Capstone curriculum across disciplines: Synthesising theory, practice and policy to provide practical tools for curriculum design

Final Report

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Acknowledgements

List of acronyms used

AQF   Australian Qualification Framework

ALTC   Australian Learning and Teaching Council

ICT   Information and Communication Technologies

LTAS   Learning and Teaching Academic Standards

OLT   Office for Learning and Teaching

UK   United Kingdom

US   United States

Other terminology

Educational terminology varies enormously from institution to institution and country to country. For ease, we have used the following terms:

Course as synonymous with 'program' – a series of credit-bearing activities leading to an award

Unit as synonymous with 'subject' or 'module' – a discrete assessed component of a student's course or program

Executive summary

Although there have long been final year projects in many disciplines that closely reflect the idea of a capstone, it is only in recent years that the term has moved into popular usage in Australia. The term capstone, very generally speaking, refers to a culminating educational experience with a focus on the consolidation of prior learning, the development of graduate capabilities and the transition to post-graduation settings.

Traditionally, capstones were conceived and designed to operate as a synthesis of prior course experiences, often largely focused on the demonstration of knowledge. Increasing emphasis on the contribution of higher education to the development of a wide range of skills and capabilities relevant to employability, social engagement and lifelong learning means that capstones now more often than not aim to involve students in independent engagement with complex, authentic real-world problems that build on prior learning. This situates capstones as a significant personal and professional transitional experience for students as they prepare for their post-graduation lives. From an institutional quality point of view, capstones have the potential to provide a means of demonstrating course-level learning outcomes, raise the profile of courses and graduates, and enhance retention and satisfaction rates.

From the outset, the fellowship identified significant gaps in the literature on capstones, along with clear indications of sector readiness and a desire for capacity-building and engagement on the topic of capstone curriculum. While capstones are a common feature of courses in many disciplines, there has historically been little cross-disciplinary literature. Areas in which capstones are considered an essential component of undergraduate courses, such as engineering and ICT, dominate the field. Nonetheless, there is evidence that capstones are more widespread than this suggests, and that they often share common features regardless of discipline. Commencing from the premise that there is much to be gained from sector-wide and cross-disciplinary model sharing, the broad aims of the fellowship program were to:

- unpack the complexity of capstone theory and practice nationally and internationally, including the variety of capstone models and their implications for courses, as well as staff and student experiences;
- provide professional development and a range of cross-disciplinary tools and resources for the ongoing development of innovative capstone curriculum;
- build collegial networks that would provide the basis for sustained capacity-building across the sector in the design and delivery of a diverse range of capstone models, and;
- enhance awareness across the sector concerning the need to develop and embed policy and institutional structures that support capstone innovation.

The fellowship proceeded with two interconnected strands. The first strand featured formal research on the nature of capstone curricula in Australia and internationally, as well as on the experiences of staff engaged in their design and delivery. This included a large-scale survey of capstones and staff perspectives on capstone design; interviews with capstone coordinators; case study collection and desktop reviews of publicly available capstone curriculum materials.

Findings from this work demonstrated the dominance of project-based capstone curricula; diverse, but also largely conventional assessment practices; focused, fit-for-purpose design; and deeply student-centred principles underpinning many capstones. The findings also provided some insight into the opportunities and limitations of whole-of-course assessment on the basis of capstone outcomes. Perhaps most critically for the issue of quality assurance, the findings indicated that well-designed capstones can be an appropriate mechanism for peer review and quality assurance processes. However, there are also some inherent limitations of scope and timing that need to be taken into account in basing course evaluation on capstone outcomes.

The second strand featured sector-wide network engagement and dissemination activities designed to support the development of resources and provide assistance to individuals and institutions during the process of capstone design and/or evaluation. The fellowship has drawn heavily on the expertise of many of these staff in developing the fellowship outputs. Over the course of the fellowship, contact was made with more than 700 academics, senior managers and administrators at universities in Australia, the US, Europe and Asia. A network was also established, and has provided a forum for engagement and dissemination. At the time of writing, the network has over 300 members. A total of 48 Australian institutions, including eight private providers, have taken part in at least one of the fellowship activities. Another 42 overseas institutions were represented in various activities. The fellowship website,[1] which houses discussions and outputs from the fellowship, has to date received over 41,000 visits and 21,500 unique visitors from all over the world viewing an average of 12 pages per visit. Resources have been downloaded over 2000 times. By far the most traffic has been Australian, with high numbers also from the US, New Zealand and the UK.

Both of these strands were woven together to form the basis of the fellowship outputs. In short, the development of outputs was an iterative process, drawing on the literature, research data, examples of current practice, as well as ongoing feedback from scholars and capstone coordinators from across the sector. These outputs included:

- an evidence base of capstone models-in-use across the Australian sector and the perceptions of staff delivering capstones, including a companion report detailing the survey findings;

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[1] www.capstonecurriculum.com.au

- a wide range of tools and resources, including 11 blog posts, 14 case studies, numerous curriculum resources and a set of principles and guidelines for the implementation of effective capstones;
- the provision of professional development opportunities and support to staff from across the sector, including 15 workshops delivered across five Australian states, with travel support provided for staff from other states and regional universities to attend the six state-based principles development workshops, and;
- a variety of other dissemination activities including a co-authored book chapter, four articles and six presentations at university learning and teaching fora and conferences, four in collaboration with other Office for Learning and Teaching (OLT) project leaders and fellows.

The principles and guidelines produced by the fellowship were progressively developed and tested at the state-based workshops and in an online evaluation survey. These are outlined in more detail on the fellowship website. In summary, the key features of capstone curriculum, expressed as principles, are:

1. integration and extension of prior learning;
2. authentic and contextualised experiences;
3. challenging and complex problems;
4. student independence and agency;
5. a concern with critical inquiry and creativity, and;
6. active dissemination and celebration.

Feedback on the fellowship activities and outputs has been overwhelmingly positive and the work shows signs of sustained interest from across the sector. This includes a desire for further development of particular models, and the adaptation of the principles and guidelines to institutional contexts. Requests for support and advice on capstone evaluation, workshops and projects also continue to be received, and activities have been scheduled through to 2016. Support for staff from across the sector in applying, adapting and extending the fellowship outcomes is also ongoing.

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Chapter 1: About the fellowship

In 2013, the Australian Government Office for Learning and Teaching (OLT) funded a National Senior Teaching Fellowship on the topic of capstone curriculum across disciplines. The broad aim of this fellowship program was to build on prior work in the sector to: examine capstone concepts and current models in use both nationally and internationally; develop a coherent set of guides; and support the sector in the development of effective capstones.

Undergraduate courses impact more staff and students than any other in higher education. They are also the focus of much of the current discourse around learning and teaching, university quality and student outcomes. We therefore focused our work on the delivery of capstones within undergraduate courses. Depending on the course, this may be at level 7 or 8 of the Australian Qualifications Framework (AQF). Nonetheless, it is important to acknowledge that there are also capstones occurring across diploma, associate degree and postgraduate courses, and some of these were referenced in the Fellowship program.

1.1 What are capstones?

Although there have long been final year units in many disciplines that could be identified as capstones, it is only in recent years that the term has moved into popular usage in Australia (Strand, Cutforth, Stoecker, Marullo, & Donohue, 2003). Internationally, the term capstone has most commonly been used in the US, where a capstone often takes the form of a 'senior seminar'. As a graduation requirement, this may comprise a service or workplace experience and project, a significant paper, or a series of culminating activities in a major or an interdisciplinary area. In the UK the terminology is not common, but similar concepts can be found in the final year project or honours thesis, as described by Healey, Lannin, Stibbe, and Derounian (2013).

In the simplest terms, capstones are substantial culminating learning experiences that take place in the final stage of an educational course, offering closure and a focus for the sense of achievement that comes with completion. From a quality assurance point of view, capstones can also provide a means of demonstrating course-level learning outcomes (Krause et al., 2014; Rasul et al., 2009).

Capstones were traditionally designed as a synthesis of all prior course experiences. As such, capstones, and their assessment, were often focused on the demonstration of discipline knowledge, expressed through an extended essay or formal examination.

Over recent years, however, capstones have become increasingly diverse; there are significant differences in the way that institutions, and individuals within them, structure and assess capstones (Rasul et al., 2009; van Acker et al., 2010). In both undergraduate and

postgraduate environments, capstones are now as often focused on the application of professional skills and attributes as they are on the expression of discipline content and standards. This has led to significant diversity in the range of curriculum approaches being used, the adoption of less traditional learning and assessment activities, and the transfer of models associated with particular discipline areas to other disciplines, particularly in the case of some combinations of project-based and work-integrated learning. Increasingly, capstones make substantial use of external partners from industry or community, and in many cases need to meet professional practice requirements. Capstone students may also engage with any combination of individual, team-based, discipline-focused or interdisciplinary activities.

The degree of concentration on knowledge or application within these activities varies enormously, as does the degree of autonomy afforded to students in the choice of topic, approach and outcomes. Assessment has similarly broadened to include any combination of products, reports, presentations or defence, peer and self-review, dissertation and examination; as well as differing weightings given to products and processes, inquiry, skills and knowledge.

The scale of these activities in the final year spans anywhere from one eighth to a quarter or more of the final year, with work carried out in a single semester or over the full year. The activities themselves may be integrative projects in which learning from other units is assessed, operate as discrete units of study, or be a combination of curricula and co-curricula activities. Further complexity is present in the variations of outcome levels in relation to the AQF. Undergraduate capstones, as demonstrations of academic standards, can occur at AQF levels 7 or 8.

Clearly, the design of a capstone is not a simple task. The range of possible approaches, complex interactions between student and external stakeholder needs, institutional and course structures, as well as logistical and budgetary constraints, can all place a significant burden on staff tasked with designing and delivering an exceptional capstone experience. That capstone staff and institutions often toil alone, and have (in many disciplines) little information about what others have experienced, only compounds the challenge.

1.2 Aims of the fellowship

Capstone curricula are diverse; there are significant differences in the way that institutions, and individuals, structure and assess capstones (Healey et al., 2013; Kift et al., 2013; Lee, 2014a; Rasul et al., 2009; van Acker, Bailey, Wilson, & French, 2014). However, at the outset of this fellowship, little evidence was available regarding the range of models in use across disciplines and their key characteristics, or the ways in which capstone staff perceived their relative challenges and benefits. As a result, there existed a significant, sector-wide need to expand understandings of the capstone experience; to unpack the complexity concerning

the range of capstones and their role in demonstrating course-level outcomes; as well as to identify the factors impacting curriculum design and, ultimately, the student experience.

