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A bridge to 'being' a practitioner: the role of pedagogical practice-in-context knowledge in the design, delivery and experience of a capstone subject

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Issues of 'pulling the course together' for students and facilitating the transition to work-life beyond study concern many disciplines. Paramedicine is a particularly challenging environment for curriculum design and implementation given the complexities of being a paramedic and the consequent challenges of providing authentic, contextualised learning experiences for students. Capstone experiences help students to both look back over their course and look forward to life beyond study. Our project to design, implement and evaluate a paramedic capstone subject contributes to thinking about key factors in capstone design. The design is heavily influenced by staff experiences of 'being a paramedic'. It fundamentally repositions the student from learning about paramedicine, into immersion in lived experiences of the profession. A traditional learning focus on "content" is replaced by "practice-in-context". Students experience messy, complex situations. They are required to interrogate, extend and apply their knowledge and understanding. Student performance, and judgements about their own performance are calibrated against industry expectations through conversations with practicing paramedics. Data on student perceptions of the experience indicate that the subject achieved two key objectives: enhancing preparedness for the paramedic role and calibrating students' learning against industry expectations.
This experience draws on designers' and teachers' own lived experience of 'being' a practitioner in the discipline. Their ability to help students learn about 'being' relies on what we have named pedagogical practice-in-context knowledge. Our evaluation of the curriculum points to the central role of pedagogic practice-in-context knowledge in creating an immersive experience in which students learn to be, by being.

Keywords: capstone experience, design, pedagogical practice-in-context knowledge

Bridging to practice: the role of capstone experiences

Addressing issues of transitioning out of higher education study and into work or other environments has long been of concern to many disciplines. The graduate employability agenda dominating contemporary debates around Higher Education in Australia and elsewhere has brought even greater attention to these issues. One mechanism that has been gaining increasing attention is the use of capstone experiences in their many guises. Culminating experiences such as final year practical projects in the engineering disciplines, honours theses and work placements and practicums are well established in higher education in Australia. In recent years the term 'capstone experience' has been adopted from the US as a generic label for learning experiences that are designed to assist students to bridge from study to life beyond study. Such experiences have a long history in USA with some tracing

capstone-like culminating learning experiences back to the late 18th century (Alstete and Beutell, 2016) but with significant expansion from the late-20th century (Kinzie, 2013).

The unifying concept behind capstone experiences is the intention to help students to both look back and look forward as a bridge between theory and practice. Durel (1993, p. 223) describes a capstone as:

> coming at the end of a sequence of courses with the specific objective of integrating a body of relatively fragmented knowledge into a unified whole. As a rite of passage, this course provides an experience through which undergraduate students both look back over their undergraduate curriculum in an effort to make sense of that experience, and look forward to a life by building on that experience.

Capstones have been situated as a significant personal and professional transitional experience for students as they prepare for their post-graduation lives (Lee & Loton 2015). While there is a large literature on capstone courses (e.g. Lee and Loton (2015) identified 500 reference sources), much of the literature describes particular examples with until recently, little research to theorise or model capstone experiences or evaluate their effects on student learning (Kinzie, 2013; Lee and Loton, 2015). Beyond general agreement on intent, capstone experiences seem to be characterised by variety. Rowles et al. (2004) identify three 'organizing models' – mountaintops, magnets and mandates - that influenced the development of capstone experiences at their university: Mountaintops cross disciplines; magnets draw together learning within a single discipline; mandates are organised to meet external requirements such as professional registration. While the three models shared common underlying design principles, the principles were enacted through a range of designs. Alstete and Beutell (2015) similarly identify a diversity of capstone designs in business schools across the USA.

