

## **Developing a generic review framework to assure capstone quality**

Sara Hammer<sup>\*a</sup>, Lindy Abawi<sup>b</sup>, Peter Gibbings<sup>c</sup>, Hazel Jones<sup>d</sup>, Petrea Redmond<sup>e</sup> and Syed Shams<sup>f</sup>

*<sup>a</sup> Advancement of Learning and Teaching, University of Southern Queensland, Toowoomba, Australia; <sup>b</sup> Faculty of Business, Education, Law and Arts, University of Southern Queensland, Australia; <sup>c</sup> Faculty of Health Engineering and Science, University of Southern Queensland, Australia; <sup>d</sup> Advancement of Learning and Teaching, University of Southern Queensland Australia; <sup>e</sup> School of Teacher Education and Early Childhood, University of Southern Queensland, Australia; and <sup>f</sup> School of Commerce, University of Southern Queensland, Australia*

\*West Street, Toowoomba, QLD, 4350; email: Sara.Hammer@usq.edu.au

## **Developing a generic review framework to assure capstone quality**

Within the higher education context capstone units can be viewed as a significant means of assuring intended learning outcomes for programs. They provide students with the opportunity to consolidate and apply prior and new disciplinary learning, as well as employability skills and graduate attributes. This paper describes the first stage of an initiative in a regional, Australian university to develop a capstone quality review framework that can be applied across disciplines. A deductive, thematic analysis of relevant literature, guides and institutional strategic documents using a constant comparison method was used to develop a collectively-agreed upon set of capstone quality domains and related criteria. These would enable reviewers to assess whether capstone curricula were fit-for-purpose. Capstone domains and criteria were validated and revised using a multi-stage, moderated review of 10 capstone units. This validation process affirmed that to avoid issues with reviewer inter-rater reliability, future use of our Framework should emphasise calibrating reviewer interpretation to ensure greater levels of shared understanding of underlying concepts. It further suggested the desirability of incorporating aspects of teacher self-assessment, teacher feedback and student results. Provided these findings are accounted for, we conclude that the proposed capstone review domains and criteria could be used for quality review and enhancement, or capstone benchmarking processes, regardless of discipline area.

Keywords: capstone; framework; higher education; learning outcomes; review

### **Introduction**

In many three and four-year university degree programs a final-year capstone unit is considered the culmination of students' undergraduate work. Capstone units often manifest as an honours project in four-year degrees but they can also take the form of simulations, portfolios, projects, consultancies or placements depending on the discipline. They are significant learning experiences that provide the opportunity for students to consolidate knowledge, apply prior and new learning in discipline contexts, extend existing skills in decision-making and interpersonal management, and develop maturity as independent learners (Lee & Loton, 2015a). Where such units exist, we argue that capstones can be used

to assure student attainment of desired program learning outcomes, including graduate attributes, or sector and disciplinary or professional standards. For the purposes of this paper we focus on capstone units within Bachelor and Bachelor Honours degrees, which in our context generally equate to 3 and 4 years of full-time study, respectively.

Assurance of learning outcomes within programs of study is a regulatory requirement for self-accrediting universities in Australia (Commonwealth of Australia, 2015) and internationally. This is also a particular focus for professional accrediting bodies. The Higher Education Standards Framework (HESF) (2015) requires universities to specify, assess and externally reference student achievement of expected learning outcomes. Capstone units are acknowledged in the HESF as one way of ensuring that program learning outcomes are ‘credibly assessed’ and, as such, provide universities with a potential targeted quality assurance strategy (Commonwealth of Australia, 2015). We believe that assuring the quality of capstones can be used as one component of a systemic, internal quality assurance regime associated with monitoring, review and accreditation of programs. This extends established practices of curriculum ‘mapping’ which track where within a degree expected program learning outcomes are taught, practised and assessed (Oliver, 2015). The quality review of capstones adds value by enabling an institution to assure student attainment of ‘exit’ or degree level outcomes or standards including Australian Qualification Framework (AQF) standards, graduate attributes, threshold learning outcomes or employability skills. Assuring graduate learning outcomes requires two principal strategies: first, review of capstones against ‘good practice’ principles to determine if they are ‘fit for purpose’ or whether unit curricula are designed and taught to enable student achievement of intended learning outcomes (Hénard & Leprince-Ringuet, 2008, p.12); and, second, the collection of student assessment data to assess graduate performance of intended learning outcomes. Our present paper is focused on the former strategy. This is because, to date, there has been no universally