In the context of regulatory change and the substantial re-organisation and curriculum renewal occurring in the sector, it was timely to bring together the scholars and other available resources involved in capstone curriculum development and delivery, and to build on these to create a holistic and cohesive view of the current landscape of capstone curriculum. The emphasis in the proposed activities and outcomes was on widening collegial networks, leveraging the expertise of staff already delivering exceptional capstone experiences, and stimulating discussion and enhancement of capability in capstone design across the sector. Accordingly, the fellowship activities focused on improving understanding of the nature of capstones across the disciplines, working with networks and individuals to create and disseminate resources and information on key capstone issues.

These broad emphases translated to a set of desired overarching outputs:

- an evidence base of capstone models-in-use across the Australian sector and the perceptions of staff delivering capstones regarding the purposes, benefits and challenges involved in capstone development;
- the establishment of holistic principles and guidelines for the implementation of effective capstones from a synthesis of practice and theory, mindful of contextual opportunities and barriers to good practice, and;
- the provision of professional development opportunities and resources to the sector, enabling staff to undertake informed evaluation of, and to make improvements to, their current practice, or to develop their first capstone with an understanding of the dimensions of capstone experiences.

1.3 Approach

Rather than employ discrete phases, the fellowship proceeded with two interconnected strands. The first strand featured formal research on the nature of capstone curriculum in Australia and internationally, as well as on the experiences of staff engaged in their design and delivery. The second featured sector-wide network engagement and dissemination activities designed to support the development of resources and provide assistance to individuals and institutions during the process of capstone design and/or evaluation.

In both cases, the fellowship sought to answer four high-level questions regarding capstones:

- What are the capstone models in use across the disciplines?
- What are the key characteristics or dimensions that make a capstone?
- What are the benefits of capstones from a staff perspective?
- What are the challenges of capstone delivery and how are they resolved?

The approach to answering these questions involved an iterative process drawing on the literature, research data, examples of current practice, as well as the expertise of scholars and capstone facilitators from across the sector, to develop and refine the fellowship's activities and outputs. Working with an action-oriented Theory of Change process (Hart, Diercks-O'Brien, & Powell, 2009), which allowed for the ongoing development of both the approach and outputs in response to the course context, the following activities formed the backbone of the fellowship:

- the establishment of a network of capstone experts, facilitators and stakeholders and a website for the dissemination of findings and tools;
- a critical review of the literature and existing practice-based resources, including both case and broader capstone-related literature;
- research into capstone models and staff perspectives on their delivery;
- the iterative development of guides, typologies, tools and case studies in identified areas of need, tested and refined through workshops and online, and;
- Support for capstone-related research and implementation projects, workshops and events.

In late 2013, ethics approval was gained for the research components of the fellowship program: a national survey, later approved for international participation; a series of semi-structured interviews designed to deepen understanding of the survey results; and collection of a series of case studies.

Chapter 2: Status of the field

The term capstone, in general terms, refers to a culminating educational experience with a focus on the coherence of prior learning, the development of graduate capabilities and the transition to post-graduation settings. Nonetheless, it is not straightforward to identify exactly what a capstone is, or may be. As part of the fellowship program, the fellowship team undertook an extensive literature review, compiling over 500 references. Much of this literature is case-based and distributed across discipline-focused journals. However, over recent years there have been some large-scale research projects on this topic, and increasing interest and debate, for example: in the UK, Healey et al. (2013); in Australia, Strand et al. (2003), Kift et al. (2013), Bailey, van Acker, and Fyffe (2012), Bailey, van Acker, and Fyffe (2013) and Rasul, Nouwens, Swift, Martin, and Greensill (2012); as well as substantial studies in the US, including Henscheid (2000), Schermer and Gray (2012) and Hauhart and Grahe (2012).

2.1 A brief history

In the US, where capstones are often synonymous with the 'senior seminar' or project, they have been described as an essential component of a well-rounded undergraduate curriculum since at least the 1940s (Neiswanger & Allen, 1947). The concept is much older: Levine (1998), for example, points to the presence of elements comparable to capstones in the form of senior projects and 'master classes' as far back as the medieval University of Paris, and pinpoints something akin to a senior seminar emerging in the US around the close of the eighteenth century. He also notes that US universities likely inherited the undergraduate honours thesis – which can be thought of as a form of capstone – from the German universities of the 1820s. These capstones appear to have had a similar goal to those in contemporary higher education – that of acting as a transition to post-graduation. One historical review of higher education curriculum describes a US capstone in the 1920s as 'finally having sent young graduates out into the world with a reassuring sense of their own fitness to play a role' (Rudolph, 1977, p. 90).

Hauhart and Grahe (2015) describe sporadic use of the capstone model in the US in the early twentieth century, largely dependent on individual staff, dating the re-emergence of capstones into popular usage in the latter half of the century. The widespread adoption of capstones in US colleges followed a series of discipline and national reports and, in particular, the Boyer Commission's 1998 *Reinventing Undergraduate Education*. This report recommended that all undergraduate courses should culminate with a capstone experience, and that this 'experience should enable the student to bring to a symbolic conclusion the acquisition of knowledge and skills that has preceded this final effort' (p. 27). In the same period, the literature on the final year student experience in general, and the capstone experience in particular, expanded. Within a decade, George Kuh's highly influential report

for the American Association of Colleges & Universities listed capstones as a 'high-impact' educational experience that should 'be made commonly available to every student' (2008, p. 20).

While the terminology is not generally used in the UK or Europe, many of the characteristic features of capstones can be found in the form of undergraduate projects and honours dissertations (as distinct from the more common honours 'year' in Australia). The terminology is also relatively new in Australia, and appears to have come into common usage gradually over the past decade or so, although there is clear evidence of capstone-like activities occurring for a much longer period. It is certainly the case that a significant integrative project in final year has long been a common feature of undergraduate courses in many disciplines in Australia and elsewhere, particularly engineering, ICT and design (Dutson, Todd, Magleby, & Sorensen, 1997; Lee, 2009; Rasul et al., 2009). A cursory glance at the course offerings of Australian higher education institutions suggests there is increasing adoption of capstones in a variety of formats.

Large-scale empirical investigation of capstones is a relatively new exercise, especially in Australia. However, several projects with nationally representative samples have recently been undertaken in the US (Hauhart & Grahe, 2010; Henscheid, 2000; Howe, 2010; Padgett & Kilgo, 2012; Schermer & Gray, 2012). These found that approximately 70-80 per cent of US higher education institutions offered a capstone, with higher prevalence in smaller institutions, private rather than public institutions, and in institutions that offer only sub-doctoral level qualifications (Hauhart & Grahe, 2012). A recent Australian audit of business courses found a similar prevalence of capstones, at 82 per cent (Bailey et al., 2013).

2.2 The characteristic features of capstones

Many authors describe the characteristic features of the capstone experience as being the synthesis, consolidation and application of prior learning (Rowles, Koch, Hundley, & Hamilton, 2004; van Acker et al., 2014; Weimer, 2013). In describing the adoption of capstones at Indiana University-Purdue University Indianapolis, Rowles et al. (2004) assert that capstones should be 'a culminating set of personal, academic and professional experiences [and] the primary focus should be on synthesis, integration, or application of previously acquired knowledge rather than on acquisition of new knowledge or skills' (p. 14).

There is also broad agreement that capstones should involve students in a process of addressing authentic and complex problems (Healey et al., 2013). Authenticity, in this context, usually refers to the alignment between capstone activities and the contexts, methods and issues of professional settings (Herrington, Reeves, & Oliver, 2014; Savery & Duffy, 1995). In practice, and in acknowledgement of the diverse post-graduation paths that students take, these professional contexts may be industry or research-based.

Whether the capstone is centred on professional contexts or research appears to be somewhat dependent on the field of study and course orientation. While Healey (2014) argues that research forms an important component of many final year projects, McNamara et al. (2012) argue that business capstones should support students in gaining direct and authentic workplace or community organisation experiences. Work-readiness and the development of professional identity are certainly present as important concepts across much of the literature (see, for example, Bailey et al., 2013; Nouwens et al., 2013). Large-scale survey studies have reported that employability is a major focus of many capstones (Howe, 2010), while multiple authors have argued, either directly or indirectly, that capstones should be concerned with the enhancement of professional capabilities and the transition to work (Dunlap, 2005; Holdsworth, Watty, & Davies, 2009; Keller, Parker, & Chan, 2011; Lee, 2014b). These positions are not mutually exclusive – our review found numerous instances of capstones which integrated professional and research activities to good effect (for example, Healey, 2014).

Regardless of whether a particular capstone is primarily oriented towards research or professional learning, a substantial level of student independence in tackling these challenges is central (Healey et al., 2013). Capstones are most often described as utilising inquiry, problem or project-based curriculum models, emphasising experiential learning in which students undertake investigation, ask questions, define their own paths, make decisions and deal with challenges in an iterative learning process (Healey, 2014; Lee, 2009, 2011, 2014b). These activities are often connected to a desire to develop a wide range of mature personal and professional capabilities, such as comfort with ambiguity, self-efficacy and self-awareness, judgement, curiosity, creativity and resilience (Lee, 2011; Magolda, 2004). This accords with recent shifts in the broader educational literature, where the integration of inquiry into the undergraduate curriculum has become the subject of increasing interest and debate (Aditomo, Goodyear, Bliuc, & Ellis, 2011; Brew, 2013; Healey, 2014; Spronken-Smith, Mirosa, & Darrou, 2013; Spronken-Smith, Walker, Batchelor, O'Steen, & Angelo, 2011).

The final common element of capstones identified in the literature is that of dissemination and celebration. Healey et al. (2013) argue that 'making work public is one of the simplest ways of raising the quality of work and acknowledging the amount of effort put into it' (p. 74). Sharing outputs in particular is an authentic element of professional life and has the positive effect of deepening students' capacity across all facets of their work, as well as enhancing purposeful engagement. Healey also argues that dissemination may have broader benefits for institutions, not least the opportunity to publicise the work of final year students to employers.

We further argue that public dissemination provides the context for students in earlier years to identify with the final year experience as an aspirational goal. The breadth of ways that dissemination and celebration, as part of the learning and assessment experience, occurs is

evident in the case literature. For creative disciplines, capstones have traditionally featured a culminating public exhibition or performance event that showcases final year outcomes (Healey et al., 2013). In business, engineering and ICT, presentations to clients and peers within the cohort are more common (Bailey et al., 2013; Dugan, 2011; Rasul et al., 2012). In the humanities and sciences, there is a variety of possible approaches reflecting a range of academic activities, such as publishing in undergraduate journals, or presenting at mini-conferences and poster sessions (Boyce, Moran, Nissen, Chenery, & Brooks, 2009; Conway & Ahmed, 2012; Rosenberry & Vicker, 2006; Schroetter & Wendler, 2008; Wadkins & Miller, 2011). The growing interest in research dissemination as part of the undergraduate experience across disciplines can also be seen in the establishment of the Australasian Conference of Undergraduate Research (ACUR), which invites students to present posters and papers using the same processes as other academic conferences.

