-portfolio in class and supervisors through a remote group training session via videoconference. Additional written instructions regarding e-portfolio and EPAs

used to assess performance and expectations were included within the e-portfolio, as were instructions for placement assessment. Individual training for new supervisors was provided as part of general orientation to the placement in 2018 and 2019.

### **EPA and e-portfolio evaluation**

Content validity, feasibility and acceptability of the EPAs and work-based assessment tool were evaluated using surveys distributed to users (students and supervisors) via anonymous web-link. Surveys were distributed to students and supervisors in the week following placement with a reminder seven days later, with timing chosen to maximise response rate and ensure recency of experience following low response rate in action research cycle 1. No incentives were provided for participating.

The surveys consisted of two demographic questions and 25 Likert scale response questions designed to evaluate content validity, acceptability and feasibility of the EPAs and structure and function of the e-portfolio, including inclusion of student self-assessment and design (Supplementary materials 4). Seven free-text response questions offered opportunity for participants to provide more detailed feedback regarding their experience with the work-based assessment tool. As participants were non-academics, the term “skill descriptors” was used in place of EPAs to overcome lack of familiarity with this recent academic term.

### **2.6 Action research cycle 2 and 3: Implementation, content validity, acceptability and feasibility evaluation**

#### **Modification of EPAs and e-portfolio work-based assessment tool**

Following the 2017 evaluation cycle, the community and public health dietetic EPAs were modified and re-mapped to the competencies in a matrix (Supplementary materials 5). The modifications were made by the lead author in conjunction with the academic domain lead for community and

public health dietetics. The new EPAs were mapped to the National Competency Standards for Dietitians in Australia to determine context validity. No changes were made to e-portfolio design and inclusion of student self-assessment remained. A change to the entrustment scale was made in 2018 with the wording of level 4 “independent and competent” changed to “work ready” to reflect the highly collaborative nature of dietetic work in this setting.

### **EPA and e-portfolio work-based assessment tool evaluation**

Student and supervisor evaluation of EPAs and the work-based assessment tool was repeated with surveys distributed to all students (2018 n = 48, 2019 n=49) and their supervisors (2018 n =25, 2019 n=24) using the methods described in action research cycle 1.

## **2.7 Data analysis**

Data were analysed using statistical software (SPSS, IBM version 25). Likert responses were converted to numerical scales using means and standard deviations to describe results. Group means were compared using ANOVA with Bonferroni correction for normally distributed data or Mann-Whitney U tests for non-parametric data. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement was adhered to when preparing the manuscript (Von Elm et al., 2008).

## **3.0 Results**

The results of each action research cycle are reported below. As the evaluation methods for cycle 2 and 3 are identical, results have been presented in table format to allow for comparisons between each cohort. Demographics of each cohort of respondents are reported in Table 1. Table 2 reports on key survey items regarding content validity, Table 3 reports on key survey items regarding

acceptability and Table 4 reports on key items regarding feasibility of the EPA based e-portfolio over the evaluation period. Results from 2018 and 2019 have been pooled to simplify reporting. Results are reported as means and standard deviations.

### **Formative cycle**

Formative evaluation of existing assessment methods was inconclusive due to low response rates in the evaluation (Students n=4, response rate 7% and Supervisors n=7, response rate 36%) and focus groups (n=2). Students and supervisors reported mean levels of overall satisfaction with the existing assessment e-portfolio with competency-based assessment method as  $3.50 \pm 1.30$  and  $3.54 \pm 0.53$  respectively. As survey response rates were low, focus group questions developed for the evaluation of the clinical e-portfolio (reference removed for blind peer review) were adapted for the community and public health setting. Results of the mixed methods clinical dietetics evaluation indicated the preferred work-based assessment approach was EPAs embedded in an e-portfolio (reference removed for blinded peer review). Owing to the low participation in this phase of the study, the team elected to use an e-portfolio with embedded EPAs for work-based assessment in community and public health placements so that the assessment method would be consistent across placement types and decrease the cognitive load for students with regards to navigating software. It also presented an opportunity to test the potential of EPAs for assessment in a non-clinical setting.

### **Creation of EPAs for community and public health dietetics and design of the e-portfolio work-based assessment tool.**

A total of 40 EPAs were developed and linked to the National Competency Standards for dietitians (Supplementary material 3). The community and public health dietetic EPAs were nested into subheadings reflecting the program management cycle derived from social marketing (needs

assessment, planning, implementation, evaluation and dissemination) and professional skills (cultural competency and professional behaviour) (Grier & Bryant, 2005).

A four-point entrustment scale ranging from level 1 (observing) to level 4 (independent and competent) was developed to assess student performance based on level of supervisor input needed to execute the activity to a satisfactory level (Chen et al., 2015). Given the breadth of experiences possible in the community and public health dietetic placement, and that these placements focused typically on only one aspect of the performance management cycle, an additional grade of 'Not Assessed' was incorporated into the assessment scale to allow students and supervisors to indicate an activity was not performed during the placement. Milestones were not created due to an absence of literature to inform mapping and the short nature of the 25-day placement.

Performance feedback using the work-based assessment tool was provided to students at mid-placement (formative feedback) and end of placement (summative feedback). Students were required to self-assess their performance against each EPA at each time point which triggered unlocking of a corresponding supervisor field. Academics were able to track students' feedback remotely in real time and assessment data could be exported into a CSV file for input into programmatic assessment and for future analysis of trends within and between student cohorts. Additional areas to upload informal feedback via a weekly paper goal sheet were included to ensure students and supervisors discussed project progress. Fields to upload learning artifacts as evidence of achieving EPAs were incorporated into the e-portfolio design. A free-text field for qualitative feedback at mid-point and endpoint of each placement was included as qualitative feedback has been identified in the literature to be important for learning (van der Schaaf, et al., 2017). Although EPA content differed, design and navigation of the clinical and community and public health dietetics e-portfolios were very similar. The intent of this was to increase familiarity with the technology,

addressing criticism in the literature and from our previous study that e-portfolios are difficult to use (Andrews & Cole, 2015; Garrett et al., 2013; reference removed for peer review).

### **Action research cycle 1**

When compared to the 2016 formative evaluation, mean overall satisfaction in 2017 remained relatively unchanged for students ( $3.50 \pm 1.30$  vs  $3.42 \pm 0.52$ ) and supervisors ( $3.54 \pm 0.53$  vs  $3.78 \pm 0.44$ ) following implementation of the community and public health dietetic EPAs and e-portfolio. This, in combination with low or ambivalent student responses to evaluation survey items regarding the ability of EPAs to link work activities to competency standards ( $2.58 \pm 0.79$ ) and the ability of EPAs to help students take charge of their learning needs ( $2.92 \pm 0.67$ ) prompted revision of the EPAs for 2018. The EPAs were revised, decreased to 23 in number and remapped to the competency standards (Supplementary Material 5). Structure of the e-portfolio with areas for student self-assessment, formative and summative assessment were unchanged as results for feasibility and acceptability were mostly  $>3$  for items evaluating these aspects (Tables 3 and 4).

### **Action research cycle 2 and 3: Implementation and Evaluation**

No changes were made to EPAs or portfolio design in 2018 following maintained or improved results for most evaluation survey items, particularly among supervisors. No significant differences were found with intragroup comparisons between 2017 and 2018/2019 evaluations but there were many significant differences found when comparing student to supervisor evaluation.

Overall, supervisors evaluated both the e-portfolio and EPAs more positively than students with survey items evaluating content validity trending higher after the 2018 revision (Table 2).

Supervisors reported that the EPAs were effective to assess student performance ( $3.67 \pm 0.87$  in 2017 and  $3.79 \pm 0.93$  in 2018/19) and expressed preference for the four-point entrustment scale ( $3.44 \pm 1.33$  in 2017 and  $3.79 \pm 0.82$  in 2018/19). Furthermore, they indicated they would not prefer a five-point entrustment scale ( $3.33 \pm 1.23$  in 2017 and  $2.88 \pm 0.82$  in 2018/19), nor direct assessment

against the national competency standards ( $2.56 \pm 0.53$  in 2017 and  $2.48 \pm 1.80$  in 2018/19) (Table 2). Overall satisfaction increased over time for supervisors with the median overall satisfaction increasing from  $3.78 \pm 0.44$  in 2017 to  $4.00 \pm 0.83$  in 2018/2019. Satisfaction with the length of time taken to complete the portfolio improved following the 2018 EPA revision with 97% of supervisors in 2018/19 finding the length of time to complete the portfolio reasonable compared to 77.8% in 2017 (Table 3). Students' evaluation was ambivalent regarding EPAs accurately assessing placement performance ( $2.92 \pm 1.08$  in 2017 and  $2.57 \pm 1.04$  in 2018/2019) and this was significantly different to supervisors who evaluated this survey item positively ( $3.67 \pm 0.81$  2017 and  $3.67 \pm 0.85$  2018/19;  $p < 0.000$ ).

All users were in favour of opportunities to provide formative and summative feedback with the most frequent preference being expressed for two assessment points, mid- and end of placement in both groups ( $\geq 89\%$ ). Similarly, both groups agreed that student self-assessment against the EPAs was useful but supervisors valued this more highly (students  $3.42 \pm 0.79$  in 2017 and  $3.93 \pm 0.78$  in 2018/19 compared to supervisors  $4.33 \pm 0.50$   $4.27 \pm 0.45$ ) (Table 4).

## **4.0 Discussion**

The community and public health dietetic EPAs and e-portfolio work-based assessment tool demonstrated content and context validity, acceptability and feasibility with dietetic supervisors. Dietetics students reported an ambivalent response with regards to effectiveness of the EPAs in assessing placement performance and the response to this survey item decreased following the 2018 EPAs revision. In contrast, dietetic supervisors reported EPAs effectively and accurately assessed student performance in community and public health settings. Both groups, however, indicated that they would not prefer competency assessment in this context, with this preference being more strongly expressed by supervisors, suggesting that EPAs are the preferred method for

work-based assessment. Supervisors expressed preference for a four-point entrustment scale; however, students reported preference for a five-point scale. Other studies using EPAs have found similar preference for more granular feedback in their student populations (Croft et al., 2019; Cuter et al., 2019).

There may be several reasons for the disparity between student and supervisor evaluations. Given the short placement duration (25 days), poor student evaluation may stem from lack of familiarity with dietetic work in this setting, rather than lack of EPA validity. This interpretation is supported by the significant intergroup differences with supervisors evaluating both the EPAs and e-portfolio more positively than students on multiple survey items, supporting EPAs' viability for work-based assessment in this context. Alternatively, the diverse nature of dietetic work in this sector, combined with the requirement for students to focus on a single project during their placement, suggests that EPAs may not lend themselves well to assessment in this context. While other health professions have successfully used EPAs for student assessment in community settings, the difference with dietetic placements in our study is that the placement is project-based, so it is possible the style of placement is less conducive to use of EPAs for assessment (Valentine et al., 2019; Westein et al., 2019). There are no examples of EPAs to assess project work in any discipline that are known to the authors. There are reports exploring feasibility of interprofessional education EPAs; however, it has been questioned whether such an EPA would meet the definition of an EPA, as it may not be sufficiently focussed (ten Cate & Pool, 2020). While EPA use in professions outside medicine such as nursing, pharmacy and dentistry is emerging, very few examples exist of EPAs in areas not involving direct patient care such as research and teaching (Dewey et al., 2017; Haines et al., 2017; Lau et al., 2020; ten Cate & Taylor, 2020; Tonni et al., 2020).

The inclusion of both formative and summative assessment against the EPAs was positively evaluated by both our groups of users. Similarly, use of EPAs for student self-assessment was valued highly by both groups. This finding is consistent with other reports in the literature that support use

of self-assessment to promote reflective practice and track progress (Palermo et al., 2018). Our study supports sustainability of the EPAs and e-portfolio, as minimal training was provided to supervisors with regards to use of the portfolio. Additionally, the majority of supervisors felt the length of time taken to assess students using the tool was reasonable supported acceptability.

A strength of this study was inclusion of user co-design in creation of the portfolio, resulting in an electronic tool that was well accepted by users. This method has been demonstrated in other contexts to improve functionality and its use in health professions assessment is supported by our study (Whittaker et al., 2012). Following a low response rate in the 2016 formative study, timing of the anonymous survey was adjusted. The response rate amongst supervisors was high, increasing confidence in our results. Response rates were lower in students, but still reasonable given that they were preparing for final examinations and course work submission. Despite high participant engagement, our study is limited to a single discipline at one institution. As surveys were anonymous it is possible that supervisors completed the surveys on more than one occasion and that may be a potential source of bias. Inclusion of qualitative methods to more deeply explore themes may have resulted in richer results; however, recruitment to focus groups during the exploratory stage was difficult due to the fractional nature of the community and dietetic workforce and thus, was not considered feasible. The method of EPA development could be further critiqued, as although our working party consisted of community and public health dietetic academics and education experts, wide consultation with the sector was not possible due to timing of the academic year. Furthermore, the recent rapid increase in adoption of EPAs in health professions education has seen further methodological publications in this area including frameworks for evaluating EPA quality and structure (Taylor et al., 2017; Taylor et al., 2021). Revision of the EPAs to further align their description to more recent definitions of an EPA combined with wider consultation involving practising experts and using robust consensus-building methodology would result in improvement of the current EPAs.

Another consideration is that the work of dietitians employed in the community sector where the placements were based has become more orientated towards delivery of individual dietetic care in primary healthcare settings (Hughes 2004). While a professional activity of community dietitians is program management, to which the EPAs are aligned, their public health activities may be secondary to delivery of direct patient care. This may explain why supervisors felt the EPAs accurately assessed student performance and linked day-to-day placement activities with the national competencies for dietitians, but students less so, as the provision of direct patient care is more visible during the 5-week placement compared to longer term project work.

Two aspects of van der Vleuten's utility framework that were not addressed in this study are reliability and educational impact. Reliability analysis and the development of milestones is planned for future studies when additional data from graduating cohorts can increase the sample size. Similarly, educational impact and analysis of the frequency of specific EPAs attained by dietetic student will be conducted when more data is available. This will inform future revisions of the EPAs as dietetic work in this sector evolves and has the potential to drive evidence-based curriculum revision (Tekian et al., 2020). From a faculty perspective, ability to track progress remotely and generate educational data regarding what experiences and EPAs dietetic students achieve on placement is highly useful and has potential to drive evidence-based curriculum revisions, measure impact of curriculum revision and identify gaps (Murray et al., 2019; Tekian et al., 2020; Wijnen-Meijer et al., 2015).

This study adds to existing knowledge with regards to work-based assessment of dietetic students in contexts outside of clinical dietetics. It confirms other studies that report on effective use of e-portfolios to support student learning in food service or community contexts, but is the first to our knowledge that incorporates use of EPAs as an additional assessment strategy (Porter et al., 2015).

Other professions have begun to expand EPA use from inpatient hospital settings into primary and community care settings, but this is the first example in the dietetic profession. A key difference in our study is creation of a set of EPAs for a specific workplace context, namely community and public health dietetics, and it could be argued that this is incongruent with recent definitions of EPAs (Taylor et al., 2021). Recent work by Begley et al. (2019) to develop a set of national EPAs defining dietetic work in all contexts occurred after commencement of this project. Other authors report that there is a need for EPAs to be more specific to allow greater feedback for students (Chen et., 2015). One approach may be to have a series of smaller activities known as observable practice activities (OPAs) or EPAs that nest into larger ones to provide more guidance (Holzhausen et al., 2019; Warm et al., 2014). A further challenge in the community and public health setting is that work is interprofessional and highly collaborative, and independence and autonomy is not usual work practice. In our study, we altered our entrustment scale to have the highest assessment level described as “work ready” to reflect this with positive support from supervisors shown in our evaluation. Other reports of EPAs in the pre-graduate domain report similar expectations with students being allowed to practise with post hoc supervision and have their findings checked (Tekian et al., 2020).

## **5.0 Conclusion**

The community and public health dietetic EPAs demonstrated validity, feasibility and acceptability for work-based assessment following a three-year evaluation from supervising community and public health dietitians. Students were less positive in their evaluation of the EPA-based work-based assessment tool but did not express preference for an alternative assessment method. Both groups valued student self-assessment and found the e-portfolio structure easy to use, supporting sustainability of the model. This work provides an example of the use of EPAs for work-based assessment in an allied health profession in a non-hospital setting, demonstrating the potential for EPAs to be used in placements not focused on direct individual patient care. The EPA-based tool

offers opportunity to increase knowledge of how students learn on placement and educational opportunities they have in the evolving area of community and public health dietetics. Additional potential to measure educational outcomes and identify potential curricula gaps represents an area for future research.

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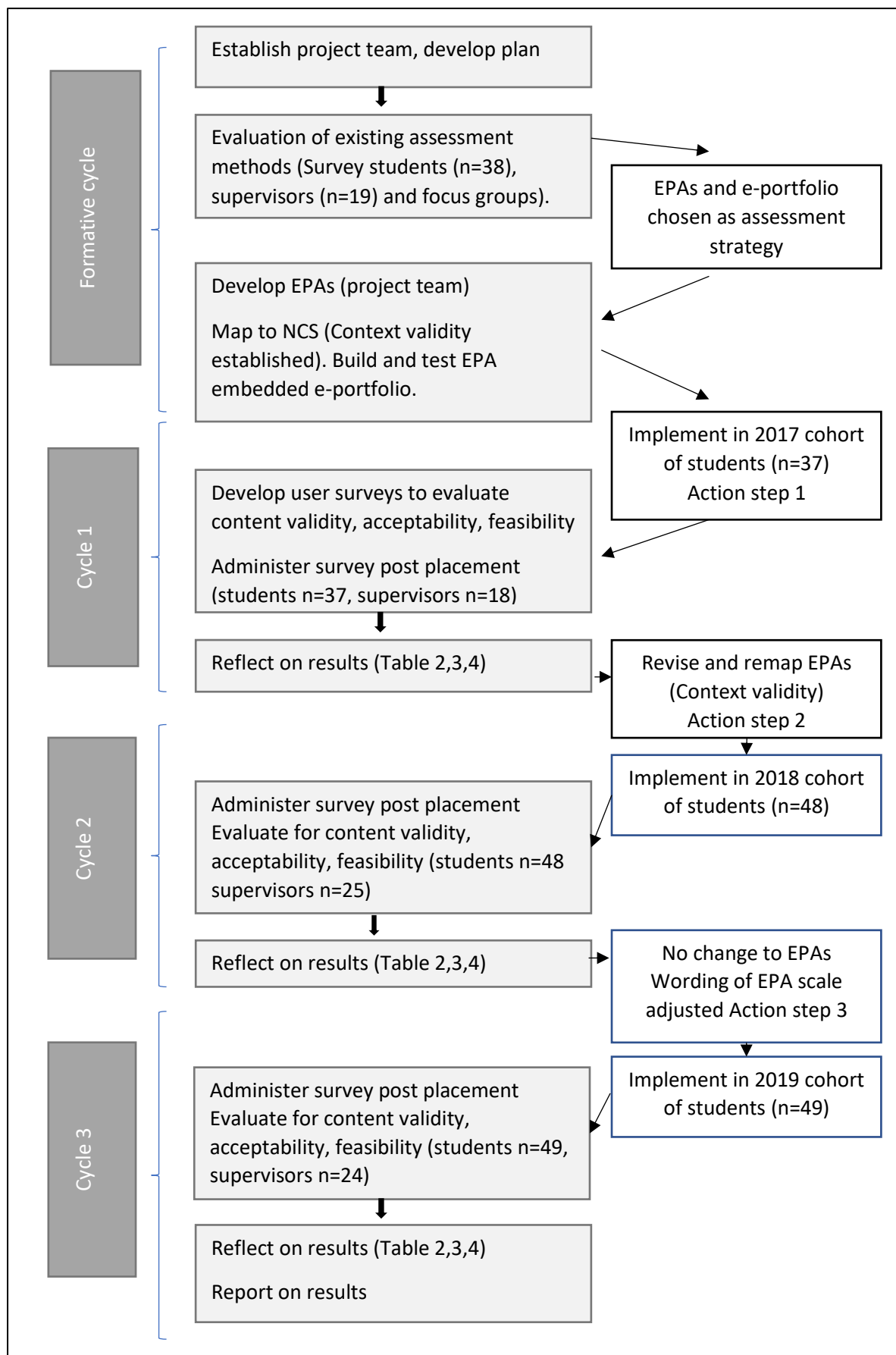


Figure 1 Action research cycles used to develop, implement and evaluate the EPAs and e-portfolio

**Table 1 Participant demographics**

	Students			Supervisors		
Year	2017 (n=12)	2018 (n= 15)	2019 (n=15)	2017 (n=9)	2018 (n=17)	2019 (n=16)
Response rate (%)	32	31	31	50	68	67
Gender	12 female 0 male	14 female 1 male	13 female 2 male	8 female 1 male	16 female 1 male	16 female 0 male
Age (years) Mean (SD)	27.75 (5.43)	24.85 (7.70)	24 (3.59)	Not collected	Not collected	Not collected
Supervisor Experience						
First time				1 (11.1)	2 (11.8)	0 (0)
1-2 years				0	4 (23.5)	3 (18.8)
3-4 years				1 (11.1)	2 (11.8)	4 (25.0)
5-10 years				5 (55.6)	5 (29.4)	4 (25.0)
10+ years				2 (22.2)	4 (23.5)	5 (31.3)

**Table 2 Content Validity of an e-portfolio with embedded EPAs and self-assessment during Community and Public Health Dietetic professional placement.**

Survey item	2017 Mean (SD)			2018/2019 Mean (SD)		
	Students	Supervisors	P value	Students	Supervisors	P value
The portfolio was effective to assess my development on placement	3.25 (1.14)	3.67 (0.71)	0.382	2.90 (1.12)	3.79 (0.93)	0.001
The skill descriptors accurately assessed my performance of placement	2.92 (1.08)	3.67 (0.87)	0.129	2.57 (1.04)	3.67 (0.85)	0.000
The current 4-point scale adequately describes the range of performance on placement	2.92 (0.90)	3.44 (1.13)	0.193	2.77 (1.38)	3.79 (0.82)	0.002
I would prefer a 5-point scale	3.67 (0.89)	3.33 (1.23)	0.508	3.53 (1.20)	2.88 (0.82)	0.009
I was comfortable with interpreting the skill descriptors and rating my/ my student's performance	3.00 (1.04)	3.44 (1.24)	0.345	2.83 (1.23)	3.67 (1.02)	0.007
The skill descriptors helped me link day to day activities on placement with the graduate entry dietetics competencies.	2.58 (0.79)	3.56 (0.73)	0.015	3.20 (1.16)	3.45 (0.94)	0.345
I would prefer to be assessed directly against the competencies rather than skill descriptors	2.75 (1.22)	2.56 (0.53)	1.00	2.97 (1.10)	2.48 (1.80)	0.04

*Survey responses were Likert scale with 1=highly dissatisfied and 5 = highly satisfied. Survey responses of students and supervisors were pooled in 2018/2019. Means were compared to identify inter-group differences. P values were calculated using Mann Whitney-U tests and considered significant if  $p < 0.05$ .*

**Table 3-Acceptability of an e-portfolio with embedded EPAs and self-assessment Community and Public Health Dietetic professional placement.**

Survey item	2017 Mean (SD) n (%)			2018/2019 Mean (SD) n (%)		
	Students	Supervisors	P value	Students	Supervisors	P value
I was comfortable using the e-portfolio	4.08 (0.52)	3.78 (0.44)	0.310	3.87 (0.94)	4.12 (0.82)	0.254
I found the e-portfolio interface easy to use and navigate	3.92(0.79)	3.67 (0.71)	0.58	3.90 (1.06)	3.79 (0.74)	0.299
Overall, I would describe my experience using the Pebblepad™ e-portfolio as positive	3.42 (0.52)	3.78 (0.44)	0.169	3.37 (0.93)	4.00 (0.83)	0.006
The amount of time taken for me to complete the student /supervisor section of the e portfolio was						
Reasonable	10 (83.3%)	7 (77.8)		28 (93.3)	32 (97%)	
Too much	2 (16.7%)	2(22.2)		2 (6.7)	1 (3%)	

*Survey responses were Likert scale with 1=highly dissatisfied and 5 = highly satisfied. Survey responses of students and supervisors were pooled in 2018/2019. Means were compared to identify inter-group differences. P values were calculated using Mann Whitney-U tests and considered significant if  $p < 0.05$*

**Table 4 Feasibility of an e-portfolio with embedded EPAs and self-assessment during Community and Public Health Dietetic professional placements.**

Survey item	2017 Mean (SD)			2018/2019 Mean (SD)		
	Students	Supervisors	P value	Students	Supervisors	P value
The skill descriptors helped me identify my strengths and weaknesses in community and public health nutrition.	3.33 (0.89)	3.67 (0.71)	0.310	2.93 (1.11)	3.55 (0.91)	0.017
The skill descriptors helped me understand what I needed to achieve on placement community and public health placement	3.25 (1.22)	3.44 (1.01)	0.745	3.17 (1.18)	3.70 (0.98)	0.045
The skill descriptors helped me take charge of my own learning needs	2.92 (0.67)	3.67 (0.87)	0.049	2.87 (1.11)	3.79 (0.96)	0.001
I would like to be assessed on placement (n(%))						
Once (endpoint)	0 (0%)	0 (0%)		0 (0%)	0 (0%)	
Twice (midpoint & endpoint)	11 (92%)	8 (89%)		29 (97%)	32(97%)	
Three times	0 (0%)	0 (0%)		1 (3%)	0 (0%)	
Weekly	1 (8%)	1 (11%)		0 (0%)	1 (3%)	
It is useful for me/ my student to self-assess their performance against skill descriptors prior to supervisor assessment	3.42 (0.79)	4.33(0.50)	0.018	3.93 (0.78)	4.27 (0.45)	0.057
Self-assessment helped me track my/ their progress and develop a plan for improvement	3.33 (0.78)	4.11 (0.60)	0.049	3.73 (0.83)	4.18 (0.39)	0.009

Survey responses were Likert scale with 1=highly dissatisfied and 5 = highly satisfied. Survey responses of students and supervisors were pooled in 18/19. Means were compared to identify inter-group differences. P values were calculated using Mann Whitney-U tests and considered significant if  $p < 0.05$

**Supplementary Materials 1. Community and Public Health EPA work-based assessment tool**  
**Student and Supervisor evaluation survey pre-pilot**

1. I received enough information to activate and use my community and public health placement workbook  
*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*
2. Overall I would describe my experience using the pebblepad eportfolio  
*Strongly negative/negative/neutral/ positive/ strongly positive*
3. When I needed help I used  
*Dietetic Specific written instructions./ general pebblepad instructions/ other students (supervisors)/ lecturer*
4. I accessed my eportfolio using a  
*Mac /PC / tablet/ ipad/ mobile phone*
5. I completed the student section of my e-portfolio (students only)  
*Mostly at home/ home and placement equally/ mostly placement*
6. It was clear to me what was required to complete the community and public health e-portfolio workbook  
*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*
7. The amount of time taken for me to complete the community and public health e portfolio was appropriate  
*Too little /reasonable/ too much*
8. It was appropriate to record my placement goals and objectives on the community and public health e-portfolio workbook  
*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*
9. I felt that only being assessed against Domain 5 Community and Public Health Nutrition competencies was appropriate  
*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*
10. I felt that other competencies could have been assessed  
*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*
11. If you agreed/strongly agreed which competencies would you like assessed (free text)
12. I liked the fact that I was not required to self-assess prior to the end of block review with my supervisor  
*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*
13. I feel that self-assessment would help my learning and skill development with regards to community and public health dietetics

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

14. I would prefer a grading scale such as “below expectations, meets expectations, exceeds expectations” rather than competent not competent.

