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Embedding Transferable Competencies and Skills in Engineering Curricula: A Comparative Case Study of the University of Sydney and the University of Technology Sydney

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This chapter presents a comparative review of whole-of-degree approaches to embedding transferable competencies and skills in accredited engineering programmes at the University of Sydney (USYD) and the University of Technology Sydney (UTS). This analysis draws on two decades of experience in programmes enrolling 6,500-8,000 students. It examines sustained, coherent, and durable approaches to embedding transferable competencies and skills over time. The discussion identifies four design principles: curriculum-wide embedding, progressive scaffolding, authentic contextualisation, and evidence-informed assessment. It analyses how these principles are enacted through contrasting structural models: UTS's dedicated five-unit core sequence and USYD's distributed integrated units combined with a co-curricular professional engagement framework. While structurally different, both models achieve programme-level outcomes, including curriculum coherence, institutional resilience, and long-term sustainability. Beyond curriculum design, the chapter highlights governance and change management as central to success. It identifies persistent challenges such as alignment drift, stakeholder resistance, and resource sustainability. The study presents insights related to programme governance, coordination, and continuous improvement. The chapter demonstrates that sustained institutional commitment and explicit governance structures — rather than any single structural model – are critical to embedding transferable competencies and skills without compromising technical excellence.

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1 Introduction

This chapter examines how the University of Sydney (USYD) and the University of Technology Sydney (UTS) integrated transferable competencies and skills across their accredited engineering programmes. Both universities serve large cohorts and have implemented whole-of-degree approaches across multiple engineering disciplines.

Critically, both are mature programmes that have undergone multiple iterations over more than a decade, providing insights into the full lifecycle of embedding transferable competencies and skills — including teamwork, communication, ethical practice, and sustainability — from initial implementation through to sustained operation. This maturity brings challenges to the fore that only emerge over time: maintaining programme coherence through changing institutional priorities and leadership, managing staff turnover, building support across multiple stakeholders, adapting to evolving accreditation requirements and industry needs, and sustaining quality through continuous programme renewal.

The chapter situates both programmes within their educational context, before presenting the structural design of each approach through paired case studies. It then examines the shared pedagogical principles underpinning both models and how each institution translates these into practice. The chapter explores the change management processes required to implement and sustain these frameworks through further institutional case studies. The chapter concludes with a review of key enablers, ongoing challenges, and practical recommendations for educators undertaking similar reforms. Thus, it contributes to the literature on curriculum-wide approaches to transferable competency and skill development (see Crawley et al., 2014).

2 Educational context

The engineering programmes at USYD and UTS operate within the Australian Qualifications Framework (AQF), which parallels the European Qualifications Framework (EQF). Both institutions deliver Bachelor of Engineering Honours degrees (AQF Level 8, comparable to EQF Level 7) and Master of Engineering programmes (AQF Level 9, comparable to EQF Level 8), all accredited by the national accreditation body, Engineers Australia (EA). USYD has ca. 8,000 engineering students while UTS has ca. 6,500 engineering students.

Both institutions have responded to sustained industry demands for graduates with strong transferable competencies and skills (Crosthwaite, 2021; King, 2008) by integrating these throughout the curriculum. This involved moving beyond a focus on technical knowledge alone to encompass the broader competencies emphasised in qualification frameworks like the EQF. Distinctly different implementation structures have been used to achieve these goals.

The EQF emphasises intentional integration and progression. It highlights the importance of scaffolding, so students encounter, practise, and reflect on their development at increasing levels of sophistication. Engineering programmes typically integrate transferable competencies and skills through one of two broad approaches:

dedicated standalone units that teach competencies explicitly, or distributed integration where competencies are embedded across disciplinary units. The choice of approach is influenced by institutional priorities, accreditation requirements, and available resources. Many engineering programmes adopt hybrid strategies to maximise contextual relevance and skill transferability (Male et al., 2011; Walther et al., 2011). Both UTS and USYD adopt hybrid approaches: transferable skills are scaffolded through dedicated units alongside the disciplinary curriculum, but the tasks within those units require students to apply technical engineering knowledge across disciplines. This ensures transferable competencies and skills are developed in context rather than in isolation. At UTS, core units foreground transferable competencies and skills as explicit learning objectives while embedding them in tasks drawing on technical knowledge from students' engineering specialisations — for example, communication is addressed in the context of responding to tender requests. USYD ensures no skill is taught in isolation; competencies are woven into progressively complex project tasks — for example, teamwork is not addressed as a standalone topic but scaffolded as an essential element of larger project delivery.