2.3 Capstone models and dimensions

Some scholars have theorised distinct capstone models or dimensions. Rowles et al. (2004) describe three capstone models: 'mountaintops' – interdisciplinary subjects that cross majors and bring together diverse groups of students; 'magnets' – discipline or major specific capstones that pull together the richness of content from across the area of study; and 'mandates' – subjects mandated by external practitioner or registration bodies (pp. 13-14). A recent Australian study mapped capstones in business against this typology (van Acker et al., 2014).

Levine (1998) identifies three capstone types, organised around the style of delivery and assessment: comprehensive examinations, which are rarely used; senior theses; and senior seminars. The latter are characterised by a few class meetings at the beginning of semester, a lengthy period in which students work on a topic-related project, followed by further meetings in which the outcomes and results are discussed.

Rather than distinct models, Healey et al. (2013) suggest that capstones can be characterised according to their position in relation to five key dimensions:

Conception
The overarching structure of the capstone. For example, an independent research or consultancy project.

Function
The emphasis on particular goals. For example, in-depth analysis, synthesis of ideas or materials, or preparation for professional life is emphasised.

Organisation
The ways in which students go about their work as a class. For example, the extent of individual versus group work and how this work is structured.

Location
The primary place of learning. For example, campus-based, online and/or involving some degree of community or workplace participation.

Outputs
Types of outputs produced for assessment or in the course of the capstone experience. For example, a dissertation or thesis, portfolios, performances or exhibitions, or physical products such as artworks.

2.4 The use of capstones in quality assurance

In line with increasing expectations concerning quality assurance and accountability, higher education institutions around the world are currently considering how best to demonstrate whole-of-course learning outcomes. In Australia, several recent Australian Learning and Teaching Council (ALTC) and OLT-funded projects have set the scene for national moderation and benchmarking of the curriculum and student learning outcomes. Krause et al. (2014) trialled an inter-institutional peer review and moderation process for assurance of learning and teaching standards. A national model of expert peer review for benchmarking learning outcomes against nationally agreed threshold learning outcomes in accounting is currently under investigation (Hancock et al., 2013; Watty et al., 2014). O'Keefe et al. (2014) investigated the harmonisation of quality assurance processes for the assessment of threshold learning outcomes in health. These projects take place alongside other efforts on quality assurance, such as the Group of Eight 'Quality Verification System' (see The Group of Eight, 2014).

Capstones have been described as a possible source of evidence for many of these processes. Indeed, Krause et al. (2014) observe that 'capstones are being increasingly used as a device to put whole-of-course learning together to assess whether graduates are work ready in their chosen disciplines' (p. 74). According to Rasul et al. (2009), capstone projects can 'provide a robust vehicle for assessing the professional capabilities of individual students who are about to graduate, as well as provide evidence of the effectiveness and standards of a course of study for accreditation' (p. 206).

A similar emphasis on quality assurance through the outcomes of final year projects has been seen in Europe. In 2007, the Swedish National Agency for Higher Education Quality made final year projects a key quality indicator for assurance of learning outcomes (2011, p. 7). Several government bills and the directive given to the National Agency emphasise the central importance of independent student projects in confirming students have achieved the outcomes required for the award of a given qualification. Expert panels review random samples of student projects, which are used as an indicator of course-level learning outcomes.

Some authors have expressed caveats to using capstones for this purpose. In particular, in order for capstones to be used appropriately in assessing whole-of-course learning outcomes, they must be of adequate form and scale to provide a deep and thorough view of student capabilities. Some caution is also needed in assessing an entire course based on the outputs of one part of the semester, particularly if that part is weighted equally with all other parts. As Kift et al. (2013) argue, 'it is unlikely that a single capstone subject will be able to bear the burden of assuring the entirety of a particular course's learning outcomes' (p. 63).

An additional dimension of this issue relates to the inconsistent application of whole-of-course coordination, and the implications for development of capstones that can reasonably provide integrated and consolidated assessable outcomes. As Hauhart and Grahe (2015) contend, 'The fact that we use the term capstone to refer to this final phase of an education suggests that there must be a coherent course to "cap"' (p. 10).

Regardless of these challenges, and given the potential benefits to students and their capacity to provide a focus for evaluation, there are indications that capstones will play a key role in establishing and assessing course-level learning outcomes in Australia. While consideration of such a process fell outside the scope of the fellowship, it is hoped that the insights gathered through the fellowship program will contribute to the debate by opening up discussion around the nature of capstones and the intrinsic challenges of whole-of-course assessment.

Chapter 3: Research findings

A major activity during the fellowship was a series of research activities including a national survey, interviews and case study collection. By far the most data was collected through the survey, which was complemented and unpacked during fourteen semi-structured interviews with survey participants. Interviewees were selected from those indicating willingness to take part, with selection based on coverage of a range of capstone types. A review of publicly available capstone material and case study collection further deepened understanding and provided the basis for many of the resources. This section focuses primarily on the survey findings, augmented, as appropriate, with interview and other data.

3.1 Survey design

The survey was designed to gather data on current Australian capstone models-in-use. For the purposes of the survey, capstones were defined very broadly as:

> A significant, culminating and assessed learning experience within a qualification, although it may also be non-credit bearing. Capstones are likely to implicitly or explicitly focus on providing students with an opportunity to integrate and apply prior learning, and to support the transition to professional life or post-graduate studies. It may be called a capstone, a final year project or dissertation, depending on the country and nature of the curriculum.

The survey questions were wide-ranging, covering the following areas:

- institutional and course context, including capstones' place in the wider course, their length and weighting;
- structural components, such as cohort sizes, delivery formats and timing, proportions of full-time study load and staff–student ratios;
- overarching characteristics, including whether capstones were project- or problem-based, work-integrated, multidisciplinary and/or international;
- methods of delivery and organisation, including how contact hours and independent working time were organised, assessment products and methods, and assessors;
- purposes, mapped against a list of 28 different capstone purposes derived from the literature, and;
- challenges and benefits, as well as support mechanisms available and/or needed via institutions, professional bodies and other agencies.

The survey design drew on previous studies in the US (see Hauhart & Grahe, 2015 for a summary) and relevant themes in the literature, and was adapted for the Australian context. This adaptation was informed by the fellow's prior work in the field as well as a

desktop review of capstones in Australia. A combination of ranking, multiple-choice, sliding scale and open comment question formats was used. The combination of quantitative and qualitative approaches offered participants the opportunity to elaborate or provide alternative responses throughout and, when analysed in combination with interview data and the wider capstone literature, provided a rich description of capstone concepts. More information on the survey is available on the fellowship website.

3.2 Survey sample

Following ethics approval and a pilot in 2013, the survey was publicised on the fellowship website and social media, and distributed by email to institutions and discipline leaders across Australia. As a result of the wide-ranging promotion and the lack of a baseline measure of the numbers of capstone or capstone-like subjects across the sector, it is not possible to identify response rates in relation to the overall pool. Nonetheless, it is clear that the survey sample represents a substantial cross-section of capstone models and the academics that work with them in the Australian higher education sector, as well as a smaller but useful set of international responses for comparison.

In total, 216 participants completed the survey; 171 (79 per cent) of these were based within Australia, and 45 (21 per cent) were international. Universities dominated the Australian sample (n=166, or 97 per cent, representing 88 per cent of all Australian universities) as compared to private higher education providers (n=5, or four per cent of all providers). Another 27 universities located outside of Australia were represented. A wide range of fields of education was represented in the sample, albeit somewhat dominated by business, arts and health (see Figure 1 below).

Figure 1: Discipline groupings in the sample
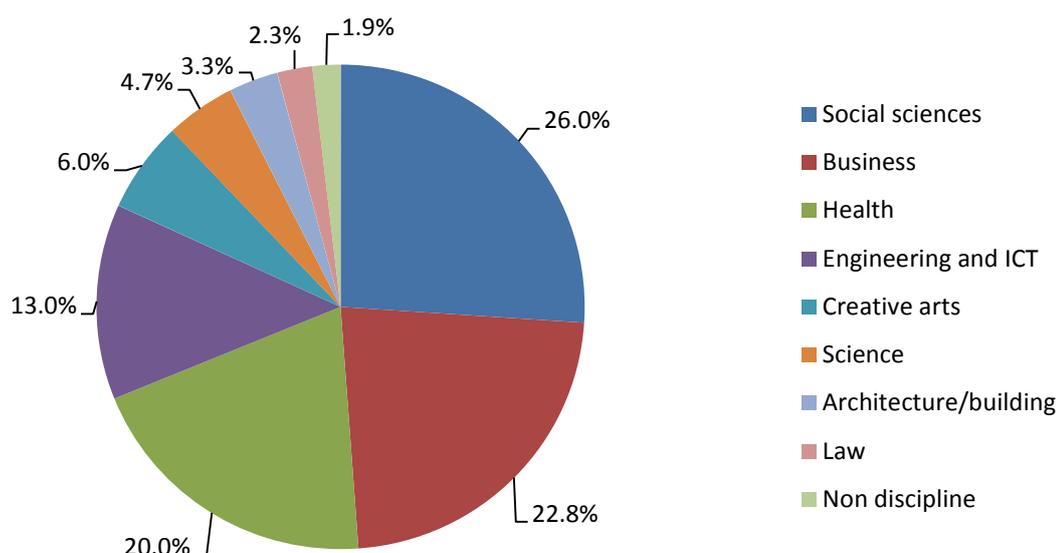
The full findings from the survey can be found in the companion survey report.

3.3 General findings

Most capstones in Australia have been designed and implemented as a course initiative independent of institutional requirements. Capstones are also reasonably well-established – the capstones reported in the survey showed a reasonably even spread, from the very recently introduced to those more than ten years old, with slightly more in the latter category. Only seven per cent of participants indicated that capstones were the norm in their institution. Nonetheless, 29 per cent indicated that capstones are required, suggesting that there are emerging institutional strategies and imperatives with regard to capstones. Although some professional bodies encourage or require capstone-type experiences, reporting of this was inconsistent, suggesting that staff may have individual interpretations of such requirements.