agreed framework for reviewing the quality of capstone units, particularly given the considerable diversity in the type of capstones that are used, and the complexity of comparing capstone quality across disciplines.

In this paper we share the findings of an initiative to develop a framework for assessing the quality of capstone units with a particular focus on capstone fitness-for-purpose and capstones as sites for assuring program level outcomes. Our framework is founded on a staged review and moderation process, using capstone quality domains, criteria and a capstone typology, which we revised after validating via 10 capstone units from a range of disciplines. This cross-disciplinary focus complements findings of Thomas, Wonga and Li (2014) for journalism capstones and Van Acker, Bailey Wilson and French's (2014) review of business capstones. The paper is organised as follows: first, we describe the context of our initiative, then review the relevant higher education literature; second, we outline the methodology used in our study: this includes relevant documents synthesised to produce our initial review framework, including capstone quality domains and criteria, and the evaluation process we used to validate and revise our framework. Finally, we present our findings, conclusions and study limitations.

## **Context**

The initiative described in this paper takes place in an Australian, regional university, which specialises in distance education, and where approximately 70% of students study off-campus, in the distance or online mode. Our institutional cohort is diverse with a relatively high percentage of 'first-in-family', low socio-economic background, and mature-aged students as well as students from rural, regional and remote areas. Institutional values and strategic aims reflect a strong social justice stance and a focus on making a positive contribution to local communities. Ours is a multi-disciplinary research team comprised of

two Associate Deans, learning and teaching, academics from business, education and science disciplines, and staff from a central learning and teaching unit. The team had a shared desire to better understand both the role and the quality of capstone units across a number of university programs.

## **Literature Review**

Capstones occupy a unique pedagogical and curricular space in higher education. They are seen as a significant, culminating learning experience that provides an opportunity for students to consolidate, interrogate and apply prior and new learning, develop skills in decision-making and interpersonal management, and develop maturity as independent learners (Lee & Loton, 2015a). According to Van Acker et al. (2014) capstone unit outcomes, “look both ways...backwards to consolidate and apply what students have learnt, and forward to students’ emerging role as active, confident practitioners and citizens”(p.1050). In this paper, a ‘unit’ is the basic component of study for which a student may accumulate credit towards the completion of a degree or ‘program’ of study.

Capstone units vary according to type, yet all can be seen as degree ‘exit points’ that provide a point of closure and transition. Capstone units or units that together act as capstones can be practice oriented, consultancy, simulation-based, or inquiry-centred, and may incorporate other combinations and variations (Schroetter & Wendler, 2007). Yet, because of their role in student transition to post-graduation life, many capstones focus on the development of desired graduate outcomes (McNamara et al., 2011). For this reason, capstone units can be used as one way to assess university program quality. According to Lee and Loton (2015a), quality assurance of capstones is one way universities can respond to pressure from stakeholders to assure and evidence student attainment of stated learning outcomes.

Capstones can act as sites to assure student attainment of disciplinary mastery and higher order academic skills, employability skills, and graduate attributes. There is agreement that they generally require students to demonstrate the accumulation and synthesis of knowledge from other units (Stephen, Parente & Brown, 2002; Weimer, 2013). There is also some consensus that capstones should provide students with the opportunity to integrate important academic skills such as research skills, as well as generic and employability skills such as problem-solving, teamwork, communication and professionalism (Dunlap, 2005; Johnson & Halabi, 2011; Lee & Loton, 2015b). According to Davies (2015), capstones can also provide students with the opportunity to demonstrate critical thinking and judgement capabilities, which are increasingly emphasised by university stakeholders, such as governments and employers. As they require students to engage with complex situations and problems, this also makes capstones potentially rich spaces for the application and assessment of critical reflection, empathy and ethical practice: attributes our university is committed to in the form of an emphasis on equity and social justice.