The following two subsections describe the structural design of each institution's approach. Programme maturity has meant that transferable competencies and skills are an accepted curriculum component. Once the principle is established, the programme becomes sustainable at least until the next major curriculum review.

2.1 The UTS approach: an engineering core

UTS centralises transferable competency and skill development in a dedicated five-unit core sequence (ca. 15% of the engineering degree in time allocation and course credit), ensuring all students across every engineering discipline receive consistent, explicitly scaffolded competency development regardless of technical specialisation. UTS judged these competencies and skills warranted dedicated curriculum space — both as a matter of educational priority and because explicit positioning communicates to students and staff that these capabilities are fundamental to engineering practice, not an adjunct to it.

All core units incorporate a multidisciplinary focus, requiring engineering majors to work together. Each unit builds on the previous, providing progression from foundational to advanced competencies.

The core sequence is closely tied to the Professional Engagement Program. This programme guides students through preparation for, participation in, and reflection on, mandatory industry placements (internships, which receive academic credit and are usually paid). It ensures transferable competencies and skills developed in the classroom are applied, tested, and developed in industry settings, supporting the transition from student to engineer.

A typical structure for the four-year degree is illustrated in Fig. 4.9.1 (unit timing varies by specialisation; labels indicate typical degree position). Australian universities operate on a February–November academic year with two main teaching periods (semesters). The normal undergraduate engineering programme is four years. The subjects below are indicated in Fig. 4.9.1 as the "Core Program".

- *Year 1.* Introduction to Engineering Projects: fundamentals of teamwork, design thinking, communication, and collaborative project work in a real-world context. This unit lays the foundation for reflective and effective engineering practice and is typically taken in Semester 1 of first year.
- *Year 2.* Engineering Project Appraisal: economic and sustainability evaluations of engineering projects, applying critical thinking and ethical practice. The focus is on using frameworks to appraise project decisions.
- *Mid degree.* Designing Sustainable Engineering Projects: interdisciplinary teams address real-world sustainability challenges through integrated analysis and reflective practice to design impactful solutions.
- *Year 3.* Professional Engineering Communication: project management, financial considerations, critical thinking, and workplace communication through the context of tendering.
- *Final year.* Collaboration in Complex Projects: a 'capstone' core unit consolidates teamwork and stakeholder engagement in real-world design projects requiring consideration of commercial, environmental, social and Indigenous perspectives.