Staff–student ratios

The staff to student ratios in capstones are reasonably equivalent to discipline norms but did tend to a higher staff to student ratio than might normally be expected in a standard lecture/tutorial delivery mode. By far the most common ratios reported were one staff member to between six and 20 students (44 per cent), followed by one staff member to greater than 20 students (40 per cent). The most resource intensive ratio of one staff member to five or fewer students was relatively rare (12 per cent). Higher staff-student ratios appeared to be linked to research-intensive and individually supervised capstone projects, with lower ratios reflecting more class-based delivery. Seven participants (four per cent) did not know the staff to student ratio in their capstone.

Credit/weighting

The majority of capstones are compulsory components of courses, rather than elective. A majority was reported to occupy one eighth of the annual full-time equivalent student workload (63 per cent) and are a single semester in length (72 per cent). However, based on comments from respondents, it appears that some of these capstones may in fact operate as two-unit experiences, only one of which was reported. Nonetheless, participants with single-unit capstones commonly argued that this weighting was insufficient for the scale and complexity of the work expected of students. A US study (Schermer & Gray, 2012) similarly found that capstone coordinators often believed that students in capstones worked more intensively than suggested by the allocation of time or credit in a course.

Capstone models

Reflecting findings elsewhere (Hauhart & Grahe, 2015), the most common capstone curriculum models are project or problem-based (89 per cent) and feature a combination of

individual and group work. About half of capstones were also described as work-integrated (49 per cent). Certain types of capstones dominate and are found in all disciplines. This finding was also reflected in the desktop review of Australian capstones and explored during interviews, where the way in which each model operated was discussed. The dominant capstone types can be broadly classified according to the following four categories:

- externally-oriented projects – a real or simulated industry project, often with an external client
- academic inquiry projects – a research-oriented project, generally of personal interest
- practice-based simulations – a replication of an industry or research context, in which students work as if in practice; and
- practice-focused consultancies – operating businesses in which students carry out typical professional tasks under the management of staff.

Combinations of these types were common, primarily a mix of academic and either external, portfolio or simulation types. Streaming, in which students could choose from a selection of capstone options, was also present in a small proportion of cases. Less common, but still reasonably frequently reported, were task-oriented simulations (such as online or paper-based exercises exploring the consequences of decisions) and placements. The degree to which these latter types met the general definition of capstones varied, particularly with regard to the degree of student control and problem complexity usually described. In the survey, just under half of all participants indicated having a multidisciplinary component to their capstone (44 per cent), while a smaller number reported having an international component (20 per cent). However, the type and depth of these components also varies enormously. Multidisciplinary capstones tend to involve similar (cognate) discipline areas, and many consist of generic project structures that are used across a number of courses. International components range from fully international experiences, to collaborations with overseas students, to the inclusion of case studies from other countries.

Assessment

Assessable outputs from capstones are dominated by reports (71 per cent) and presentations (69 per cent), followed by evidence of behaviours (e.g. team work, organisation, contribution) and reflective journals, at 42 per cent and 40 per cent respectively. However, a wide range of activities – portfolios, observed practice, creative outputs, journal articles, blogs, wikis, websites, products and videos – were also reported. As outlined in the National Institute of Learning Outcomes Assessment article (Lee, 2014a), there was a strong indication in the survey results that although tests and examinations were also found to form a component of capstone assessment (22 per cent), capstones are typically assessed on the work students carry out during the semester. The predominance of

public activities such as presentations to clients, exhibitions and websites also indicates that the concept of public dissemination is often embedded in the capstone experience.

Teachers generally carry out the bulk of the assessment: 95 per cent of all capstones are at least partly assessed by teachers, and 40 per cent are assessed only by teachers. Although there is a great deal of variation in the weightings given to each element and to particular assessors when used in combination, teacher assessments are usually given the strongest weighting – at a mean of 80 per cent. External, self and peer assessments follow, with peer assessment occupying the least favoured position, at an average of only 15 per cent.

Benefits and challenges

Overwhelmingly, in both the survey and interviews, capstone staff reported that the most positive part of the capstone experience was the excitement generated for students, watching students develop independence and confidence, and sharing their own passion for the field. Participants argued that they saw substantial benefits for students where capstones were challenging, complex and provided students with ownership of their work. They also, however, indicated that students often struggled with moving into independence and dealing with ambiguity during the first stages of capstone units. Staff also found the process of adjusting to facilitation and mentoring, and designing curriculum that enabled student agency, both exciting and at times difficult.

The most challenging organisational barriers participants reported included the ways in which budgets or timetables were organised, along with the difficulty of engaging others in the potential for interdisciplinary capstones. Some participants also argued that capstone weightings, determined by standard course structures, did not necessarily reflect the scope of the work involved, provide the space to try out new things, or opportunities to share ideas with others.

Reflecting the comments of Hauhart and Grahe (2015), many participants suggested that whole-of-course coordination is not consistently applied, creating challenges for the design of capstones that leverage prior learning. These challenges are exacerbated in highly flexible courses in which students effectively create their own course based on large numbers of elective units. Nevertheless, some participants indicated that by designing highly flexible and individually oriented capstone experiences focused on transferable capabilities, it remained possible to accommodate the variability of prior student experience.

Chapter 4: Capstones in relation to quality assurance

4.1 Use of outcomes to measure course quality

In the survey, participants were asked to comment on their views concerning the benefits and/or challenges of using capstones for whole-of-course quality and standards assessment. Although the majority of participants agreed that this was a useful role of capstones, it was ranked poorly in comparison to a range of student learning outcomes. In the qualitative responses, many participants argued that it was not reasonable to expect a single subject to demonstrate all learning outcomes from a given course, or the overall course quality. The most common sentiment expressed was that this was possible, but that there were limitations.

Discussions across the fellowship activities indicated particular challenges. This included that a capstone used to assess course quality would be quite distinct from current practice. A number also noted specific difficulties relating to staff capacity (and resourcing) to support students in integrating skills and knowledge from across a course; tensions between providing a variety of options for students and assuring comparability; and the vagaries of external partnerships in relation to managing consistent outcomes. Most tellingly, many expressed their concern that courses were often not sufficiently well coordinated across subjects for staff to be able to identify prior learning experiences for integration.

Participants also identified a critical teleological issue: that the capstone is commonly undertaken alongside other subjects, making its outcomes naturally limited. Where the capstone constitutes a quarter of the final semester's credit or workload, they asked, how can it be used to assess the outcomes of the entire course? Further, they argued that doing so would present an inherent risk that courses would then be designed with 'light' subjects to sit alongside the capstone, while most substantive curriculum would be delivered earlier.

A response to this problem was found in (a very few) cases of integrative assessment. These capstones run simultaneously with other units, with all studies being assessed through the capstone activities (for an example, see The Associate Degree in Fashion Design and Technology capstone, RMIT case study, below). This approach has some significant benefits for students. In particular, it allows for substantial flexibility, scale and complexity of tasks, holistic learning and increased focus, and is more likely to reflect professional activities. However, it is worth noting that such activities are also more complex to manage, staff and design than a single, well-delineated unit.

4.2 Capstones and threshold learning outcomes

At the commencement of the fellowship, it was proposed that the activities would include a mapping of threshold learning outcomes against dimensions of capstone models. As the fellowship progressed, however, it became apparent that to do so in great detail would be of limited value – capstones are designed and delivered in context, and many of the learning outcomes are developed through a unique combination of conditions and experiences, rather than being based on a particular model. Nonetheless, the mapping activity remained a valuable process through which it was hoped that common features across the threshold learning outcomes, that would also reflect common outcomes in capstones, could be identified.

To explore this, a straightforward thematic analysis of the LTAS[2] learning outcomes was undertaken. The dimensions arising from this analysis were then synthesised with common capstone learning outcomes identified through the desktop review, online survey, interviews and case studies. The result of this activity was a set of common learning outcomes for capstones that also reflect a wide range of discipline threshold learning outcomes. These learning outcomes were produced as a resource for capstone design and published on the fellowship website.

Although, in general terms, most capstones meet all of the generic threshold learning outcomes and more, the emphasis varies from capstone to capstone and from type to type. For example, although abstract knowledge and its utilisation can be present in, and even underpin, all capstone types, these outcomes are emphasised in academic inquiry projects and those where the investigation or practice is highly reliant on theoretical or scientific inquiry. Stakeholder engagement, on the other hand, is more explicitly present in externally oriented projects. It is the way in which each capstone and its learning activities are structured that creates the conditions for the achievement of particular learning outcomes. For example, projects and consultancies with external partners are more obviously likely to provide the context for students to develop skills in working with stakeholders, including employers. However, an external focus can address this issue in other forms of capstone. Students developing a book chapter may be required to engage with issues of reader, user or public needs as part of the development of their work, or to draw on research and seek external feedback regarding the implications of any particular argument or critique.

In short, the type of capstone selected is not as important as the way in which it is structured to provide a balance of professional and personal knowledge, skills and capabilities.

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[2] LTAS documents can be found at www.olt.gov.au/resource-library?text=LTAS.

Chapter 5: The capstone principles and guidelines

The final output from the fellowship program was a set of principles and guidelines for capstones across disciplines. These were developed as a synthesis of data from all elements of the fellowship, including the literature review, engagement with the sector and analysis of research findings. In particular, they were informed by the work of Kift et al. (2013) and their principles for capstones in law (pp. 41-68). The final versions of each set of outputs were further refined with participants in state-based workshops and through an online feedback survey. Summaries of these outputs are provided below.

5.1 The six principles of capstone design

Capstones are diverse, but also share common features that provide students with a distinctive culminating and transitional experience. The characteristics identified through the fellowship study fall into six categories, presented below as the principles of capstone design. Although all principles are applicable across disciplines, courses and cohorts, the emphasis on each may differ according to capstone type and desired outcomes. Nonetheless, the principles provide a guide to the nature and fundamental importance of the capstone experience in the student journey to graduation and beyond. Full descriptions of the principles are available on the fellowship website, but in short, great capstones involve:

1. integration and extension of prior learning;
2. authentic and contextualised experiences;
3. Challenging and complex problems;
4. Student independence and agency;
5. A concern with critical inquiry and creativity, and;
6. Active dissemination and celebration.

5.2 Guidelines for institutions

There is no doubt that capstones are enabled or constrained by a wide range of factors, and that these factors have implications for the quality of the student capstone experience and outcomes. Bailey et al. (2013) found that, although most lecturers were aware of the key purposes of capstones, institutional factors had a significant impact on quality. The results of poor institutional accommodation of capstone principles, they argued, included superficial adaptation of existing subjects and poorly-designed capstones, described as 'just another brick in the wall' (p. 16).