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

15. I would prefer to record my performance in the workbook more frequently rather than at the end of placement

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

16. I would prefer to be assessed against skill descriptors rather than directly against the competencies (students only)

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

17. I would like to upload evidence to support my demonstration of competence

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

18. I would like to record reflections in my community and public health eportfolio workbook

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

19. What other ways do you think your assessment on placement could have been better supported? Do you have any other comments

20. Overall I would prefer a - Selected Choice

*Unstructured paper portfolio/ structured paper portfolio/unstructured e-portfolio/ structured e-portfolio*

21. My Age is (students) / How many years have you been supervising students

22. I am male / female

23. The course I am studying is (students only)

## **Supplementary Materials 2. Stakeholder Consultation Question Prompts**

Our survey evaluation indicate the “about me page” was helpful, why do you think this was so?

The current DAA National Entry Level Competency Standards use a framework of a framework of novice, advance beginner, competent, other professions use a different scales of observing, highly assisted, assisted, independent etc? Explore themes regarding marking/ grading including discussion of Australian Physiotherapy and Speech Pathology professional Bodies

Student self- assessment is currently a feature of the clinical e-portfolio, how do you think this assists in learning? Should it be a part of the CPH portfolio

Currently students are assessed once at the end of placement only? Should this be more frequent in CPH?

How much time would be reasonable to complete a formative assessment?

How much time would be reasonable to complete a summative assessment?

Currently only Domain 5 is assessed on CPH placement. Do you feel that other domains or areas of practice could be assessed? How would you see this working.

Some of the new competencies could potentially be assessed in multiple domains. Competencies regarding professional behaviour, proactive learning and reflective practice are examples of this. Given that supervisor’s typically only work in one domain of dietetics, how could supervisors assess in different domains.

What would be useful to supervisors to make assessment more transparent or expectations clearer?

Do you think that new supervisors need different levels of support with assessing competencies?

Although most supervisors were satisfied with using an electronic workbook, are there any issues with this such as IT access or privacy? what strategies might improve this process?

In Community and Public Health and food service supervisor feedback is taken into strongly into account, yet overall competency is assessed by the university by triangulating other assessment tasks and participation in class/ on line discussion. Do you think this approach should be continued or do you think that assessment of competence should be made by the supervisor during placement?

**Supplementary Materials 3 Community and Public Health Dietetic Entrustable Professional Activities and Dietitians Australia National Competency Standards for Entry Level Dietitians matrix 2017**

<b>Needs Assessment</b>	Competency
Collects relevant information from a range of authoritative sources and key stakeholders	1.4.2, 2.1.1, 2.2.3, 3.1.1, 3.1.2, 3.2.1, 3.2.3
Consults individuals, groups, organisations and other key stakeholders as relevant	2.1.4, 3.1.1, 3.1.2, 3.2.3, 4.2.2
Accurately interprets information collected to identify the needs of individuals, groups, organisations or communities	2.1.1, 3.1.3, 3.2.3
Identifies a range of issues influencing the nutrition and health of individuals, groups, organisations or communities	2.2.1, 2.2.2, 2.2.3, 3.1.2, 4.1.1
Appropriately prioritises actions to improve the nutrition and health of individuals, groups, organisations or communities	2.1.3, 2.2.2, 3.1.3
<b>Planning</b>	
Appropriately applies the theoretical principles of marketing to develop interventions to influence dietary and health behaviours of individuals, groups, organisations or communities	1.4.5, 2.2.2
Consults individuals, groups, organisations and other key stakeholders as relevant	2.1.3, 3.1.1, 3.1.2, 3.2.3, 4.2.2
Advocates for the nutrition and health needs of individuals, groups, organisations or communities as appropriate, including communication with key policy and decision makers	2.2.2, 4.1.1
Identifies and prioritises appropriate actions to address the nutrition and health needs of individuals, groups, organisations or communities	2.1.3, 2.2.1, 2.2.2, 3.1.3, 4.1.1
Develops comprehensive action plans with detailed descriptions of planned activities and resources	2.1.3, 4.2.2
Develops realistic timelines for planned actions	2.1.3, 4.2.2
<b>Implementation</b>	
Develops resources that address the identified nutrition and health needs and are appropriate for the food, nutrition and health literacy levels of the intended audience	2.2.5, 4.1.1, 4.1.4, 4.1.5, 4.2.3
Uses a client-centred approach to negotiate nutrition and health behaviour change with individuals, groups, organisations or communities	2.2.5, 4.1.1, 4.1.2, 4.1.4, 4.2.3
Presents information that is relevant and appropriate for the intended audience and their nutrition and health needs	2.2.5, 4.1.1, 4.1.4, 4.1.5, 4.2.3
Adapts planned activities based on reflection of performance and in relation to new information about the nutrition and health needs or literacy levels of the intended audience	2.1.4, 2.2.1, 2.2.5, 4.1.1, 4.1.4
<b>Evaluation</b>	
Develops or identifies evaluation tools that are simple to use and appropriate for the activities to be evaluated and the intended audience	1.4.2, 3.2.1
Evaluates resources, programs or activities in a manner that is respectful and considerate of those involved	2.1.4, 2.2.3, 3.1.2, 3.2.3, 4.1.1, 4.1.2
Considers a range of factors that may influence the outcomes of evaluation	2.2.1, 3.1.1

Evaluates, or plans evaluation of formative and summative aspects of resources, programs or activities	1.4.2, 3.1.2, 3.2.3
Evaluates, or plans evaluation of process, impact and outcomes of resources, programs or activities	1.4.2, 3.1.2, 3.2.3
Appropriately analyses results of evaluation	3.1.3, 3.2.3
Makes clear and appropriate recommendations for change based on the results of evaluation	3.1.3, 4.1.5
<b>Dissemination of results</b>	
Reports on findings, activities or outcomes in a timely manner using a format that is suitable for the intended audience	3.1.2, 3.2.4, 4.1.1, 4.1.4, 4.1.5
Presents findings, activities or outcomes to key stakeholders including practitioners and management	3.1.2, 3.2.4, 4.1.5, 4.2.1, 4.2.2
Uses effective communication skills to report on findings, activities or outcomes	3.2.4, 4.1.4, 4.1.5
Develops reports that are professional and provide a record of activities and plans to support future work by others	3.2.4, 4.1.4, 4.1.5, 4.2.1
<b>Cultural competency</b>	
Identifies personal biases in interpretation of foods and dietary practices	1.5.1
Seeks to identify cultural factors that may influence the dietary practices or preferences of the individual, group, organisation or community	2.2.3, 2.2.5, 3.1.1, 4.1.1
Adjusts practice to reflect the food, nutrition and health literacy, and dietary preferences and practices of the individual, group, organisation or community	2.1.4, 2.2.5, 4.1.1, 4.1.4
Acts in a respectful manner towards individuals and groups of all cultural backgrounds	4.1.1, 4.1.2
<b>Professional behaviour</b>	
Consults with supervisors to determine an appropriate workplace, schedule and project goals and objectives	1.1.4, 1.1.6, 4.1.1, 4.3.2
Arrives on time	1.1.4, 1.1.6, 4.1.1
Regularly communicates with supervisor regarding progress, challenges and any time away from placement	1.1.4, 1.1.6, 1.3.3
Reflects on personal performance and seeks feedback from supervisor(s)	1.1.4, 1.1.6, 1.3.3, 1.4.2
Addresses all colleagues and clients in a professional and respectful manner	1.1.4, 1.3.3, 4.1.1
Completes tasks in a timely manner, or negotiates changes to tasks to accommodate unplanned barriers	1.1.4, 1.1.6, 4.1.1
Assesses the skills and knowledge required to complete set tasks and seeks appropriate support as needed	1.1.4, 1.1.6, 1.4.2
Completes project tasks independently with minimal input from supervisors	1.1.6
Communicates with, but does not rely on or complete work for peers	1.1.6, 1.3.3, 4.2.1, 4.3.2, 4.3.3
Sets high personal standards and pursues excellence in personal performance and completion of tasks	1.3.2

#### Entrustment Assessment Scale

1 = observing 2 = highly assisted 3 = minimal assistance 4 = independent and competent

N/A = not assessed

**Supplementary Materials 4. Community and Public Health EPA work-based assessment tool Student and Supervisor evaluation survey**

1. My age is (students only)

2. I have been supervising student for (supervisors only)

First time supervisors/ 1-2 years/3-4 years/5-10 years/10+ years

3. My gender is

Female/ Male

4. I received enough information to activate and use the CPH placement workbook

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

5. I found the e-portfolio interface easy to use and navigate

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

6. I found the 'about me' page useful to tell my supervisors about me and my learning needs

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

7. The portfolio was effective to assess my development on placement

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

8. I liked that I was assessed against skill descriptors rather than directly against competencies

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

9. The skill descriptors helped me identify my/my student's strengths and weaknesses in community and public health nutrition.

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

10. The skill descriptors helped me understand what I/my students needed to achieve on placement

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

11. The skill descriptors accurately assessed my/my students' performance of placement

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

12. The skill descriptors helped me take charge of my learning needs

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

13. I was comfortable with interpreting the skill descriptors and rating my performance

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

14. My student/ supervisor was comfortable with interpreting the skill descriptors and rating my performance

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

15. My student/ supervisor appeared comfortable with using the e-portfolio

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

16. I was comfortable using the e-portfolio

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

17. The skill descriptors helped me link day to day activities on placement with the graduate entry dietetics competencies.

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

18. I would prefer to assess directly against the competencies rather than skill descriptors

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

19. Currently performance is documented on the e-portfolio twice on placement (mid-point and end of placement). I would like to be assessed/ assess on PebblePad®

*Weekly/twice (midpoint and endpoint)/3 times/4 times*

20. The weekly feedback sheet was useful to provide feedback and keep the project and student on track

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

21. The weekly feedback sheet was useful to help the student develop improvement goals

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

22. I would prefer the weekly feedback sheet to be

*Paper only/ paper with upload option (current method)/ electronic only*

23. The current 4-point scale adequately describes the range of performance on placement

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

24. I would prefer a 5-point scale

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

25. I would prefer another description or performance rating (please describe)

*Free text response*

26. The subheading sections are useful to help the structure and usability of the workbook

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

27. The subheadings sections help reinforce the role of the dietitian in community and public health

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

28. Can you suggest any improvements to the subheadings sections?

*Free text response*

29. Do you have any comments or suggestions about what the expected level of performance should be at mid-point for profession standards and cultural competence?

*Free text response*

30. Do you have any comments or suggestions about what the expected level of performance should be at mid-point for programme management cycle (needs assessment, planning, implementation, evaluation, dissemination etc?)

*Free text response*

31. Do you have any comments or suggestions about what the expected level of performance should be at end point for professional standards and cultural competence?

*Free text response*

32. A requirement for this placement was for students to be pro-active and drive their own placement learning. As such students are required to self-assess against each skill descriptor prior to meeting with their supervisor.  
It is useful for me/my student to self-assess my performance against skill descriptors prior to supervisor assessment

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

33. Self-assessment helped me track progress and develop a plan for improvement

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

34. Overall, I would describe my experience using the PebblePad® e-portfolio

*Highly negative/ negative/ neutral/ positive/ highly positive*

35. The amount of time taken for me to complete the student section of the e portfolio was

Too little/ reasonable / too much

36. I like the fact that the same layout and assessment are used on each placement block

*Strongly disagree/ disagree/ neutral/ agree/ strongly agree*

37. I completed the student section of my e-portfolio (students only)

*Mostly at home/ mostly during placement/ combination of home and placement*

38. Are there any skills or aspects of placement that are not captured in the e-portfolio that you think should be?

Free text response

39. Are there any other thoughts you would like to share about the e-portfolio used in clinical placements including suggested improvements?

Free text response

**Supplementary Materials 5 Community and Public Health\_Dietetic Entrustable Professional Activities and Dietitians Australia National Competency Standards for Entry Level Dietitians matrix 2018/19**

<b>Needs Assessment</b>	<b>Competency</b>
Identifies and collects relevant information from a range of authoritative sources and key stakeholders including individuals groups and organisations as relevant	1.4.2, 2.1.1, 2.2.3, 3.1.1, 3.1.2, 3.2.1, 3.2.3
Accurately interprets information collected to identify the needs of individuals, groups, organisations or communities	2.1.1, 2.2.1, 2.2.3, 3.2.3, 4.1.1
<b>Planning</b>	
Identifies and prioritises appropriate actions to address the nutrition and health needs of individuals, groups, organisations or communities	2.1.3, 2.2.1, 2.2.2, 3.1.3, 4.1.1
Consults individuals, groups, organisations and other key stakeholders as relevant	2.1.3, 3.1.1, 3.1.2, 3.2.3, 4.2.2
Applies the theoretical principles of marketing to develop interventions to influence dietary and health behaviours of individuals, groups, organisations or communities	1.4.5, 2.2.2, 2.2.5, 4.1.1, 4.1.2, 4.1.4, 4.2.3
Advocates for the nutrition and health needs of individuals, groups, organisations or communities as appropriate, including communication with key policy and decision makers	2.2.2, 4.1.1
Develops comprehensive action plans with detailed descriptions of planned activities and resources	2.1.3, 4.2.2
<b>Implementation</b>	
Develops resources that address the identified nutrition and health needs and are appropriate for the food, nutrition and health literacy levels of the intended audience	2.2.5, 4.1.1, 4.1.4, 4.1.5, 4.2.3
Uses a client-centred approach to negotiate nutrition and health behaviour change with individuals, groups, organisations or communities	2.2.5, 4.1.1, 4.1.2, 4.1.4, 4.2.3
Presents information that is relevant and appropriate for the intended audience and their nutrition and health needs	2.2.5, 4.1.1, 4.1.4, 4.1.5, 4.2.3
Adapts planned activities based on reflection of performance and in relation to new information about the nutrition and health needs or literacy levels of the intended audience	2.1.4, 2.2.1, 2.2.5, 4.1.1, 4.1.4
<b>Evaluation</b>	
Develops or identifies evaluation tools that are simple to use and tailored to the activities to be evaluated and the intended audience	1.4.2, 3.2.1
Evaluates resources, programs or activities in a manner that is respectful and considerate of those involved	2.1.4, 2.2.3, 3.1.2, 3.2.3, 4.1.1, 4.1.2
Appropriately analyses results of evaluation including identifying strengths and limitations	2.2.1, 3.1.1, 3.1.3, 3.2.3
Makes clear and appropriate recommendations for change based on the results of evaluation	3.1.3, 4.1.5
<b>Dissemination of results</b>	
Uses effective communication to report on findings, activities or outcomes in a timely manner using a format that is suitable for the intended audience	3.1.2, 3.2.4, 4.1.1, 4.1.4, 4.1.5

Develops reports that are professional and provide a record of activities and plans to support future work by others	3.2.4, 4.1.4, 4.1.5, 4.2.1
<b>Professional behaviour</b>	
Consults with supervisors to determine an appropriate workplace, schedule and project goals and objectives	1.1.4, 1.1.6, 4.1.1, 4.3.2
Is accountable for time management by regularly communicating with supervisor regarding progress, challenges and any time away from placement	1.1.4, 1.1.6, 1.3.3, 4.1.1
Reflects on personal performance and seeks feedback from supervisor(s)	1.1.4, 1.1.6, 1.3.3, 1.4.2
Addresses all colleagues and clients in a professional and respectful manner and considers cultural, socioeconomic, religious or other background	1.1.4, 1.3.3, 4.1.1
Completes tasks in a timely manner, or negotiates changes to tasks to accommodate unplanned barriers	1.1.4, 1.1.6, 4.1.1
Assesses the skills and knowledge required to complete set tasks and seeks appropriate support as needed	1.1.4, 1.1.6, 1.4.2

1 = observing

2 = highly assisted

3 = minimal assistance

4 = independent and competent

N/A = not assessed

## 6.8 Conclusion

This study is the first to report on the development of an EPA-based assessment tool in community and public health dietetics and is one of few published studies that explores the use of EPAs for activities not related to direct care of individual patients. After two cycles of action research 25 EPAs were developed for community and public health dietetics and mapped to the National Competency Standards for Dietitians in Australia. Supervisors were more satisfied with the tool compared to students, however the EPA based tool demonstrated utility, specifically context validity, content validity, reliability and acceptability. As the community and public health placement is shorter than the clinical placement and only two assessment points are collected with each cohort of students, there is insufficient data to determine milestones, educational impact and construct validity. These analyses have been conducted for the clinical dietetic EPA work-based assessment tool and are presented in the following chapter.

## Chapter 7: Validity and educational impact of Entrustable Professional Activities for work-based assessment of entry-level dietetic students: Evaluation of a 3-year implementation study

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### 7.1 Declaration of authorship: Chapter 7

Student's declaration:

The nature and extent of contributions to Chapter 7 are:

Name	Nature of Contribution	Contribution %
Andrea Bramley	Study concept and design, ethics application, data collection, data analysis, manuscript preparation and revision for publication	80
Lisa McKenna	Advice on data analysis, advice on manuscript structure, revision of manuscript	10
Adrienne Forsyth	Advice on data analysis, advice on manuscript structure, revision of manuscript	10

### 7.2 Preface to Chapter 7

This study has been submitted for publication and is currently under review in the *Journal of the Academy of Nutrition and Dietetics* and is included in its submitted form. The objective of this study was to further evaluate the utility of the EPA-based e-portfolio for assessment of dietetic students during clinical placements focusing on construct validity and educational impact. The scoping review included in Chapter 3 identified potential for EPAs to drive curriculum and teaching improvement by highlighting differences between expected and actual student performance. Chapter 7 reports on the educational impact of EPAs in measuring actual vs predicted student performance and identifying EPAs that students are most and least entrusted to perform.

### 7.3 Publication

# Journal of the Academy of Nutrition and Dietetics

## Validity and educational impact of Entrustable Professional Activities for work-based assessment of entry-level dietetic students: Evaluation of a 3-year implementation study

--Manuscript Draft--

<b>Manuscript Number:</b>	
<b>Article Type:</b>	Research Paper
<b>Keywords:</b>	Entrustable Professional Activities; Work-based Assessment; Nutrition Care Process; Clinical Dietetic Education; Competency Based Education
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<b>Abstract:</b>	<p>Validity and educational impact of Entrustable Professional Activities for work-based assessment of entry-level dietetic students: Evaluation of a 3-year implementation study</p> <p>Background. Entrustable Professional Activities (EPAs) describe key workplace activities and are increasingly being used for student work-based assessment. An EPA-based work-based assessment tool offers potential to increase understanding of dietetic student skill development and opportunity for standardised work-based student assessment.</p> <p>Objective. To determine construct validity and educational impact of an EPA work-based assessment tool for dietetic placement students in clinical settings.</p> <p>Design. Using a time series design, supervisor and student self-assessment data collected from an EPA based assessment tool from three cohorts of dietetic students and supervisors from 2017-2019 was analysed.</p> <p>Participants/setting . Dietetic students (n= 145) from an accredited dietetic training program in Australia and affiliated metropolitan and rural hospitals.</p> <p>Main outcome measures . Construct validity was determined through analysis of supervisor evaluation of student performance against EPAs over time. Educational impact was determined through comparing student performance across EPAs to identify areas of least entrustment.</p> <p>Statistical analyses performed. Student performance over time and differences between student self-assessment and supervisor assessment for each EPA were investigated using Wilcoxon-Signed rank tests and linear mixed-model analysis. Descriptive statistics summarised student performance against each EPA.</p> <p>Results. Performance significantly increased over time in 35/37 EPAs. Significant differences between supervisor and student self-assessment were evident in 9/37 EPAs. Dietetic student performance varied across EPAs with 88.2% of students achieving entrustment for nutrition management EPAs compared to 100% for professionalism EPAs.</p> <p>Conclusions. The tool's construct validity and educational impact was established. EPAs identified areas of NCP skills development requiring additional support. Data collected by the tool can inform teaching.</p>

**Validity and educational impact of Entrustable Professional Activities for work-based assessment of entry-level dietetic students: Evaluation of a 3-year implementation study**

**Key Words**

Entrustable Professional Activities

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This work was carried out at La Trobe University in the discipline of Dietetics and Human Nutrition with approval from the La Trobe University Human Research Ethics Committee (Application ID HEC S16-198).

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### **Authorship Declaration**

AB designed and led the study and prepared the manuscript with support from AF and LM. All authors critically reviewed and edited the manuscript and approved the final copy and declare that the content has not been published elsewhere.

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### **Conflict of interest**

No conflict of interest is declared by the authors.

13 August 2021

Professor Linda Snetselaar,  
Editor in Chief,  
Journal of the Academy of Nutrition and Dietetics

Dear Professor Snetselaar,

Please find attached our manuscript for electronic submission to the Journal of the Academy of Nutrition and Dietetics entitled: **Validity and educational impact of Entrustable Professional Activities for work-based assessment of entry-level dietetic students: Evaluation of a 3-year implementation study** by Bramley, Forsyth and McKenna. We believe this paper will be of interest to the readers of your journal as it outlines the evaluation of a novel work-based assessment tool designed to assess student skills in the Nutrition Care Process using an emerging concept in health profession education, Entrustable Professional Activities (EPAs).

Having been pioneered by medical education, EPAs are a novel educational concept that can be used to assist the implementation of professional competency standards. Entrustable Professional Activities define the work that is done by a competent professional in a specific context and are observable, measurable actions. They are a useful tool for assessment *for* learning as well as assessment *of* learning and help address some of the challenges of implementing a competency framework in a university curriculum. Additionally, EPAs are well accepted by practising professionals who are often charged with the assessment of students during work-based placements or internships. The development of an EPA based tool to assess NCP skills in students offers potential to address the current lack of a widely accepted work-based assessment tool for dietetic students.

This manuscript describes the analysis of educational data collected through the implementation of the EPA based tool from three consecutive dietetic student cohorts to determine construct validity. A second outcome is the interrogation of the data to determine areas of NCP that students are most and least entrusted to perform. This has significant educational impact for individual students as it can identify gaps in skill development to identify learning needs and areas to focus on during placement. From an educators' perspective the tool allows analysis of areas of weakness or strength across cohorts to inform teaching. As there is no widely accepted work-based assessment tool in clinical dietetics we hope that this paper addresses a current gap and that sharing our methodology may assist other health professions educators in addressing challenges in work-based assessment.

The material in the manuscript is original and has not been published previously or is currently under consideration for publication elsewhere. All listed authors meet the criteria for authorship and no individual meeting these criteria has been omitted.

Thank you for considering this manuscript for peer review and publication.

Kind regards,

Andrea Bramley,

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## STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page No
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	1
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-4
Objectives	3	State specific objectives, including any prespecified hypotheses	4-5
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	5-6, Figure 1
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	5, 6,7
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6,7
Bias	9	Describe any efforts to address potential sources of bias	6,7
Study size	10	Explain how the study size was arrived at,	6,7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6,7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7,8
		(b) Describe any methods used to examine subgroups and interactions	7
		(c) Explain how missing data were addressed	7
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	

(e) Describe any sensitivity analyses

N/A

Continued on next page

<b>Results</b>			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9
		(b) Indicate number of participants with missing data for each variable of interest	N/A
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	Table 1,2,3 Figure 2,3
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Table 1,2,3 Figure 2,3
		(b) Report category boundaries when continuous variables were categorized	
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	9,10,11,12
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	12
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	17,18
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	12-18
Generalisability	21	Discuss the generalisability (external validity) of the study results	17,18
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	N/A

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

# **Validity and educational impact of Entrustable Professional Activities for work-based assessment of entry-level dietetic students: Evaluation of a 3-year implementation study.**

## **Research Snapshot**

**Research Question** Can dietetics students' skills in nutrition care process be assessed using an EPA based work-based assessment tool in the clinical setting?

**Key Findings** Educational data from three consecutive dietetic student cohorts (n=145) was analysed to determine construct validity and educational impact of the novel EPA work-based assessment tool. Student performance in all EPAs increased over time demonstrating construct validity. The tool identified areas of NCP that students were least entrusted offering benefit to individual students by highlighting learning needs with findings to inform future teaching. Clinical dietetic EPAs offer potential for a widely accepted work-based assessment tool.

## **Abstract**

**Background.** Entrustable Professional Activities (EPAs) describe key workplace activities and are increasingly being used for student work-based assessment. An EPA-based work-based assessment tool offers potential to increase understanding of dietetic student skill development and opportunity for standardised work-based student assessment.

**Objective.** To determine construct validity and educational impact of an EPA work-based assessment tool for dietetic placement students in clinical settings.

**Design.** Using a time series design, supervisor and student self-assessment data collected from an EPA based assessment tool from three cohorts of dietetic students and supervisors from 2017-2019 was analysed.

**Participants/setting.** Dietetic students (n= 145) from an accredited dietetic training program in Australia and affiliated metropolitan and rural hospitals.

**Main outcome measures.** Construct validity was determined through analysis of supervisor evaluation of student performance against EPAs over time. Educational impact was determined through comparing student performance across EPAs to identify areas of least entrustment.

**Statistical analyses performed.** Student performance over time and differences between student self-assessment and supervisor assessment for each EPA were investigated using Wilcoxon-Signed rank tests and linear mixed-model analysis. Descriptive statistics summarised student performance against each EPA.

**Results.** Performance significantly increased over time in 35/37 EPAs. Significant differences between supervisor and student self-assessment were evident in 9/37 EPAs. Dietetic student performance varied across EPAs with 88.2% of students achieving entrustment for nutrition management EPAs compared to 100% for professionalism EPAs.