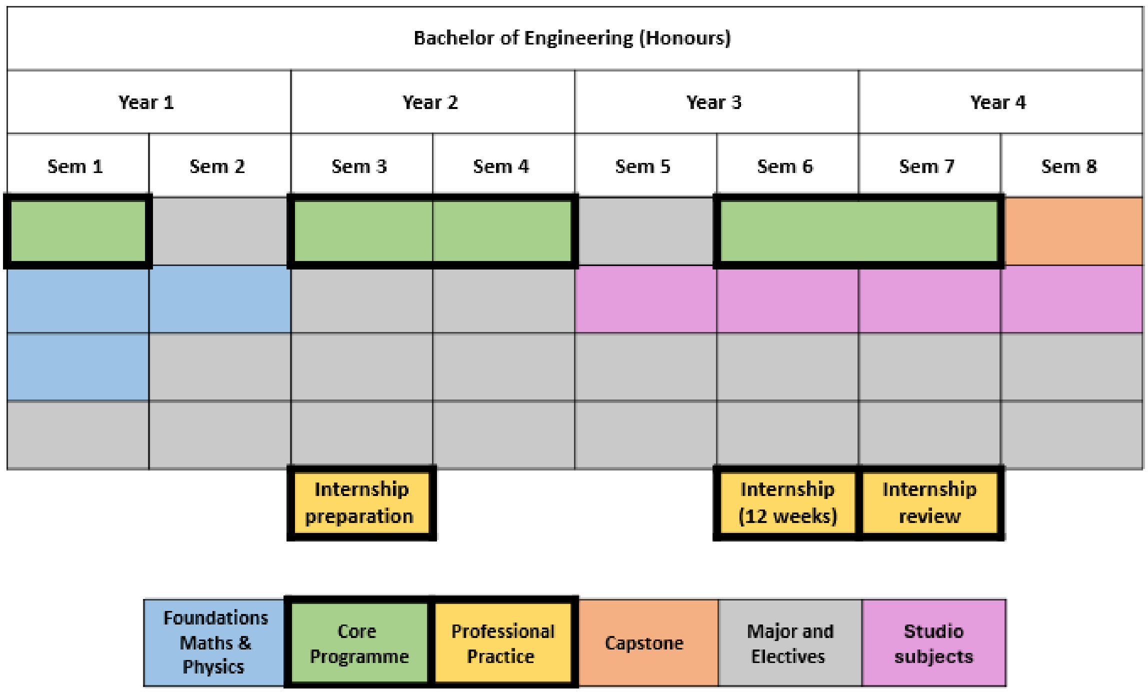

Figure 4.9.1: Typical degree structure for four-year engineering degree (Own Work by Tania Machet, 2025)

Students may also enrol in the optional Diploma of Professional Practice, which replaces the mandatory industry placements with two extended six-month placements in Years 2 and 4, supported by preparatory and reflective units developed in consultation with industry. The programme culminates in a discipline-based industry event at which industry representatives view students' work and meet students, providing networking opportunities and supports career progression. These are illustrated as the "professional practice" subjects in Fig. 4.9.1.

2.2 USYD approach: integrated framework

USYD combines two components to deliver transferable skills across the programme: the Integrated Engineering Program (IEP) and the Programme (PEP).

IEP

The IEP was designed to provide a staged development of transferable skills with continued exposure throughout the degree programme. The initial implementation was four core-curriculum units across all degree years. The programme began with foundations of professional engineering and design thinking in Year 1, building progressively in complexity and breadth through Years 2 to 4.

From Year 2, IEP units, taken in addition to a standard study load, involved multidisciplinary collaboration across specialisations, providing opportunities for students to integrate knowledge and methods from different disciplines. Projects moved from basic project management skills and project opportunity responses, to identifying a project client and opportunity, to analysing organisational context and stakeholders to recommend change.

IEP was revised in 2021 to comprise three larger units positioned within a standard study load. This enabled delivery of more substantial project experiences with an emphasis on multidisciplinary capability and transferable competencies.

1. *Year 1.* Introduction to discipline: students develop disciplinary identity through well-defined single discipline problems.
2. *Year 2.* Multidisciplinary engineering: project management and data-driven decision making through multidisciplinary project teams.
3. *Year 3.* Interdisciplinary engineering: client engagement, problem formulation, and project leadership. Students undertake interdisciplinary, externally sponsored, and ill-defined projects requiring diverse engineering competencies, plus methods drawn from outside engineering.

PEP

The PEP was designed to encourage and recognise diverse forms of exposure to professional practice, beyond traditional internships. It was structured as a co-curricular requirement (i.e., compulsory, but existing outside the conventional requirement of completing specified individual modules within semester constraints) where students must independently complete 600 hours of activities, comprising:

- Engineering-focused activities (minimum 200 hours) – e.g., attending industry seminars, completing an industry project, hackathon or competition, etc.
- Transferable competencies development (minimum 70 hours) – e.g., leadership within a volunteer association, casual employment, online courses, etc.

- Engineering work experience (minimum 200 hours) – e.g., employment in an engineering internship

This dual approach to curricular and co-curricular professional competencies provides structured integration and flexible professional development opportunities tailored to individual students.