Recently efforts have been made to develop frameworks to help to systematically compare and differentiate capstone designs. Healey et al. (2013) propose that capstones can be characterised according to their position in relation to five key dimensions: conception – the overarching structure of the capstone; function - the emphasis on particular goals; organisation - the ways in which students go about their work as a class; location - the primary place of learning; outputs – the types of artefacts produced for assessment or in the course of the capstone experience. Following Healy et al. (2013) and others, Lee and Loton (2015) identify the key features of capstone curriculum as:

- integration and extension of prior learning;
- authentic and contextualised experiences;
- challenging and complex problems;
- student independence and agency;
- a concern with critical inquiry and creativity, and;
- active dissemination and celebration.

These efforts to identify key features of effective capstone experiences begin to provide a basis to systematically describe, analyse and evaluate particular projects to design and implement such experiences. Without such frameworks, it is difficult to identify and share what works, for whom and in what circumstances and contexts.

Recent reviews of the literature (French et al., 2015; Lee and Loton, 2015) note, specifically in relation to degrees in Australia, a distinct shortage of information about designing for quality and about the experiences of students undertaking capstones. In the American context,

Kinzie (2013) makes the observation that capstone experiences have a long history 'yet we know little about the nature of the experience for student learning': Kinzie's analysis of data collected through the National Survey of Student Experience in the USA over multiple years indicates broad perceived benefits from capstone experiences however the data does not provide any clear pointers to what works for which students, how or why. Similarly, van Acker et al. (2014, 1060) note "data on the experiences of students undertaking capstones, [and] the views of lecturers teaching them … provide untapped areas for further research".

In our investigations we were unable to find any research on the deliberate use of transition pedagogies in paramedicine to help students to bridge the theory-practice gap by looking back to consolidate learning from their degree and looking forward to 'road readiness'.
Our work adds to the body of research by: first describing the process we followed to develop and implement a capstone experiences in the specific context of paramedic education; secondly, analysing quantitative data from participating students on their perceptions of the value of the experience in helping them to look back and look forward; and third, reflecting on the implications for others engaging with capstone pedagogy of our experience as the designers, teachers and evaluators of the capstone subject. We propose that a key feature of the subject that contributed to its effectiveness is the expertise of the design and teaching team. This capstone 'bridging to being' experience shifts well beyond teaching and learning disciplinary knowledge and skills drawing on designers' and teachers' own lived experiences of 'being' a practitioner in the discipline. Their ability to help students learn about 'being' relies on what we have named pedagogical practice-in-context knowledge. Our reflections on and formal evaluation of the designed, implemented and experienced curriculum points to the central role of pedagogic practice-in-context knowledge in creating an immersive capstone subject in which students learn to be, by being.

Capstone experience: an answer to issues in paramedic education?

Paramedic education is a developing discipline with a relatively short history and limited research on teaching and learning in the discipline (Hou, Rego and Service, 2013). Previously paramedics were taught through the vocational education and training system with substantial 'on the job' training but since the mid-1990s there has been a shift towards university-based education for the role. This shift has brought with it numerous challenges to the higher education system, including to determine how best to train students so that they will be 'work ready', having the skills necessary to perform in what can be a dynamic, unpredictable and intense role in environments characterised by variety. Currently some uncertainty surrounds the preparedness of graduating paramedic students from Australian universities (O'Brien et al., 2014).

Paramedicine is a particularly challenging case for curriculum design and implementation given: the developing nature of the discipline; the demanding nature of the paramedic process (Carter and Thompson, 2013) and 'road ready' requirements; the often physically and emotionally demanding characteristics of the work environment; and the consequent challenges of providing authentic and contextualised educational experiences for students. Through their structured review of the literature, Kennedy et al. (2015) identify four key themes in the experience of university educated paramedics transitioning to practice: "I'm out of my depth", the discrepancy between theory and practice, 'ability to fit in', and 'the expectation to control emotions'. They note the limited research about enhancing the transition, echoing Hou et al.'s (2013) observations about the literature on paramedic education more broadly. Both studies however indicate the need to provide better preparation

for the transition from student to beginning practitioner. Learning to become a paramedic involves more than simply being able to demonstrate practical task competence: it also requires the development of judgement and the capacity to self-reflect on performance.