**Conclusions.** The tool's construct validity was established. EPAs identified areas of NCP skills development requiring additional support. Data collected by the tool can inform teaching.

## Introduction

Entrustable Professional Activities (EPAs) is an educational concept that describes key activities performed by a competent health professional in a work-based context. <sup>1</sup> EPAs were first used in graduate medical education, and have recently extended into entry-level

medicine, pharmacy, nursing and allied health professions such as dietetics.<sup>2-5</sup> EPAs have emerged in response to criticisms and challenges in implementing competency-based education, particularly in the context of work-based assessment (WBA). Work-based assessment, in the form of supervised placements, is common to most entry-level health professional placements providing the means for students to translate knowledge into practice and demonstrate competence.<sup>6</sup> A criticism of competency frameworks is they describe professional behaviours and attributes, rather than observable actions which can pose WBA assessment challenges.<sup>7</sup> As EPAs describe observable actions a competent professional would perform, EPAs represent a means to operationalise competency frameworks in a way that is easily understood by practising clinicians who are often charged with supervision and assessment of students.<sup>8,9</sup>

A recent scoping review identified 30 reports of EPAs being used for WBA in entry-level health professional programs, with entry-level defined as the point at which a learner would be trusted to practise independently with post-hoc supervision.<sup>10</sup> In this context, EPAs define the practice of a work-ready student or graduate, entrustment scales describe the level of supervisor support required for acceptable execution of the task, and the creation of milestones indicate the expected level of EPA attainment at defined time points.<sup>11</sup> Together, these three concepts set expectations of student performance across the study program, create a shared mental model of what students can do during the placement and describe educational outcomes at placement completion. In this way, EPAs offer a curriculum map that is valued by students and educators alike.<sup>12</sup>

Although uptake of EPAs for entry-level student placement assessment has rapidly expanded, several authors have highlighted research gaps including the need to create empirical evidence of EPA effectiveness and explore their application in professions other than medicine.<sup>13,14</sup> Like other health professions, dietetics in Australia defines the profession

through competency standards with accredited training programmes required to include in the curriculum a minimum of 100 days (~800 hours) of supervised placement to allow students to demonstrate competence.<sup>15</sup> Internationally, there is variation in the number of days of supervised practice required in entry level dietetic training with the UK specifying 1000 hours and the USA specifying 1200 hours.<sup>16,17</sup> The reasons behind this difference are likely to be historical rather than evidence-based as the work practices, health care systems and competency standards across the three countries are similar with a relative lack of published reports regarding attainment and assessment of dietetic competence.<sup>18,19</sup>

Additionally, there is wide variation in work-based assessment processes in dietetic training programs with each course developing individual assessment tools and processes despite similarities in educational outcomes.<sup>20</sup> Developing a WBA tool using EPAs in dietetics may potentially address these issues. Measuring entrustment of dietetic students over time may provide insight into how dietetics students develop skills in a practical setting and increase understanding of the amount of placement time required until students reach an acceptable level of entrustment. Furthermore, as EPA-based assessment has been well accepted by clinicians charged with supervising students in several health professions<sup>3,21,22</sup>, development of an EPA-based WBA tool in dietetics offers potential for a widely accepted WBA tool with resulting improvements in and standardisation of assessment practices in the workplace.

We conducted a three-year action research study to develop, implement and evaluate a WBA tool using EPAs for dietetic student professional placements. We aimed to explore the utility of the tool to assess students' performance in supervised clinical placements using a framework informed by Van der Vleuten<sup>23</sup> and Van der Vleuten and Schuwirth<sup>24</sup> who argue that the utility of assessment is comprised of reliability, validity, acceptability, educational

impact and cost (feasibility). Details of the creation of the EPAs, the design and development of the e-portfolio containing the EPA-based WBA tool, feasibility, face validity, content validity and acceptability of the EPA-based WBA have been reported separately (reference removed for blind peer review).<sup>25</sup> The focus of this paper is to report on construct validity and educational impact of the EPA-based WBA tool. Construct validity will be explored via testing the hypothesis that when measured by the EPA-based tool, dietetic student performance increases overtime. Educational impact will be explored through comparison of entrustment (EPA) over time compared to predicted milestones.

## **Methods**

This study was conducted with three cohorts of dietetics students from (blinded for peer review) university and their placement supervisors from affiliated metropolitan and rural hospitals in Australia between November 2016 and November 2019. Approval was granted by the HREC of (blinded for peer review) (#S16-98).

As part of their course, dietetic students are required to complete three supervised clinical placements in an acute or sub-acute hospital setting. Placement A is a 16 day/ 4-week placement, Placement B is a 20 day/5-week placement and Placement C is a 25 day/5-week placement. By the end of the final C placement, students are expected to perform the activities of an entry-level dietitian and manage a clinical case load.

Owing to the electronic nature and importance of user acceptability in any assessment method, a project implementation methodology based on action research and informed by mobile health development was used to design, implement and evaluate the EPA work-based assessment tool (Figure 1).<sup>26</sup> The new tool was piloted with the 2017 cohort during their B and C placements. The 2018 and 2019 students used the EPA work-based assessment tool for

all placements (A, B and C). As part of each action research cycle, the EPA statements, entrustment scale and functionality of the WBA tool were evaluated via anonymous survey distributed in the week following C placement, for validity, acceptability and feasibility.

A key step in the action research cycle included development of the EPAs, entrustment scale and e-portfolio design. The methods and results of this cycle have been reported in detail elsewhere (reference removed for blind peer review).<sup>25</sup> Briefly, a project team consisting of the lead author, a clinical dietitian and senior academic and other dietetic faculty members with expertise in dietetic education conducted a literature review regarding the creation of EPAs. The three-step method described by Mulder et al<sup>27</sup> was chosen for its pragmatic approach to generate initial EPA statements. Other common EPA creation methods described in the literature, such as the use of broad-based working parties<sup>28</sup> or Delphi approaches<sup>29</sup>, could be argued to be more robust methods for creation; however, the action research methodology in our study ensured multiple phases of consultation and feedback by clinical educators who were practising dietitians. As the standardised Nutrition Care Process, endorsed by the Academy of Nutrition and Dietetics<sup>30</sup> is widely used by clinical dietitians in Australia as the framework to provide individual nutrition care<sup>31</sup>, EPA statements were created to align with each part of the model (Assessment, Diagnosis, Intervention, Management, Evaluation). Additional EPAs addressing professionalism and legal aspects of practice were also created. All EPA statements were then mapped to the dietetic competency standards in a matrix<sup>25</sup> and embedded in an e-portfolio using PebblePad™ software. Each EPA was linked to between one and nine national competency standards. The team was supported by an educational designer and university statistician.

A four-point entrustment scale was used to evaluate student performance. The ordinal scale reflected the amount of input required by the supervisor for the student to execute the EPA to an acceptable standard. Level 1 on the scale reflected the student observing the supervisor

execute the activity, level 2 described the student being able to execute the EPA with a high level of supervisor assistance, level 3 reflected EPA execution with minimal supervisor support, while level 4 reflected a level of performance where the student could execute the activity at a satisfactory level with no support from the supervisor. This four-point scale differs to the five-point entrustment scale, developed by ten Cate.<sup>32</sup> The fifth level of the original entrustment scale, instruct others, was not included in our scale as the highest level of performance expected of an entry-level dietitian is to execute the EPA without active support from a supervisor. Furthermore, this original five-point scale is more aligned to postgraduate education where EPAs first emerged. Predetermined milestones were created by the expert working party to describe the expected level of student achievement on the entrustment scale for each EPA. Feedback was sought from lead educators from each of the major clinical placement providers as part of routine course meetings.

Students are formally assessed by their supervisor at two time points on each placement (6 assessment points in total) using the EPA work-based assessment tool. The midpoint assessment provides formative assessment, and summative assessment is provided at the end of placement. Students must achieve a level of entrustment equal to the milestone to progress to the next placement. Students are required to self-assess against each EPA at each time point which then “unlocks” the corresponding field for the supervisor to evaluate the student. Self-assessment has been reported to increase reflection required for skills development and was highly valued by students and supervisors in our formative study (reference removed for blind peer review). Data regarding student progress can be viewed in real time remotely by academics and can be exported in a CSV file for further analysis.

Our data analysis strategy was informed by other studies with similar research questions albeit in different professions: entry-level pharmacy and medicine and postgraduate medicine in an Australian community setting.<sup>21,34,35</sup> All data were described and characterised using

descriptive statistics with student self-assessment and supervisor assessment of student performance presented as median and interquartile range. To assess difference between the midpoint (time point 3) and endpoint (time point 6) evaluations, Wilcoxon Signed rank tests were performed with a level of  $p < 0.05$  indicating significant difference.

Differences between student self-evaluations and supervisor evaluations at each of the six time points were determined using linear mixed model analysis. Analyses were performed using SPSS v 26 (IBM) and JASP version 0.14.1. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement was adhered to when preparing the manuscript.<sup>36</sup>

## Results

### Participants

At total of 145 students and their supervisors participated in the study. In the 2016/2017 cohort there were 42 students, in the 2017/2018 cohort there were 51 and in the 2018/2019 cohort there were 52. The mean student age was  $24.3 \pm 4.9$  (range 20—50) years. Other demographic data was not collected. There were six assessment points across the three placements with students self-assessing and receiving a corresponding supervisor assessment against each EPA at mid and endpoints of each placement. Placement A included timepoint 1 and 2, Placement B timepoint 3 and 4 and placement C timepoint 5 and 6. As the 2016/2017 cohort was the pilot year, only data for placements B and C (timepoints 3-6) were collected.

### Construct validity: comparison of assessment at different time points

Medians and interquartile ranges for student self-assessment and supervisor assessment for each EPA are reported in Table 1 at the midpoint of the placement program (timepoint 3) and end of the placement program (timepoint 6).

The medians of student self-assessment and supervisor self-assessment increased significantly for most EPAs between the two time points with some exceptions. There were statistically significant differences between medians for EPA 9 (greet patient appropriately) and EPA 10 (introduces self and other present), however, this was not of practical significance as the medians were the same at each time point. Similarly, there were statistically significant, but not practically significant, differences in median scores at each time point for EPAs 30, 31, 32, 34, and 36. There was no significant difference at mid-placement and final assessment for EPA 33 (maintains patient confidentiality for student self-assessment).

When comparing groups, the median EPA scores at time point 3 were the same for both students and supervisors with two exceptions. The median student self-assessment score at midpoint for EPA29- communicates appropriately with dietetic and other hospital staff was lower (3 (1)) compared to the median supervisor assessment score (4 (1)); however, this difference is not significant ( $p = 0.06$ ). Conversely, students assessed themselves higher at midpoint for EPA 37-is an active member of the health care team and advocates for nutrition care, compared to supervisors 3(1) vs 2 (1) and this difference is significant ( $p=0.03$ ). At time point 6 (endpoint assessment), there were no differences between the median scores for all EPAs when comparing student self-assessment and supervisor assessment.

The spread of entrustment scale scores for student self-assessment and supervisor assessment at time point 3 (midpoint) and 6 (endpoint) are depicted in Figures 2 and 3. Professionalism EPAs (29-37) show a much higher proportion of students achieving entrustment ratings of 3-

217 4 at midpoint assessment, although only 6.7% of students achieved a score of 4 for EPA 37 at  
 218 assessment point 3. Within the EPAs linked to communication skills (EPA 9-16), students  
 219 were assessed by their supervisors to have a high level of entrustment at midpoint assessment  
 220 for EPA 9 and 10 with 76.3% and 56.3% of supervisors rating their students at entrustment  
 221 level 4 respectively but for more complicated EPAs 11-16 there was a much wider range of  
 222 assessment scores at midpoint (5.2% level 4 entrusted- EPA 16 to 20.7% level 4 entrusted -  
 223 EPA 13) suggesting these skills took a longer time to develop. In the nutrition assessment  
 224 EPAs, students achieved a rating of level 4 for EPA 3-collects and interprets anthropometry  
 225 (31.9%) and EPA5 (collects relevant social, clinical and environmental data) (40.7%) at  
 226 midpoint assessment point. Entrustment was much lower at this time point for EPA 2 (5.9%),  
 227 4 (5.2%) and 7 (8.9%). Once again, this score distribution suggests that some EPAs took  
 228 greater experience or time to achieve. Students were least entrusted to achieve EPA 17  
 229 (identifies and understands major medical problems and impact on nutritional status or  
 230 management), EPA 20 (formulates and prioritises, tailored goals and objectives for nutrition  
 231 management and can justify choices), EPA 21 (able to provide appropriate, tailored nutrition  
 232 education that addresses the nutrition problems/diagnosis), EPA 22 (works in partnership  
 233 with patient, carers and health care team to develop an appropriate plan) and EPA 23 (follows  
 234 up patients appropriately and adjusts care plan) accordingly with 2.4%, 0.7%, 0%, 3.0% and  
 235 1.5% of students achieving entrustment scores of 4 for these respective items at midpoint.

236 Linear mixed model analysis was used to compare EPA ratings between groups for students  
 237 and supervisors across all six time points and is reported in Table 2. All EPA ratings were  
 238 significantly different over time, and ratings for EPA 3, 7, 20, 23, 24, 28, 32, 35 and 37 were  
 239 significantly different between supervisors and students. Students rated their performance  
 240 higher than supervisors for EPA 3 ( $p=0.04$ ;  $d=0.043$ ), EPA 7 ( $p=0.004$ ;  $d=0.06$ ), EPA 20 ( $p$   
 241  $<0.001$ ;  $d=0.076$ ), EPA 28 ( $p <0.001$ ;  $d=0.117$ ) and EPA37 ( $p=0.001$ ;  $d=0.096$ ). Supervisors

rated performance higher than student self-assessment for EPA 23 ( $p=0.04$ ;  $d=0.074$ ) EPA 24 ( $p < 0.001$ ;  $d=0.097$ ), EPA 32 ( $p=0.028$ ;  $d=0.044$ ) and EPA35 ( $p=0.003$ ;  $d=0.043$ ).

## **Educational impact**

At endpoint assessment, supervisors assigned the maximum rating (4) to 100% of students for nine EPAs (6, 9, 10, 15, 33, 34, 35, 36), 95-99.9% of students for 19 EPAs (1-5, 8, 11-14, 18-19, 22-24, 29-32) and 90-94.9% for nine EPAs (7, 15, 16, 17, 20, 26, 27, 28, and 37). The lowest percent of students (88.2%) achieved a score of 4 for EPA 21 (able to provide appropriate, tailored nutrition education that addresses the nutrition problems/ diagnosis).

Student performance for each EPA, as indicated by student assessment at the end of each placement block (timepoint 2, 4 and 6) were compared to predetermined milestones with results shown in Table 3. The milestones were determined by the expert working party based on experience and were confirmed by lead clinical teachers at each major clinical placement partner as part of the first phase in the action research cycle. Where the expert working party expressed uncertainty regarding the predicted level of performance, a range was provided rather than an absolute milestone. The median actual student level of achievement equalled the predicted level of student performance for all EPAs at all time points except for EPA 26 and EPA 32 at end of placement block A (timepoint 2) where the actual level of student performance exceeded predicted. Where a range was provided, the actual level of performance fell within the predicted range for all EPAs.

## **Discussion**

The use of EPAs for entry-level and graduate health professional students is rapidly expanding; however, several recent reviews highlight the lack of supporting evidence that

266 move beyond EPA development and implementation.<sup>2,10,37</sup> In our previous studies, we  
267 confirmed feasibility, acceptability, face and content validity of our EPA-based WBA tool for  
268 dietetic students on their clinical placements (reference removed for blind peer review).<sup>25</sup>  
269 This study aimed to extend our research and understanding of the utility of EPAs for entry-  
270 level dietetic WBA through evaluation of construct validity and educational impact of the  
271 tool. Our hypothesis that dietetic student levels of entrustment for each EPA increased over  
272 time was confirmed with significant differences observed for both supervisor assessment and  
273 student self-assessment when comparing timepoints. Our comparison of entrustment ratings  
274 generated by student self-assessment compared to supervisor assessment showed there was  
275 no difference between the two groups for most of the EPAs.

276 This study highlighted the educational impact of EPAs, as analysis revealed at what time  
277 points students were entrusted to perform different EPAs, with some being achieved at early  
278 and others toward the end assessment point. From an educator's perspective, the model of  
279 repeated assessments against each EPA in the workplace results in generation of rich  
280 educational data and offers potential to inform curriculum and support evidence-based  
281 education.

282 Dietetic student entrustment increased significantly over time for all EPAs with one  
283 exception: EPA 33 (maintains patient confidentiality). This is unsurprising as this aspect of  
284 professionalism is essential for all health professional students to be entrusted to prior to  
285 commencing clinical placement.<sup>38</sup> The concept of confidentiality is explicitly taught pre-  
286 placement and is further covered in placement orientation by the health care service. Other  
287 professionalism EPAs showed high median scores at the midpoint assessment point  
288 suggesting that many students achieve entrustment in this domain of practice early in their  
289 overall placement experience. Although there are few studies that examine the development  
290 of dietetic students' skills, they show a similar relationship between time and performance.<sup>39</sup>

291 This study adds to the body of knowledge regarding areas of the Nutrition Care Process that  
292 are more complex for student dietitians to develop.<sup>20,39</sup> Nutrition Assessment EPAs all  
293 demonstrated a median score of 3 at midpoint assessment for both student-self assessment  
294 and supervisor assessment; however, there is a reasonable spread of scores across the scale as  
295 depicted in Figure 2. EPA 3-collects and correctly interprets relevant anthropometry and  
296 EPA 5-collects and interprets relevant social, physical, environmental data show high  
297 percentages of students achieving a level of 4 at midpoint assessment with EPA 2-  
298 interpretation of biochemistry and EPA 7-taking a diet history showing much lower  
299 percentages of students achieving a level 4 at this timepoint. This knowledge may help  
300 improve pre-placement teaching or inform teaching methods. For example, EPA 3 and 5 are  
301 straightforward to simulate in a classroom allowing pre-placement skills acquisition.  
302 Alternatively, common teaching practices of simulation with scripted actors or role plays  
303 with knowledgeable peers may insufficiently prepare students for the challenges of working  
304 with unwell people or clients from culturally and linguistically diverse backgrounds in the  
305 real world. As such, our EPA-based WBA tool offers potential to inform teaching practice  
306 and curriculum and measure the outcome of any change by tracking changes in entrustment  
307 across cohorts.

308 Other EPAs where many students did not receive entrustment until the endpoint assessment  
309 included EPAs linked to nutrition diagnosis and nutrition management (EPAs 20-23) with  
310 other studies showing similar results.<sup>39</sup> The reasons for this are likely to be multifaceted.  
311 Firstly, while EPAs are often linked to multiple competencies, in our tool, EPAs 20-23 are  
312 linked to more competencies compared to other EPAs (supplementary materials). Given that  
313 a student must possess multiple competencies to execute the EPA to an entrustable standard  
314 as well as engage clinical reasoning, the degree of difficulty associated with an EPA is likely  
315 to be greater necessitating more time or experience. Furthermore, as these EPAs reflect direct

dietetic patient care, the degree of risk associated with EPAs is higher, which means that supervisors may be more reluctant to rate students at a work ready standard.<sup>40</sup> Lastly, the structure of the course may impact opportunities for students to perform these activities. The shorter 16-day placement A is focused on students becoming orientated to the clinical environment, observing practising dietitians at work and beginning to assess and provide nutritional care for patients, meaning it is likely that students have had limited opportunity to perform these EPAs by this assessment time point.

In entry-level health professions education it has been proposed there is a need for increased granularity with regards to the number of professional activities and supervision levels included on entrustment scales.<sup>35</sup> The original entrustment scale proposed by ten Cate was an ordinal scale with five supervision levels ranging from 1- observation of an EPA being performed to 5-may provide supervision to juniors.<sup>41</sup> Other entrustment scales, namely the Chen supervisory scale, have been adapted for entry level medicine and contain five levels, although levels one through four contain several sub scales resulting in a 10-point ordinal scale.<sup>9</sup> In our tool, a four-point entrustment scale was chosen with the fifth level removed for two reasons. Firstly, the ability to teach others is not expected of an entry-level dietitian, and secondly, to keep the electronic tool as concise as possible, as our pre-testing results suggested this was important for acceptability and feasibility which are key aspects of an assessment tool's utility.<sup>24</sup> Our four-point entrustment scale demonstrates reasonable range or spread of scores in the assessment of each EPA as shown in Figures 2 and 3. This confirms the finding from our previous study that a four-point assessment scale is acceptable for work-based assessment of entry-level dietetic students (reference removed for blinded peer review). Although very few students were rated 1 for any item at the midpoint assessment, this is to be expected as students have had approximately 30 days out of a total of 61 clinical placement days, so would be expected to have moved from baseline by this stage.

Key to the design of the e-portfolio were fields for students to self-assess against each EPA using the same entrustment scale as the supervisor. Literature reports that student self-assessment is often unreliable with students overestimating their performance.<sup>42</sup> The intention behind the inclusion of student self-assessment was to promote students to be active learners, increase reflective practice skills and identify specific areas for improvement.<sup>33</sup> Linear mixed model analysis identified few significant differences between student self-assessment and supervisor assessment suggesting that student self-assessment was overall comparable to supervisor assessment. It is reported elsewhere that students tend to rate higher than supervisors; however, this was not confirmed by our study with students rating themselves higher on five EPAs compared to for EPAs where supervisors provided higher ratings.<sup>34,43</sup> From a patient safety perspective, it is vital to identify over-confident students who may be unaware of what they do not know.<sup>44</sup> The general concordance of student self-assessment and supervisor assessment in our study suggests that an EPA-based tool, where students are required to self-assess multiple times against EPA statements using an entrustment scale, promotes reflective practice and self-awareness which are essential to become a safe health care professional.<sup>33</sup> Although in different professions, pharmacy and medicine, two recent studies also report high levels of concordance between student self-assessment and supervisors' assessment when using EPAs and entrustment scales supporting this assertion.<sup>21,34</sup>

Although the time taken for students to achieve entrustment differed between individual EPAs, nearly 90% of students had reached entrustment for all EPAs by the endpoint assessment (61 days of supervised clinical practice). Educational impact is an important aspect of overall utility of an assessment tool with our tool demonstrating the ability to measure educational outcomes for individual students as well as offering potential to identify and measure educational attainment across cohorts with regards to specific EPAs. This

ability to measure outcomes is important and addresses the lack of a well-accepted work-based assessment tool in dietetics. The results of this study suggest that the current placement model embedded in our curriculum is effective and sufficient for most students to achieve the expected level of practice required of an entry-level dietitian. Our EPA-based tool makes it possible to measure student learning outcomes at different time points and will generate data that will provide insight into the amount of supervised practice required for dietetic students to be able to practice at a work ready level. Currently, despite similarities in training, competency frameworks and health care systems, the amount of supervised practice for dietetics specified in the training programs for Australia, UK and USA vary greatly. <sup>(15-17)</sup> The reasons behind these differences are unknown and reflect a continuation of educational tradition rather than true competency-based education which is not time bound. From a practical perspective, supervised work-based placements, agreed as an essential part of health profession education are a finite time-limited resource, making competency-based education a challenge to operationalise.<sup>1</sup> An EPA-based WBA tool, such as ours, offers potential to measure and evaluate the impact of different placement lengths and configurations on student skill acquisition, a potential beginning to be explored in other health professions. <sup>27,45</sup>

Although included in Van der Vleuten's assessment utility framework, reliability was not explored in this study.<sup>23</sup> Reliability refers to the reproducibility of scores of an assessment method and this has always been a challenge in authentic WBA due to the dynamic environment.<sup>24</sup> Karupaiah et al. determined inter-rater reliability for their dietetic student performance evaluation tool through concurrent observations of a student/patient interaction by two assessors.<sup>39</sup> This method for determining inter-rater reliability would not have been feasible in our current study and such measures may not be required as part of the appeal of EPAs and entrustment scales for workplace assessment is they overcome challenges with reliability in an authentic learning environment. Rekman et al. argue that rather than

requiring assessors to make judgements against an abstract competency scale, assessment of the level of supervision required for students to perform day-to-day activities of the profession in the workplace using a behaviourally anchored ordinal entrustment scale is clinically meaningful resulting in increased reliability.<sup>46</sup> Compared to judgements made from a single high-stakes performance, such as in an Objective Structured Clinical Examination where an assessment tool with high interrater reliability is required, supervisors rate students on their ability to execute an EPA with decreasing levels of supervision which requires multiple observations, confirmation of findings and incorporation of indirect feedback from multiple sources such as other team members and patients, reducing the need to evaluate reliability of the tool. The high level of concordance between supervisor and student self-evaluation demonstrated in our study supports this concept.

As with other reports of EPA implementation and evaluation, our study pertains to a single discipline at one institution which may limit the generalisability of our results. Compared to other health professions, dietetic student cohorts are relatively small with approximately 50 students graduating each year, limiting the number of potential participants. We have sought to address this by using a longitudinal approach, thus increasing participant numbers and therefore confidence in our findings. Furthermore, clinical placements were provided by multiple healthcare institutions including large metropolitan, small metropolitan, public, private and rural hospitals which demonstrates utility in different settings and potential for broad uptake. The trial of the tool by another dietetic education institution would be an area for further research.

The definition of EPAs has evolved since the commencement of our study and some items in our WBA tool may not align with recent definitions of an EPA.<sup>47</sup> Part of our tool design was

the mapping of milestones to each placement block which provided an indication of what students needed to achieve at each time point to progress to the next placement resulting in potential for cognitive or anchoring bias by supervisors. Although our study has identified areas of the nutrition care process that students are least entrusted in, this potential for bias means we should interpret these results with caution and further research is required.

## **Conclusion**

This study demonstrates the utility of our WBA tool that incorporates EPAs and an entrustment scale to assess dietetic student performance during clinical placements. The entrustment of students to perform EPAs with decreased supervisor support increased over time, with minimal differences observed when student self- assessment and supervisor assessment were compared. The educational impact of the tool is high as assessment against the EPAs multiple times over placements identifies specific areas of improvement required by individual students whilst simultaneously generating data that can track cohort performance in the workplace setting. This cohort assessment data can be used to inform curriculum redesign and identify specific areas of practice that may benefit from increased pre-placement instruction or teaching methods. Furthermore, continued use of the tool with consecutive student cohorts can provide a means to evaluate the impact of any changes. Our study increases knowledge about the time of supervised practice required for dietetic students to be entrusted to perform at the level of an entry level dietitian with most of the students being entrusted in all EPAs by the end of their three placements and increases knowledge of how dietetic students develop competence with the application of the tool to a different placement structure an area for future research. Finally, our study adds to the growing body

of evidence regarding the efficacy and acceptability of EPAs for work-based assessment in health professions education.