Only a small proportion of survey respondents indicated their knowledge of an institutional policy or set of guidelines regarding capstones, although roughly half of the respondents in

the survey reported having a professional body governing their discipline. Yet interview and survey respondents, as well as workshop participants, commonly suggested that institution-level understanding of, and support for, the particular needs of capstone subjects was an important factor in the success of their capstone. In many cases, staff described structural contexts that influenced the scope and significance of the capstone experiences that could be offered. The topics most commonly raised as institutional influencers have been compiled as a set of guidelines for institutions, iteratively refined through workshops and online evaluation surveys. The final set of guidelines invites institutions to:

1. enable innovative curriculum and assessment approaches;
2. support flexible scheduling and workload patterns;
3. require whole-of-course design;
4. undertake tailored capstone design;
5. encourage benchmarking and shared practice, and;
6. collectively celebrate and affirm capstone outcomes.

5.3 Guidelines for coordinators and tutors

While many participants were highly skilled and experienced in capstone design, others expressed uncertainty concerning how to proceed with more complex capstone scenarios, or in contexts in which they were unsure about student capabilities. As is the case for the principles and guidelines for institutions above, these challenges are not necessarily limited to capstones alone. However, the relatively complex and high-stakes nature of capstone curriculum means that this was felt to be critical in the capstone context.

The gaps and concerns identified by the fellowship can be divided into two categories: capstone definition questions about 'can I?' or 'do capstones have?'; and fundamental capability concerns framed as 'where do I start with?' or 'but how do I?'. In response to the general questions, a set of 'frequently asked questions' were developed for the website, while fundamental 'how to' concerns have been grouped into seven short guidelines for capstone design and delivery (also published on the website), which encourage coordinators and tutors to:

1. start with the end in mind;
2. choose a model that works for your context;
3. provide an underpinning structure;
4. explicitly give students ownership;
5. build in regular feedback from a range of sources;
6. recognise the benefit of uncertainty and creativity, and;
7. link to the future.

Chapter 6: Engagement, dissemination and evaluation

Over the course of the fellowship, contact was made with more than 700 academics, senior managers and administrators at universities in Australia, the US, Europe and Asia. A network was also established through individual contact and requests, and provided a forum for direct dissemination and feedback. At the time of writing, the network has over 300 members. In total, 48 Australian institutions, including eight private providers, have taken part in at least one of the fellowship activities. Another 42 overseas institutions have been represented in the survey and network.

The fellowship website, which houses the outputs from the fellowship, has to date received over 41,000 visits and 21,500 unique visitors from all over the world, with visitors viewing an average of 12 pages per visit. By far the most traffic has been from Australia, with high numbers also from the US, New Zealand and the UK. The fellowship resources, also available as web pages, have been downloaded over 2000 times, while blogs have averaged 600 views per post. The site has also been listed as a capstone resource on numerous other learning and teaching sites, including a US national qualifications framework website.[3]

A series of blog posts and short articles were also published over the course of the fellowship. These included five blog posts by the fellow and another six by contributing authors on the fellowship website, a co-authored book chapter (Funston & Lee, 2014), as well as viewpoint articles for the National Institute of Learning Outcomes Assessment in the US[4] and *The Conversation* in Australia.[5] Another article was published with the *Council on Undergraduate Research Quarterly* (Lee & Loton, 2015)*.* A full list of resources and publications can be found in Appendix B: Summary of resources and publications.

The fellowship has also afforded an opportunity for the fellow to deliver presentations and other forms of dissemination, including presentations at symposia and fora for related projects, a panel presentation at the OLT *Learning and Teaching for Our Times* conference in June 2014, and as convenor of the capstone special interest group at the *Students, Transitions, Achievement, Retention & Success* (STARS) conference in Melbourne in July 2015.[6]

6.1 Collaborative development

The process of developing outputs was designed to take place in collaboration with staff currently involved in capstone delivery, as well as with senior leaders and scholars from

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[3] See www.degreeprofile.org/resource-kit/capstones/.
[4] See www.illinois.edu/blog/view/915/115701.
[5] See www.theconversation.com/how-can-we-prepare-university-students-for-the-real-world-22117.
[6] See www.unistars.org/program/special-interest-groups/capstone-sig/.

across the sector, both nationally and internationally. In particular, the final resources were developed with the input of both experienced and novice capstone staff, who provided the themes for inclusion as well as feedback that enabled refinement of the final documents through both workshops and online evaluative surveys.

In total, 15 state-based and institutional workshops and six presentations were delivered across five Australian states, with over 600 participants in total (for a full list, see Appendix A: Sector participation). Travel support was offered to staff from Tasmania, the ACT, the Northern Territory and regional areas to attend the state-based development workshops.

6.2 Links with other projects

Links with other capstone-related, OLT-funded projects were wide ranging, including: participation in the *Capstones in Law* national forum, *Deployment of Final Year Curriculum Design Principles in the Development of Arts Capstone Units*;[7] a keynote presentation for the *Capstones: The Time is Now!* national forum emanating from the *Capstone Courses in Undergraduate Business Degrees* project; participation in the *Final Year Experience in Engineering* project evaluation workshop; as well as the fellow's advisory role for the *Interprofessional Education (IPE) National Forum* management group.

In addition to these activities, the fellowship program achieved international recognition. This included mention of the fellowship program in the US-based Hauhart and Grahe's book: *Designing and Teaching Undergraduate Capstone Courses* (2015), and invitations to prepare articles for the *National Institute of Learning Outcomes Assessment* and the *Council for Undergraduate Research*.

Other opportunities arose through the fellowship, including the fellow's appointment to the editorial board for the *Journal of the First Year Experience and Students in Transition*, and as a member of the steering group for the Australasian Conference of Undergraduate Research (ACUR). A number of invitations to provide support for related national activities and university development projects were also accepted, including acting as reference group member and providing feedback for related grant proposals.

6.3 How the fellowship has used and advanced existing knowledge

The evidence indicates that capstones have enormous potential for enhancing educational experiences and outcomes and meeting the manifold goals of demonstrating prior learning, stimulating self-direction and facilitating the transition to post-university life. Yet their complexity can present substantial challenges to educators in balancing the factors of cost,

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[7] A video produced for this project can be found at http://www.murdoch.edu.au/School-of-Arts/Research/Grants-and-projects/Deployment-of-Curriculum-Design-Principles-in-the-Development-of-Arts-Capstone-Units/.

management, quality assurance, benchmarking and innovation. The full range of capstones' complexity is not yet understood, although recent Australian projects have offered substantial insights (Bailey et al., 2013; Kift et al., 2013; Rasul et al., 2012). These prior projects have also pointed to a dearth of data on Australian capstone models.

Building on prior work on the topic, the fellowship was proposed to address this gap directly and to provide resources and support to capstone staff and institutions across the Australian higher education sector. Fellowship activities centred on investigating contemporary approaches to capstone curriculum design and delivery in Australia, alongside leading sector-wide engagement and discussion around how capstones can successfully meet the needs of educators, institutions and students.

The primary research element of the fellowship drew heavily on the survey design aspects of mainly US-based studies (Hauhart & Grahe, 2012; Henscheid, 2000). The survey yielded comprehensive data that provide a bird's-eye view of Australian capstone curriculum, as well as rich perspectives from capstone coordinators. In-depth interviews provided further evidence and triangulation on the developing conceptualisations of the capstone experience. The findings from the fellowship's research contribute to the body of knowledge on capstones and facilitate comparisons between Australian practices and those found in the US, as well as in specific disciplines. These findings offer the sector insight into the current state-of-play concerning capstone curriculum in Australia.

The findings in relation to quality assurance provide insights into the opportunities and limitations of whole-of-course assessment through capstone outcomes. Perhaps most critically, the evidence suggests that while well-designed capstones are an appropriate mechanism for peer review and quality assurance processes, there is much more work to be done across the sector in order to ensure they are designed in such a way as to offer a true insight into student capabilities and overall course quality.

Alongside the research components of the fellowship, the program of activities stimulated and engaged capstone professionals in reconceptualising capstone design, improving their practice and connecting with colleagues from other universities and disciplines. The fellowship generated and produced a wide range of resources, available via the fellowship website, to assist capstone coordinators in reconceptualising and enhancing capstone curriculum design. These resources, developed in collaboration with staff and developed to target identified needs, appear to be in extensive use. Certainly feedback to date suggests that the principles and guidelines are already being used to design and evaluate capstones at several Australian institutions.

6.4 Formal evaluation

In programs such as this, the evaluation of outcomes is gathered from a number of evidence sources. In addition to the quantitative data on participation and use of the resources,

qualitative data from participants on their engagement with, and use of, the activities and outputs from the fellowship provide evidence of value and impact for individuals and institutions. Over the period of the fellowship, 190 qualitative feedback surveys were distributed to workshop participants. The survey asked them to answer four simple questions:

1. What was the best thing about this workshop?
2. What, if anything, did you learn that will be useful for your capstone work?
3. What should we consider doing differently in the future?
4. Any other comments?

The responses were overwhelmingly positive. Although there were suggestions for additional online activities, as well as some requests for more activities on particular components, overall participants commented positively on the depth and breadth of their learning, the relevance of the content, and the quality of engagement. For example:

> *A great range of new ideas about how to organise and assess capstone units.*

> *Thanks to this workshop, I can describe my role and what I do more easily. I can talk about the importance of Capstones and what they should look like. I have ideas for things I can develop in the future.*

> *I now understand what a capstone subject should be.*

> *I had not considered the importance of celebration and dissemination in capstones. There were other things I hadn't considered too, for example converting an existing topic to a capstone, considering whole of curriculum design, and more.*

> *Really interesting to see the development in thinking about and applications of capstones, especially making them so intrinsic to the curriculum in a way that first year students get excited about them. Also great to be able to provide feedback on developing guidelines and principles.*

> *A great deal and too much to list here. The workshop was fabulously brilliant and enlightening.*

> *Brilliant presentation from the two speakers. Lots of stimulating conversations with fellow participants. I've already exchanged several emails today with people from other institutions.*

> *Nicki made us think about creating the right environment (teaching, curriculum and administrative) for capstones and the importance of getting champions (senior academics and administrators) on the capstone team to help us create that environment.*

Feedback provided by the Advisory Group provides further evidence of the overall

coherence and value of the program. This feedback has been invaluable in guiding fellowship activities, and support for the approach adopted has been positive. In September 2014, one member of the group, Professor Emeritus Susan Jones, commented:

> *I have been keeping up with the progress of your Fellowship, via your 'update emails' and the website, and wish to congratulate you on the wealth of information that the survey is obviously delivering - including the de-bunking of some current myths about who actually embeds capstones in their courses! I have particularly enjoyed the blogs on the website as they come direct from our practitioner colleagues, and provide some very insightful commentary.*

External evaluation

The external evaluator for the fellowship was Professor Emeritus Mick Healey. Professor Healey was engaged in the process from its inception and during development of the proposal. The evaluation design was structured within a Theory of Change framework (Hart et al., 2009), adopted for its utility in establishing the context, desired outcomes, factors, processes and potential impacts of a given program of activity. That process set the scene for a flexible plan for the program and identified the key factors, such as multiple levels of engagement, involved in building the context for impact.