Other desired program outcomes that are commonly applied and assessed in capstone units include meta-cognitive skills and attributes such as autonomy and self-management (Dyanan, Cate & Rhee, 2008). These skills and attributes enable students to manage and implement complex tasks (Buzzetto-More, 2013; Thomas et al. 2014). Lee and Loton agree (2015a) emphasising the necessity for capstone units to target student development of independence and agency. Student meta-awareness associated with meta-cognition and self-reflection also enables them to examine personal, and community values and beliefs (Wagenaar, 1993): learning outcomes that also resonate with the values of our own institution.

Related desirable graduate learning outcomes also associated with capstone units include moral and civic attributes such as social and environmental responsibility. For example, the capstone described in Brooks, Benton-Kupper and Slayton's (2004) case required student

reflection and social contribution and reflects a particular ‘liberal arts’ agenda within American Higher education (Mitchell, 2007). Yet Brennan and Naidoo (2008) argue that notions of social and environmental responsibility should be important attributes of every graduate regardless of nationality.

Based on existing research, it is clear that capstone units are tailored to develop and assure a range of desired learning outcomes, using a range of formats, and aimed at addressing a range of stakeholder expectations (Lee & Loton, 2015a). For example, portfolio-based capstone units are usually aimed at an employer audience whereas extended essays or project demonstrations might target a disciplinary audience of academics or peers. Thus, capstones are diverse and apply varied teaching styles, standards, and industry requirements, and use assessment tasks that range from cross-disciplinary, industry-embedded projects to individual research projects. This means that ‘the degree of concentration on knowledge or application within these activities varies enormously, as does the degree of autonomy afforded to students in their choice of topic, approach and outcomes’ (Lee & Loton, 2015a, p. 2). Despite this growing diversity, Lee and Loton (2015a) have identified a set of common quality principles that, they argue, apply to all disciplines. These include: integration and extension of prior learning; authentic and contextualised experience; challenging and complex scenarios; student independence and agency; a concern with critical inquiry and creativity; and, active dissemination and celebration. Assessing unit alignment with principles such as these is one way for universities to ensure capstone curricula can deliver on their promise.

### ***Issues with capstone quality***

Prior studies have highlighted issues with capstone curriculum fitness-for-purpose, such as issues and limitations associated with capstone design and learner outcomes. Van Acker et al.’s (2014) review of business discipline capstones found that a significant proportion did not

meet good practice expectations, either having limited focus on student transition, being incompletely realised, or resembling more traditional lecture and tutorial-based units. Kachra and Schnietz (2008) queried the compatibility of learning and teaching approaches used by capstones in their study with the integrated thinking required in the workplace environment. Kift, Butler, Field, McNamara and Brown (2013) found that capstone experiences varied significantly within and across disciplines, and achieved varying levels of effectiveness. These studies highlight the importance of assessing capstone unit quality to ensure they achieve their intended purpose of evidencing student attainment of intended program learning outcomes.

A review of the literature uncovered a range of capstone principles but found no account of institution-wide application as a form of quality assurance. Most of the literature on capstone implementation is focused at the discipline level (see for example Kachra & Schnietz, 2008; Kift, et al., 2013; Van Acker & Bailey, 2011), even where the context is multi-institutional (see for example McKinney & Day, 2012). Some examples of research from the US focus on cross-institutional evaluation of students' capstone experience and the impact on their learning outcomes (see, for example, Rhodes & Agre-Kippenhan, 2004). However, the focus in such instances is on the student experience, rather than whether capstone curricula are fit for purpose and, whilst Lee and Loton's (2015a) principles have been synthesised from cross-disciplinary examples, it is not known whether they can be effectively deployed at the institutional level as components of a quality lens. Instances of cross-disciplinary disagreement about the purpose of capstones should alert us to the possibility that applying capstone principles in this way will not be a straightforward task (Cullen, 2016; McNamara et al, 2010). Nonetheless, our project sought to build on the work of Lee and Loton (2015a) by developing a framework to review capstone unit quality with a particular focus on capstone fitness-for-purpose and capstones as sites for assuring program level outcomes. Our primary