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Figure 1 Action Research Project Methodology adapted from Whittaker et al. <sup>25</sup>

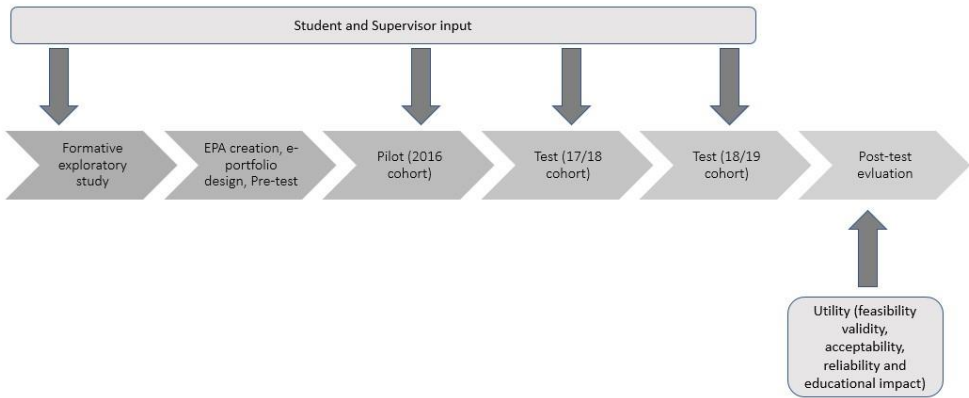
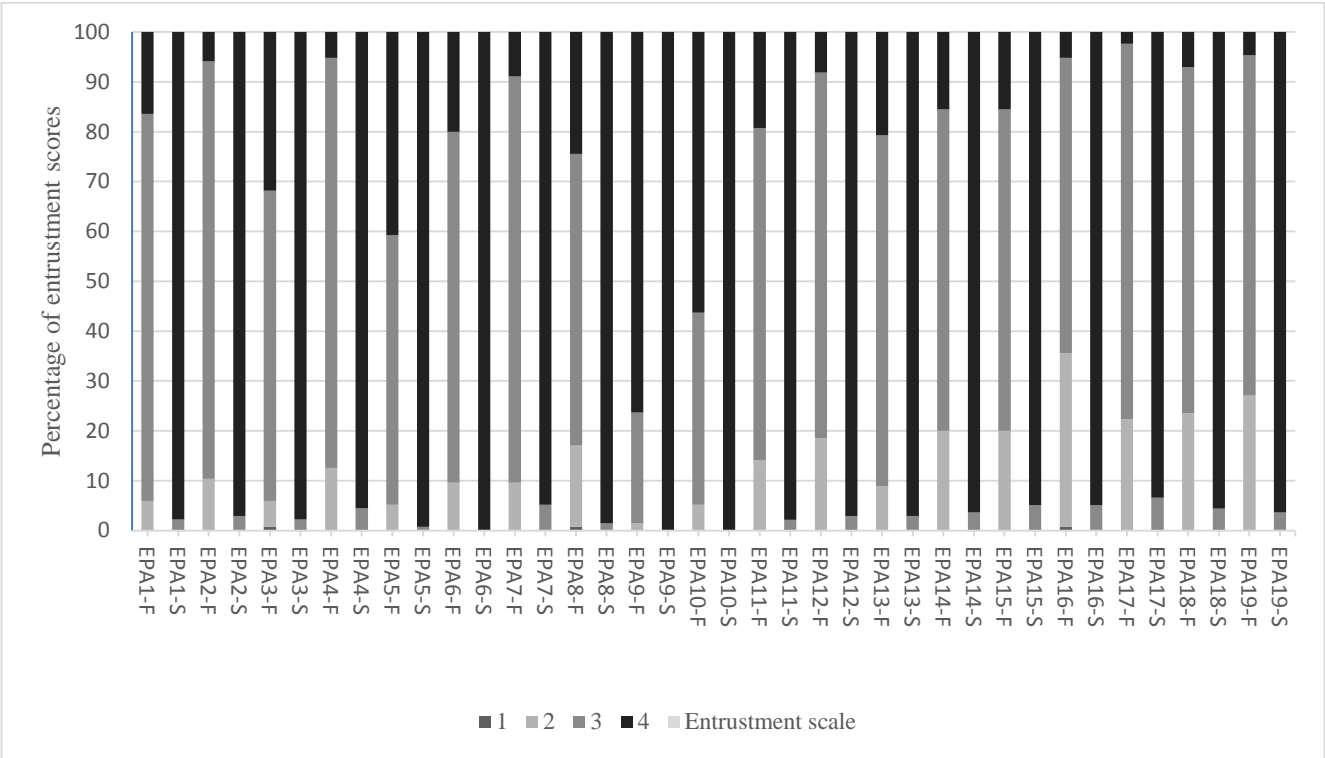
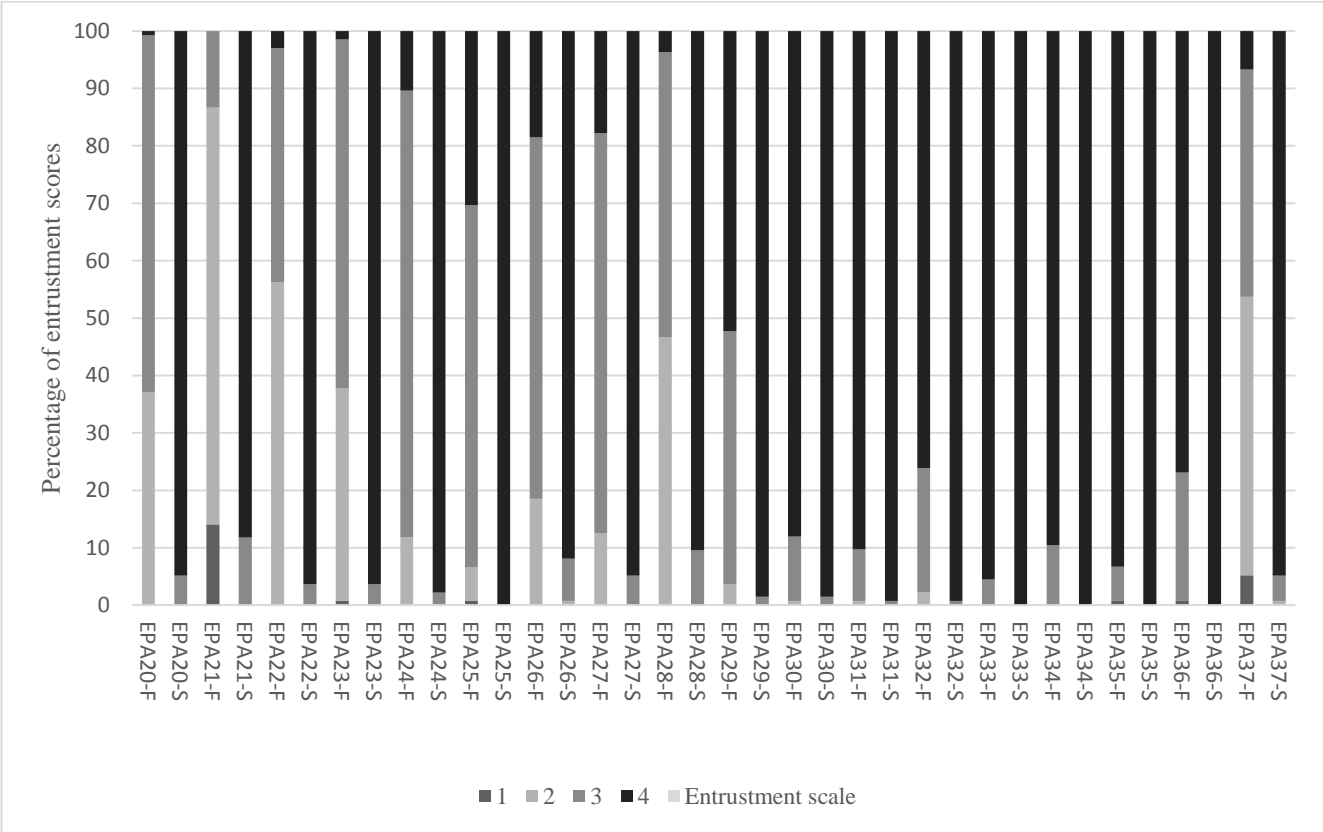


Figure 2 Comparison of formative (timepoint 3) vs summative (timepoint 6) supervisor entrustment rating of student performance for EPA1-EPA19



EPA Entrustable Professional Activity F- Formative Assessment Point S-Summative  
assessment point

Figure 3 Comparison of formative (timepoint 3) vs summative (timepoint 6) supervisor entrustment rating of student performance for EPA20-EPA39



EPA Entrustable Professional Activity F- Formative Assessment Point S-Summative assessment point

Table 1 Comparison of student self-assessment and supervisor midpoint assessment (Timepoint 3) and endpoint assessment (Timepoint 6)

EPA	EPA Statement	Student self-assessment				Supervisor assessment			
		Mid median (IQR)	End median (IQR)	Z	<i>p</i> <i>value</i> <sup>a</sup>	Mid median (IQR)	End median (IQR)	Z	<i>p</i> <i>value</i> <sup>b</sup>
<i>Assessment: Data collection</i>									
EPA1	Collects appropriate data from the medical file	3 (0)	4 (0)	-10.07	<0.001	3 (0)	4 (0)	-9.81	<0.001
EPA2	Collects and correctly interprets relevant biochemistry	3 (0)	4 (0)	-10.10	<0.001	3 (0)	4 (0)	-10.31	<0.001
EPA3	Collects and correctly interprets relevant anthropometry	3 (1)	4 (0)	-9.05	<0.001	3 (1)	4 (0)	-8.69	<0.001
EPA4	Collects and interprets correctly clinical information and medications	3 (0)	4 (0)	-9.91	<0.001	3 (0)	4 (0)	-10.34	<0.001
EPA5	Collects and interprets relevant social, physical, environmental data	3 (1)	4 (0)	-7.77	<0.001	3 (1)	4 (0)	-8.25	<0.001
EPA6	Correctly estimates nutrition requirements using appropriate equations or evidenced based values	3 (0)	4 (0)	-9.67	<0.001	3 (0)	4 (0)	-9.59	<0.001
EPA7	Obtains accurate and complete dietary information using the most appropriate method that considers social background, is linked to nutrition and medical problems and can analyse dietary information qualitatively and quantitatively	3 (0)	4 (0)	-9.36	<0.001	3 (0)	4 (0)	-10.25	<0.001

EPA8	Demonstrates an understanding of and is able to use nutrition screening and assessment tools	3 (1)	4 (0)	-7.90	<0.001	3 (0)	4 (0)	-8.96	<0.001
<b><i>Communication Skills</i></b>									
EPA9	Greets patient appropriately and introduces self and other present	4 (1)	4 (0)	-5.29	<0.001	4 (0)	4 (0)	-5.32	<0.001
EPA10	Establishes rapport with patient	4 (1)	4 (0)	-7.50	<0.001	4 (1)	4 (0)	-7.05	<0.001
EPA11	Understands and is able to explain to the patient the reason for Dietetic intervention/ referral	3 (1)	4 (0)	-9.43	<0.001	3 (0)	4 (0)	-9.42	<0.001
EPA12	Uses open and closed questions appropriately	3 (0)	4 (0)	-10.09	<0.001	3 (0)	4 (0)	-10.09	<0.001
EPA13	Obtains/ confirms medical/ social / clinical history from patient as appropriate	3 (1)	4 (0)	-8.93	<0.001	3 (0)	4 (0)	-9.61	<0.001
EPA14	Uses appropriate verbal and non-verbal communication strategies	3 (1)	4 (0)	-9.30	<0.001	3 (0)	4 (0)	-9.60	<0.001
EPA15	Interviews are conducted in a flexible yet logical sequence	3(0)	4 (0)	-9.70	<0.001	3 (0)	4 (0)	-9.48	<0.001
EPA16	Uses appropriate language throughout the interview and is able to translate technical information into practical advice/ information	3 (0)	4 (0)	-9.73	<0.001	3 (1)	4 (0)	-9.87	<0.001
<b><i>Nutrition Diagnosis/ Problem Identification</i></b>									
EPA17	Identifies and understands major medical problems and impact on nutritional status or management	3 (0)	4 (0)	-8.05	<0.001	3 (0)	4 (0)	-8.29	<0.001
EPA18	Is able to identify and prioritise major nutritional problems	3 (0)	4 (0)	-8.23	<0.001	3 (0)	4 (0)	-8.004	<0.001
EPA19	Is able to develop a nutritional diagnosis (PES)/ problem ID and verbalise clinical reasoning	3 (0)	4 (0)	-8.21	<0.001	3 (1)	4 (0)	-8.03	<0.001

<b><i>Nutrition Management and Evaluation</i></b>									
EPA20	Formulates and prioritises, tailored goals and objectives for nutrition management and can justify choices	3 (1)	4 (0)	-9.83	<0.001	3 (1)	4 (0)	-10.07	<0.001
EPA21	Able to provide appropriate, tailored nutrition education that addresses the nutrition problems/ diagnosis	2 (1)	4 (1)	-9.77	<0.001	2 (0)	4 (0)	-10.13	<0.001
EPA22	Works in partnership with patient, carers and health care team to develop an appropriate plan	2 (1)	4 (0)	-9.98	<0.001	2 (1)	4 (0)	-9.90	<0.001
EPA23	Follows up patients appropriately and adjusts care plan accordingly	3 (1)	4 (0)	-9.80	<0.001	3 (1)	4 (0)	-10.06	<0.001
EPA24	Documents nutrition care in the medical record	3 (0)	4 (0)	-9.69	<0.001	3 (0)	4 (0)	-10.0	<0.001
EPA25	Accesses the food service system to support nutrition care	3 (1)	4 (0)	-9.44	<0.001	3 (1)	4 (0)	-9.08	<0.001
<b><i>Manages own time effectively</i></b>									
EPA26	Manages own time effectively	3 (1)	4 (0)	-8.32	<0.001	3 (0)	4 (0)	-9.22	<0.001
EPA27	Manages time with patients effectively	3 (0)	4 (0)	-9.54	<0.001	3 (0)	4 (0)	-9.40	<0.001
EPA28	Able to plan and prioritise workload	3 (1)	4 (0)	-9.77	<0.001	3 (1)	4 (0)	-9.76	<0.001
<b><i>Professional Behaviour</i></b>									
EPA29	Communicates appropriately with Dietetic and other hospital staff	3 (1)	4 (0)	-8.22	<0.001	4 (1)	4 (0)	-7.16	<0.001
EPA30	Demonstrates respect and professionalism at all times (professional language, punctuality and attitude)	4 (0)	4 (0)	-2.83	.008	4 (0)	4 (0)	-3.13	.002
EPA31	Is actively engaged with all learning opportunities provided by clinical sites	4 (0)	4(0)	-3.46	<0.001	4 (0)	4 (0)	-3.32	.001

EPA32	Improves practice in responds to feedback provided by supervisors and own reflections	4 (1)	4 (0)	-6.00	<0.001	4 (1)	4 (0)	-4.99	<0.001
EPA33	Maintains patient confidentiality	4 (0)	4 (0)	-2.00	.125	4 (0)	4 (0)	-2.50	.031
EPA34	Maintains safe practice (does not provide unsupervised advice)	4 (0)	4 (0)	-2.65	.016	4 (0)	4 (0)	-3.61	<0.001
EPA35	Follows procedure for absence and all relevant hospital procedures such as infection control.	4 (0)	4 (0)	-2.97	.002	4 (0)	4 (0)	-2.89	.004
EPA36	Is able to use hospital communications and data management facilities appropriately	4 (0)	4 (0)	-4.94	<0.001	4 (0)	4 (0)	-5.40	<0.001
EPA37	Is an active member of the health care team and advocates for nutrition care	3 (1)	4 (0)	-9.12	<0.001	2 (1)	4 (0)	-9.49	<0.001

*EPA Entrustable Professional Activity*

*Entrustment scale rating (1) Observing (2) Highly assisted (3) Minimally assisted (4) Work ready*

<sup>a</sup> *Compares student self-assessment median score at midpoint (formative assessment, time point 3) to student self-assessment median score at end point (summative assessment, time point 6) using Willcox-signed rank test for each EPA. P value considered significant if <0.05.*

<sup>b</sup> *Compares supervisor assessment median score at midpoint (formative assessment, time point 3) to supervisor self-assessment median score at end point (summative assessment, time point 6) using Willcox-signed rank test for each EPA. P value considered significant if <0.05.*

Table 2 Exploration of the relationship of time and person (student self-assessment and supervisor assessment) for each EPA using linear mixed model analysis.

EPA	EPA Statement	Overall group comparison linear mixed model	
		Time <sup>a</sup>	Person <sup>b</sup>
EPA1	Collects appropriate data from the medical file	F (5,1358) 244 <i>p</i> <0.001	F (1,1330) 0.04 <i>p</i> 0.841
EPA2	Collects and correctly interprets relevant biochemistry	F (5,1360) 366 <i>p</i> <0.001	F (1,1331) 0.69 <i>p</i> 0.41
EPA3	Collects and correctly interprets relevant anthropometry	F (5,1365) 295 <i>p</i> <0.001	F (1,1337) 4.2 <i>p</i> 0.04
EPA4	Collects and interprets correctly clinical information and medications	F (5,1355) 357 <i>p</i> <0.001	F (1,1326) 0.60 <i>p</i> 0.438
EPA5	Collects and interprets relevant social, physical, environmental data	F (5,1365) 267 <i>p</i> <0.001	F (1,1340) 0.009 <i>p</i> 0.923
EPA6	Correctly estimates nutrition requirements using appropriate equations or evidenced based values	F (5,1369) 387 <i>p</i> <0.001	F (1,1333) 3.94 <i>p</i> 0.05
EPA7	Obtains accurate and complete dietary information using the most appropriate method that considers social background, is linked to nutrition and medical problems and can analyse dietary information qualitatively and quantitatively	F (5,1359) 454 <i>p</i> <0.001	F (1,1330) 8.36 <i>p</i> 0.004
EPA8	Demonstrates an understanding of and is able to use nutrition screening and assessment tools	F (5,1363) 379 <i>p</i> <0.001	F (1,1337)0.101 <i>p</i> 0.750
EPA9	Greets patient appropriately and introduces self and other present	F (5,1370) 176.9 <i>p</i> <0.001	F (1,1343) 0.289 <i>p</i> 0.591
EPA10	Establishes rapport with patient	F (5,1361) 204 <i>p</i> <0.001	F (1,1340) 0.136 <i>p</i> 0.712

EPA11	Understands and is able to explain to the patient the reason for Dietetic intervention/ referral	F (5,1364) 301 $p < 0.001$	F (1,1338) 2.90 $p 0.09$
EPA12	Uses open and closed questions appropriately	F (5,1358) 406 $p < 0.001$	F (1,133) 0.172 $p 0.678$
EPA13	Obtains/ confirms medical/ social / clinical history from patient as appropriate	F (5,1365) 424 $p < 0.001$	F (1,1338) 0.099 $p 0.75$
EPA14	Uses appropriate verbal and non-verbal communication strategies	F (5,1360) 330 $p < 0.001$	F (1,1336) 0.004 $p 0.95$
EPA15	Interviews are conducted in a flexible yet logical sequence	F (5,1355) 357 $p < 0.001$	F (1,1326) 0.60 $p 0.438$
EPA16	Uses appropriate language throughout the interview and is able to translate technical information into practical advice/ information	F (5,1362) 475 $p < 0.001$	F (1,1336) 1.16 $p 0.282$
EPA17	Identifies and understands major medical problems and impact on nutritional status or management	F (5,1182) 486 $p < 0.001$	F (1,1433) 0.055 $p 0.46$
EPA18	Is able to identify and prioritise major nutritional problems	F (5,1232) 411 $p < 0.001$	F (1,194) 2.363 $p 0.125$
EPA19	Is able to develop a nutritional diagnosis/ problem ID and verbalise clinical reasoning	F (5,1278) 391 $p < 0.001$	F (1,239) 1.363 $p 0.243$
EPA20	Formulates and prioritises, tailored goals and objectives for nutrition management and can justify choices	F (5,1361) 623 $p < 0.001$	F (1,1333) 12.3 $p < 0.001$
EPA21	Able to provide appropriate, tailored nutrition education that addresses the nutrition problems/ diagnosis	F (5,1364) 1029 $p < 0.001$	F (1,1334) 2.617 $p 0.11$
EPA22	Works in partnership with patient, carers and health care team to develop an appropriate plan	F (5,1356) 1042 $p < 0.001$	F (1,1333)13.06 $p < 0.001$
EPA23	Follows up patients appropriately and adjusts care plan accordingly	F (5,1361) 832 $p < 0.001$	F (1,1336)8.27 $p 0.004$
EPA24	Documents nutrition care in the medical record	F (5,1362) 467 $p < 0.001$	F (1,1338) 16.01 $p < 0.001$

EPA25	Accesses the food service system to support nutrition care	F (5,1363) 748 $p < 0.001$	F (1,1337) 6.61 $p 0.01$
EPA26	Manages own time effectively	F (5,1348) 215 $p < 0.001$	F (1,1325) 0.21 $p 0.647$
EPA27	Manages time with patients effectively	F (5,1360) 371 $p < 0.001$	F (1,1336) 0.104 $p 0.747$
EPA28	Able to plan and prioritise workload	F (5,1358) 388 $p < 0.001$	F (1,1331) 19.15 $p < 0.001$
EPA29	Communicates appropriately with Dietetic and other hospital staff	F (5,1358) 257 $p < 0.001$	F (1,1332) 2.535 $p 0.112$
EPA30	Demonstrates respect and professionalism at all times (professional language, punctuality and attitude)	F (5,1351) 31 $p < 0.001$	F (1,1319) 31 $p 0.624$
EPA31	Is actively engaged with all learning opportunities provided by clinical sites	F (5,1363) 31 $p < 0.001$	F (1,1331) 2.93 $p 0.087$
EPA32	Improves practice in responds to feedback provided by supervisors and own reflections	F (5,1365) 132 $p < 0.001$	F (1,1335) 4.816 $p 0.028$
EPA33	Maintains patient confidentiality	F (5,1355) 15 $p < 0.001$	F (1,1318) 0.0597 $p 0.440$
EPA34	Maintains safe practice (does not provide unsupervised advice)	F (5,1356) 13 $p < 0.001$	F (1,1320) 13.54 $p 0.983$
EPA35	Follows procedure for absence and all relevant hospital procedures such as infection control.	F (5,1373) 23 $p < 0.001$	F (1,1338) 8.81 $p 0.003$
EPA36	Is able to use hospital communications and data management facilities appropriately	F (5,1369) 99.8 $p < 0.001$	F (1,1338) 2.93 $p 0.087$
EPA37	Is an active member of the health care team and advocates for nutrition care	F (5,1349) 547 $p < 0.001$	F (1,1324) 12.05 $p 0.001$

<sup>a</sup> Mean group ratings compared for all time points using LMM with differences identified using post hoc last significant difference testing.

<sup>b</sup> Mean group ratings of student self-assessment compared to supervisor assessment for each EPA using LMM with differences identified using post hoc last significant difference testing.

Differences considered significant if  $p < 0.05$ .

Table 3 Comparison of supervisor determined actual level of attainment for each EPA at the end of placement blocks A, B and C to predetermined milestones

EPA	EPA statement	End of placement A (time point 2)		End of placement B (time point 4)		End of placement C (time point 6)	
		ELA-milestone	ALA-median (IQR)	ELA-milestone	ALA median (IQR)	ELA-milestone	ALA median (IQR)
EPA1	Collects appropriate data from the medical file	3	3 (0)	3-4	4 (1)	4	4 (0)
EPA2	Collects and correctly interprets relevant biochemistry	3	3 (0)	3-4	3 (1)	4	4 (0)
EPA3	Collects and correctly interprets relevant anthropometry	3	3 (0)	4	4 (0)	4	4 (0)
EPA4	Collects and interprets correctly clinical information and medications	3	3 (0)	3	3 (0)	4	4 (0)
EPA5	Collects and interprets relevant social, physical, environmental data	3	3 (0)	4	4 (0)	4	4 (0)
EPA6	Correctly estimates nutrition requirements using appropriate equations or evidenced based values	3	3 (0)	4	4 (0)	4	4 (0)
EPA7	Obtains accurate and complete dietary information using the most appropriate method that considers social background, is linked to nutrition and medical problems and can analyse dietary information qualitatively and quantitatively	3	3 (0)	4	4 (1)	4	4 (0)
EPA8	Demonstrates an understanding of and is able to use nutrition screening and assessment tools	3	3 (0)	4	4 (1)	4	4 (0)
EPA9	Greets patient appropriately and introduces self and others present	3	3 (1)	4	4 (0)	4	4 (0)
EPA10	Establishes rapport with patient	3	3 (1)	3	4 (0)	4	4 (0)
EPA11	Understands and is able to explain to the patient the reason for Dietetic intervention/ referral	3	3 (0)	3	3 (1)	4	4 (0)

EPA12	Uses open and closed questions appropriately	2	3 (1)	3	3 (1)	4	4 (0)
EPA13	Obtains/ confirms medical/ social / clinical history from patient as appropriate	2	3 (1)	4	4 (1)	4	4 (0)
EPA14	Uses appropriate verbal and non-verbal communication strategies	2	2 (1)	3	3 (1)	4	4 (0)
EPA15	Interviews are conducted in a flexible yet logical sequence	2	2(1)	3	3 (1)	4	4 (0)
EPA16	Uses appropriate language throughout the interview and is able to translate technical information into practical advice/ information	2	2 (0)	3	3 (0)	4	4 (0)
EPA17	Identifies and understands major medical problems and impact on nutritional status or management	2	2 (1)	3	3 (0)	4	4 (0)
EPA18	Is able to identify and prioritise major nutritional problems	2-3	3 (1)	3	3 (0)	4	4 (0)
EPA19	Is able to develop a nutritional diagnosis/ problem ID and verbalise clinical reasoning	2-3	3 (1)	3	3 (0)	4	4 (0)
EPA20	Formulates and prioritises, tailored goals and objectives for nutrition management and can justify choices	2	2 (0)	3	3 (0)	4	4 (0)
EPA21	Able to provide appropriate, tailored nutrition education that addresses the nutrition problems/ diagnosis	2	1 (1)	3	3 (0)	4	4 (0)
EPA22	Works in partnership with patient, carers and health care team to develop an appropriate plan	1	1 (1)	2-3	3 (0)	4	4 (0)
EPA23	Follows up patients appropriately and adjusts care plan accordingly	1	1 (1)	2-3	3 (2)	4	4 (0)
EPA24	Documents nutrition care in the medical record	2	2 (1)	3	3 (1)	4	4 (0)
EPA25	Accesses the food service system to support nutrition care	2	2 (1)	3-4	4 (1)	4	4 (0)
EPA26	Manages own time effectively	2	3 (1)	3-4	4 (1)	4	4 (0)
EPA27	Manages time with patients effectively	2	2 (1)	3-4	3 (1)	4	4 (0)
EPA28	Able to plan and prioritise workload	2	2 (0)	3	3 (0)	4	4 (0)
EPA29	Communicates appropriately with Dietetic and other hospital staff	2-3	3 (0)	3-4	4 (1)	4	4 (0)
EPA30	Demonstrates respect and professionalism at all times (professional language, punctuality and attitude)	4	4 (1)	4	4 (0)	4	4 (0)
EPA31	Is actively engaged with all learning opportunities provided by clinical sites	4	4 (0)	4	4 (0)	4	4 (0)

EPA32	Improves practice in responds to feedback provided by supervisors and own reflections	3	4 (1)	4	4 (0)	4	4 (0)
EPA33	Maintains patient confidentiality	4	4 (0)	4	4 (0)	4	4 (0)
EPA34	Maintains safe practice (does not provide unsupervised advice)	4	4 (0)	4	4 (0)	4	4 (0)
EPA35	Follows procedure for absence and all relevant hospital procedures such as infection control.	4	4 (0)	4	4 (0)	4	4 (0)
EPA36	Is able to use hospital communications and data management facilities appropriately	4	4 (0)	4	4 (0)	4	4 (0)
EPA37	Is an active member of the health care team and advocates for nutrition care	2	2 (1)	3	3 (0)	4	4 (0)

ELA: Predetermined expected level of achievement. ALA: Actual level of achievement- supervisor assessment at end of placement block

*Entrustment scale rating (1) Observing (2) Highly assisted (3) Minimally assisted (4) Work ready*

## **Practice Implications**

### **What is the current knowledge on this topic?**

EPAs are a novel educational concept that assist to translate competency frameworks into observable actions that can be used to assess learners in the workplace. EPAs are gaining rapid acceptance in health professional education.