Throughout the fellowship period, the program's progress and opportunities were discussed regularly via both email and Skype. In October 2014, Professor Healey visited Australia for a two-day evaluation meeting, and also co-delivered an open workshop with the project team on *Rethinking Undergraduate Capstones*. The formal summative evaluation commentary is attached to this report as Appendix C: External evaluator's report.

6.5 Success factors

The following factors ensured the success of the fellowship.

The currency of the topic

The centrality of capstones to institutional curriculum renewal was a factor in the proposal, and this has been borne out by the comments of participants throughout the fellowship. It is believed that this context was a factor in the high levels of engagement experienced from staff across the sector. High levels of engagement were also evident from staff with many years' experience in capstone design and delivery, whose comments indicated that they felt the unique and complex nature of capstones had been largely neglected.

The flexibility of the program

The capacity of the program to respond to the needs of individuals in context and to adjust plans to incorporate travel to institutions provided more opportunities for gathering

insights, engaging with the sector and disseminating tools, resources and findings than would otherwise have been the case. Similarly, as a result of professional changes there was an extension to the proposed timeframe that provided a longer development period than would otherwise have been the case. These were key factors in enabling much of the engagement work, especially assuring the relevance of the fellowship outputs and providing assistance to staff as they began the process of capstone review or implementation.

Utilising expertise from the sector

From the outset of the program, the view was taken that there already existed substantial knowledge across the sector and that this should provide the basis for fellowship outputs. A significant part of the fellowship process involved drawing these insights together in such a way that they could be shared across the network, and could also form the basis for resource development. The targeted nature of the resources and insights about others' practice produced by the program has consistently been described as one of the most valuable aspects of the fellowship in workshop evaluations.

A multi-layered approach to engagement

From the early stages of the fellowship, the position was adopted that multiple ways in which staff could engage should and would be provided – via individual discussions, workshops, as well as the website, survey and interviews. As a result, the capstone network has brought together large numbers of staff working with capstones across a wide range of disciplines. Many of these staff have engaged at multiple levels and across the entire period of the fellowship, and continue to access resources and share information.

Project staffing

From a management point of view, in any program of this scale, having a dedicated and highly skilled project manager is critical to the success of the activities. That was certainly the case for this fellowship. This was especially important during fluctuations in the fellow's work and professional circumstances, including appointment as Acting Pro Vice-Chancellor and subsequently Executive Director (Learning and Teaching), and during the various peak periods of university responsibilities. The project manager was able to maintain progress, ensure deadlines were met, and carry out essential research and administration activities.

6.6 Challenges

Over the course of the fellowship, the normal challenges of a national program were experienced. Gathering detailed data on capstones from institutional websites, identifying capstone staff and drawing out the most interesting cases were ongoing challenges. It was found that capstone staff quite often did not have a clear picture of the quality of their

capstone other than a feeling that it was special to their students. As a result, a substantial part of the process involved helping them to unpack and benchmark their curriculum.

We were well aware, from the beginning of the program, that some aspects of dissemination would likely take a back seat in comparison to the importance of engagement activities. In particular, that journal papers might be developed after the reporting period rather than during the fellowship, in part due to the scale and complexity of the research to be conducted, but also because this was not the primary aim of the fellowship. The fellowship was primarily concerned with disseminating to the sector in ways that would be timely and immediately accessible to as many people as possible. As a result, much of this particular type of output will follow the official end of the program.

6.7 Conclusion

This fellowship's activities were designed to unpack and clarify the nature of capstone practice in Australia, to enable engagement with staff from across a wide range of disciplines and to draw on their experiences and perspectives, as well as to provide the sector with resources and information. The sector-wide engagement with this process, and the generous contributions of individuals, enabled the breadth and depth of activity. As a result, we have some confidence in the relevance and usefulness of the outputs to the needs of staff across disciplines. It is hoped that the outcomes of this process will assist capstone staff in affirming or re-imagining capstone curriculum as an exciting, challenging and highly engaging culminating event in the undergraduate experience.

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Appendix A: Sector participation

Table 1: Summary of workshops and presentations

Date	Title	Location	Purpose	Participants	Institutions
29/10/13	*Learning to fly: Capstones and the Transformation of Student Experience*	Brisbane	Presentation, panel at full-day *Capstones: The Time is Now* forum, Griffith University	86[*]	6
09/04/14	*Learning to fly: Capstones across disciplines*, and *Building Your Capstone from the Ground Up*	Perth	Full-day workshop on capstones supporting extension project at Murdoch University, open to external participants	30	3
14/05/14	*Learning to fly: Capstones across disciplines*	Melbourne	Professional development workshop, Victoria University	45	1
11/06/14	*Graduate productivity and employability*	Sydney	Brief presentation and panel participation at the OLT Conference 2014 – Learning and teaching for our times	18	Not known
17/06/14	*Capstones across disciplines: What, why and how*	Wollongong	Presentation and seminar participation in Learning, Teaching and Curriculum forum at the University of Wollongong	80*	5
02/09/14	*Capstones across disciplines: What, why and how*	Melbourne	Presentation at RMIT University Learning and Teaching forum	85[*]	6
06/10/14	*Rethinking undergraduate capstones*	Melbourne	Capstone concepts workshop (co-delivered with Professor Emeritus Mick Healey)	25	12
10/11/14	*Capstones across disciplines: Principles and guidelines*	Perth	Dissemination and development workshop, feedback on guidelines and principles	17	6
11/11/14	*Capstones across disciplines: Principles and guidelines*	Adelaide	Dissemination and development workshop, feedback on guidelines and principles	15	5
26/11/14	*Capstones across disciplines: What, why and*	Melbourne	Presentation at the 2014 Deakin University Learning	22	1

	how		and Teaching Expo		
02/12/14	*Capstones across disciplines: Principles and guidelines*	Melbourne	La Trobe University Faculty of Business capstone workshop, including feedback on guidelines and principles	20	1
10/02/15	*Capstones across disciplines: Principles and guidelines*	Sydney	Dissemination and development workshop, feedback on guidelines and principles	15	6
12/02/15	*Capstones across disciplines: Principles and guidelines*	Brisbane	Dissemination and development workshop, feedback on guidelines and principles	15**	5
13/02/15	*Learning to fly: Capstones and the transformation of student experience*	Brisbane	Presentation at the Law Capstone Experience Forum	24	12
17-18/02/15	*Capstone design retreat*	Melbourne	Two-day capstone development workshop, Monash Business School	23[*]	1
01/04/15	*Rethinking undergraduate capstones*	Townsville	Capstone development workshop, James Cook University, Townsville Campus	18	1
02/04/15	*Rethinking undergraduate capstones*	Cairns	Capstone development workshop, James Cook University, Cairns Campus	10	1
15/07/2015	*Capstone Special Interest Group (SIG)*	Melbourne	Students Transitions Achievement Retention Success (STARS) conference	6	4
15/09/2015	*Rethinking undergraduate capstones*	Melbourne	Capstone development workshop, RMIT School of Business	13*	1
28/09/2015	*Rethinking undergraduate capstones*	Perth	Capstone development workshop, Murdoch University	23	1
30/09/2015	*Rethinking undergraduate capstones*	Adelaide	Capstone development workshop, Flinders University	20	1
			Approximate total participants	**610***	

* Numbers are approximate where precise counts were not provided

** Not included in total count as most also attended the subsequent forum   *** May include some unrecorded repeat participation

Table 2: Participating Australian institutions

	Host activity	Attend event	Research	Network
Australian Maritime College			✔	
Australian National University		✔	✔	✔
Bond University			✔	✔
Catholic Theological College				✔
Central Queensland University		✔	✔	✔
Charles Darwin University		✔	✔	✔
Charles Sturt University		✔	✔	
Curtin University	✔	✔	✔	✔
Deakin University	✔	✔	✔	✔
Edith Cowan University		✔	✔	✔
Federation University			✔	✔
Flinders University		✔	✔	✔
Griffith University	✔	✔	✔	✔
James Cook University	✔	✔	✔	✔
La Trobe University	✔	✔	✔	✔
Macquarie University		✔	✔	✔
Monash University	✔	✔	✔	✔
Murdoch University	✔	✔	✔	✔
National Institute of Dramatic Art			✔	
Phoenix Institute			✔	
Queensland University of Technology	✔	✔	✔	✔
RMIT University	✔	✔	✔	✔
SAE Institute		✔	✔	✔
South Australian Institute of Business and Technology			✔	
Southern Cross University		✔	✔	✔
Summer Institute of Linguistics Australia			✔	
Swinburne University of Technology		✔	✔	✔
Open Universities Australia			✔	✔
Torrens University Australia				✔
The University of Adelaide	✔	✔	✔	✔

University				
The University of Canberra		✓	✓	✓
The University of Divinity		✓		✓
The University of Melbourne			✓	✓
The University of New England		✓	✓	✓
The University of New South Wales			✓	✓
The University of Newcastle		✓		
The University of Notre Dame Australia		✓		✓
The University of Queensland			✓	✓
The University of South Australia		✓	✓	✓
The University of Southern Queensland		✓	✓	✓
The University of Sydney			✓	✓
The University of Tasmania		✓	✓	✓
The University of Technology, Sydney			✓	✓
The University of the Sunshine Coast			✓	✓
The University of Western Australia			✓	✓
The University of Western Sydney	✓	✓	✓	✓
The University of Wollongong	✓	✓	✓	✓
Victoria University	✓	✓	✓	✓

Table 3: Participating international higher education providers

Aalto University	Kingston University	Portland State University	Unitec Institute of Technology
Alverno College	Lewis University	Pratt Institute	University of Auckland
Athabasca University	Lincoln University	Saint Martin's University	University of Georgia
Bradley University	Loughborough University	San Jose State University	University of Hong Kong
Carnegie Mellon University	Marietta College	Sinclair Community College	University of Minnesota
City University of Hong Kong	Marquette University	Singapore Management University	University of Otago
Duke University	Massey University	South Carolina State University	University of Waikato
Duoc UC	MIT	Southern Methodist College	Victoria University of Wellington
Grenich University	Open University	St John Fisher College	University of Wisconsin-Stout
Indiana Purdue	Oxford Brookes University	State University of New York	
Kalamazoo College	Pacific Lutheran University	Stonehill College	

Appendix B: Summary of resources and publications

Typologies

Typologies serve as decision-making guides, helping readers to define and navigate the choices they make with regard to a variety of approaches to the curriculum. During the course of the fellowship, four typologies were produced, some based on prior work by the fellow and refined/adapted for this purpose.