The impetus to explore the potential of capstone experiences in Flinders University's Bachelor of Paramedic Science degree developed in response to student and industry criticism of the previous version of the program. Students criticised quality of teaching and relevance to future professional roles. Industry criticised the program whenever graduates were seen not to be 'road ready'.

The need to respond to criticisms presented a unique opportunity to redesign a final year subject within the degree. A broad literature search focused on terms including graduate readiness identified a capstone model as an appropriate solution to the complexities of issues affecting the student completing their final study requirements. The capstone label and principles offered considerable flexibility to mould an approach to the specific needs of the student cohort. As students were already engaged in on-road clinical placements, we sought an approach which specifically addressed the gap existing between their on-road practice and the classroom curriculum: the theory-practice gap. The culminating experience needed to target the holistic features linked to the paramedic role.

The Paramedic capstone: the planned, implemented and experienced curriculum

The final semester subject 'Applied Paramedic Practice' was redesigned as a capstone experience. Over five years, significant investment has been made into the design and refinement of the approach: refinements to the design have built on feedback from staff about delivering the designed curriculum and from students about their experience of what has been delivered. The design sought to consolidate the knowledge and learning experiences presented from the broad curriculum within the degree by using a mixture of learning experiences which are closely aligned with authentic 'real-world' paramedic events. The data and analysis presented later focuses on the students' perceptions of the impact of the curriculum as they experienced it.

The following description and analysis of the capstone experience follows Prideaux's (2003) model of the curriculum as comprising three stages: the planned curriculum, the delivered curriculum and the experienced curriculum. For the purposes of this paper, Healy et al.'s (2013) framework provides a means to broadly describe the defining characteristics of the intended curriculum experience to provide context for subsequent discussion of the student perceptions of the experienced curriculum.

At the macro-level the subject design has the following characteristics.

Conception – the overarching structure of the capstone

The official subject description states that the subject is aimed at providing the student with an integration of all the paramedic related skills, knowledge and attitudes, in order to enable them to graduate with confidence and a thorough grounding in paramedic practice …. (course website). Although the subject is not formally labelled as a capstone experience, the aims clearly articulate the characteristics of one: it is designed to consolidate and integrate previous learning (to look back) and to prepare the students for practice as a paramedic (to look forward to beyond study). The design encompasses interconnected theoretical and practical

experiences linked by a variety of assessment tasks which contribute to the mapping of an individualised, differentiated pathway for each student through the experience.

Function - the emphasis on particular goals

The intended learning outcomes in subject documentation state:

At the completion of this topic it is intended that the participants will be able to:

- Demonstrate the recommended qualities and attributes associated with the paramedic degree graduate
- Demonstrate comprehensive skills in the evaluation of; the environment, the setting and the patient
- Demonstrate the safe and proficient execution of appropriate clinical skills
- Incorporate the knowledge from all pre-requisite curriculums and apply to the clinical decision
- Critically evaluate the existing evidence that underpins current paramedic practice

The outcomes encompass the three curriculum domains of knowledge, action and self identified by Barnett et al. (2001). The 'knowledge' domain refers to those components that build discipline-specific competences towards creating a competent practitioner in the discipline. The 'action' domain includes the broad generic skill 'of doing' identified as graduate attributes: communication, presentation and similar. The domain of 'self' develops a thoughtful, critical disposition in relation to the discipline: a critically reflective practitioner. While the aims seem to address the domains separately the organizational aspects of the design focus on drawing together and integrating these areas.

Organisation

Broadly the curriculum is organised as interconnected group and individual components covering both theoretical/conceptual and practical areas of paramedic practice. Specific elements are designed and presented to as far as possible replicate for students the complex challenging and uncertain contexts in which paramedics apply their vocational expertise as 'knowing in practice' (Billett, 2001).