aim was to develop a capstone quality review framework that would enable a thorough assessment of capstone units within our university context, and to make a broader contribution to the quality assurance of capstones. Our framework drew on Lee and Loton's (2015a) capstone good practice principles and guidelines, the work of other capstone researchers, sector standards, and relevant, institutional strategic foci. To validate the domains and criteria used in our framework, we applied it to a selection of capstone units from different disciplines, which would help us confirm whether a set of generic quality domains and criteria could be used effectively to review units from a range of different disciplines. To achieve our research aims, we first sought to answer the following questions:

- What domains and criteria of capstone unit quality emerge from a synthesis of capstone literature, relevant sector standards and our own institutional strategic aims?
- How can a generic capstone quality review framework be used across disciplines?

Our second question, in particular, is underpinned by social constructionist theory (Schwandt, 2000) and is based on the assumption that knowledge is jointly developed in discreet social groups: in this case, academic disciplines form the basis for shared beliefs, epistemologies and practices that are not always transparent to others.

## **Method**

Our method is divided into three phases. For the first two phases we used an adaptation of the 'Framework Method' (Gale, Heath, Cameron, Rashid & Redwood, 2013). The Framework Method is generally associated with a deductive thematic analysis of multi-disciplinary health research. It is a systematic and flexible approach to analysing cross-disciplinary data. In this instance, the cross-disciplinary data originated from the literature on capstone criteria, models and use, in conjunction with considerations of external and internal policy and curriculum documents. Phase 1 included a deductive, thematic analysis of the literature. Phase 2

involved the development of a review framework incorporating policy and curriculum documents to generate capstone quality domains and criteria. Phase 3 involved the validation of the quality domains and criteria along with a moderation and refinement process.

### ***Phase 1: Deductive, thematic analysis of the literature***

Our adaptation of the Framework Method (Gale et al., 2013) was first used to develop ‘quality themes’. These provided the basis for the capstone unit domains and criteria to be used within a quality review process. No single epistemological stance guides the Framework Method. It is a flexible approach adaptable to all sorts of theme generation.

We began by conducting a broad review of existing local and international capstone literature, with a particular focus on good practice typologies, principles and standards such as those produced by Australia’s Government Office of Learning and Teaching (OLT) (2016) projects. Table 1 shows an extract from this literature exploration and theme collation process.

[Table 1 goes here]

Table 2 shows the types of categories and capstone domains identified from the literature. Six categories and five domains were identified.

[Table 2 goes here]

### ***Phase 2: Capstone quality review domains and criteria development***

Categories and domains synthesised from capstone literature were compared with criteria and descriptors in sector quality frameworks and institutional strategic documents to develop a draft of capstone quality domains and criteria. First, we analysed expectations of bachelor and bachelor (honours) degree graduate outcomes as outlined by the Australian Qualifications Framework (Australian Qualifications Framework Council, 2013). Next, the team identified relevant institution-specific requirements such as those expressed in our

university's strategic plan. From our institution's focus on broadening higher education attainment and making a positive social impact for communities, we derived a criterion based on social justice. This was not strongly represented in the capstone literature and would be included as an institution-specific, quality criterion to be added to our other capstone quality domains and criteria. An extract from the collation and comparison processes is captured in Table 3.

[Table 3 goes here]

Underlying principles were further categorised into overarching themes, and developed into a framework comprised of capstone domains and criteria. A collaborative distilling process was used to refine initial wording and categories. Finally, an initial framework was produced featuring identified capstone quality domains and criteria, and a capstone unit typology, which we combined with a review and moderation process.