Professional contexts

The typology of professional contexts focuses on mechanisms to embed professional contexts in the curriculum. The variations outlined form a continuum from basic simulations to each student working with a partner or client that they have sourced. Some of the pros and cons of these approaches are provided. While not exhaustive, it can be used as a tool to support decision-making in curriculum design relative to curriculum control, goals and available resources.

- www.capstonecurriculum.com.au/portfolio/typology-professional-contexts/gallery/documents/

Projects

It is very common for capstone curriculum to be project-based. However, the ways in which projects are structured and, in particular, the level of autonomy and complexity in those projects, varies enormously. This typology provides a broad overview of four major types of project, focusing on the degree of control exerted on topic, processes and outcomes. It is intended to provide general guidance on considerations for the way projects are defined, and to aid decision-making for those new to developing project-based curriculum. As always, this is a provisional guide, subject to revision and adaptation in differing circumstances.

- www.capstonecurriculum.com.au/portfolio/typology-projects/gallery/documents/

Group work

This typology outlines possibilities for grouping and the implications for assessable outcomes, as well as some pros and cons of each approach. The group types presented have been differentiated for ease of selection and application. In practice, many or all of them may be combined in a single learning experience depending on the learning outcomes desired. However, the choice and communication of assessment is crucial in maintaining the behaviours expected by the models chosen – otherwise students may shift spontaneously

into modes of organisation with which they are more familiar, and as a result fail to achieve the desired outcomes.

- www.capstonecurriculum.com.au/portfolio/organising-group-work/gallery/documents/

Disciplinarity

This typology can be used as a decision-making tool when designing curriculum for one or more disciplines. It provides an introduction to the common definitions of the ways in which disciplines can be combined or integrated, along with some of the benefits and challenges of each approach.

- www.capstonecurriculum.com.au/portfolio/resources/gallery/documents/

Guides, samples and teaching ideas

Guides, samples and teaching ideas provide resources for capstone coordinators or tutors in developing their capstone. Some resources were developed, and others sourced for publication on the fellowship website, in response to questions raised by participants.

Rubrics

Rubrics are useful marking guides for dimensions of assessment deliverables, behaviours and activities. The project collected and adapted rubrics from relevant capstones across disciplines. These include a rubric for *individual contributions to teamwork*, a rubric for *ethical reasoning* and rubrics for *understanding*, *analysis* and *literary quality* in Computer Science projects.

- www.capstonecurriculum.com.au/portfolio/samples-rubrics/gallery/documents/

Considerations for capstone design

This table is the first version of a document intended to highlight some of the common considerations across capstones. It is intended to offer a brief overview of several of the dimensions and issues involved, rather than an extensive explanation. Many of the considerations are about balance – considering depth when you have breadth, moderating client assessments, etc. Others are reminders to consider alternatives, as well as the upsides and downsides of any particular approach. Feedback on whether this format and/or the content is helpful, or suggestions for additional dimensions, would be very welcome.

- www.capstonecurriculum.com.au/portfolio/considerations-for-capstone-design-v1/gallery/documents/

Sample capstone project outline

This is a sample of a generic project-based capstone subject covering common outline components. This capstone project assumes a staged, classroom-based process in which students have a broad project brief but are expected to develop individual responses. It is also team-based, although there is only a light touch on those elements in this outline. Outlines are limited to an overview of the basic curriculum elements, and as such are not intended to be exhaustive or prescriptive. Elements can and should be adapted to meet differing needs and contexts, and additional documentation provided to students for each learning activity.

- www.capstonecurriculum.com.au/portfolio/sample-capstone-project-outline/gallery/documents/

Group work teaching ideas

This resource contains a few ideas found for learning activities that engage students with one another. Each represents a structured approach to achieving specific learning outcomes utilising a combination of approaches.

- www.capstonecurriculum.com.au/portfolio/teaching-ideas-group-work-combinations/gallery/documents/

Published case studies

Fourteen case studies were collected as part of the fellowship, with the aim of providing a cross-section of disciplines and approaches. These include capstones that are project-based, inquiry-based, cross-disciplinary, involve blended learning and have large student intakes. Full case studies are available on the website:

The international program (Prague) of SUNY Empire State College

A cross-border, Baccalaureate-level capstone run in the Czech Republic by Empire State College of the State University of New York (SUNY) within the discipline of Business Administration and delivered primarily online. Relationships and project scoping are established in-person with SUNY staff travelling to Prague briefly at the beginning of each semester, with video-conference mentoring for the remainder of the capstone.

- www.capstonecurriculum.com.au/portfolio/case-study-the-international-program-prague-of-suny-empire-state-college/gallery/case-studies/

The Bachelor of Arts (Music Industry) at RMIT University

In this capstone within the Music Industry course at RMIT, students are expected to deliver a high quality (negotiated) project outcome as well as a substantial piece of scholarly writing. The capstone is complemented by a separate industry internship.

- www.capstonecurriculum.com.au/portfolio/case-study-the-ba-music-industry-project-at-rmit/gallery/case-studies/

The mental health clinical practice camp at the University of Wollongong

In this capstone, students from a range of courses in the area of health spend a week at an outdoor camp with consumers who are undergoing treatment for mental health problems, otherwise known as *Recovery Camp*.

- www.capstonecurriculum.com.au/portfolio/case-study-mental-health-clinical-practice-camp-at-wollongong-university/gallery/case-studies/

Dental technology in the Dentistry and Oral Health Clinic at Griffith University

Working under the supervision of academic staff, each student in this capstone takes part in, and provides services for, inter-professional teams of dentistry students (from a range of specialist areas). Students work together to develop treatment plans and dental technology students produce prostheses and orthodontics for patients.

- www.capstonecurriculum.com.au/portfolio/case-study-dental-technology-at-the-griffith-oral-health-clinic/gallery/case-studies/

IT industry experience at Monash University

As a long-standing capstone running since the 1970s, IT students at Monash undertake a team-based project, with industry partners. Mostly web-based but also sometimes software (app) based, these projects generally require administration and management functions to support the client business goals and are designed to prepare students for the transition into the workforce.

- www.capstonecurriculum.com.au/portfolio/case-study-it-industry-experience-at-monash/gallery/case-studies/

The Unravelling Complexity capstone at ANU

The Unravelling Complexity capstone is a problem-based course that provides students with the opportunity to explore dimensions of complexity and approaches to dealing with complex issues from multiple disciplinary and cross-disciplinary perspectives.

- www.capstonecurriculum.com.au/portfolio/case-study-unravelling-complexity-capstone-at-anu/gallery/case-studies/

International dance tour at Queensland University of Technology

The Creative Industries Faculty at QUT operates *Creative Industries Project* units, within which a variety of projects and experiences are offered as part of the Work-Integrated Learning approach. One of these is the *International Dance Tour*, which provides students with the opportunity to experience touring as a performance group, much like being part of a professional dance company, in an international context.

- www.capstonecurriculum.com.au/portfolio/case-study-international-dance-tour-at-qut/gallery/case-studies/

Engineering at Victoria University

In this capstone students are given the opportunity to work on a significant project, usually with an industry client. Students apply problem-based learning skills and engineering theory to solve real-world problems, undertaking a complete engineering project cycle, including the identification and analysis of a problem, prototyping, experimental testing, refinement, and finally product and full performance testing against criteria.

- www.capstonecurriculum.com.au/portfolio/case-study-engineering-at-victoria-university-2/gallery/case-studies/

The HealthFusion Team Challenge

The HealthFusion Team Challenge is a competition-based capstone activity. Students from a wide range of health-related disciplines work in teams to solve a case-based challenge and can compete at local, national and international events. The Challenge is non-credit bearing although it could feasibly be incorporated into the curriculum at the member institutions.

- www.capstonecurriculum.com.au/portfolio/case-study-the-healthfusion-team-challenge/gallery/case-studies/

Professional development capstone in tourism at the University of Queensland

This capstone offers students seven streams. These range from executive shadowing to event production for clients. All streams are designed to bridge theory and practice, introduce students to the world of work and allow them to gain practical insights into careers within the industries of tourism, hospitality and events.

- www.capstonecurriculum.com.au/portfolio/case-study-professional-development-capstone-in-tourism-at-the-university-of-queensland/gallery/case-studies/

Strategic marketing simulation at Queensland University of Technology

Students work in an immersive, competitive, online simulation (the Markstrat™ simulation). Student teams work to set strategic goals, implement and monitor them, make tactical

adjustments based on market and brand position and, finally, evaluate the success of their marketing activities on their business.

- www.capstonecurriculum.com.au/portfolio/case-study-strategic-marketing-simulation-at-qut-australia/gallery/case-studies/

Bachelor of Arts graduating project at Victoria University

In this cross-disciplinary, inquiry-based capstone unit students work with community partners to address complex social issues or problems. Staff act as facilitators and mentors to this process and students can produce a wide range of outputs.

- www.capstonecurriculum.com.au/portfolio/case-study-ba-graduating-project-at-victoria-university-australia/gallery/case-studies/

The Professional Writing Placement at Curtin University

The Curtin Professional Writing Placement is a supported placement experience, structured to develop students' career literacy and thinking, and to support their transition from study to work. Students refine the skills and capabilities needed for careers in professional writing, and compile evidence of achievements that can be presented to potential employers.

- www.capstonecurriculum.com.au/portfolio/case-study-the-professional-writing-placement-at-curtin/gallery/case-studies/

The Associate Degree in Fashion Design and Technology capstone, RMIT

This industry-engaged and integrated capstone involves students working in teams to design collections for an industry partner. Several units of study combine to provide the inputs and assessment criteria for the products. Through a combination of classes and individual coaching, students build confidence and independence through exploring, applying and extending their prior learning.

- www.capstonecurriculum.com.au/portfolio/case-study-associate-degree-in-fashion-design-technology-rmit-university/gallery/case-studies/

Blog posts on the fellowship website

Throughout the fellowship period, a blog was used to discuss and disseminate capstone concepts. Many of the blog posts were provided by participants.