Lee and Loton's (2015) key features of capstone curriculum provide a useful framework for presenting the organizational detail of the planned and delivered curriculum.

Integration and extension of prior learning

This is achieved through a sequence of interconnected assessment activities and individualised learning paths (see figure 1 below). All students undertake an initial diagnostic assessment which highlights gaps in their retained knowledge from earlier parts of the degree: these become the focus for individualised learning activities for each student.

All of the learning experiences including assessment activities intentionally link both forward and back to consolidate and extend student learning. Assessment culminates with an oral examination specific to each individual student. Student performance within the mid-year exam is used to profile knowledge strengths and ongoing learning opportunities. Used as a diagnostic tool, each student has a curriculum area highlighted as the focus for their personal learning investment. Students are advised well ahead of the final exam of the potential areas in which they are required to demonstrate their knowledge and learning achieved. The oral is designed to enable each student to demonstrate the growth and consolidation of their knowledge.

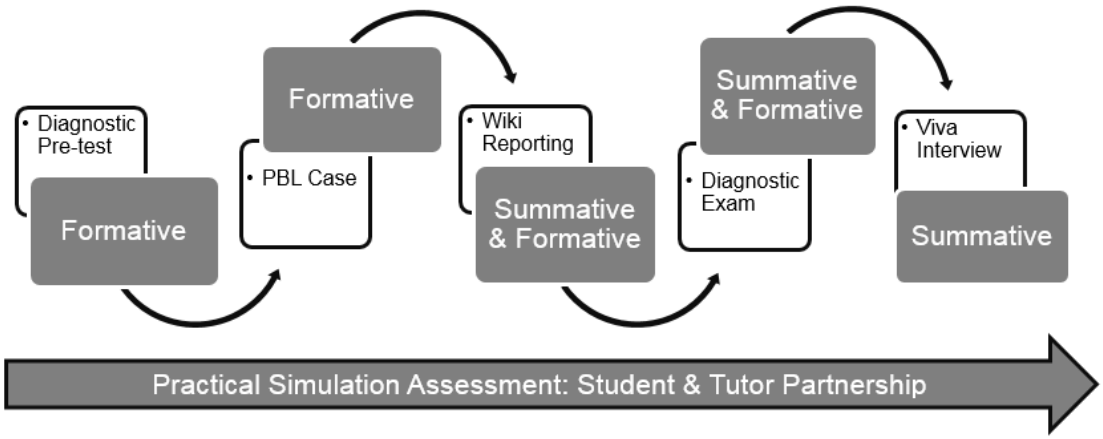

Figure 1: elements and linkages in the capstone experience

Authentic and contextualised experiences
The subject features a series of staggered intensive full days, each divided into both theory and practical components addressing selected themes. No advanced warning of content is provided to students, forcing them to arrive at class without specific preparation. This strategy of withholding preparatory learning material, and concealing the education themes of the day, was designed to serve several key purposes. Firstly, it echoes the spontaneous pre-hospital setting, where the paramedic has no knowledge of what their next case will be or what knowledge of skills they will be required to call upon in order to effectively respond to it. Secondly, it means that the knowledge or skills the student brings to the classroom, are an authentic representation of their current ability, instead of being a rehearsed response to a specific scenario.

Challenging and complex problems
Problem based learning (PBL) sessions encourage the students to unravel authentic patient cases. Students apply their knowledge, while becoming self-aware of the key understanding they need to solve the clinical case mysteries. In a shift from conventional PBL practice, the subsequent student reporting of self-identified knowledge gaps, are made through a wiki platform. This strategy offers every student a reporting voice while continuing the learning conversation well beyond the classroom. At this stage the learning pathway for each individual student becomes further differentiated.