### **How does this research add to knowledge on this topic?**

An EPA based work-based assessment tool implemented in the clinical setting was valid and demonstrated educational impact by identifying aspects of NCP where learners need more support.

### **How might this knowledge impact current dietetic practice**

The EPA based tool for skill assessment in clinical dietetics offers potential for a widely accepted and validated work-based assessment tool which is currently lacking in dietetics.

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## 7.4 Conclusion

Utility of the EPA- and work-based assessment tool embedded in an e-portfolio was further demonstrated with construct validity established. The EPAs identified areas of clinical dietetic practice that students were least entrusted to perform and most entrusted to perform. The EPAs demonstrate educational impact as they informed learning goals for individual students. Furthermore, analysis of the educational data produced by EPA assessment provided insight into the development of competence in the workplace and identified areas of practice dietetic students are most and least trusted to perform which can inform future teaching.

## Chapter 8 Discussion and conclusion

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The overarching aim of this thesis was to develop, implement and evaluate a work-based assessment tool using an e-portfolio structure featuring embedded EPAs and student self-assessment for dietetic education with the overall goal of improving the utility of assessment methods. The studies presented in this thesis describe a program of work that addresses a gap in previously existing knowledge regarding the use of EPAs in entry-level dietetics and establish the utility of EPAs for work-based assessment of dietetic students. The novel use of EPAs in this context offers potential to improve assessment processes for dietetic students and their professional placement supervisors and addresses the lack of a work-based assessment tool with proven high utility. Key findings of each of the studies included in this thesis are summarised below and positioned in the broader existing knowledge base.

### 8.1 Key Findings

**Chapter 2** presented a narrative review that provided an overview of different education concepts and assessment strategies in health professions education. This chapter identified a relative lack of understanding of how dietetic students develop competency in supervised practice, challenges associated with assessment and the lack of a widely accepted assessment tool for workplace assessment of dietetic students. This thesis chapter included a publication outlining the application of Entrustable Professional Activities in the textbook *Clinical Education for the Health Professions* (Bramley & McKenna, 2020). Given the identified shortcomings of competency-based education and current assessment strategies in dietetic education, the novel concept of Entrustable Professional Activities may help improve practice and increase understanding of how dietetic students develop competency.

**Chapter 3** comprised a scoping review which aimed to map available evidence of EPA use in entry-level healthcare education to understand how EPAs are being used and in what contexts. This study extended current knowledge to provide insight into the use of EPAs in the entry-level context for health professional education. A total of 30 studies were included for review and described EPA use in medicine, dietetics, pharmacy, and physician assistance. A key finding of the study was that the use of EPAs in the entry-level context has gained momentum, as indicated by the rapid increase in publications from one in 2014 to 15 in 2019. As well as gaining

popularity in multiple health professions, use of EPAs can be found in multiple countries ranging from the U.S.A, Canada, Mexico, Australia, Netherlands, Switzerland and Germany. As the use of EPAs in the entry-level context is still a recent phenomenon, the majority of studies reported on development of EPAs, with fewer reporting on implementation and evaluation of EPAs.

Another key finding of the scoping review was that a major driver in the development of EPAs was to help define practice activities and expectations of entry-level professionals and identify gaps or mismatches between expected and actual performance. This is a key advancement for patient safety as EPAs can help decrease the risks of patients being cared for by clinicians unable to perform at the expected level or requiring new clinicians being expected to complete activities beyond that expected of them without sufficient supervision. EPAs and entrustment scales offer potential for significant education impact for student learning in the workplace as they clearly identify areas of weakness or strength. Additionally, some studies identified in the review were using EPAs, not only to assess student performance, but to create flexible education programs where the student progresses according to ability to perform the EPAs, rather than in a time-based fashion. The use of EPAs to enhance educational research in this way was reported by several studies included in the review.

The review did not identify a dominant method for developing EPAs and a research gap to identify the best method for developing EPAs was identified. Similarly, multiple methods of validating EPAs were identified including surveying health professionals to ensure that working professionals performed the EPAs and cross-checking with job descriptions. Another area of controversy identified by the review included the number of EPAs required to describe professional work. As there is a need for granularity to support junior levels, too few or too broad EPAs may not provide sufficient targeted feedback. Several studies included in the review solved this by dividing EPAs into smaller tasks nested into the overarching EPAs.

**Chapter 4** described the methodology used to develop, implement and evaluate the utility of the EPA work-based assessment tools. Action research is a methodology that allows the input of participants in the research which was essential to achieve acceptability of the tool. Van der Vleuten (1996) asserts that an assessment method must be acceptable to stakeholders to have utility. Other disciplines have used action research or other iterative frameworks to develop EPAs (Haines et al., 2017; Pittenger et al., 2017; Rhodes et al., 2019). This thesis, however, is the first to describe the application of these methods to develop an EPA based assessment tool in the dietetic context.

**Chapter 5** consisted of exploratory formative research to explore students' and educators' perceptions of work-based assessment, the use of EPAs as an assessment strategy in professional placements and to evaluate utility of the existing e-portfolio, specifically the inclusion of student self-assessment and reflection. This study was the first published study to evaluate the use of EPAs in entry-level dietetic education. Key findings from this study were that both students and supervisors expressed preference for EPAs (labelled skill descriptors in this study) compared to competency-based assessment for assessment of dietetic students in the clinical work-based setting.

In addition to informing the decision to adopt EPAs over other assessment methods for work-based assessment in clinical dietetics, the results of this study identified key aspects of assessment that were important for both dietetic students and their supervisors. These were the inclusion of student-self assessment to promote reflective practice and use of an electronic format to collate assessments in the form of an e-portfolio. This confirms the finding of other studies and adds to the evidence that e-portfolios help support reflective practice and self-awareness in students and are an effective strategy to help orientate students to the curriculum (Buckley et al., 2009; Garrett et al., 2013; Watty & McKay, 2015).

A significant finding of this study was the identification of support for an entrustment scale as a way of clearly communicating expectations to both students and supervisors and decreasing subjectivity. Both students and supervisors expressed frustration with the existing competency scale as it failed to adequately describe student performance, particularly during formative assessment. This finding is consistent with the findings of Bacon et al., (2017) concerning the experience of dietetic students and assessors that showed a lack of consistency between assessors when assessment of student performance was determined using a three-point visual analogue scale (Novice/Intermediate/Competent).

**Chapter 6 Part A** presented an implementation study that aimed to evaluate utility of an EPA-work-based assessment tool for use in the clinical dietetic setting. This chapter reported on pre-testing, pilot and implementation stages and evaluated the feasibility, face and context validity and acceptability aspects of Van der Vleuten's model of utility (Van der Vleuten & Schuwirth, 2005; Van der Vleuten, 1996). This is the first published report of longitudinal implementation and evaluation of EPAs for use in assessment of dietetic students in the clinical setting. Hence, it adds new knowledge to the evidence base on EPAs. A total of 37 EPAs were developed to describe the nutrition care process, communication skills and aspects of professionalism and mapped to the National Competency Standards for Dietitians in Australia confirming construct

validity. Milestones of expected student performance at the end of each of the three placements were described using the 4-point entrustment scale. Although the entrustment scale proposed by Ten Cate (2013) had a fifth level, teach others to perform the EPAs, this level of performance is above the expectations of a new graduate. Therefore, a four-point scale with the highest level of entrustment being described as work ready was chosen. Chen et al. (2015) who examined EPA use in entry-level medical students have made a similar suggestion, confirming that completely unsupervised practice is not realistic or appropriate for entry level students.

Both students and supervisors reported EPAs to be a valid assessment of student performance on placement. EPAs helped link day-to-day activities on a clinical dietetic placement to assessment and provided a curriculum map as they described educational outcomes. Feasibility and acceptability of the EPAs were confirmed. There were some statistical differences but no practical differences between student and supervisor evaluation, with satisfaction being maintained over the three-year evaluation period. Students requested a five-point scale to assess performance in preference to the four-point scale suggesting a need for increased granularity in early learners confirming similar findings by others (Chen et al., 2015; Curran et al., 2018).

**Chapter 6 Part B** reported on the development, implementation and evaluation of the utility of an EPA-based work-based assessment tool for use in community and public health dietetic setting. This is the first study to report on use of EPAs in the dietetic community and public health setting and the first to report on the use of EPAs for assessment of students' skills in a project style placement.

The exploratory study, although comprising low participant numbers, showed that students and dietetic supervisors were open to the use of EPAs to assess dietetic students in community and public health settings. As found in the clinical dietetic study reported in Chapter 5, both dietetics students and their supervisors valued student self-assessment to promote reflective practice, the electronic format, and opportunity for both formative and summative assessment during placement.

In the first action research cycle, a total of 40 EPAs were developed to describe the program management cycle, and these were mapped to the National Competency Standards for Dietitians in Australia. The same four-point entrustment scale was used in the clinical EPAs; however, milestones were not created due to a lack of data to inform creation and a shortened placement length decreasing their relevance. Owing to ambivalent evaluation, particularly by

dietetic students, the EPAs were revised with the resulting 25 EPAs remapped to the national competency standards to confirm construct validity. Following this revision, dietetic supervisors reported that EPAs effectively and accurately assessed dietetic student performance in the community and public health setting; however, students evaluated the EPAs less positively compared to supervisors.

Although face and construct validity, acceptability and feasibility of the community and public health dietetic EPAs were confirmed, the evaluation was weaker than that of the clinical EPAs reported in Chapter 6A. Given this is the first example where EPAs have been developed to assess a project type placement, this study found that EPAs could be used to assess performance of students in non-hospital settings and in performing activities of a professional nature not linked to direct patient care.

**Chapter 7** expanded the evaluation of the utility of the clinical dietetic EPAs confirming that the EPA-based clinical dietetic work-based assessment tool addressed the lack of a well-accepted tool to assess the skills of dietetic students on clinical placement.

This study confirmed construct validity of the EPAs by demonstrating that dietetic student performance using the EPA-based work-based assessment increased over time. The educational impact of EPAs for dietetic students was confirmed with actual performance against EPAs matching predicted performance for all except two milestones. A range of performance against each EPA was shown with students reaching the level of work-ready entrustment during placement A or B for some EPAs, while not achieving work-ready entrustment towards the end of the final clinical placement C for others. Early entrustment was achieved in EPAs linked to professionalism and those that were linked to relatively few competencies such as collect and correctly interpret anthropometry data. Entrustment was achieved later in EPAs that were linked to multiple competencies such as nutrition management e.g., providing tailored dietary advice. The ability to measure these aspects of practice in the workplace by this novel tool increases the knowledge of how dietetic students gain competency during clinical placements and addresses a current knowledge gap.

While the importance of student involvement in assessment has been highlighted, it has also been reported that student self-assessment is unreliable (Eva & Regehr, 2005). In comparison to this, the linear mixed model analysis reported in Chapter 7 suggests a high level of accordance between student self-assessment and supervisor assessment with time being the only variable related to student performance in each EPA. This finding supports the educational impact of

EPAs to assist students to identify areas of weakness and areas of strength. This feedback has clear benefits for individual student learning of placement and can promote discussion to identify and discuss strategies that will lead to improved performance and increased independence.

Importantly, the educational data automatically collected by the tool can be used by education providers to analyse student performance. This can be used by educators to support individual students but can also be interrogated to determine areas of weakness or strength within or across cohorts with data being used to inform teaching and measure the outcome of different pre-placement learning activities in the work-based setting.

## 8.2 Strengths

There were strengths and limitations of both the research and the resulting work-based assessment tool. Key strengths and limitations will be highlighted with a more detailed discussion to follow.

Key strengths of the research included the range of study designs resulting in a comprehensive picture of the current state of play and knowledge gaps with regards to EPA use and work-based assessment practices in entry-level health care, and more specifically in dietetics. The longitudinal nature of the study and multifacility evaluation increases confidence in the results. Limitations of the research included the single educational institution and the niche discipline of dietetics potentially limiting generalisability of the findings. At the time of commencement, there was no clear best method for EPA creation reported in the literature and the methods used did not consult broadly with the profession as many other published studies have done.

With regards to the strengths of the work-based assessment tool developed as an outcome of the research, a clear strength is the high utility of EPAs and the EPA assessment scale for workplace assessment. EPAs are acceptable to both dietetic students and their supervisors because they describe work that is routinely done by dietitians in clinical and community and public health settings and link the activities to competencies. The entrustment scale is a strength as it does not require translation to an arbitrary competency scale which increases acceptance and the sustainability of the tool. Embedding the assessment tool in an e-portfolio provides opportunity for student self-assessment and allows easy collection of rich educational data. Limitations of the tool may be that the EPAs in the tool may demonstrate some inconsistencies

with more recent definitions of EPAs and that a more granular assessment scale may be preferable.

### **8.2.1 Strengths of the research**

A range of different study designs were used in this research including narrative review, scoping review and several studies joined by action research cycles designed to provide a thorough evaluation of the utility of EPA use in the entry-level dietetic context. The repeated cycles of action research is a strength of the research and allowed a deep exploration of this novel use of EPAs for work-based assessment of dietetic students during their professional placements.

Another strength of the research is the scoping review which employed the rigorous methodology outlined by the Joanna Briggs Institute and PRISMA-ScR (JBI, 2015). The broad search strategy and inclusion of all health professions resulted in deeper understandings of the use of EPAs in the entry-level context than that previously published (Meyer et al., 2019). As the use of EPAs in entry-level health professions education is less than 10 years old, excluding perspectives or opinion articles provided targeted analysis of empirical research and identified how EPAs were being used, along with what methods are being employed to develop, implement and evaluate their use.

Van der Vleuten argues that for an assessment method to have utility it must be acceptable to both learners and assessors and be feasible (Van der Vleuten, 1996). The use of mixed methods in the formative explorative study (Chapter 5) provided a meaningful appreciation of what would be acceptable to users, why this would be acceptable and what would be feasible in the field. The use of anonymous surveys allowed for broad consultation and maximised participation while the follow-up stakeholder interviews allowed in depth exploration of users' perspectives on assessment and understanding of some of the practical implications, such as understanding IT infrastructure. Using a convenience sample and conducting the focus groups on site at major clinical partners maximised participation in the focus groups. Consultation with an educational designer with technical knowledge of the functionality of the e-portfolio software at this key point meant that the needs of stakeholders (students, supervisors, academics) were incorporated in the design and functionality of the tool.

The use of an action research methodology strengthened this research as it allowed for repeated cycles of feedback to be used to modify the EPAs or assessment process to maximise utility. This also provided opportunity to adjust the research protocol to maximise participation resulting in

increased survey response rates in the pilot and implementation phases of the study (Chapter 6a and 6B) compared to participation rates in the exploratory study (Chapter 5). Additionally, the inclusion of multiple cohorts of students and their supervisors increased the overall participation in the study and increased the size of the dataset used in the final study (Chapter 7). A longitudinal approach increased confidence regarding the sustainability of the tool.

The utility research framework developed by Van der Vleuten and Van der Vleuten and Schuwirth allows for comprehensive evaluation of the EPA-based work-based assessment tool (Van der Vleuten, 1996; Van der Vleuten & Schuwirth, 2005). The scoping review identified a lack of a dominant method for development, implementation and evaluation of EPAs and most papers reported on only one aspect. The use of Van der Vleuten's utility framework had been used by other researchers to evaluate implementation of EPAs (Peters et al., 2019). A strength of this approach is the resulting broad and comprehensive evaluation.

An additional strength of this research is inclusion of evaluation of several different types of validity with a recent commentary highlighting the need for multiple validity evaluation to ensure that EPAs are appropriate for work-based assessment (Taylor et al., 2021). Content validity was ensured by the involvement of an expert working party to contribute to EPA development. This expert working party included academics but also current practitioners to ensure relevance to the workplace. Context validity evidence was provided through mapping the EPAs, not only to the National Competency Standards for Dietitians in Australia, but also to key practice frameworks, namely the Nutrition Care Process (Lacey & Pritchett, 2003) and the Program Management Cycle (Grier & Bryant, 2005). Construct validity for the clinical EPA-based tool was established through the analysis of educational data.

In addition to providing comprehensive evidence for validity, evaluating multiple types of validity by using a diverse expert working party and mapping to competency standards and dietetic processes ensured that both the EPAs and the assessment tool were acceptable to practising professionals. The exploratory study (Chapter 5) identified additional factors that were likely to influence acceptability, and these were considered in the design of both EPAs and functionality of the tool itself. Acceptability was evaluated specifically in studies 6a and 6b in a longitudinal fashion with multiple cohorts of students and supervisors. While cost was not specifically evaluated, feasibility as a proxy measure for cost, was explored and addressed by interrogating the infrastructure required to use the electronic tool and time involved in administering the tool in the surveys.

The evaluation of educational impact in Chapter 7 is a key strength. It has been highlighted that little was previously known about how dietetic students develop competence during supervised placements (Palermo et al., 2018) and this thesis contributes to expanding knowledge in this area. The EPA- and work-based assessment tool collects data about student skill development in the Nutrition Care Process at each time point. How entrusted dietetic students were to perform each of the EPAs across time was measured and the study identified EPAs that students were entrusted to perform after a short period of supervised practice, as well as other EPAs where students did not achieve entrustment until the end of their final placement. Understanding of student skill development over time increases knowledge of how many days of supervised practice are required for students to be able to perform the activities of a practising dietitian at the standard expected of a new graduate. While there are other studies that have reported on the development and implementation of other assessment tools and methods in dietetics (Brennan & Lennie, 2010; Jamieson et al., 2019; Karupaiah et al., 2016; Lennie & Juwah, 2010), this is the first that has used evaluated educational impact alongside other measures such as validity.

### **8.2.2 Strengths of the tool**

As described above, the methods used allowed stakeholder input into the design of the tool and resulted in two work-based assessment tools that had high utility. The EPA-based tools, embedded in an e-portfolio that included student self-assessment, address several issues that have been highlighted in the literature. Palermo et al. (2018), in their exploration of dietetic student placement experiences, identified a need in dietetic education for assessment based on practice, a desire for students to be involved in assessment and a shared understanding of expectation of entry-level practice (Palermo et al., 2018). The work-based assessment tool with EPAs embedded in an e-portfolio addresses all these concerns. There is opportunity for students to self-assess using the same criteria as supervisors and the EPAs describe the practice of dietitians in the workplace. In the clinical tool, expectations of the degree of independence are described through the mapping of milestones that illustrate transparently the expected educational outcomes at different timepoints. The development of milestones in the community and public health tool are planned as future research. There are no other published tools that address these areas of concern in the way that the two tools described in this thesis do, representing a significant contribution to this field of practice and research.

Additionally, it has been noted that there is a need in the field of dietetic education to shift from assessment of learning to assessment for learning and there that there can be inconsistencies in

the judgements of supervisors when using quantitative competence assessment tools, such as a visual analogue competence rating scale (Bacon et al., 2017). The novel use of an entrustment scale and inclusion of both formative and summative assessments are key strengths of the tool that address limitations in current dietetic education practices.

One of the main aspects of the tool that underpins utility is the use of an entrustment scale to rate student performance. Rekman et al. (2016) suggest that the use of an entrustment scale is appealing to supervisors performing work-based assessment and reflect real world judgements already made routinely in the workplace. There is no need for supervisors to compare performance to an abstract scale, such as above or below expectations. They can easily judge whether the student can safely perform an activity independently or whether they need active or passive support. This has several benefits for utility. Firstly, it is meaningful to supervisors so has high acceptability. Secondly, because the scale is meaningful to supervisors, minimal supervisor training or support materials are required which has positive implications for costs of implementation and feasibility (Crossley & Jolly, 2012). Thirdly, the scale allows high performers maximal independence and identifies areas to target learning in students who are not reaching their milestones. The use of EPAs and entrustment scales in the tool described in this thesis addresses the issue of a need for assessment based on actual practice and the need for shared understandings of entry-level competence that has been noted in the literature (Palermo et al., 2015; 2018).

## **8.3 Limitations**

### **8.3.1 Limitations of the research**

As with most educational research, this study was limited to a single institution and discipline which may limit the generalisability of the research. Furthermore, the total number of participants in the studies was quite low, owing to the fact that dietetic enrolments at this institution are limited to around 50 students per academic year. The longitudinal nature and repeated evaluation study design involving four cohorts of students in total was chosen to minimise the impact of this unavoidable limitation. Furthermore, the use of multiple cycles of action research with clear engagement of stakeholders multiple times increases the generalisability of the results and makes them applicable to other institutions and professions.

In the first exploratory study, the number of participants, particularly student participants, in both the evaluation surveys and stakeholder interviews was low. The most likely explanation is that the evaluation surveys were sent at a time that corresponded with students completing their final assessments before exiting the course. They were likely fatigued and focused on completing placements and course work, hence de-prioritised providing feedback that was not going to benefit them directly. The response rate for supervisors was much higher, increasing confidence that the evaluation was reflective of the broader views of supervisors. The timing of the distribution of the survey was adjusted and resulted in higher response rates in the remaining cycles of action research.

It proved difficult to recruit students to participate in the stakeholder interviews, most likely as they were conducted after all course work had been completed. The structure of the course meant it was not possible to conduct these interviews prior to course completion as students would not have completed their clinical and community and public health placements. Out of a possible 38 students, only four agreed to participate necessitating a change in methodology through combining evaluation of assessment in all professional placements rather than three separate groups. This reduced the breadth of evaluation and increased the risk that views reported by the students were not representative of the entire cohort. The use of convenience sampling to recruit clinical supervisors to stakeholder interviews, and conducting these at their workplaces, resulted in a higher number of participants which increases confidence of the results of this evaluation. An additional limitation was that only metropolitan clinicians from publicly funded facilities participated. Testing the tools in private hospitals and practices is recommended for the future.

Recruitment of supervisors from the community and public health setting was also problematic. It was not possible to use the convenience sampling method to recruit these dietitians and a low number of participants in this aspect of the study resulted, once again decreasing confidence that the feedback was representative of the broader group. All interviews were conducted by the candidate, meaning that the interviewer was known to participants in the student and clinical supervisor feedback groups, which may have influenced their responses. The candidate and participants in the community and public health supervisor interviews were not known to each other. Although feedback from the stakeholder interviews was incorporated in the development of the EPAs and the e-portfolios, formal qualitative analysis was not performed. The constraints and timings of the placements meant there was insufficient time between conducting the interviews and building and testing the new e-portfolios to conduct such detailed

analysis. Again, the choice of an action research methodology and longitudinal evaluation helped decrease the impact of this limitation.

A key finding of the scoping review determined there was no dominant methodology for EPA development. The methods employed to create the EPAs for this study were the methods described by Mulder et al. (2010). Although a working party was established to enable broader input into EPA development than just the candidate and the PhD supervision team, the working party consisted of academic stakeholders and practitioners. However, all practitioners had teaching links and were employed by the institution in addition to their practitioner roles which represents a selection bias. The use of these methods may result in EPAs that are too narrow and do not sufficiently describe the activities of the profession. Other published studies on EPA development list the establishment of broad-based working parties, Q sorting and Delphi techniques to establish wide consensus (Hauer, et al., 2013; Ten Cate et al., 2018; Touchie, et al., 2014; Wisman-Zwarter et al., 2016). The action research methodology overcame this limitation as it allowed supervisors to provide feedback on the EPAs with each cycle with no additional EPAs suggested.

Since 2016 and the commencement of this project, the definition of EPAs has also evolved and developed. An early paper key paper by Ten Cate et al. (2013) suggests that the ideal number of EPAs should be between 20 and 30, although this is in the context of graduate medical education. The clinical dietetic EPAs, and the first version of the community and public health dietetic EPAs, both exceeded this number, and it could be argued that the EPAs are not truly EPAs but are more consistent with other related concepts, such as Observable Practice Activities, which are smaller observable actions that nest into a broader EPA (Warm et al., 2014). Recently, there has been additional debate about the need for granularity in entry-level and below entry-level assessment. Other authors who have published regarding the development of EPAs in entry-level education have a much larger number of EPAs, or sub-EPAs, that nest into a broader EPA to allow this granularity of feedback (Peters et al., 2019). An area for future research will be to conduct additional evaluation, such as Rasch analysis (Rasch, 1993), to determine if any EPAs are redundant or could be consolidated. This method has been employed successfully in other allied health professions, such as physiotherapy, to improve their work-based assessment tools (Dalton et al., 2011). Further work is required to determine the sample size required for this analysis.