### ***Phase 3: Framework validation and refinement***

We validated the resulting Capstone quality review framework domains and criteria by using them to review the curriculum of 10 units of differing capstone types, and from different disciplines. It is generally agreed that a curriculum in a unit should incorporate the following key elements: intended learning outcomes, learning activities, teaching activities and the required subjects of study (Biggs, 2003). In our university, each unit within a program of study documents its curriculum through the use of unit outlines, introductory guides and study materials, as well as assessment guides, criteria, and marking guides or rubrics. These text-based or digital documents were treated by the review team as representations of unit curricula and, to some extent, teacher intention.

A variety of documents and instruction materials from each unit sampled were selected for analysis: all were representative of different aspects of unit curricula. The materials accessed by the research team are listed in Table 4.

[Table 4 goes here]

The research team used the Capstone quality review framework as a guide to analyse materials for 10 capstone units, encompassing the disciplines of biology (2 units), creative arts (2 units), education (1 unit), engineering (1 unit), information systems (1 unit), marketing (2 units), and psychology (1 unit). Units were selected to ensure we applied our draft Capstone quality review framework to as wide a range of disciplines as possible.

#### *Capstone review and moderation stages*

The capstone review and moderation process was applied based on the following stages:

1. An initial review. Collated materials for each selected unit were reviewed by one of the research team;
2. An initial group moderation meeting. Here reviewers met to reflect on their experience of applying the Capstone framework and to make minor adjustments to their review focus or to the review sheet itself.
3. A second review. At this stage each unit was blind-reviewed by a second individual moderator.
4. A final group moderation meeting. At this stage reviewers reflected on review findings, explored implications for ongoing use, and suggested refinements to the review sheet.
5. A rating comparison. For this final stage we compared the results for the two reviewers of each unit using a simple count of the number of identical ratings for each domain criterion. For each of the 29 domain criteria the ratings for each of the two

reviewers of each unit were compared and the number of rating agreements (Yes, No, Partly or Unsure) per quality domain noted; this number was then converted into a percentage.

In their review of unit materials, reviewers were asked to determine: the unit type; whether a particular domain and/or criterion was addressed; the extent to which it was addressed; and to provide evidence to support their assessment.

## **Findings**

The range of quality domains that emerged from our deductive analysis of the literature in Phase 1, as well as relevant sector standards and our institution's strategic plan from Phase 2, included: 'Disciplinary mastery'; 'Unit quality', 'Personal and professional development'; 'Critical thinking and being'; 'Creativity, innovation and enterprise', and 'Institution enablers for quality practice'. Between four and six criteria were found for each domain. Resulting quality domains and criteria were focused on desired graduate outcomes such as disciplinary mastery and creative and critical thinking. The generic Unit quality domain enabled us to capture general curriculum quality concepts such as curriculum alignment. This and the Institutional enablers for quality practice domain include criteria for accepted practices, which would enable the fitness-for-purpose of capstone curricula (Biggs, 2003; Van Acker et al, 2014).

The resulting framework developed in Phase 2 was validated by conducting a moderated review of 10 units from various disciplines in Phase 3. Our review results will be the subject of further research. Materials for each unit were initially reviewed by a member of the research team. The documented review and moderation process is excerpted here in Table 5:

[Table 5 goes here]

Subsequent to the initial group moderation meeting a second research team member conducted a blind review of unit materials. Individual and group moderation processes accounted for differences in interpretation, and helped assess the applicability and transparency of framework domains and criteria. We found this process of unpacking reviewer interpretation, discussion and consensus building (Sadler, 2013) key to making a fair assessment of each unit under review. In the end, however, some Framework criteria were found to be too opaque for reviewers to reliably assess within the context of our particular validation process.

One finding from the validation stage of this capstone quality review framework development process was the importance of reviewer disciplinary background for the effective assessment of some domain criteria. Reviewers in our research team came from a range of disciplinary backgrounds and one or two had some familiarity with units under review. It was noted that if the researcher was from the same discipline as the unit under review this led to greater ease in applying some capstone quality domains and criteria.