Student independence and agency
Students are individually required to find and evaluate supportive learning material or resources unique to each learning need, which replaces traditional generic pre-reading provisions. Once established, the wikis remain the property of the student cohort, free from academic judgement or interference. The quality control of the information presented on this platform is solely the responsibility of the student. Rigor of student learning is achieved when the subjects which are identified and presented by students, are incorporated into a mid-year exam. In effect, students have discovered their own knowledge deficiencies, collaborated with their peers to produce a dynamic collection of study notes, and in doing so contributed to writing their own class exam.

A concern with critical inquiry and creativity
Throughout the subject students engage in critical enquiry and critical reflection. In the practical simulations, students are assessed on not only their practical performance but also

their ability to reflect critically on their own performance – including the quality of their professional judgements in situ.

Active dissemination and celebration
Throughout the experience students actively share their learning particularly through the wiki and through observation, critique and acknowledgement of achievements in simulations. Extending peer-to-peer collaborative student learning opportunities from the PBL classroom to the wiki forum was intended to foster student reliance upon each other for the co-construction of learning responding to earlier issues associated with adverse impact of graduate competitiveness upon the learning.

Location
Multiple sites are provided for student learning. Large parts of the course occur on campus with face-to-face experiences in lecture rooms, simulation laboratories and similar spaces but the subject also has an on-line environment for students to work individually and collectively on learning tasks. Other components occur in the field with simulated scenarios. All learning sites are designed to promote independence, interdependence and agency.

Outputs
The new design, delivery and experience explicitly links the development and consolidation of knowledge, action and self for each individual student through an individualised experience that helps the individual student to both look back and look forward. Students are given multiple opportunities to demonstrate their developing knowledge, the application of their knowledge in practice and to demonstrate their ability to judge the quality of their own performances. The intended key outputs are not artefacts of assessment but rather, students who emerge from immersive experiences as beginning practitioners with vocational expertise built through knowing in practice.

The result is a student-centric design for teaching, learning and assessment intended to help students.

Student perceptions of the experienced curriculum

Students enrolled in the subject in Semester 2, 2015 were invited to complete two questionnaires, one prior to commencing and another after completing all of the teaching and assessment requirements of the subject. 90 of the 94 enrolled students completed the questionnaires. Response patterns for key questions are presented below (see figures 2 and 3).

Students reported that the capstone subject helped them feel well prepared for the paramedic role with 84.0% either agreeing or strongly agreeing with this statement (Figure 2). All students felt that they agreed, strongly agreed or were neutral with the statement that they recognise the expected standards of local industry paramedics. 88.8% of students felt more confident in their knowledge and practice after undertaking the capstone subject and 89.9% believed that the subject helped to consolidate previous curricula in the undergraduate degree.