Despite different structural implementations, both institutions arrived at their chosen approach through a common recognition: that transferable competencies and skills would not develop reliably without close oversight across all engineering discipline programmes on offer. The following sections examine the shared pedagogical principles applied within these different structures, the change management required to implement them, and the challenges encountered along the way.

3 Approach to competency and skill development

USYD and UTS develop transferable competencies and skills aligned with established frameworks for competency progression in engineering education (Crosthwaite, 2021; Male et al., 2011), while addressing the challenges of implementation at a large scale (Graham, 2012). Despite different implementation approaches, the universities share several design principles:

- Embedding competencies across the curriculum;
- Adopting progressive scaffolding and assessment moving students from foundational to advanced levels of competency, supporting independence, increasing agency, and responsibility;
- Emphasising authentic contexts integrating technical and professional capabilities;
- Analysing level of cohort learning outcome achievement to drive learning delivery decisions, activity design, and assessment.

The following sections examine each principle, discussing its rationale and pedagogical foundations with illustrative case studies.

3.1 Whole-of-curriculum integration

Both universities integrate transferable competencies and skills throughout their curricula. This approach is supported by evidence that integrated competencies are valued by industry (Male et al., 2011) and improve transfer to professional practice (Winberg et al., 2020). The approach allows students to experience these capabilities as essential to engineering work. Despite structural differences, both approaches ensure students repeatedly encounter, practise, and refine transferable competencies and skills (abilities applicable across diverse sectors and life situations) in increasingly complex engineering contexts.

3.2 Progressive development through the degree

Transferable competencies and skills require systematic scaffolding, practice (application), and feedback to move students from foundational understanding to advanced application.

This requires students to receive different levels of support at different stages. Early in their studies, students need clear instruction, structured activities, and significant feedback to understand and use these competencies. As students gain experience, academic support is replaced with increased internal and peer feedback. Internal feedback, generated from self-monitoring, helps students to adjust strategies and performance, which is central for self-regulated learning (Butler & Winne, 1995). This adaptive support mirrors professional development where practitioners move from supervised practice to independent application.

3.3 Authentic contexts

Authenticity is contextual and cannot be defined by a fixed checklist. It is better understood as aspirational principles focused on real-world learning and assessment that develop the attributes and competencies students need for their future learning and work (Sokhanvar et al., 2021; Villarroel et al., 2018). Effective authenticity incorporates the complexity of real-world contexts (Lombardi, 2007) through experiential, student-centred learning rather than replicating problematic or inconsistent workplace conditions. This provides students with meaningful challenges requiring both technical and professional competencies, helping them understand how these operate together in engineering practice.

However, authenticity alone is insufficient. Without assessment that genuinely measures the intended competencies and structures that hold students accountable for their own learning, authentic tasks risk becoming performative (Villarroel et al., 2018). Assessment must be designed to capture evidence of genuine competency development. In universities, incorporating the complexity of real-world contexts may be overwhelming for students lacking the competencies to manage multidimensional problems. This may lead to student resistance, poor satisfaction (Brookfield, 2017), and unproductive use of time. Clear scaffolding, including learning theories explaining the intended approach, expected experiences, and evaluation of learning and achievement, is required for success (Willey & Gardner, 2012).

3.4 Evidence-based learning and assessment

Using learning outcome achievement to drive curriculum design represents a commitment to evidence-based education, including assessment that captures the complexity of transferable competencies and skills while maintaining validity and reliability. It demands assessment and feedback systems that support and develop student learning. Assessment fidelity evaluates how students learn, think, and develop their work, not just their final product. Feedback should help students understand and identify areas for continued development (Carless & Boud, 2018).

Both universities use structured self- and peer assessment to facilitate evidence-based assessment and feedback. Thus, they maintain a cycle of judgement, feedback, and reflection that could be implemented through various tools or carefully designed manual processes. As an example, both institutions use SPARKPLUS, a web-based platform that collects evidence of task contribution and collaborative processes and can also convert group marks to individual marks reflecting individual contributions.

Iterative self- and peer assessment promotes reflection, improves academic honesty, increases student motivation, and develops feedback literacy, all of which model the professional practice students are being prepared for (see SPARKPLUS, n.d.).