The other limitation of the EPAs described in this study are that some may not fit the definition of EPAs, as they are not considered unique to the profession of dietetics (Ten Cate et al., 2021).

This is particularly true of the EPAs linked to professionalism and time management as these are activities that would be common to all health professions and not unique to dietetics. A further criticism may be that the creation of separate sets of EPAs for clinical and community and public health dietetics is inconsistent with the definition of EPAs capturing or describing the profession entirely. A challenge in dietetics is that practice and associated professional activities vary across different settings. The practice activities of clinical dietetics are linked to the nutrition care process that aim to address a medical nutrition problem of an individual and are different to the practice activities of community and public health dietetics where the focus is program management to address a nutrition problem in a group or population. Other professions that have developed entry-level EPAs such as medicine, have less variation in practice and a single set of EPAs is more realistic. Importantly, in the graduate space, particularly in medicine, there are many examples where individual specialties have developed their own EPAs that describe the professional activities of that specialty (Aimer et al., 2016; Rose et al., 2014; Valentine et al., 2019).

With regards to the evaluation of utility, an aspect of this framework that was not included in this thesis was reliability. A key methodology to determine reliability is to employ multiple assessors to establish inter-rater reliability. A possible way to determine this would be to have students assessed by a pair of assessors; however, this may be challenging to achieve in practice as there is limited capacity for student supervision in the Victorian workforce. It has been argued that there is less need for reliability analysis in work-based assessments where performance is longitudinally judged, rather than judged on a single performance (Van der Vleuten, 1996). Furthermore, Rekman et al. (2016) argue that entrustment scales, being a “behaviourally anchored ordinal scale passed on progression to competence” (pg. 186) have increased reliability as they are structured in the way that evaluators already make decisions regarding the amount of supervision to provide junior staff. In contrast, other scales, such as visual analogue competency scales, have demonstrated significant inter-rater variability between different assessors (Bacon et al., 2017). Evaluation of reliability of the tool was not in the scope of this research.

An aspect of Van der Vleuten’s framework that was not evaluated was cost. Feasibility was used as an alternative indicator with evaluation survey items included to obtain user feedback on this. A key question regarding the length of time taken to complete the assessment electronic workbook was included with the majority of both students and supervisors reporting that the time taken for assessment was reasonable. In the formative evaluation concerns were also

noted around privacy and access to IT infrastructure, particularly in the clinical setting where computers are often in shared spaces. For this reason, a hybrid model was included in the e-portfolio design where students could discuss weekly progress and set goals using a paper document that could be uploaded into the portfolio.

Another consideration regarding cost was the resource required to support the assessment process. In each year of the study, students were provided with one hour of orientation and training to the EPAs and the assessment process. This represented a decrease from the four hours of training provided in the pre-pilot year when all assessment was competency-based. In the first year of implementation, supervisors were provided with one hour of training via site visit or webinar. Following this, training was only provided to new clinical placement partners as part of overall orientation to the course. Compared to competency-based education, this represents a much-reduced need for support which supports the sustainability of this assessment method and addresses a recent finding that sustainable assessment practices are a key consideration (Bacon et al., 2018).

### **8.3.2 Limitations of the tool**

As already discussed, although the tool demonstrated high overall utility, some participants expressed preference for a five-point scale to provide increased granularity of feedback. Although an educational designer was consulted to maximise usability, some students struggled to activate and use their e-portfolio and needed support from peers and academics. With this in mind, a decision was made for the clinical dietetic e-portfolio to combine all three placements into a single portfolio. A potential negative implication for this was that student supervisors could view feedback from past assessments which may bias their assessment. If this was deemed a risk by the supervising academic, a new portfolio with no previous feedback could be created. The design of the e-portfolio was such that the assessor fields were locked until the student had completed their self-assessment. This design feature was included to ensure that student had reflected prior to assessment; however, some supervisors reported they would like to access these fields earlier to assist with their own time management.

## **8.4 Implications for practice, education and research**

As noted in Chapter 2, there is no widely accepted tool for the assessment of dietetic students on clinical placement (Jamieson et al., 2019). From the perspective of a clinical placement

supervisor, the need to navigate multiple tools and placement structures can increase the burden of supervising students and place downward pressure on capacity. Although different training programs have different placement structures, the learning outcomes are the same as they are all required to provide opportunity for students to demonstrate the National Competency Standards for Dietitians in Australia in a work-based setting.

Other allied health professions have developed and validated national assessment tools (McAllister et al., 2013, Dalton et al., 2009). As the EPAs described in this thesis are linked to the daily work practice of dietetics in each setting, the tool could be used for work-based assessment in any program where students are required to provide individual patient care in a health care setting or provide dietetic care to groups and populations using the program management cycle. The high utility of the tool increases the likelihood of implementation and uptake at other training institutions.

With wider adoption of the tool, there will be potential to determine the impact of different placement structures on learning. While all accredited courses are mandated to provide a minimum of 100 days of supervised practice, there is no mandate on how to deliver this, resulting in many different placement structures in dietetics nationally. An example of this variation is in the state of Victoria, where the four accredited training programs have different placement lengths and structures. It may be that some models are more effective in supporting student learning and skill development, however it is not possible to determine this currently as each course uses a different assessment process. If all courses used the EPA model and the tool described in this thesis, it would be possible to collect data on when students reached different milestones and compare placement structures to determine the optimal structure for student learning. The lack of a widely accepted tool is a barrier here, and the tool described in this thesis offers a strategy to address and overcome this barrier.

If there was wide adoption of the tool, there may be potential to understand the impact of different placement settings on student learning. It is widespread practice to rotate students during placement to different settings, for example a 10-week placement may be divided into four weeks of placement in a sub-acute setting followed by six weeks in an acute hospital. This has the benefit of exposing students to a variety of clinical conditions and health care teams and decreasing the burden for supervisors. What is not known is the impact of this on student learning. Is it beneficial to have this model of rotation or is it disruptive to student learning? Should exposure to subacute placement be timed as an early experience, or do students benefit from this if they have developed some degree of independence? These questions could

potentially be answered if the tool was widely adopted and the data generated from different placement formats interrogated.

Furthermore, there has been some interest in expanding clinical dietetic placements to less traditional settings, mainly residential aged care and the provision of individual case management in primary care settings (Bacon et al., 2015). The adoption of the EPA-based assessment tool would have advantages from a supervisor support perspective as the utility of the tool has been demonstrated. As already mentioned, the EPA-based tool allows automatic collection of educational outcome data and this could be easily analysed to determine the impact and viability of these placement settings on student outcomes. This is a unique and novel aspect of the tool that would contribute significantly to the field of dietetic education.

The findings of the thesis clearly describe the meaningful and novel contribution the two work-based assessment tools make to the field of dietetic education. This research has made an impact locally with the tools being used for placement assessments. In addition to this, the work of this thesis makes a significant contribution to the field of health professions education more generally and increases understanding of the application and value of EPAs. As found in Chapter 3, the majority of published studies explore EPA use in entry-level clinical education where they describe activities of clinicians providing direct patient care. This thesis explored the novel application of EPAs for assessment in non-clinical settings, namely the practice of program evaluation that is a key work activity of dietetic practice in the community and public health setting. While directly applicable to dietetic education, many health professions include work-based assessment or project placement, and this thesis demonstrates that EPAs have utility for assessment in non-clinical settings, thus contributing to research in this area.

The utility of EPAs for work-based assessment in entry-level dietetics has been demonstrated by this thesis. The collection of studies in this thesis show that EPAs are effective as they describe activities that are intrinsic to the profession and are tangible to students and supervisor. The assessment scale is successful as it is phrased in a familiar language aligned to existing workplace practice that supports individuals to practice safely with the degree of independence being a factor of the setting, complexity of the patient and the abilities of the learner. The publications associated with this thesis have drawn interest from other professional groups, such as veterinary science and nursing, who have been in contact with the candidate and supervision team to discuss the application of EPAs in their practice areas. O'Connor et al. (2021) have suggested that research in EPAs at the entry-level area needs to move on from development studies and the publications included in Chapters 6 and 7 make a contribution to this area of

academic research. Of note, the candidate was requested to record a podcast on the findings of the scoping review in Chapter 3 demonstrating significant interest in this output of the thesis.

## 8.5 Future directions

One aspect that was not addressed in this thesis was determination of milestones, construct validity and educational impact of EPAs in the community and public health setting. As there were only two assessment points in CPH, compared to six in clinical dietetics, there was an insufficient sample size for this analysis to occur. As cohorts move through the program and this data is collected, it will be possible to conduct such analysis in the future.

Although problems with access to IT are likely to decrease as hospitals become increasingly digitised, there is potential to increase accessibility through translating the work-based assessment tool to a mobile application. This may also increase uptake at other institutions that do not use the PebblePad® software that the tool is currently built in. Other allied health professions in Australia have adopted this strategy and this has decreased administration burden for individual education providers and clinical placement providers.

Revisiting the technology that the tool is hosted in would also provide opportunity to revisit the number of items on the entrustment scale. The impact of the length of the tool and ease of navigation on utility factored into the decision to have a four-point scale. In the current software, including a fifth point on the entrustment scale would have significantly increased the length of each page and this influenced the decision to have a four-point scale. Although the majority of participants were happy with the four-point scale, there has been some debate in the literature about the entrustment scale in the entry-level space with some advocating for more scale points to describe practice (Chen et al., 2015; Peters et al., 2019). Revising the technology used to host the tool would allow recent developments in thesis space to be reconsidered.

Owing to the global SARS COVID-19 pandemic, there has been significant disruption to health professions education. To decrease the spread of the pandemic, many institutions pivoted the majority of teaching to online formats to reduce physical interaction of students. While clinical placements have continued, they have often required modification. The educational outcomes of these are unknown but anecdotally it is reported that students display reduced skills in physical assessment and some aspects of professionalism are reported to be underdeveloped (G Tsao and C Little personal communication Aug 2021). Some skills, such as communication, may

potentially be advanced due to increased opportunity to develop these with many clinicians changing their model of care to telehealth. It would be possible to measure the impact of some of these changes by comparing student achievement against predicted milestones of post-pandemic compared to pre-pandemic cohorts.

The National Competency Standards for Dietitians in Australia have been updated in 2021. This will necessitate a remapping of the EPAs to the new competency standards and represents an opportunity to address some of the limitations of the current EPAs. This also offers an opportunity to extend collaboration on the EPAs to additional educational institutions. Additionally, there may also be potential for EPAs to be developed in the postgraduate dietetics space, for example, paediatric, diabetes or renal EPAs. This has been the experience in medicine with graduate medical education and specific medical specialties developing EPAs for their areas of practice (Shorey et al., 2019).

## 8.6 Conclusion

The research presented in this thesis has demonstrated the utility of EPAs embedded in an e-portfolio for work-based assessment of entry-level dietetic students in both clinical and community and public health settings. The use of EPAs helps link the national competency standards to the observable work performed by practising dietitians and helps provide a curriculum map for students and educators that describes expectations of student performance on placement through milestones. The use of an entrustment scale represents an advance in work-based assessment of dietetic students compared to traditional competency-based assessments. The combination of EPAs, entrustment scale and an electronic portfolio facilitate routine collection of educational data that supports individual student learning and offers the additional opportunity for data-informed teaching. The novel use of EPAs to assess a project style placement described in this thesis suggests that EPAs can be valid and viable in non-clinical settings, representing an advance in understanding of the use of EPAs in health professions education.

## Appendix 1 Screenshots of clinical dietetics EPA based e-portfolio and community and public health e-portfolio

### Clinical dietetics EPA based e-portfolio

The e-portfolio is structured in four main sections. A general tab contains an overview of the placement program, hyperlinks to key documents such as the National Competency Standards for Dietitians in Australia and links to key subject forms that are used during clinical placements.

**Tabs to each placement assessment section**

**Placement subject code**

**General Information**

Welcome to Individual case management in Dietetics. This ePortfolio is the place where you can find resources for use on placement and where you can document your development as a Dietetic student during your three clinical placements. The National Competency Standards for Dietitians in Australia (<https://daa.asn.au/wp-content/uploads/2017/01/NCS-Dietitians-Australia-with-guide-1.0.pdf>) describe what student dietitians should be able to do across a variety of domains when they are ready to practice independently upon entry to the profession of Dietetics. These standards describe the function of a Dietitian in Australia. They should not be viewed as skills to tick off but rather as observable actions, attributes that a dietitian performs in practice.

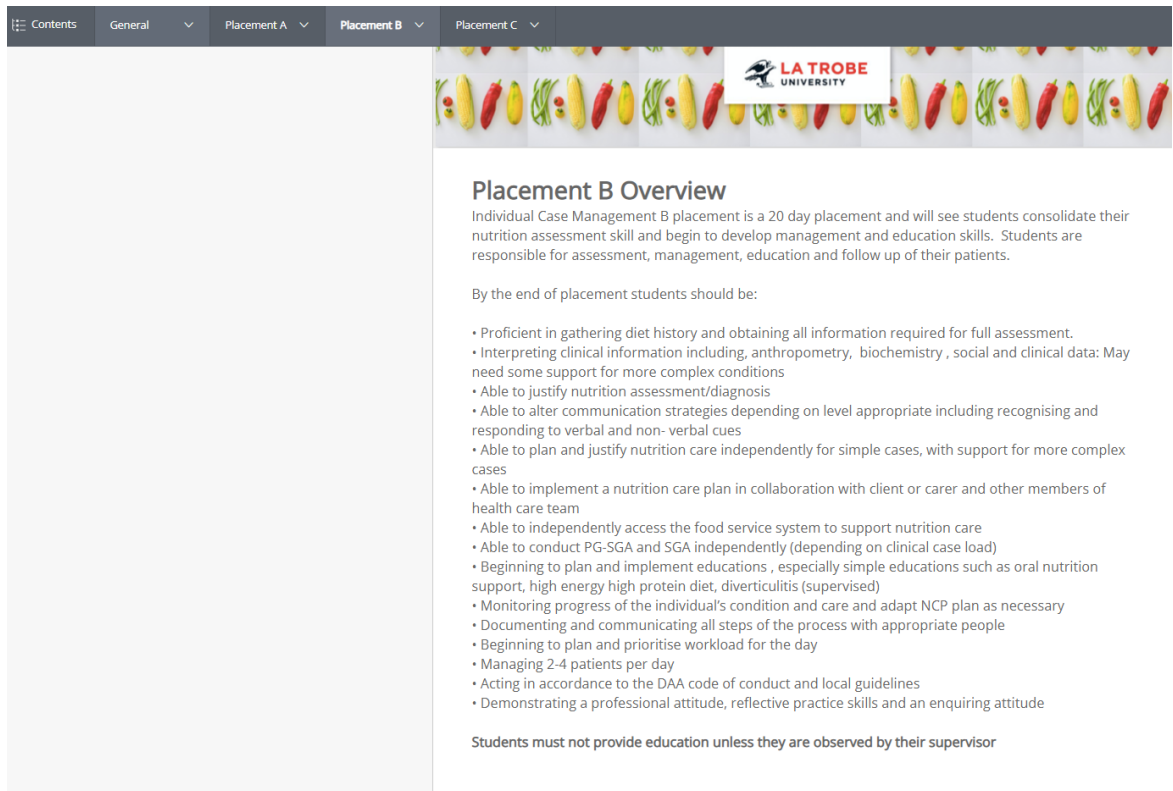
This ePortfolio workbook allows you to document your skill development in individual case management and will be used in DTN5IPB and DTN5IPC. Competence is a point on the spectrum of improving performance from beginner to advanced practitioner. The competence of any one individual at any point in time will depend on the complexity of the situation, the environment of practice and the personal state of the individual professional. Entry level competence is demonstrated when individuals have had some experience, and are able to make autonomous decisions regarding nutrition problems with limited complexity, based on process and the analysis of the situation. There should be no expectation that complex issues are managed autonomously by an entry-level practitioner.

To help support learning and skill development in individual case management a set of skill descriptors/ attributes have been created. These represent skills and attributes that Dietitians working the domain of individual case management need to be able to demonstrate consistently. During placements students will be able to develop and demonstrate clinical skills in nutrition assessment, education and management as well as other professional attributes. Each skill or attribute described in the ePortfolio is linked to the National Competency Standards for Dietitians in Australia. Competence is a spectrum and

**Subject Forms**

- [Knowledge and Skills Milestone Document](#)
- [Weekly Formal Placement Reflection and Goal Sheet](#)
- [Supervisor and Peer Observation Sheet](#)
- [3rd year Food Service Activities](#)

The layout of the assessment section is identical in each placement. Each placement contains an instructions section that includes a qualitative description of professional activities that a dietetic student should be able to complete at the end of their placement. Expectations of assessment processes and procedures are also described.



**Placement B Overview**

Individual Case Management B placement is a 20 day placement and will see students consolidate their nutrition assessment skill and begin to develop management and education skills. Students are responsible for assessment, management, education and follow up of their patients.

By the end of placement students should be:

- Proficient in gathering diet history and obtaining all information required for full assessment.
- Interpreting clinical information including, anthropometry, biochemistry, social and clinical data: May need some support for more complex conditions
- Able to justify nutrition assessment/diagnosis
- Able to alter communication strategies depending on level appropriate including recognising and responding to verbal and non-verbal cues
- Able to plan and justify nutrition care independently for simple cases, with support for more complex cases
- Able to implement a nutrition care plan in collaboration with client or carer and other members of health care team
- Able to independently access the food service system to support nutrition care
- Able to conduct PG-SGA and SGA independently (depending on clinical case load)
- Beginning to plan and implement educations, especially simple educations such as oral nutrition support, high energy high protein diet, diverticulitis (supervised)
- Monitoring progress of the individual's condition and care and adapt NCP plan as necessary
- Documenting and communicating all steps of the process with appropriate people
- Beginning to plan and prioritise workload for the day
- Managing 2-4 patients per day
- Acting in accordance to the DAA code of conduct and local guidelines
- Demonstrating a professional attitude, reflective practice skills and an enquiring attitude

**Students must not provide education unless they are observed by their supervisor**

A dropdown menu aids navigation. The EPAs are nested within subheadings that are linked to the nutrition care process, communication skills, time management skills and professionalism

Contents	General	Placement A	Placement B	Placement C
		Placement A Instructions Weekly Goal Sheet Data Collection > Communication Skills > Diagnosis/Problem ID > Nutrition Management > Time Management > Professional Behaviour > Food Service Placement Summary	<h2>Subject Forms</h2> <ul style="list-style-type: none"> <li><a href="#">Knowledge and Skills Milestone Document</a></li> <li><a href="#">Weekly Formal Placement Reflection and Goal Sheet</a></li> <li><a href="#">Supervisor and Peer Observation Sheet</a></li> <li><a href="#">3rd year Food Service Activities</a></li> </ul>	

The EPAs are listed twice with the entrustment assessment scale below. One field is for students to self-assess their performance. The other field is for their placement supervisor to complete. The national competency standard that the EPA is linked to is listed underneath the EPA. The expected level of performance or milestone for each placement is described underneath.

Contents

General

Placement A

Placement B

Placement C

EPA

Milestones

NCS linked to this EPA

Entrustment Scale

☐ Independent and Competent (4)

Collects and correctly interprets relevant biochemistry

Competencies: 2.1.1

Expected Level of Performance: A= 3, B= 3-4, C= 4

☐ Observing (1)
☐ Highly Assisted (2)
☐ Minimal Assistance (3)
☐ Independent and Competent (4)

ASSESSOR FIELD

Collects and correctly interprets relevant biochemistry \*

Competencies: 2.1.1

Expected Level of Performance: A= 3, B= 3-4, C= 4

☐ Observing (1)
☐ Highly Assisted (2)
☐ Minimal Assistance (3)
☐ Independent and Competent (4)

Collects and correctly interprets relevant anthropometry

Competencies: 2.1.1

Expected Level of Performance: A= 3, B= 4, C= 4

Contents

General

Placement A

Placement B

Placement C

Demonstrates an understanding of and is able to use nutrition screening and assessment tools

Competencies: 3.1.1, 3.1.2

Expected Level of Performance: A= 3, B= 4, C= 4

☐ Observing (1)
☐ Highly Assisted (2)
☐ Minimal Assistance (3)
☐ Independent and Competent (4)

ASSESSOR FIELD

Demonstrates an understanding of and is able to use nutrition screening and assessment tools \*

Competencies: 3.1.1, 3.1.2

Expected Level of Performance: A= 3, B= 4, C= 4

☐ Observing (1)
☐ Highly Assisted (2)
☐ Minimal Assistance (3)
☐ Independent and Competent (4)

Evidence

Upload your evidence for Data Collection

This has not been evidenced

The layout and the EPAs are the same for each placement block is identical to increase navigation and familiarity of the e-portfolio. The tool is used twice on each placement, midpoint and end point for formal feedback to students on their entrustment to perform each EPA.

Contents

General

Placement A

Placement B

Placement C

Placement B Instructions

Weekly Goal Sheet

Data Collection

Communication Skills

Diagnosis/Problem ID

Nutrition Management

Time Management

Professional Behaviour

Placement Summary

Demonstrates an understanding of and is able to use nutrition screening and assessment tools

Competencies: 3.1.1, 3.1.2  
Expected Level of Performance: A= 3, B= 4, C= 4

- Observing (1)
- Highly Assisted (2)
- Minimal Assistance (3)
- Independent and Competent (4)

**ASSESSOR FIELD**

Demonstrates an understanding of and is able to use nutrition screening and assessment tools \*

Competencies: 3.1.1, 3.1.2  
Expected Level of Performance: A= 3, B= 4, C= 4

- Observing (1)
- Highly Assisted (2)
- Minimal Assistance (3)
- Independent and Competent (4)

Evidence

Upload your evidence for Data Collection

This has not been evidenced

Contents

General

Placement A

Placement B

Placement C

Placement C Instructions

Weekly Goal Sheet

Data Collection

Communication Skills

Diagnosis/Problem ID

Nutrition Management

Time Management

Professional Behaviour

Placement Summary

Demonstrates an understanding of and is able to use nutrition screening and assessment tools

Competencies: 3.1.1, 3.1.2  
Expected Level of Performance: A= 3, B= 4, C= 4

- Observing (1)
- Highly Assisted (2)
- Minimal Assistance (3)
- Independent and Competent (4)

**ASSESSOR FIELD**

Demonstrates an understanding of and is able to use nutrition screening and assessment tools \*

Competencies: 3.1.1, 3.1.2  
Expected Level of Performance: A= 3, B= 4, C= 4

- Observing (1)
- Highly Assisted (2)
- Minimal Assistance (3)
- Independent and Competent (4)

Evidence

Upload your evidence for Data Collection

This has not been evidenced

At the bottom of the menu, the placement summary link opens up a section to record qualitative feedback comments at midpoint and end of placement. Students can also use this for reflection.

The image displays two screenshots of a web application interface for placement assessments. Both screenshots show a navigation menu at the top with options: 'Contents', 'General', 'Placement A', 'Placement B', and 'Placement C'.

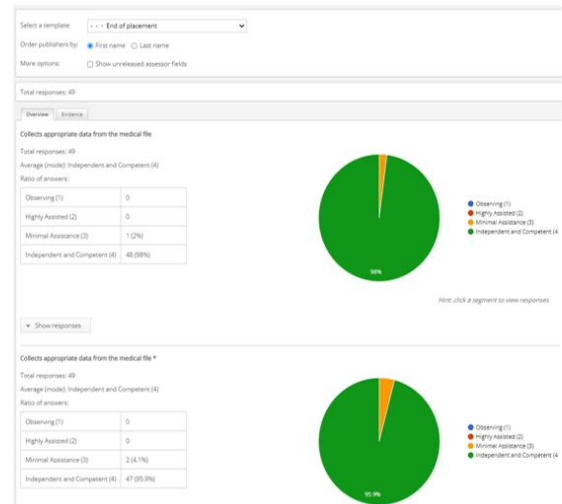
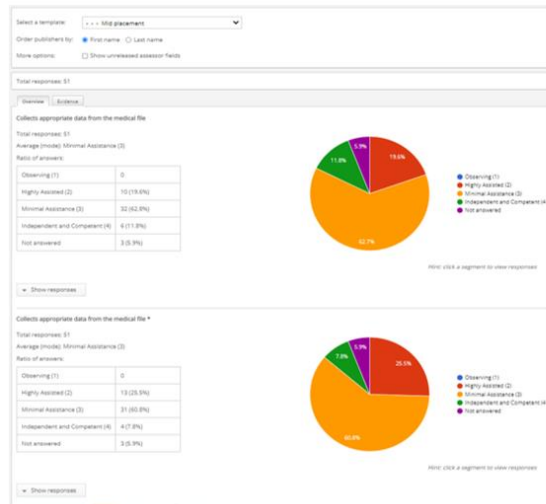
**Left Screenshot: Placement Summary**

- Supervisor comments on strengths and areas to develop:** A text input field with a '1/1' indicator.
- Assessment:** A section with the text 'I assess that this student has reached an overall acceptable level of performance in individual case management' and two radio buttons: 'Yes' and 'No'.
- Placement Supervisor Name:** A text input field with the instruction 'By entering your name in this field you acknowledge this to be a true and accurate record'.
- Student Name:** A text input field with the instruction 'By entering your name in this field you acknowledge this to be a true and accurate record'.
- Buttons:** A blue button labeled 'Save' and a link 'Return to previous feedback form'.

**Right Screenshot: Mid Placement Assessment and End of Placement Assessment**

- Mid Placement Assessment:**
  - Student comments on strengths and areas to develop:** A text input field.
  - Supervisor comments on strengths and areas to develop:** A text input field with a '1/1' indicator.
- End of Placement Assessment:**
  - Student comments on strengths and areas to develop:** A text input field.
  - Supervisor comments on strengths and areas to develop:** A text input field with a '1/1' indicator.
  - Assessment:** A section with the text 'I assess that this student has reached an overall acceptable level of performance in individual case management'.

Dashboards to monitor student performance at various time points through their placements can be created to quickly track how the co-hort of students are progressing with each EPA. This allows remote quick and easy track for the university education team. Results can also be exported to a CSV file for deeper analysis.



## Community and public health dietetics EPA based e-portfolio

The community and public health dietetic e-portfolio has a similar look and feel to the clinical dietetic portfolio. There is an introductory page with links to the NCS and an overview of assessment. As the community and public health placement is only 25 days in length, students are not expected to reach independent & competent for all EPAs and they have other opportunities to demonstrate their entrustment.