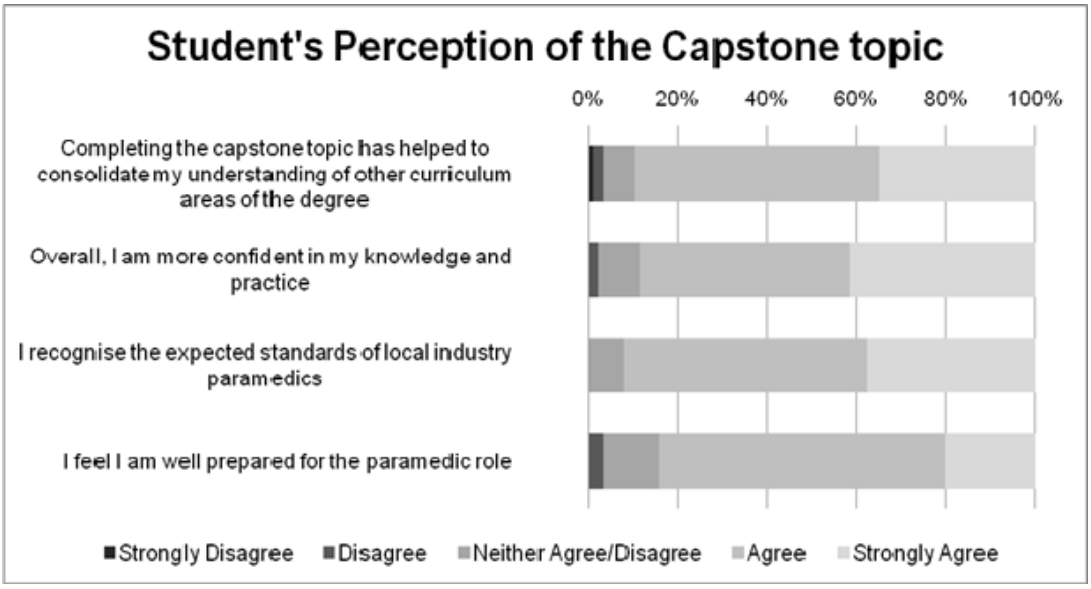

Figure 2: Overall student perceptions

Before subject commencement 74.8% of students either agreed or strongly agreed that the degree was effective in preparing them for the role of a paramedic. This increased to 91.4% after completion. Commencing the capstone subject 6.6% of students either disagreed or strongly disagreed that the Paramedic degree was effective in preparing them for the role of a paramedic (Figure 3). This reduced to 0% of students feeling this way after completion of the capstone subject.

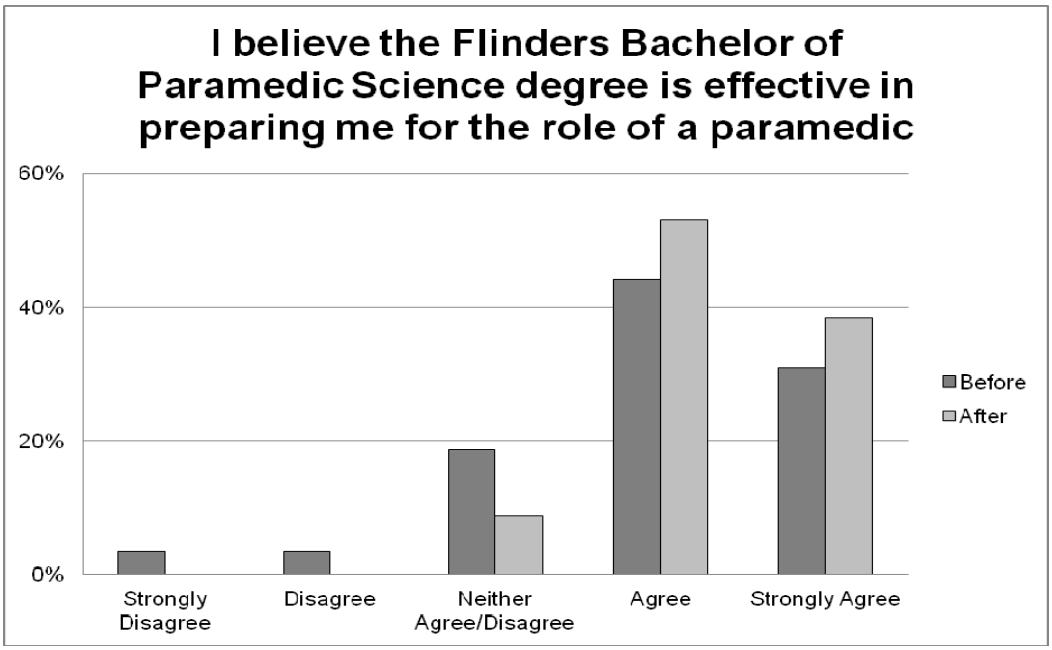

Figure 3: Perceptions of preparation for the role of a paramedic

Before commencing the subject 4.4% disagreed or strongly disagreed with the statement that they valued their degree qualification: this reduced to 0% after completion of the capstone (Figure 4). Whereas overall agreement (strongly agree and agreed) with this statement increased from 86.9% before commencing the subject to 91.4% after completion.