Another finding was that the transparency of Capstone domains and criteria was influenced by differing levels of reviewer experience in quality review processes. Those with greater experience in quality reviews of unit and program curricula were able to apply domains and criteria more effectively overall. It is also worth noting that the Unit quality domain showed the lowest level of inter-rater reliability and there were also numerous instances of ‘unsure’ ratings for ‘institutional enablers of quality practice’ domain criteria, although in some cases unsure ratings stemmed from a lack of relevant available information in unit instruction documents.

These findings led to refinement of and additions to the Capstone review framework, which are presented in Table 6 and extended in the ‘discussion’ and ‘implications for future practice’ sections below.

[Table 6 goes here]

A list of different capstone types was included in initial and subsequent versions. These are listed below in Table 7.

[Table 7 goes here]

Reviewers experienced no particular issue with the capstone unit typology beyond a consensus finding that some units could be quite legitimately categorised according to more than one type.

## **Discussion**

The validation stage of our development process highlighted the importance of incorporating an explicit calibration dimension into our Capstone quality review framework moderation stage. This will enable reviewers to intentionally develop a shared language or understanding of particular higher education concepts. For example, the concept of student autonomy and how to recognise that its development is taking place in a unit is not straightforward matter of interpretation. Existing research (Hammer, Collins, Chardon & Hart, 2012), which explored teacher perception of lifelong learning capabilities such as learner autonomy and how to assess it, supports the idea that complex learning phenomena such as this will require a more deliberate unpacking of domain criteria and reviewer conceptions (Sadler, 2013, p.6).

Our finding that experienced reviewers made more effective use of the Capstone quality review framework highlights the need for an accompanying reviewer guide. The guide will unpack relevant ideas and concepts for reviewers and provide discipline-specific examples to assist their interpretation of each domain and the domain criteria. Nonetheless, whilst we can incorporate greater support for reviewers into the Framework, the validation stage of its development strongly suggests that these supports will fall short of enabling reviewers from outside a given discipline to determine unit alignment with some quality criteria.

As a group of reviewers from a range of disciplines, we found that it was simply not possible to determine whether units, in disciplines markedly different from our own, featured ‘cutting edge, innovative, disciplinary thinking’ or focused on ‘challenging and complex problems’. The importance of disciplinary context for interpreting some aspects of capstone quality provides support for our earlier assumption that applying capstone principles across disciplines would not be a straightforward endeavour (Cullen, 2016; McNamara et al, 2010). There is certainly some suggestion that whilst we can categorise and express graduate attributes, capabilities and skills in generic terms they are often interpreted and enacted within discipline in ways specific to that discipline (see for example, Green, Hammer & Star, 2009; Moore, 2011). Challenges or innovations may be opaque or invisible to a reviewer who is unfamiliar with the traditions of thought, application or experimentation known and practiced by a particular disciplinary community.

### ***Review limitations***

The principal limitation of our study stems from the use of capstone instruction documents as the focus for Capstone quality review framework validation. Unit materials reviewed can be regarded as forms of written instruction, particularly for our own context where distance student enrolments are the dominant mode of learning. For blended learning (a combination of face-to-face and online approaches) and online learning contexts, which are common to our institution, communication and even collaboration (Garrison & Vaughan, 2008) take place through reading and writing. However, these can only partially capture the full intention of teachers who were absent during the documentary validation process. Perceiving teacher intention for a given unit is further complicated by a general tendency towards implied or tacit communication of expected student learning outcomes (see, for example, Devlin, 2013). This lack of transparency was also observed during the validation phase by



reviewers in our team, which sometimes made it difficult to conclusively apply particular Framework domains and criteria.