Contents

General

Placement

About Me

General Information

Subject Forms

Supervisor resources

### General Information

Welcome to Community and Public Health Nutrition. This ePortfolio is the place where you can find resources for use on placement and where you can document your development as a Dietetic student during your Community and Public Health Nutrition placement. The National Competency Standards for Dietitians in Australia (<http://daa.asn.au/wp-content/uploads/2015/12/NCS-Dietitians-Australia-with-guide-1.0.pdf>) describe what student dietitians should be able to do across a variety of domains when they are ready to practice independently upon entry to the profession of Dietetics. These standards describe the function of a Dietitian in Australia. They should not be viewed as skills to tick off but rather as observable actions and attributes that a dietitian demonstrates in practice.

Competence is a point on the spectrum of improving performance from beginner to advanced practitioner. The competence of any one individual at any point in time will depend on the complexity of the situation, the environment of practice and the personal state of the individual professional. Entry level competence is demonstrated when individuals have had some experience, and are able to independently carry out projects to improve the health, nutrition or food supply of individuals, groups and communities based on process and the analysis of the situation. There should be no expectation that complex situations are managed autonomously by an entry-level practitioner.

To help support learning and skill development in Community and Public Health Nutrition a set of skill descriptors/ attributes have been created. These align closely with the National Competency Standards for Dietitians in Australia, and have been broken down into specific project categories to help you identify which skills, attributes and practices may be relevant to your specific placement project. These represent skills and attributes that dietitians working the Community and Public Health Nutrition need to be able to demonstrate consistently. Given the Competence is a spectrum and students will move from novice towards competence throughout the placement block. Since there is only one Community and Public Health placement, students are expected to achieve entry level competency on a range of skill descriptors/attributes within the five week placement.

Given the broad range of placements, students are not expected to address all skill descriptors/attributes within a single placement block. Rather, supervisor assessment and student demonstration of competence on placement will be taken into consideration in a global assessment of competencies including performance in class and in university-assigned assessment tasks. Final student competencies will be determined by university academics.

At La Trobe Dietetics, we use a scale that reflects the amount of input required by the supervisors to support competent practice:

*Observing (1):* The student is observing the skill / attribute as demonstrated by the supervisor

*Highly Assisted (2):* The student is performing the skill / attribute but is requiring a lot of supervision or input by the supervisor

*Minimal Assistance (3):* The student is performing the skill/ attribute and is only requiring minimal input or direction from the supervisor. Performance may be inconsistent.

*Independent/ Competent (4):* The student is consistently performing the skill/ attribute at an entry/graduate level with observation only from the supervisor

A drop-down menu helps navigation around the e-portfolio. The EPAs are nested into sub heading that follow the program management cycle. Instructions regarding assessment are included.

The screenshot displays the e-portfolio interface. On the left, a dark sidebar contains a 'Placement' dropdown menu with the following options: Placement Instructions, Weekly Goal Sheet, Needs Assessment, Planning, Implementation, Evaluation, Dissemination of Results, Professional Behaviour, and Placement Summary. The main content area is titled 'Community and Public Health Nutrition Placement Overview'. It includes a paragraph about the 25-day placement, a section on documentation requirements, and a summary of documentation needed.

**Community and Public Health Nutrition Placement Overview**

Community and Public Health Nutrition placement is a 25-day placement in the final semester of Dietetics training that provides an opportunity for students to independently undertake a project to improve the health, nutrition or food supply of individuals, groups, organisations or communities.

At the end of this placement students will be familiar with community and public health organisations and the diverse role of dietitians within these organisations. Students should have the opportunity to observe practicing dietitians undertake a range of usual duties, and are encouraged to observe individual case management in the community setting where relevant. The primary objective of this placement is for students to undertake an independent project, and this should be the main focus of time spent on placement.

Over the course of five weeks, students will negotiate project details with their supervisor(s), plan and undertake their projects, and provide final written and oral reports as required. Students should make regular contact with their supervisor(s) to ensure that the actions they are undertaking are appropriate for the project and meeting the needs of the organisation. Students should also document activities undertaken and reflect on performance to inform self-evaluation of skill descriptors/attributes. Students should be familiar with the required level of performance on placement and be seeking out experiences on placement that will enable them to acquire and demonstrate the skills and attributes to the level required of the placement.

**Documenting Progress on Placement**

Students and supervisors should sit down at the end of week 1 or beginning of week 2 and complete the weekly goals sheet. This should also occur at the end of week 3/ beginning of week 4. Upload your weekly goals sheet to the weekly goals section, you should have 2 in total.

The weekly goals sheet template is located in >General>Subject forms. This is then to be uploaded to >Placement>Weekly Goals Sheet.

At the end of week 2/ beginning of week 3 students and supervisors should complete the **midpoint** assessment on PebblePad. Read each skill descriptor and rate your performance. **The student must complete this prior to meeting with their supervisor. Supervisors cannot complete their section of the workbook until it is saved by the student.** At the end of the placement, complete the endpoint assessment section on PebblePad. You can attach evidence that shows how you have demonstrated the skills. Both students and supervisors should also write comments about your overall progress in the comments section. At the end of placement you should complete the overall summary section.

**Summary of documentation required:**

- Week 1** Student goals
- Week 2**
- Week 3** Midpoint assessment
- Week 4** Student goals
- Week 5** Endpoint assessment

Each EPA is assessed twice on placement, mid-placement and end of placement. The EPA is listed twice with the accompanying entrustment scale, the top field is for student self-assessment and the lower field for supervisor assessment. Owing to the broad nature of community and dietetic project placements, an additional option to the four-point entrustment scale, Not Applicable allows students and supervisors to indicate that this EPA is not assessed as part of the project.

The screenshot shows a web interface for a 'Needs Assessment - Mid Placement Assessment'. The top navigation bar includes 'Contents', 'General', and 'Placement'. The main content area has a title 'Needs Assessment - Mid Placement Assessment' and a description: 'Identifies and collects relevant information from a range of authoritative sources and key stakeholders including individuals groups and organisations as relevant'. Below this, a list of competencies is shown: '1.4.2, 2.1.1, 2.2.3, 3.1.1, 3.1.2, 3.2.1, 3.2.3'. A list of assessment options follows: 'Observing (1)', 'Highly Assisted (2)', 'Minimal Assistance (3)', 'Independent and Competent (4)', and 'Not Applicable (N/A)'. A red box labeled 'ASSESSOR FIELD' is present. A sidebar on the left contains a search bar and a list of items: 'EPA', 'NCS linked to this EPA', and 'Entrustment scale'. Blue arrows point from these items to the assessment options in the main content area.

In the placement summary link, there are free text boxes for student reflections and supervisor qualitative feedback comments.

The screenshot shows the 'Placement Summary' page. The left sidebar contains a list of items: 'Placement Instructions', 'Weekly Goal Sheet', 'Needs Assessment', 'Planning', 'Implementation', 'Evaluation', 'Dissemination of Results', 'Professional Behaviour', and 'Placement Summary'. The main content area has a title 'End of Placement Assessment' and a description: 'Identifies and collects relevant information from a range of authoritative sources and key stakeholders including individuals groups and organisations as relevant \*'. Below this, a list of competencies is shown: '1.4.2, 2.1.1, 2.2.3, 3.1.1, 3.1.2, 3.2.1, 3.2.3'. A list of assessment options follows: 'Observing (1)', 'Highly Assisted (2)', 'Minimal Assistance (3)', 'Independent and Competent (4)', and 'Not Applicable (N/A)'. A red box labeled 'ASSESSOR FIELD' is present. The main content area also includes two sections for feedback: 'Student comments on strengths and areas to develop' and 'Supervisor comments on strengths and areas to develop', each with a text input field and a 'B I' button.

Dashboards can be created, and results exported in a CSV file to monitor student progress across the co-hort.

Select a template: - - Mid Placement

Order publishers by: ☒ First name ☐ Last name

More options: ☐ Show unreleased assessor fields

Total responses: 49

OverviewEvidence

Identifies and collects relevant information from a range of authoritative sources and key stakeholders including individuals groups and organisations as relevant

Total responses: 49

Average (mode): Minimal Assistance (3)

Ratio of answers:

Observing (1)	0
Highly Assisted (2)	4 (8.2%)
Minimal Assistance (3)	19 (38.8%)
Independent and Competent (4)	13 (26.5%)
Not Applicable (N/A)	10 (20.4%)
Not answered	3 (6.1%)

● Observing (1)

● Highly Assisted (2)

● Minimal Assistance (3)

● Independent and Competent (4)

● Not Applicable (N/A)

● Not answered

Hint: click a segment to view responses

Show responses

## Appendix 2 Copyright permissions and ethics approval

## ANDREA BRAMLEY

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**From:** ResearchMasterEthics@latrobe.edu.au  
**Sent:** Thursday, 27 October 2016 11:21 AM  
**To:** ResearchMasterEthics; Andrea Bramley  
**Cc:** Adrienne Forsyth; Regina Belski; Sharon Croxford; Vicki Barrington  
**Subject:** S16-198 (Finalised - Approved) - Application finalised as Approved

Dear Andrea Bramley,

The following project has been assessed as complying with the National Statement on Ethical Conduct in Human Research. I am pleased to advise that your project has been granted ethics approval and you may commence the study.

Application ID: S16-198

Application Status/Committee: Finalised - Approved

Project Title: EVALUATION OF AN E-PORTFOLIO TO SUPPORT DEVELOPMENT OF DIETETIC COMPETENCIES

Chief Investigator: Andrea Bramley

Other Investigators: Sharon Croxford, Adrienne Forsyth, Regina Belski, Vicki Barrington

Date of Approval: 27/10/2016

Date of Ethics Approval Expiry: 31/12/2016

The following standard conditions apply to your project:

- Limit of Approval. Approval is limited strictly to the research proposal as submitted in your application.
- Variation to Project. Any subsequent variations or modifications you wish to make to your project must be formally notified for approval in advance of these modifications being introduced into the project.
- Adverse Events. If any unforeseen or adverse events occur the Chief Investigator must immediately notify the UHEC immediately. Any complaints about the project received by the researchers must also be referred immediately to the UHEC.
- Withdrawal of Project. If you decide to discontinue your research before its planned completion, you must inform the relevant committee and complete a Final Report form.
- Monitoring. All projects are subject to monitoring at any time by the University Human Ethics Committee.
- Annual Progress Reports. If your project continues for more than 12 months, you are required to submit a Progress Report annually, on or just prior to 12 February. The form is available on the Research Office website. Failure to submit a Progress Report will mean approval for this project will lapse.
- Auditing. An audit of the project may be conducted by members of the UHEC.
- Final Report. A Final Report (see above address) is required within six months of the completion of the project.

You may log in to ResearchMaster (<https://rmenet.latrobe.edu.au>) to view your application.

If you have any further questions, please contact the:

UHEC at [humanethics@latrobe.edu.au](mailto:humanethics@latrobe.edu.au)

SHE College Human Ethics Sub-Committee at [chesc.she@latrobe.edu.au](mailto:chesc.she@latrobe.edu.au) ASSC College Human Ethics Sub-Committee at [chesc.assc@latrobe.edu.au](mailto:chesc.assc@latrobe.edu.au)

**Research Office**

---

<b>To</b>	Andrea Bramley
<b>From</b>	SHE College Subcommittee
<b>HEC Number</b>	S16-198
<b>Project title</b>	EVALUATION OF AN EPORTFOLIO TO SUPPORT DEVELOPMENT OF DIETETIC COMPETENCIES
<b>Subject</b>	Modification request received from Andrea Bramley dated 19.02.2018 re: request permission to download and interrogate de-identified student and supervisor formative and summative assessments.
<b>Date</b>	23 February 2018

---

The modification to this project submitted above was **approved** by the **SHE College Subcommittee**.

If this project is a multicentre project you must forward a copy of this letter to all Investigators at other sites for their records.

Please note that all requirements and conditions of the original ethical approval for this project still apply.

Should you require any further information, please contact the Human Research Ethics Team on:  
T: +61 3 9479 1443 | E: [humanethics@latrobe.edu.au](mailto:humanethics@latrobe.edu.au).

La Trobe University wishes you every continued success in your research.

Warm regards,

Agnes Hazi  
Deputy Chair, SHE College Subcommittee

## Human Research Ethics Application

Application ID : S16-198  
Application Title : EVALUATION OF AN E-PORTFOLIO TO SUPPORT DEVELOPMENT OF DIETETIC COMPETENCIES  
Date of Submission : 22/09/2016  
Primary Investigator : Andrea Bramley  
Other Investigators : Sharon Croxford  
Adrienne Forsyth  
Regina Belski  
Vicki Barrington

## Administration

## Important Information

Form Version: v1.1 | Last Updated: 18 February 2016

### **IMPORTANT INFORMATION FOR ALL APPLICANTS:**

- La Trobe University abides by the [National Statement on Ethical Conduct in Human Research \(2007\)](#). The University Human Ethics Committee (UHEC) is a registered Human Research Ethics Committee (HREC) with the National Health and Medical Research Council (NHMRC). All Low Risk applications are reviewed by a College Human Ethics Sub-Committee (CHESC). The CHESC is composed of academics' from within the College.
- Research involving human participants (or their data or tissue) may not commence until written approval has been obtained from the UHEC or relevant CHESC.
- Most questions in this application are mandatory and must be completed before the application can be submitted. These questions are marked with a red asterisk (\*).
- It is important that the application is written in lay language so that committee members not conversant in the discipline may fully comprehend and appreciate the proposal. Ensure all questions are appropriately answered in plain language with correct spelling and grammar.
- All applications must be sighted and approved by all members of the research team and any relevant parties. Applications will not be reviewed without appropriate authorisation.
- Please note that all applications must be submitted with the following supporting documentation, and you must use the templates provided on the [La Trobe University Human Research Ethics website](#). *Additional required attachments will be identified in "Section 6 - Documents & Attachments".*
  - Participant Information Statement
  - Consent Form
  - Withdrawal of Consent Form
  - Other documents related to your project including advertisements, flyers, questionnaires, interview schedules etc.
- To avoid unnecessary delays, please ensure the application is submitted in full and all relevant guidelines have been followed.

**THIS PROJECT MUST NOT COMMENCE WITHOUT PRIOR WRITTEN APPROVAL FROM THE UNIVERSITY HUMAN ETHICS COMMITTEE OR COLLEGE HUMAN ETHICS SUBCOMMITTEE**  
**ONGOING APPROVAL REQUIRES SUBMISSION OF AN ANNUAL PROGRESS REPORT TO THE APPROVING COMMITTEE**

### **Contact Details:**

#### **Human Ethics Approvals and Process**

For assistance in completing the form, further information regarding clarification of any fields, specific content, or ethical conduct, please contact the relevant Ethics Officer for the committee reviewing your application.

- **Senior Human Ethics Officer**  
**University Human Ethics Committee**  
Phone: 9479 1443  
Email: [humanethics@latrobe.edu.au](mailto:humanethics@latrobe.edu.au)
- **Human Ethics Officer**  
**Arts, Social Sciences and Commerce**  
**College Human Ethics Sub-Committee**  
Phone: 9479 6012  
Email: [chesc.assc@latrobe.edu.au](mailto:chesc.assc@latrobe.edu.au)
- **Human Ethics Officer**  
**Science, Health and Engineering**  
**College Human Ethics Sub-Committee**  
Phone: 9479 3370  
Email: [chesc.she@latrobe.edu.au](mailto:chesc.she@latrobe.edu.au)

#### **Technical help for eForm**

For technical assistance including access and logging in to Research Master.

- **ResearchMaster Administrator**  
Phone: 9479 6843  
Email: [ResearchMasterAdmin@latrobe.edu.au](mailto:ResearchMasterAdmin@latrobe.edu.au)

## Help and Resources

- [La Trobe University Human Research Ethics website](#)
- [NHMRC: National Statement on Ethical Conduct in Human Research](#)
- [NHMRC: Australian Code for the Responsible Conduct of Research](#)

## [Office Use Only]

Application ID

S16-198

Current Status of Application

Finalised - Approved

Date Application Submitted

22/09/2016

### For Review:

#### Assigned Ethics Committee\*

Science, Health & Engineering College Human Ethics Sub-Committee

#### Risk Level (Enter 'Above Low Risk' or 'Low Risk')\*

Low risk

Research by Academic Staff

#### Clearance Purpose\*

Research

#### File (Trim ID)\*

S16/198

#### Date Accepted by Ethics Officer (Cannot equal Date Submitted)

*This question is not answered.*

#### Application Process Comments\*

None.

#### Show 'Guide to Responding to Comments' page?\*

☒ Yes ☐ No

### For Finalisation:

#### Indicate the final outcome of this application\*

- ☒ Approved  
☐ Not Approved  
☐ Withdrawn  
☐ Not yet determined

#### Date of Approval\*

27/10/2016

**Approved Start Date for Project\***

27/10/2016

**Approved End Date for Project\***

31/12/2016

**Conditions of Approval / Additional Comments to Researcher**

*This information will be included in the final email notification. If no conditions, enter "None".\**

None.

**For Post-Approval Modifications (if any):**

**Have any requests for modification been initiated by the research team after approval was granted?**

☐ Yes

☐ No

*This question is not answered.*

## Section 1 - General Details

### Core Project Details

**Ethics Category\***

Human

**1.1. Project Title\***

EVALUATION OF AN E-PORTFOLIO TO SUPPORT DEVELOPMENT OF DIETETIC COMPETENCIES

**1.2. Primary Academic Organisational Unit (AOU)\***

Dietetics & Nutrition

**1.3. Type of research project to be conducted\***

☒ Research by Academic Staff Member

☐ Contract Research

☐ Undergraduate Research

☐ Postgraduate Research

**1.4. Project Summary**

*Provide a brief summary in lay terms of the research project as a whole. Outline the broad aims, background, design and approach of the project, with particular reference to who the participants will be and what they will be asked to do (maximum 100 words).\**

Students and their supervisors in DTN4DPA, DTN5IPB, DTN5IPC, DTN5FSM and DTN5CPC have used an e-portfolio (PebblePad) to help document aspects of their learning and skill development whilst completing these subjects. In its current format a variety of workbooks have been created to allow students to gather evidence, complete assignments and develop reflective practice skills. These workbooks have been designed to meet the both assessment needs of the subjects as well as facilitate student lead assessment of dietetic competencies. New graduate dietetic competencies have been launched by DAA and it is timely to evaluate the current workbooks in preparation for implementing the new competencies in 2017. A series of on line surveys have been created and administered to students and supervisors. We would like to conduct a series of focus groups to further explore themes identified in the surveys and provide more detailed evaluation to help inform the redesign of the e-portfolio.

**1.5. Period for which ethical approval is sought\***

☒ Immediately upon receiving ethical approval

☐ Other date

**1.6. Expected date for conclusion of project\***

31/12/2016

## Investigators

1.7. **Will any students be involved in the conduct of this project?**

This includes both student projects, where research is being undertaken for the degree in which the student is enrolled, and staff projects, where research is being undertaken by an Academic Staff Member that involves a student(s) carrying out some part of the project.\*

- ☐ Yes  
☒ No

1.8. **Will any personnel who are not current staff members or students of La Trobe University be involved in the conduct of this project? \***

- ☐ Yes  
☒ No

1.9. **List all investigators associated with this project.**

**Important:** For the purposes of this application, the nominated Chief Investigator MUST be a staff member of La Trobe University (not any affiliated institute).

You must assign only ONE person in the Chief Investigator role and this person MUST be listed as the Primary Contact on your application.

For student projects, the Chief Investigator/Primary Contact MUST be the supervisor, not the student.\*

1	<b>System Information</b>	
	Staff / Student ID Number	00071619
	Surname	Croxford
	Given Name	Sharon
	Full Name	Sharon Croxford
	College / Institute / Department	1743
	Personnel Type	Both
	Email Address	S.Croxford@latrobe.edu.au
	<b>Application Information</b>	
	Position / Role in project	Associate Investigator
	Primary contact for application? <i>Students cannot be the primary contact for an ethics application.</i>	No
	Phone number	5568
	Academic Title / Qualification If student, provide details on level and course of study (PhD, Masters, Honours, etc.)	Lecturer Discipline of Dietetics BSc. Grad.Dip.Diet. Grad. Cert. Prof. Writing. Dip. Food & Wine. Post. Grad. Cert. Academic Practice Accredited Practising Dietitian (APD)
	Experience and/or skills relevant to the project.	Senior Academic Food service domain leader Experience in qualitative research and program evaluations
2	<b>System Information</b>	
	Staff / Student ID Number	00078418
	Surname	Forsyth
	Given Name	Adrienne
	Full Name	Adrienne Forsyth
	College / Institute / Department	1743
	Personnel Type	Internal
	Email Address	A.Forsyth@latrobe.edu.au
	<b>Application Information</b>	
	Position / Role in project	Associate Investigator
	Primary contact for application? <i>Students cannot be the primary contact for an ethics application.</i>	No
	Phone number	2283
	Academic Title / Qualification If student, provide details on level and course	Lecturer Nutrition and Dietetics. Co-ordinator of the Bachelor of Food and Nutrition BSc BSc(Hons) GradDipEd MSc MEd PhD Accredited Practising Dietitian, Accredited Sports

	of study (PhD, Masters, Honours, etc.)	Dietitian, Accredited Exercise Physiologist
	<b>Experience and/or skills relevant to the project.</b>	Community Domain Leader and Subject Co-ordinator of DTN5CPC Experience with qualitative research
3	<b>System Information</b>	
	Staff / Student ID Number	00080060
	Surname	Bramley
	Given Name	Andrea
	Full Name	Andrea Bramley
	College / Institute / Department	1743
	Personnel Type	Both
	Email Address	A.Bramley@latrobe.edu.au
	<b>Application Information</b>	
	Position / Role in project	Chief Investigator
	Primary contact for application? <i>Students cannot be the primary contact for an ethics application.</i>	Yes
	Phone number	0400805301
	Academic Title / Qualification If student, provide details on level and course of study (PhD, Masters, Honours, etc.)	Lecturer / Course Co-ordinator HMDP BSc, Master of Nutrition and Dietetics, Grad Cert Health Service Management, Accredited Practising Dietitian
	Experience and/or skills relevant to the project.	Currently course co-ordinator of HMDP, clinical domain leader, professional placement co-ordinator and subject co-ordinator of professional placement subjects DTN5IPB and DTN5IPC. Has experience in evaluating programs with regards to clinical supervision and teaching
4	<b>System Information</b>	
	Staff / Student ID Number	00075489
	Surname	Belski
	Given Name	Regina
	Full Name	Regina Belski
	College / Institute / Department	1743
	Personnel Type	Internal
	Email Address	R.Belski@latrobe.edu.au
	<b>Application Information</b>	
	Position / Role in project	Associate Investigator
	Primary contact for application? <i>Students cannot be the primary contact for an ethics application.</i>	No
	Phone number	3629
	Academic Title / Qualification If student, provide details on level and course of study (PhD, Masters, Honours, etc.)	Senior Lecturer in Nutrition and Dietetics BNutrDiet (Hons), GradCertTertEd, PhD (UWA) Accredited Practising Dietitian, Accredited Sports Dietitian, Registered Nutritionist
	Experience and/or skills relevant to the project.	Involvement in eportfolio development. Involvement in competency based assessment in Dietetic practice at national level. Extensive research experience.
5	<b>System Information</b>	
	Staff / Student ID Number	00071158
	Surname	Barrington
	Given Name	Vicki
	Full Name	Vicki Barrington
	College / Institute / Department	1743

<i>Personnel Type</i>	Internal
<i>Email Address</i>	V.Barrington@latrobe.edu.au
<b>Application Information</b>	
<b>Position / Role in project</b>	Associate Investigator
<b>Primary contact for application?</b> <i>Students cannot be the primary contact for an ethics application.</i>	No
<b>Phone number</b>	nil
<b>Academic Title / Qualification</b> If student, provide details on level and course of study (PhD, Masters, Honours, etc.)	Senior Lecturer Human Nutrition and Dietetics
<b>Experience and/or skills relevant to the project.</b>	Extensive food service and research experience

## Project Funding

### 1.10. How will this project be funded?\*

- ☐ External Grant  
☐ La Trobe Internal Grant, e.g. RFA Funding  
☐ Sponsored / Contract Research  
☒ Unfunded (Supported by Department or Organisation)

### 1.11. Have you submitted an online Project Request application through ResearchMaster that is linked to this project? E.g. RAS or RFA funding application\*

- ☐ Yes  
☒ No

 **Note:** All funded research conducted at La Trobe University requires approval through the RAS. Please ensure a RAS is completed through the projects module as soon as possible.

## External Involvement

### 1.12. Is the research a collaborative effort with another organisation?\*

- ☐ Yes  
☒ No

### 1.13. Will any part of the research be conducted in a location other than a La Trobe University campus? (e.g. clinic, school, hospital, support centre, etc.)\*

- ☐ Yes  
☒ No

### 1.14. Does this research require formal approval or permission to be obtained by an external HREC, institution or authority? (e.g. Department of Education and Training)\*

- ☐ Yes  
☒ No

## Section 2 - Project Overview

### Project Description

#### 2.1. Aims

*Provide a concise statement of the aims and significance of the project in plain language.\**

To evaluate current e-portfolio workbooks used in professional placement subjects DTN4DPA, DTN5IPB, DTN5IPC, DTN5FSM and DTN5CPC. Specifically to:  
compare and contrast DTN4DPA skill based assessment with competency assessment DTN5IPB and DTN5IPC  
assess student's attitudes to eportfolio to guide learning and clinical skill development  
assess supervisor's attitudes to eportfolio use to support student learning on placement  
assess student's attitude to eportfolio to develop reflective practice skills  
evaluate current workbooks in preparation for redevelopment of workbooks to track new competencies  
To determine optimal approach for eportfolio to support the development and demonstration of Dietetic competencies.