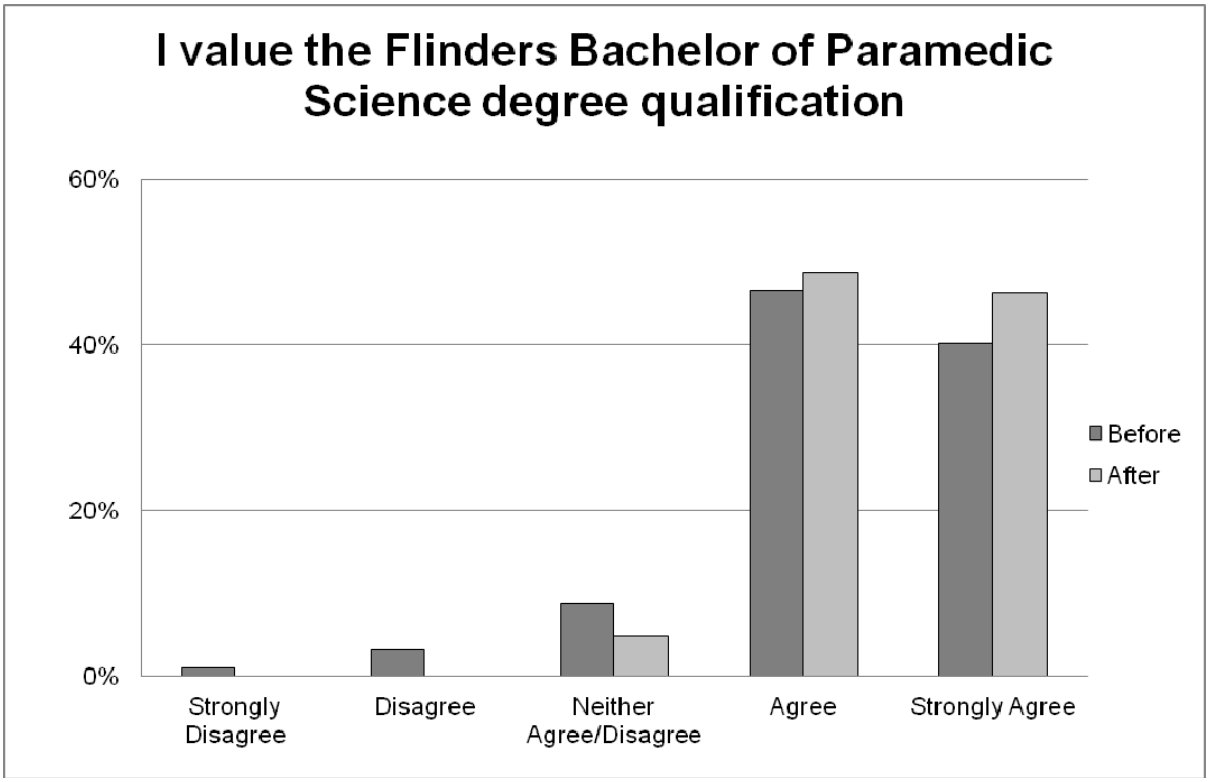

Figure 4: Perceptions of value placed on the degree

Reflections on success

Student responses show that from their perspective, the capstone experience achieved its intended outcomes of consolidating previous learning, increasing student confidence and providing a more effective bridge for students into industry. In the judgement of staff, the experience was much more effective than previous versions of the subject. We suggest that the success of the experience has been largely dependent on the capacity of the designers and teachers to bring together pedagogical expertise and discipline expertise defined in a particular way.

Shulman (1987), acknowledging the importance of disciplinary difference in education, coined the term 'pedagogical content knowledge' to highlight the particular expertise required to teach disciplinary knowledge (theory and skills) in the best or most appropriate ways. However as criticisms of previous designs of the paramedic course indicated, neither students nor industry partners were satisfied with content-focused but context-free teaching and learning, even when taught well. It seems that pedagogical content knowledge is necessary but not sufficient for developing beginning practitioners: it does not necessarily bridge the theory-practice gap. While students experienced 'on-road' placements as part of the course, there was no guarantee that 'hours served' on the road provided an effective way to bridge the gap either.