### ***Implications for future practice***

Our experience suggests that successful implementation of an institutional, cross-disciplinary Capstone quality review framework will require a collaborative, multi-layered approach. Provision of a capstone review guide that unpacks key domains and criteria for reviewers will enable unit or program teams to apply this process either as part of self-review, as part of cross-institutional reviews or sector benchmarking processes. The addition of different review layers, incorporating teacher feedback and verification as well as evaluation of examples of student work by disciplinary peer reviewers will provide a more complete picture of capstone unit quality. Therefore, the next step to further validate and refine the Framework internally will include self and peer review stages. Central quality reviews will also incorporate a stage of teacher feedback, which will be captured using semi-structured interviews, and include samples of student work to triangulate review findings.

### **Conclusion**

The capstone quality domains, criteria and the capstone typology were initially developed using key concepts, principles and criteria from the literature, supplemented with sector and institutional quality curriculum documents. The resulting framework offered a combined focus on unit quality, desired graduate outcomes and institution-level enabling practices, which could be used by reviewers as part of a multi-stage review process to assess the fitness-for-purpose of capstone unit curricula. We validated the domains and criteria of this framework by reviewing the instructional material of 10 units of different capstone type, and from a range of disciplines. Our initial evaluation of their validity and applicability led to some minor enhancements but also highlighted the need for a more guided, multi-layered

application process that addresses requirements for: conceptual calibration as well as moderation; some discipline specificity as well as generic applicability of domain indicator concepts; teacher validation of instructional intention; and, evidencing of outcomes with samples of student work. These needs notwithstanding, we believe that a revised version could provide useful pieces of the quality puzzle to be deployed by different institutional actors in different contexts: whether as higher level quality checks or as disciplinary or teaching team self-review or sector benchmarking guides.

(6594 words)

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**Table 1: Extract from the deductive thematic analysis table**

Curriculum themes	Institutional, program, unit environment	Authors
1. Integration & extension of prior learning 2. Authentic & contextualised experiences 3. Challenging & complex problems 4. Student independence & agency 5. A concern with critical inquiry & creativity 6. Dissemination & celebration.	Institution <ul style="list-style-type: none"> <li>• Enable innovative curriculum and assessment approaches</li> <li>• Support flexible scheduling and workload patterns</li> <li>• Require whole-of-course (program) design</li> <li>• Undertake tailored capstone design</li> <li>• Encourage benchmarking and shared practice, and;</li> <li>• Collectively celebrate &amp; affirm capstone outcomes</li> </ul> Unit leader/examiner <ul style="list-style-type: none"> <li>• Start with the end in mind</li> <li>• Choose a model that works for your context</li> <li>• Provide an underpinning structure</li> <li>• Explicitly give students ownership</li> <li>• Build in regular feedback from a range of sources</li> <li>• Recognise the benefit of uncertainty and creativity</li> <li>• Link to the future.</li> </ul>	Lee, N. & Loton, D. (2015a)

**Table 2: Capstone categories and domains**

Capstone category	Capstone domains
1. Externally oriented projects 2. Academic Inquiry projects 3. Practice-oriented simulations 4. Practice-based consultancies 5. Task-oriented simulations 6. Placements and portfolios	1. Mastery of disciplinary domain 2. Unit quality 3. Personal and professional development 4. Critical thinking and being 5. Creativity, innovation and enterprise

**Table 3: Extract of one theme from the theme/AQF comparison table**

Underlying Theme	AQF 7	Performance indicator domain	Capstone principle
Personal and professional development	Knowledge AQF 7 - Graduates of a Bachelor Degree will have a broad and coherent body of knowledge, with depth in the underlying principles and concepts in one or more disciplines as a basis for <u>independent lifelong learning</u>  Skills AQF 7 - Graduates of a Bachelor Degree will have: <ul style="list-style-type: none"> <li>• cognitive skills to review critically, analyse, consolidate and synthesise knowledge</li> <li>• cognitive and technical skills to demonstrate a broad understanding of knowledge with depth in some areas</li> <li>• cognitive and creative skills to exercise critical thinking and <u>judgement</u> in identifying and solving problems with <u>intellectual independence</u></li> <li>• communication skills to present a clear, coherent and independent exposition of knowledge and ideas</li> </ul> Application AQF 7 - Graduates of a Bachelor Degree will	Initiative & judgement Responsibility & Accountability	Student independence and agency