## 2.2. Background and Rationale

*Briefly describe the relevant background and rationale for the project in plain language. Outline the relevant research and literature review, and provide a justification as to why this research should proceed.\**

The Dietitians Association of Australia have developed new graduate entry level competencies for Dietitians which need to be implemented in 2017. Current practice in Dietetics is the use of an electronic portfolio e-portfolio to document the achievement of graduate level competences in Dietetic students during their professional placements. There are currently different styles of workbooks used across the professional placement subjects and it is timely to evaluate them to inform the new workbook that must be designed in order to implement the new competencies in 2017. There is limited literature on the use of electronic portfolios to support and track professional Dietetic competencies

## 2.3. Detailed Procedures

*Include all details relating to the methodology, recruitment strategy, data collection techniques, the tasks participants will be asked to do, an estimate of the time commitment involved, and methods of data analysis.\**

This project involves a mixed methods approach to develop a detailed understanding of the teaching, learning and assessment of graduate level competencies by Dietetic students and the use of an e portfolio to document and support learning. Negligible risk HREC approval has been granted for the development and administration of on line surveys that evaluate student and supervisor experiences with the e-portfolio Pebblepad workbooks used in DTN4DPA, DTN5IPB, DTN5IPC, DTN5FSM and DTN5CPC. The surveys have been developed using Qualtrics software and have been distributed to students and supervisors using an anonymous web link. These surveys are currently live and preliminary data has been obtained for the supervisor surveys only. Students are currently on placement, therefore there is currently insufficient returned surveys as only half the cohort have completed placement. The second cohort are due to complete placement in October and the focus group questions will be created at this time.

The next phase of the evaluation will involve focus groups of both students and supervisors to obtain more detailed information about experiences with the current e-portfolios. These focus groups will be conducted by two of the project investigators. The focus groups will consist of 4-8 participants, be conducted at a university campus and run for approximately 45-60 mins. The groups will be audio recorded, transcribed and then thematic analysis will occur. This current application includes an outline and prompts for running the supervisor focus groups which are planned for mid October. As described above, the students are yet to finish their placements. The outlines for the students' focus groups will be created and submitted as an addendum to this application as soon as student have finished their placement and have completed sufficient surveys to inform the process.

2.3.a. *Use this textbox if additional room is required for Detailed Procedures.*

*This question is not answered.*

## Type of Project

2.4. **Does the research only include the collection of anonymous and non-sensitive data (e.g. online survey, observational data) that poses no foreseeable risks or discomfort to participants?** In this case, any foreseeable risk must be no more than inconvenience.

*Only answer 'Yes' if there will be no other forms of data will be used throughout this project.\**

- ☐ Yes  
☒ No

2.5. **Does the research only include the use of non-identifiable and non-sensitive data from an existing database? (e.g., data mining).** Such data should pose no foreseeable risks or discomfort to individuals whose information is contained in the database, or to individuals/organisations responsible for the database.

*Only answer 'Yes' if there will be no other forms of data used throughout this project.\**

- ☐ Yes  
☒ No

2.6. **Is this project part of a larger project?\***

- ☒ Yes  
☐ No

2.6.a. **Please provide further detail about the larger project and if it will require HREC review.\***

This project will be used to inform the development of new e-portfolio workbooks that incorporate the revised graduate entry competencies for Dietetics. Further research and evaluation may occur depending on the outcome of this project.

*If the larger project has already obtained approval from LTU, please link the project from the ResearchMaster database.*

2.6.a.i. Link the related ethics application record from the ResearchMaster database.

## Target Population

! This section contains questions specifically relating to the National Statement on Ethical Conduct in Human Research, [Section 4: Ethical Considerations Specific to Participants](#). Please click the Help icons next to the questions for a link to the relevant section of the Statement.

2.7. Does the research involve pregnant women and/or the human foetus?\*

☐ Yes

☒ No

2.8. Does the research involve children and/or young people under the age of 18 years?\*

☐ Yes

☒ No

2.9. Will the research potentially involve any participants in dependent or unequal relationships with any of the members of the research team or people involved in recruitment?

For example, teacher/student, doctor/patient, student/lecturer, client/counsellor, employer/employee. Such relationships may compromise a participant's ability to give consent which is free from any form of pressure, real or implied. \*

☒ Yes

☐ No

2.9.a. If yes, explain the relationship and the measures to be taken to ensure that participation is voluntary and not influenced by the relationship in any way.\*

Student participation will be voluntary. All students will be invited to participate. The focus groups will occur after students have completed their final assessments but prior to graduation.

2.10. Does the research involve people highly dependent on medical care who may be unable to give consent?\*

☐ Yes

☒ No

2.11. Does the research involve people with a cognitive impairment, intellectual disability or mental illness?\*

☐ Yes

☒ No

2.12. Does the research involve people who may be involved in illegal activities?\*

☐ Yes

☒ No

2.13. Does the research involve Aboriginal and/or Torres Strait Islander peoples?\*

☐ Yes

☒ No

2.14. Does the research involve people in other countries?\*

☐ Yes

☒ No

## Research Methodology

2.15. Does the research involve interventions, therapies or innovations (either non-clinical or clinical)?\*

☐ Yes

☒ No

2.16. Does the research involve the collection of human biospecimens (i.e. tissue or fluid samples, etc.) directly from participants?\*

- ☐ Yes  
☒ No

2.17. **Will the research involve the use of human biospecimens (i.e. tissue or fluid samples, etc.) which will be provided by an institution or organisation?\***

- ☐ Yes  
☒ No

2.18. **Does the project involve human genetic research?\***

- ☐ Yes  
☒ No

2.19. **Will the research discover or generate health information of potential importance to the future of participants, their blood relatives or their community?\***

- ☐ Yes  
☒ No

2.20. **Does the research involve the use of ionising radiation?\***

- ☐ Yes  
☒ No

## Privacy & Disclosure

2.21. **Will participants be photographed, video recorded or audio recorded at any time? \***

- ☐ Photographed  
☐ Video Recorded  
☒ Audio Recorded  
☐ N/A

2.21.a. Will the identification of participants, either directly or indirectly, be made available in the public domain at any time during or after the research? e.g. In the reporting of research or in any display/presentation (audio or visual) of the research.\*

- ☐ Yes  
☒ No

2.22. **Will any form of deception, concealment or covert observation be used at any time?\***

- ☐ Yes  
☒ No

2.23. **Is it possible that a conflict of interest issue could arise in relation to this research?**

This includes any circumstance which might represent a **perceived, potential or actual** conflict of interest, and may relate to any type of financial, personal or other affiliated benefit for the researchers or organisations involved in this project.\*

- ☐ Yes  
☒ No

2.24. **Will participants be informed of funding source(s)?\***

- ☐ Yes  
☒ No

2.24.a. If no, explain why participants will not be informed.\*

There is no funding for this project other than staff time

2.25. **Does the research involve the collection, use or disclosure of identifiable or re-identifiable information from sources other than the individual(s) to whom the information relates, without the consent of those individuals?**

*Note that access to identifiable records for the purpose of extracting non-identifiable data constitutes 'use' and 'disclosure' of identifiable data even if such data will not be 'collected'. \**

- ☐ Yes  
☒ No

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## Section 3 - Participants

### Participant Details

3.1. **Total number of participants required for project\***

24

3.2. **Is there likely to be an imbalance between the number of males and females participating?\***

- ☒ Yes  
☐ No

3.2.a. If yes, explain why this gender imbalance is likely to occur.\*

90% of Dietitians and Dietetic students are female

3.3. **Age range of all participants\***

18-65

3.4. **Rationale for total participant number**

*Outline the analysis undertaken to determine the need for the specific number of participants for this study, explaining how this sample size will allow the aims of the study to be achieved.\**

This research is qualitative research we are seeking detailed feedback hence small numbers of participants are required.

3.5. **Will participants be split into two or more groups for the purpose of conducting the research?\***

- ☐ Yes  
☒ No

### Participant Selection

3.6. **What are the inclusion and exclusion criteria for your study? Please also include justification for each criterion.\***

Must be a student or a supervisor involved in the subjects in DTN4DPA, DTN5IPC, DTN5IPB, DTN5FSM, DTN5CPC. These participants will have experience of the subject matter and the e-portfolio's we seek to evaluate

3.7. **Does the research involve a participant population whose principal language is not English?\***

- ☐ Yes  
☒ No

3.8. **Are any of the participants La Trobe University students?\***

- ☒ Yes  
☐ No

3.8.a. If yes, explain the steps taken by the investigators to ensure that the student's participation is purely voluntary.\*


All students will be invited to attend a group  
The groups will run after their final assessments so they will not feel obliged to participate

### Recruitment


3.9. **Where will participants be approached or recruited?**

*Note: Where participants are recruited from schools, hospitals, prisons or other institutions, permission/approval from the institution or appropriate authority must be sought (see "Section 1 - External Involvement").\**

Students will be contacted via LMS message and email  
Supervisors will be contacted via email, an email will be sent to the department manager outlining the research and requesting participation of some staff in the focus groups.

- 3.10. **How will potential participants be approached and informed about the research and how will they notify the investigators of their interest in participating?**  
 *Attach the proposed Participant Information Statement and any flyers or other advertising material to be used in the research in "Section 6 - Documents & Attachments".*  
 \*
- Participants who contact the researcher demonstrating interest will be sent a PIS document. Consent forms will be collected when they attend the groups.
- 3.11. **Will you use an existing database to obtain names and contact details of potential participants? \***  
☐ Yes  
☒ No
- 3.12. **Will any personnel other than the members of the research team listed in "Section 1 - Investigators" above (e.g. independent contractors), be involved in the recruitment of participants, or approach potential participants to seek their participation?\***  
☐ Yes  
☒ No
- 3.13. **Will participants be offered any type of financial incentive or other compensation?\***  
☐ Yes  
☒ No

## Informed Consent

- 3.14. **How will consent be obtained?\***  
☒ Participants will be required to sign an informed consent form  
☐ Consent will be implied e.g. by return of completed questionnaire  
☐ Verbal consent will be obtained and recorded (audio, visual or electronic)  
☐ Other  
☐ Consent will not be obtained
- If consent will be obtained:*
- 3.14.a. Specify the type of consent that will be obtained:  
☐ Specific: limited to the specific project under consideration  
☒ Extended: given for the use of data or tissue in future closely related research projects  
☐ Unspecified: given for the use of data or tissue in any future research
- 3.14.b. Explain in detail how consent will be obtained and recorded.  
 *Attach the proposed Consent Form in "Section 6 - Documents & Attachments".*  
 \*
- Prior to attending the focus groups, participants will be given an electronic copy of the PIS and consent form to read, print and sign. Participants will have the opportunity to ask questions of the researcher prior to attending the group. The signed consent form can either be scanned and emailed back or given to the researcher prior to attending the group. The purpose of the focus group and the methods used to collect data and protect the anonymity of participants will be verbally explained. Participants will have the opportunity to choose not to participate in the group at this stage as well. They are also free to leave the focus group at any time. It will also be explained that once they participate in the focus group it will not be possible to remove their data. A copy of the signed consent form will be kept by the lead researcher in a locked file. Participants will be given a copy of the consent form for their records.
- 3.15. **Will there be any participants who do not have the capacity to give voluntary and informed consent?\***  
☐ Yes  
☒ No
- 3.16. **Will potential participants be given time to consider and discuss their involvement in the project with others (e.g. family) before being requested to provide consent? \***  
☒ Yes  
☐ No
- 3.17. **How will competence to give consent be determined and who will make this determination?**  
 Describe procedures to determine competence to give consent.\*
- All participants will be adults over 18 who are professionals or final year Dietetic students and as such are able to give informed consent

- 3.18. **Will the participant's capacity to provide voluntary and informed consent be reviewed while research is in progress?\***

- ☐ Yes  
☒ No

3.18.a. If no, provide reasons why this is not necessary for this research.\*

All participants will be adults over 18 who are professionals or final year Dietetic students and as such are able to give informed consent. The focus groups will be less than an hour in length and it would be impracticable to review ability to give consent while the research is in progress.

3.19. **Will participants be informed of their right to withdraw from participating in the study at any time?\***

- ☒ Yes  
☐ No

3.19.a. If yes, describe how participants will be able to withdraw their consent to participate in the study.

 [Attach the proposed Withdrawal of Consent Form in "Section 6 - Documents & Attachments".](#)

\*

Participants will be informed of their right to withdraw from participation at any time prior to the focus group. Once the focus group has been run it will not be possible to remove their data. They may withdraw from the study prior to the focus group by informing the researcher or not attending the group.

3.20. **Will the participants be informed of their right to withdraw their consent for their data to be used in the study, including time limitations to this?\***

- ☒ Yes  
☐ No

3.20.a. If yes, describe how participants will be able to withdraw their consent for their data to be used in the study and detail any restrictions to this.\*

Participants will be informed of their right to withdraw from participation at any time prior to the focus group. Once the focus group has been run it will not be possible to remove their participation. They may withdraw from the study by informing the researcher or not attending the group.

## Section 4 - Risks

### Risk & Safety

 You must consider any and all risks (no matter how unlikely), in both the short and long term.

#### Psychological Risks

4.1. **Is there any risk of psychological, emotional or social harm to the participants or research team?**

This includes any circumstance which may be experienced as stressful, noxious, aversive or unpleasant during or after the research procedures.\*

- ☐ Yes  
☒ No

4.2. **Is there any risk of participants being asked to perform any acts or make any statements which might diminish their self-esteem or cause them to experience embarrassment or regret?\***

- ☐ Yes  
☒ No

#### Legal Risks

4.3. **Is there any risk of legal harm or liability to the participants, the research team, and/or the University?\***

- ☐ Yes  
☒ No

#### Financial Risks

4.4. **Is there any risk of financial harm or liability to the participants, the research team, and/or the University?\***

- ☐ Yes  
☒ No

#### **Physical Risks and Safety**

4.5. **Does the research involve any potential physical risks or harm to the participants and/or researchers? \***

- ☐ Yes  
☒ No

4.6. **Does the research involve any special equipment, apparatus, plant or machinery?\***

- ☐ Yes  
☒ No

### **Potential Benefits**

4.7. **Detail any and all potential benefits this research project may provide to the individual participants.\***

Student participants will not directly benefit from the research. Supervisor participants may benefit in the future from improved and enhanced workbooks that better support student supervision and assessment.

4.8. **Detail any and all potential benefits this research project may provide to the community and humanity in general.\***

Future students and supervisors will benefit from improved e-portfolio workbooks. There is little published literature on the use of eportfolios in Dietetic teaching and learning, and in Allied Health in general. Outcomes of this learning may enhance training and education of future health professionals.

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## **Section 5 - Data & Records**

### **Data Collection**

5.1. **Indicate the type of information that will be collected: \***

- ☒ Personal information  
☐ Sensitive information  
☐ Health information  
☐ Other

5.2. **Indicate which of the following will be collected during the course of the research:\***

- ☐ Written questionnaires/survey responses  
☐ Individual interview responses/notes  
☐ Archival data  
☐ Other data  
☒ Group interview or focus group responses/notes  
☐ Participant observations  
☐ Direct electronic data entry  
☐ Blood or tissue samples  
☐ Physiological measures  
☐ Biomechanical measures  
☐ Accessed health/medical records or data  
☐ Accessed student academic records or data



*Attach copies of all proposed focus group interview schedules (including those that are published or commercially available) in "Section 6 - Documents & Attachments".*

5.3. **Will any personnel other than the members of the research team listed in "Section 1 - Investigators" (e.g. independent contractors), be involved in the collection of any data? \***

- ☐ Yes  
☒ No

- 5.4. **Will any personnel other than the members of the research team listed in "Section 1 - Investigators" (e.g. independent contractors), have access to any data collected? \***
- ☐ Yes
- ☒ No
- 5.5. **Where will the data be collected?** Give details for all types of data collected and all locations.\*
- Data will be collected at La Trobe Collins Street Campus.
- 5.6. **How will the data be analysed?** Give details for all types of data collected.\*
- Data will be themed
- 5.7. **Indicate the projects the data collected in this project is intended to be used for. This includes all data, tissues, specimens and other samples.\***
- ☒ This project only
- ☐ Future projects specifically related to this project
- ☐ Any future research

## Data Storage & Security

### During the course of the study:

- 5.8. **Indicate how the data, materials and records will be kept:\***
- ☐ All data will be entirely non-identifiable
- ☒ Data may be potentially identifiable (e.g. coded)
- ☐ Data will be wholly identifiable
- 5.9. **Indicate how the security of project documentation will be maintained.**  
*Project documentation should be stored in secure, lockable locations, preferably on campus. Computer files should be password protected.*  
 The Research Data File Storage - <http://www.latrobe.edu.au/research-infrastructure/digital-research/storage/storage>\*
- ☐ Use of the Research Data File Storage
- ☐ Codes and data kept separately
- ☒ Lockable filing cabinets
- ☐ Locked room
- ☒ Digital password protection
- ☐ Other
- 5.10. **Specify the precise location of the storage place(s). (Room number, etc.)\***
- Hard copies of signed consent forms will be kept in a locked filing cabinet in room HS3 435  
 Electronic data will be stored in a password protected file on the La Trobe University server

### Following completion of the study:

- 5.11. **Indicate how the data, materials and records will be stored:\***
- ☒ All data will be entirely non-identifiable
- ☐ Data may be potentially identifiable (e.g. coded)
- ☐ Data will be wholly identifiable
- 5.12. **Describe how the security of project documentation will be preserved and specify the precise location of the final storage place(s).\***
- Hard copies of signed consent forms will be kept in a locked filing cabinet in room HS3 435  
 Electronic data will be stored in a password protected file on the La Trobe University server
- 5.13. **Indicate the minimum period for which data will be retained.**  
*Research data and records should be kept for as long as they are of continuing value to the researcher and as long as record keeping requirements exist (such as patent requirements, legislative and other regulatory requirements). The minimum retention period for research data and records is five years after publication/public release of the work (or 15 years for clinical trials). See help for definitions. \**
- ☐ Indefinitely
- ☒ 5 years post publication
- ☐ 7 years post publication
- ☐ 15 years post publication
- ☐ 25 years after date of birth of participants
- ☐ Other

- 5.14. **Will you transfer your data or materials to a managed archive or repository during the project, after the project, or after the retention period? If so, indicate which discipline specific or institutional archives will be considered.**  
*Note that some funding agencies and publishers may require lodgement with an archive or repository. Contact ICT about the Research Data Store, or contact the Library for more information about the La Trobe University Research Repository (Research Online).\**

Data will be stored in a password protected folder in the La Trobe University Discipline Server

- 5.15. **If you specify to participants that you will destroy the data collected, what methods of appropriate disposal or destruction will be employed?**  
*When further retention of data and materials is no longer required, responsible disposal methods should be adopted. Disposal software should also be adopted if digital software, computer hardware, disks or storage media are reused or retired.*

Data will be destroyed according to ICT policy. Paper data will be destroyed using confidential document destruction procedures.

## Publication & Dissemination

- 5.16. **Indicate how the results of this research will be reported or published:\***

- ☐ Thesis  
☒ Journal article(s)  
☐ Book  
☐ Research report to collaborating organisations  
☒ Conference presentation(s)  
☐ Recorded performance  
☐ Other

- 5.17. **Will participants be informed that results of the study may appear in the publication method(s) described above? \***

- ☒ Yes  
☐ No

- 5.17.a. If yes, provide details.

*Note that this information should be included in the Participant Information Statement and given to participants prior to obtaining informed consent.\**

This is included in the PIS

- 5.18. **Will results from the study be available to participants on request? \***

- ☐ Yes  
☒ No

- 5.18.a. If no, explain and justify.\*

Participants will be referred to by code ie participant 1 to protect their identity. It may be possible, however, for individuals within groups to identify participants if they request results. Therefore data from the focus groups will not be available. The end results of the research will be written up for publication in peer reviewed journals and participants will have access to these.

- 5.19. **Will participants be informed that their personal data collected in the course of the research will be available to them on request? \***

- ☐ Yes  
☒ No


- 5.19.a. If no, explain and justify.\*

There will be minimal personal data collected and this will be de-identified. An audio recording of the focus group discussion will be made and transcribed. It will not be possible to provide individual data.





## Section 6 - Finalise Application

### Documents & Attachments

The following documentation **must** be attached to your application:

 Copy of proposed Participant Information Statement(s) (use the templates provided on the [La Trobe University Human Research Ethics website](#))

 Copy of proposed Consent Form(s) (use the templates provided on the [La Trobe University Human Research Ethics website](#))

-  Copy of proposed Withdrawal of Consent Form(s) (use the templates provided on the [La Trobe University Human Research Ethics website](#))
-  Copy of proposed recruitment advertisements, flyers, advertising materials, etc.
-  Copy of proposed group interview schedules
-  Copy of funding application(s)

6.1. **Attach each of the items specifically listed above, as well as any other supporting documentation to the table below.\***

Description	Reference	Uploaded	Not Required
Participant Information Statement	Appendix A Participant information statement e portfolio evaluation focus group.docx	✓	
Consent Form	Appendix B Participant consent form evaluation of eportfolio to support dietetic competencies.docx	✓	
Withdrawal of Consent Form	Appendix E Participant withdrawal of consent form evaluation of eportfolio to support dietetic competencies.docx		✓
Declaration Form for External Investigators	no external investigators		✓
Reference List	limited published research		✓
Advertising Material (flyers etc.)	Focus group marketing email & lms post evaluation of eportfolio.docx	✓	
Consent form V2	Participant consent form V2.docx	✓	
PIS V2	Participant information statement V2.docx	✓	
Supervisor focus group prompts	Supervisor Focus Group Questions evaluating eportfolios.docx	✓	

## Committee/Risk Assessment

**If any statements appear below, this application must be reviewed by the University Human Ethics Committee.**  
*These statements relate to projects considered to be Above Low Risk, or involve groups identified by the National Statement.*

**If any statements appear below, this application may require review by the University Human Ethics Committee.**  
*These statements relate to projects considered to be Above Low Risk in certain circumstances.*

- **Question 2.9.** Will the research potentially involve any participants in dependent or unequal relationships with any of the members of the research team or people involved in recruitment? For example, teacher/student, doctor/patient, student/lecturer, client/counsellor, employer/employee. Such relationships may compromise a participant's ability to give consent which is free from any form of pressure, real or implied.  
*You answered 'Yes'.*

**If any statements appear below, this application may be considered as Negligible Risk.**  
*Such applications may not require formal review, please contact an Ethics Officer to discuss your application before submission.*

**If no statements have appeared above, this application should be submitted to the relevant College Human Ethics Sub-Committee to be reviewed as Low Risk.**

6.2. **Considering the information above, which Committee do you wish to submit this application to?**

*Please note that the risk level will determine who reviews this application and will not necessarily influence the length of the review process. The Ethics Officer will assess your submission, then formally accept your application on behalf of the appropriate Committee.\**

- ☐ University Human Ethics Committee
- ☐ Arts, Social Sciences & Commerce College Human Ethics Sub-Committee
- ☒ Science, Health & Engineering College Human Ethics Sub-Committee

6.2.a. **Provide a short justification why you have chosen this committee to review your application based on the risks involved.\***

This application forms part of a quality improvement process to support teaching and learning of dietetic students on professional placement. The research involves focus groups only which pose little risk to participants. Although students are involved in the focus groups students will have completed all assessment tasks and be approaching graduation. Furthermore data will be de-identified and themed and individual data will not be used.

## Declaration

### Investigator Declaration

In preparing this application I/we, the undersigned, declare that I/we:

- have read and agree to abide by the La Trobe University Human Research Ethics Guidelines;
- have read and agree to abide by the conditions and constraints of the National Statement on Ethical Conduct in Human Research (2007) and any other relevant University and/or statutory requirements;
- accept responsibility for the accuracy of the information provided in this application and for the conduct of this research, in accordance with the principles contained in the NHMRC Guidelines and any other conditions specified by the University Human Ethics Committee;
- will ensure that the qualifications and / or experience of all personnel involved with the project are appropriate to the procedures performed;
- will ensure that appropriate permits from relevant external organisations, or State or Federal agencies will be obtained, that copies will be lodged with the UHEC and that any imposed conditions will be observed;
- understand that the information contained in this application is given on the basis that it remains confidential in accordance with relevant University and statutory requirements;
- abide by the terms and conditions set by the University Human Ethics Committee;
- certify that the information contained in this application is true and accurate;
- will seek approval for modifications to the research prior to their implementation.

6.3. **Declaration Table\***

1	<i>Staff/Student ID</i>	00071619
	<i>Full Name</i>	Sharon Croxford
	<i>Role in Research Project</i>	Associate Investigator
	<i>Personnel Type</i>	Both
	<b>Sign Declaration?</b> By clicking the checkbox below, you are agreeing to conduct the research project in accordance with the above declaration.	Yes
	<b>Date Signed</b>	22/09/2016
2	<i>Staff/Student ID</i>	00078418
	<i>Full Name</i>	Adrienne Forsyth
	<i>Role in Research Project</i>	Associate Investigator
	<i>Personnel Type</i>	Internal
	<b>Sign Declaration?</b> By clicking the checkbox below, you are agreeing to conduct the research project in accordance with the above declaration.	Yes
	<b>Date Signed</b>	22/09/2016
3	<i>Staff/Student ID</i>	00080060
	<i>Full Name</i>	Andrea Bramley
	<i>Role in Research Project</i>	Chief Investigator
	<i>Personnel Type</i>	Both
	<b>Sign Declaration?</b> By clicking the checkbox below, you are agreeing to conduct the research project in accordance with the above declaration.	Yes
	<b>Date Signed</b>	21/09/2016
4	<i>Staff/Student ID</i>	00075489
	<i>Full Name</i>	Regina Belski
	<i>Role in Research Project</i>	Associate Investigator
	<i>Personnel Type</i>	Internal
	<b>Sign Declaration?</b> By clicking the checkbox below, you are agreeing to conduct the research project in accordance with the above declaration.	Yes
	<b>Date Signed</b>	22/09/2016
5	<i>Staff/Student ID</i>	00071158
	<i>Full Name</i>	Vicki Barrington
	<i>Role in Research Project</i>	Associate Investigator
	<i>Personnel Type</i>	Internal
	<b>Sign Declaration?</b> By clicking the checkbox below, you are agreeing to conduct the research project in accordance with the above declaration.	Yes
	<b>Date Signed</b>	22/09/2016

## Submission Details

### Reminders

- All applications must be sighted and approved by all members of the research team and any relevant parties. Please ensure each member of the research team has completed their declaration in "Section 6 - Declaration" above, including any declaration forms supplied on behalf of External Investigators. *Applications will not be reviewed without appropriate authorisation.*
- It is strongly recommended that you save a PDF version of your application before submitting as you will lose access to the electronic record while it undergoes formal review.
- All investigators will receive a confirmation email once this application has been successfully submitted.
- You can check on the progress of this application at any time by viewing the "Process Status" information on the My Applications page.
- *Note: Only a Chief Investigator is able to submit an application for ethical approval. The Chief Investigator who is marked as the primary contact for this application is:*

Ms Andrea Louise Bramley

**You are reminded that your project may not commence without formal written approval from the University Human Ethics Committee (UHEC) or College Human Ethics Sub-Committee (CHESC).**

## SPRINGER NATURE LICENSE TERMS AND CONDITIONS

Oct 09, 2021

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