The following examples examine how the shared principles above are translated into practice, summarised in Table 4.9.1. UTS takes a taxonomy-driven approach, using a curriculum framework to map skills across all four years. USYD centres its approach on progressively increasing the authenticity and complexity of student engagement with professional practice.

Example 1. UTS implementation of shared principles

Integrating in whole-of-degree

UTS integrates transferable competencies and skills through the core units, then reinforces them across discipline units. For example: project management concepts, business, and ethics are taught and assessed in Year 2 (Engineering Project Appraisal), practised in Year 3 (Designing Sustainable Engineering Projects), become prerequisite knowledge for studios in discipline units, receive deeper teaching and assessment in Year 4 (Professional Engineering Communication), and are applied in the final core unit (Collaboration in Complex Projects). This ensures competencies are developed in multiple contexts rather than as isolated learning.

Progressive development and scaffolding

UTS operationalises progressive improvements through its Curriculum, Assessment and Learning Framework (CALF), a taxonomy that maps transferable skills through three developmental stages: Foundational, Developing, and Pre-professional. For example, teamwork competencies are taught, developed and assessed across three units and the CALF levels articulated in the following learning outcomes:

- *Year 1 (foundational): explain the collaboration and contributions of team planning, communication and problem solving in developing a design solution.*
- *Mid-degree (developing): apply relational teamwork competencies to complete a group project.*
- *Later-year (pre-professional): collaborate with stakeholders in diverse interdisciplinary teams to achieve problem solutions.*

Scaffolding is reduced and student responsibility increases in subsequent years.

Authentic real-world contexts

UTS achieves authenticity through 'scaffolded realism': workplace contexts may involve power imbalances, time pressures, or learning-inhibiting environments. Rather than exposing students to problematic conditions, UTS provides professional challenges within supportive educational frameworks, maintaining scaffolding. One example of this graduate exposure to authentic practice is engagement with Indigenous communities, an explicit priority in Australian engineering education reflecting national reconciliation commitments and accreditation expectations.

Students work on community-identified problems in Year 1 and again in Year 4, with interactions structured and facilitated by teaching and staff mediated through partner organisations with established community relationships. This allows students to learn from mistakes without harming community relationships, while developing cultural capability.

Evidence-based learning and assessment

UTS ensures assessments evaluate intended learning outcomes in authentic professional contexts. Year 4 Professional Engineering Communication uses real tender documents and procurement processes. Students submit a written tender response and deliver an oral pitch to a panel that includes industry representatives, demonstrating communication competencies within the same contexts as practising engineers. This industry-based approach extends to the professional practice programme, where students are graded complete/incomplete, mirroring workplace expectations. Tasks may require multiple iterations before completion, and feedback is deliberately direct: in the final career interview, for example, instructors are encouraged to identify the exact moment a hiring decision would be made.

Example 2. USYD implementation of shared principles

Integrating in whole-of-curriculum

USYD's intent is to integrate transferable competencies and skills through credit-bearing, project-based learning distributed across the degree. This is supported by a longitudinal co-curricular programme. Integration is achieved through the Integrated Engineering Program (IEP): three compulsory project units (ca. 13% of total credits of the degree) delivered across the first three years, complemented by the Professional Engagement Program (PEP) spanning all four years. From Year 2, IEP units require multidisciplinary teamwork, ensuring professional capabilities are developed alongside technical knowledge. In contrast to UTS's dedicated core sequence, USYD distributes skill development across both integrated project units and co-curricular activity.

Progressive development and scaffolding

Progressive development is operationalised through increased project scope and responsibility. In Year 1, students undertake well-defined, discipline-based projects teaching teamwork, communication, ethical practice, and reflection. Learning is supported through structured templates, exemplars, and guided reflective prompts. In Year 2, students complete externally sponsored multidisciplinary projects (e.g., data modelling addressing societal challenges), requiring negotiation of roles, collaborative decision making, and stakeholder-aware communication. In Year 3, students engage in ill-defined, interdisciplinary projects involving industry, government, or community partners, highlighting problem formulation, leadership, *and integration of multiple considerations. PEP scaffolds development in parallel, from early industry engagement to a compulsory industry internship.*

Authentic real-world contexts

USYD achieves authenticity across the degree through project- and team-based learning challenges supported by external industry or community partners but delivered within the institutional setting. This allows students to practise professional behaviours in realistic but supported contexts rather than replicating unmanaged workplace conditions.