Bennett, D. (2014, February). The TILE approach: Developing professional identities. www.capstonecurriculum.com.au/developing-professional-identities/

Evans, T. (2014, August). Who do I love teaching capstones so much? www.capstonecurriculum.com.au/why-do-i-love-teaching-capstones-so-much/

Jones, S. (2014, December). Capstones: The icing on the (assessment) cake or the cake itself? www.capstonecurriculum.com.au/capstones-the-icing-on-the-assessment-cake-or-the-cake-itself/

Lee, N. (2014, January). Capstones and the final year experience. www.capstonecurriculum.com.au/capstones-and-the-final-year-experience-2/

Lee, N. (2014, January). What's in a capstone? www.capstonecurriculum.com.au/whats-in-a-capstone/

Lee, N. (2014, April). One capstone, two capstone, bricolage. www.capstonecurriculum.com.au/one-capstone-two-capstone-bricolage/

Lee, N. (2014, July). The integrative capstone – integrates what? www.capstonecurriculum.com.au/the-integrative-capstone-integrates-what/

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Appendix C: External evaluator's report

Independent evaluation report for the OLT-funded National Senior Teaching Fellowship 'Capstone curriculum across disciplines'

Fellow: Professor Nicolette Lee
Evaluator: Emeritus Professor Mick Healey
Date: March 2015

Approach to evaluation

As the external evaluator I was involved throughout the program, including the preparation of the proposal, acting as a 'critical friend' and collaborator, focused on formative evaluation, support and guidance. We corresponded by email, held three Skype meetings and met face-to-face in October 2014. During the course of the program, I gave feedback on the design of the program, research reports and program deliverables. As director of a UK National Teaching Fellowship project on 'Rethinking final year projects and dissertations: creative honours and capstone projects' (Healey et al., 2013) I was able to bring an international perspective to the program. We ran a joint workshop on 'Rethinking undergraduate capstones' during my visit to Melbourne.

Theory of change

The evaluation was informed by the 'theory of change' approach (Hart et al., 2009), which aims to explain how and why a program realises the results it achieves. This approach also attempts to develop an understanding of the relationships between outcomes and the activities and contextual factors which may influence the outcomes. It is essentially a narrative approach which tells the story of the program. It aims to understand rather than audit the program. By mapping the components of the framework at more than one point during the life of the program, allows changes to be identified and explained.

The theory of change framework has five main elements:

1. The current situation – the context and rationale at the start of the program;
2. Enabling factors and resources – what is needed to do the activities leading to the desired outcomes of the program;
3. Processes and activities – what activities are required to achieve the desired outcomes of the program;
4. Desired outcomes – what the outcomes of the program would be for stakeholders;
5. Longer-term impact – what long-term changes the program would achieve.

Discussion of these elements informed the development of the evaluation framework for the program. It also helped identify the evidence required to demonstrate the extent to which the desired outcomes had been achieved. The framework was revisited towards the end of the program at the meeting in Melbourne. Only slight changes were made and some unexpected outcomes were added. These are integrated into the discussion of the theory of change components below.

Context and rationale

Capstone courses are used across the higher education sector in Australia as the culminating undergraduate student experience, as they are in several other countries and particularly in North America. Capstones are generally designed to provide students with an opportunity to integrate and apply prior learning, and are often described as a transition experience that prepares students for professional life. Nonetheless, they are diverse in scope, scale and focus. The recent emergence of a concern with the assessment of the quality of student learning outcomes at course level has led to strong sector-wide support in Australia for capstones as a mechanism for whole-of-course outcomes assessment. This has in turn led to an increasing numbers of universities implementing capstones across all courses.

While some work had been carried out in the sector at discipline level, prior to this Fellowship it had become apparent that there is limited knowledge regarding:

- The range of capstone approaches/models in use across the sector, and in particular, of innovative models;
- The challenges faced by staff in designing and delivering innovative capstone curriculum;
- The capacity of capstones to evidence whole-of-course learning outcome standards and their relationship to discipline threshold standards.

Enabling factors and resources

The fellowship required substantial existing expertise in the subject area, as well as access to expertise from across the sector. Nicolette was well qualified to carry out this work, having substantial experience in capstone curriculum design and delivery, including across disciplines and as institutional strategy. She also commenced equipped with an international profile and networks that enabled the expansive discussions and information collection. Support and guidance was provided through an Advisory Group and myself, as evaluator.

Aside from resources (funding and staffing), the enabling factors for this fellowship were the extensive engagement of the network and Advisory Group with the program of activities and dialogues, along with the readiness of the sector, and individual staff, to engage with the subject matter and findings of the program of activities. The extent to which this has occurred has been exceptional, attested by the very substantial website traffic, take up of resources, event attendances and large number of interactions between the Fellow and

academic staff from Australia and internationally. These interactions have provided the basis for achievement of many of the goals of the fellowship, particularly the substantial collection of data on capstone models in use and staff perspectives regarding their challenges and benefits. In turn, this has enabled the development of resources that target well-evidenced needs and further promote engagement with the subject of the program.

Processes and activities

The fellowship proceeded through a number of interacting processes and activities designed to achieve the high level goals of the program. These included:

- Informal consultation and engagement activities in order to build networks and enable high levels of participation;
- Publicity and dissemination activities to ensure that participation and availability of resources reached beyond a core active network;
- Structured and diverse research activities to ensure that the outcomes and outputs from the program were evidence-based and representative;
- Reflection and evaluation activities to ensure that the program was achieving its goals while being responsive to the needs of the sector, including the extensive evaluation of outputs by users.

Desired outcomes

As noted in the report, the broad desired outputs for the Senior Fellowship were:

- An evidence base of capstone models in use across the Australian sector and the perceptions of staff delivering capstones regarding purposes, benefits and challenges of developing capstones;
- The establishment of holistic principles and guidelines for the implementation of effective capstones from a synthesis of practice and theory, mindful of contextual opportunities and barriers to good practice;
- Provision of professional development opportunities and resources to the sector, enabling staff to undertake informed evaluation of, and improvements to, their current practice, or to develop their first capstone with an understanding of the dimensions of capstone experiences.

Longer term impact

In the longer term the expectation was that the program would lead to:

- Enhanced capability across the sector in the design and delivery of a diverse range of capstone models;

- Greater awareness at senior management level across the sector of the need to develop and embed policy and institutional structures that support capstone variation and innovation;
- Increased capacity in the sector to identify quality capstones, and an understanding the challenges and opportunities of using capstone outcomes for whole-of-course quality assurance;
- Ultimately, improved student experience in relation to transition, particularly in student agency, ownership and engagement.

Sources of evidence

A wide range of sources were used to evaluate the extent to which the desired outcomes had been met. These included research data and findings, activity and engagement reports, web content and analytics, invitations to connect and conference presentations, papers disseminated and published, documentation of changed practices, workshop responses, feedback from stakeholders, and research around the student experience of transition into and out of capstones, and the experience itself.

Evidence of impact

There has undoubtedly been significant impact on awareness in the sector and individual staff as a result of this program. As noted in the report, evidence of impact can be seen from several sources:

- High levels of engagement with the resources and website, including downloads;
- Co-publication and contributions by others to the Senior Fellowship outputs;
- High levels of representation from the Australian university sector in data collection;
- Consistent requests from institutions and individuals for support and advice in relation to capstone implementation;
- Comments from individuals in respect of the importance and value of the work.

The program outcomes and outputs have extended well beyond the initial plan for building evidence, resources and an initial awareness leading to capacity. Nicolette's responsive approach, direct involvement with capstone staff and provision of practical resources has meant that staff are already equipped to refine and innovate in capstone curriculum. Comments from workshop participants and others in the formal evaluations of workshops and resources are almost ubiquitously enthusiastic. The extensive positive comments from delegates at workshops about the impact participation will have on their practice discussed in the main report are impressive. As one workshop participant put it:

> *Nicolette is extremely well informed on the many permutations of capstones and was generous in sharing her experience. She has helped motivate me to reflect*

on practice in this area, and no doubt others in the workshop were similarly motivated.

The responsive approach and engagement with individual institutions to meet specific needs has also enabled the Fellowship to have a direct influence on capstone development while it is occurring. Comments from another participant are indicative:

I wanted to touch base and say thank you for all your assistance with developing our capstone subjects ... the challenge was 'how to tie it all together in the end'? I appreciate your generosity and time and intellect - and it has greatly assisted us in bringing it together.

It is clear from many of these comments that it is highly likely that students will soon, if not already, be experiencing the direct result of this work.

As the authors also note, there has been interest in the program beyond that expected at the outset, particularly in respect of international engagement and a sense of urgency that has emanated from the currency of the subject matter. The response of institutions and individuals indicates that this was a much-needed program, and indeed, that there is scope for continued development in this area.

Challenges

As discussed in the report, a program of this nature is dependent on the engagement of others and the capacity of the team to undertake the complex task of creating the framework within which this is most likely to occur. Time to do so, both from participants and the team, are crucial. As is common, the Fellow continued to undertake her senior role in the university throughout, and indeed, was the Acting Pro Vice Chancellor and then appointed as Executive Director Learning and Teaching during this period. The Project Officer, Daniel Loton, commenced the role in early 2014 at a 0.5 fractional appointment. As is argued in the main report, these were challenging circumstances under which to effect substantial impact on the national higher education sector. The fact that such comprehensive work was completed, and direct impact on staff designing and delivering capstones achieved, is a testament to the commitment and energy of those involved.

Achievements

A success factor highlighted in the report was the flexibility of the planning process, which allowed the team to respond to needs as they became evident. This included the essential condition of flexibility in the budget to allow Nicolette to visit and provide support for individuals and institutions as opportunities arose. In addition, the iterative development of resources based on the data gathered in the survey, interviews, and other discussions and comments from the sector is demonstrative of a determination to ensure that resources were targeted and appropriate. The high quality of those resources is also worthy of note.

The use of workshops and online surveys to gather feedback and further refine the principles and guidelines followed this well-established pattern of highly engaged development. This approach was evident throughout the program, and has ensured that the outputs are relevant, useful and already 'owned' by capstone staff. As such, take up is likely to remain high, and ongoing impact is more likely to be achieved than would otherwise be the case.

Concluding comments

I have been most impressed by what Nicolette, supported latterly by Daniel, has managed to achieve during the lifetime of the Senior Fellowship program. She was keen to learn from the sector and adapt as necessary as the program developed. For example, the decision to increase the number of workshops in universities undoubtedly led to a much-improved engagement with staff and an enhanced impact for the program outcomes.

It has been a pleasure to work with Nicolette and I am grateful for the opportunity this has given me to gain a greater insight into the nature of capstone courses and their potential benefits for the quality of student learning. The impact of the program is not restricted to Australia. There has been extensive international interest in the project and I have already used several of the resources and findings in workshops that I run around the world on capstones. The principles and guidelines co-developed with the sector is a model approach which other Fellows may wish to follow. The program has achieved more than it initially expected in terms of engaging capstone staff in Australia. Moreover the quality of the resources produced should be of immense value to Australian teaching and learning and internationally for many years to come.

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Appendix D: Provost approval

Certification by Provost

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

Name: …………………………………….…..Date: …….....……….………