Billett's (2001) conception of vocational expertise as 'knowing in practice' provides some insights into the limitations of the previous approach. He proposes that 'knowledge in practice' is relational, embedded, comprises competence, is reciprocal and requires pertinence. Knowledge in practice is socially and culturally positioned. The previous manifestation of the topic emphasised learning about knowing, while placements emphasised practice. Explicit strategies to develop 'knowing in practice' were missing.

In the redesign, the designers brought to bear a particular combination of expertise developed as paramedics as educators: their pedagogical knowledge developed through experience and training as educators; their paramedic 'knowing in practice' developed through being practicing paramedics; and the third element in the mix, their experience of the complexity of practice and the variety of contexts in which paramedic practice occurs, that is experience of practice-in-context. This expertise enabled the capstone to be designed to expose students to experience of being paramedics applying 'knowing in practice'. We have labelled this complex expertise as 'pedagogical practice-in-context knowledge'.

Moreover, the delivered curriculum deliberately incorporated additional 'practice-in-context' expertise by using currently practicing paramedics as sessional tutors and assessors. These practitioners are involved in assessing students' 'knowing in practice' demonstrated through complex simulations and also in 'calibrating conversations' with students. These conversations provide opportunities for students to reflect on their own performance and make judgements about their own performance against industry norms and expectations as well as academic outcomes and standards.

The design built on pedagogical practice-in-context knowledge provided a learning environment that was relation, provided practise, clearly identified competence, created opportunities for reciprocity in learning and was pertinent to performance in the discipline. The environment provided students with the opportunity to develop into being paramedics, through experiencing paramedic knowing in practice.

Conclusions and implications

As Alstete and Beutell (2015) observe 'There is no singular path that leads to capstone nirvana'. Nevertheless, Lee & Loton (2015, p 19) identify and group fundamental 'how to' concerns into seven short guidelines for capstone design and delivery, which encourage academics to:

- start with the end in mind;
- choose a model that works for the particular context;
- provide an underpinning structure;
- explicitly give students ownership;
- build in regular feedback from a range of sources;
- recognise the benefit of uncertainty and creativity, and;
- link to the future.

We believe that our paramedic capstone experience showcases the enactment of these guidelines. Providing the best possible experience requires an iterative process of refinement to enhance the alignment between the curriculum, industry expectations and the 'knowing in practice' requirements of a beginning paramedic practitioner. In our case, the ability to build and refine such an experience draws on designers' and teachers' own lived experience of good pedagogical practice and also of 'being' a practitioner in the discipline. The capstone subject as designed, implemented and experienced reflects what we have named the pedagogical practice-in-context knowledge of the paramedic educators responsible for the subject: this is arguably the key to its success. The ability to align and refine teaching and the educational experience to the particular knowledge, skills and professional attitudes and orientations of paramedic practice has been crucial.

The student response to their experience of this capstone model strongly suggests that it achieves the broad outcomes for capstone experiences generally and the specific outcomes

intended in this case. The role of a paramedic requires critical thinking and self-reflective practices. We have introduced an innovation which develops student judgement and critical thinking. The real pre-hospital world is often unpredictable, requiring a paramedic to constantly judge their practices. The large majority of students valued the opportunities both to look back and consolidate their learning from the degree and to look forward to the context of paramedic practice to more fully appreciate the expectations and challenges of being a 'road ready' paramedic. The designed, implemented and experienced curriculum now better complements the 'on-road' experience gained through industry/clinical placement to more effectively bridge the 'theory-practice gap' identified in recent literature (Kennedy, Kenny & O'Meara (2015). The capstone helps students to learn to be paramedics, by being paramedics.

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