	<p>demonstrate the application of knowledge and skills:</p> <ul style="list-style-type: none"> <li>• with <u>initiative and judgement</u> in planning, problem solving and decision making in professional practice and/or scholarship</li> <li>• to adapt knowledge and skills in diverse contexts</li> <li>• with <u>responsibility and accountability</u> for <u>own learning</u> and <u>professional practice</u> and in collaboration with others within broad parameters</li> </ul>		
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**Table 4: Document types and audience**

Document types analysed	Curriculum elements
Unit specification	Unit outcomes, assessment types, unit topics
Introductory unit guide & study materials	Unit overview, schedule of activities and learning and teaching approaches used
Assessment descriptions, supports & rubrics	Assessment summary, performance expectations, support materials, assessment criteria and standards

**Table 5: Documented review excerpt**

Domain and criteria	Coverage and Comment	Evidence
<b>Unit quality</b>		
Provides authentic/contextualised experiences	Yes. Graduating students would be working in pathology labs etc.	Assessment and residential school details state that it involves scientific research and hands-on lab work.
Focus on challenging/complex problems	Yes. Students are to construct a 3D bio-scaffold.	Assessment details: students work with an engineer to 3D print their biological element, and determine whether the cells they have cultured will grow on it to create a successful bio-scaffold.

**Table 6: Capstone quality domains and criteria**

Unit quality	Disciplinary mastery
<ul style="list-style-type: none"> <li>• Provides an authentic/contextualised experience</li> <li>• There is a focus on challenging/complex</li> </ul>	<ul style="list-style-type: none"> <li>• Prior learning is integrated/extended</li> <li>• New knowledge is presented</li> <li>• Disciplinary discourse/mastery is</li> </ul>



<p>problems</p> <ul style="list-style-type: none"> <li>• There is a manageable student workload</li> <li>• Curriculum is aligned with teacher intention &amp; program outcomes</li> <li>• Learning materials are relevant and current</li> </ul>	<p>required</p> <ul style="list-style-type: none"> <li>• Focus on cutting edge, innovative disciplinary thinking</li> </ul>
<b>Critical thinking and being</b>	<b>Creativity, innovation and enterprise</b>
<ul style="list-style-type: none"> <li>• Requires research/critical inquiry</li> <li>• Includes personal/civic narrative</li> <li>• Focus on synthesis and sense-making</li> <li>• Requires reframing and critical thinking</li> </ul>	<ul style="list-style-type: none"> <li>• Requires artistic/social/professional inventiveness</li> <li>• Focus on leadership and life skills</li> <li>• Cross-disciplinary collaboration required</li> <li>• Links to industry, community, start-ups</li> </ul>
<b>Personal and professional development</b>	<b>Institutional enablers for quality practice</b>
<ul style="list-style-type: none"> <li>• Focus on transition to work</li> <li>• Focus on social justice and global citizenship</li> <li>• Develops ethical/moral stance</li> <li>• Incorporates career narrative and development</li> <li>• Develops autonomy and teamwork capacities</li> <li>• Focus on student independence/agency</li> </ul>	<ul style="list-style-type: none"> <li>• Innovative curricula and assessment approaches supported</li> <li>• Flexible scheduling and workload patterns supported</li> <li>• Capstone design is tailored for learners</li> <li>• Whole-of-program design approach required</li> <li>• Benchmarking and shared practice encouraged</li> <li>• Capstone outcomes collectively affirmed and celebrated.</li> </ul>

**Table 7: Capstone types**

<b>Code</b>	<b>Type description</b>
EoP	Externally-oriented Projects: student develops solution for client
AIP	Academic Inquiry Projects: personal research
PoS	Practice-oriented Simulations: practice within simulation of live practice environment
PbS	Practice-based Consultancies: live practice environment for significant time period
ToS	Task-oriented Simulations: defined simulations with set activities and goals
PeP	Placements & ePortfolio: Professional, academic and practical connected to ePortfolio