Evidence-based learning and assessment

Transferable skills are assessed through aligned, explicit assessment modes. These include project artefacts (e.g., mock trade exhibitions, technical reports, design documentation, stakeholder briefings), structured peer and self-assessment of teamwork, and reflective assessments requiring students to evidence professional judgement. Feed-forward assessment is used throughout: formative feedback on proposals, interim reports, and presentations are addressed in subsequent submissions, enabling demonstration of developing competence over time.

Table 4.9.1: Comparison of UTS and USYD implementation of shared principles for approach to competency and skill development

Shared principle	*Similarity*	*How this is operationalised*
Whole-of-curriculum integration	Both integrate transferable competencies and skills across the full four-year degree.	UTS uses a sequence of core units; USYD uses dedicated units paired with a parallel professional engagement programme.
Progressive development and scaffolding	Both reduce scaffolding and increase complexity year on year.	UTS uses a defined skill taxonomy (CALF); USYD expands project scope and stakeholder complexity progressively.
Authentic real-world contexts	Both balance authenticity with appropriate student support.	UTS maintains a consistent scaffolded framework; USYD increases authenticity as student capacity develops.
Evidence-based assessment	Both align assessment with authentic professional contexts.	UTS uses professional artefacts and peer assessment; USYD uses feed-forward structures. Early feedback informs later assessments.

While these principles and their implementation are essential, equally important is understanding the change management required to establish such comprehensive programmes.

4 Change management requirements

Both programmes required substantial institutional transformation to implement change, and both institutions drew on external drivers to support this change. Engineers Australia accreditation requirements ensured compliance with competency standards, while industry advisory boards validated the approach, offering insights into graduate skill gaps and endorsing solutions.

Yet even with these external drivers supporting change, several challenges emerged during implementation. This chapter traces the journey both institutions underwent in three stages: confronting initial resistance, discovering the hidden challenges, and building the structures needed for long-term programme integrity. We offer practical insights for educators planning similar reforms.

4.1 The initial challenge: confronting resistance and building value

Implementation faced resistance from multiple stakeholder groups, such as students and some academic staff who felt that technical expertise was more highly valued than transferable competencies and skills (at least as an initial priority for employment); colleagues who felt that any focus on transferable skills was a threat to the 'curriculum real estate' available to their own teaching focus; and staff who were concerned about possible negative reactions from students.

Success depended on senior leadership support and teaching and administrative staff who understood and supported the redesigned curriculum. The change management challenges encountered echo those documented in other curriculum reform initiatives, requiring both top-down support and bottom-up engagement (Borrego & Henderson, 2014).

Beyond resistance from individuals, both institutions encountered resistance from institutional systems. The complexity of university programmes imposed constraints related to unit progression, credit point allocations, and timetabling requirements. Transition required teaching out old units whilst recruiting staff, creating temporary resource strains.

Addressing this resistance required repeated communication of learning outcomes, industry expectations, and accreditation requirements. In the early years, before graduate outcomes data was available, both institutions relied primarily on accreditation requirements and industry advisory board endorsement to justify the programmes, using external professional authority as a proxy for the employment evidence that accumulated over time. Resistance decreased as the programme's value became visible and its 'newness' faded. Student opposition dropped after the second running of each unit, as separation between cohorts working through old and new programmes increased.

4.2 The hidden challenge: discovering and preventing alignment drift

A critical lesson was the need to prevent 'alignment drift': the gradual loss of programme coherence that occurs when complex, multi-year programmes operate without ongoing attention.

Through experience, both institutions identified four key requirements for preventing loss of programme coherence:

- *Ongoing programme management.* Dedicated resources for continuous monitoring and coordination across units and years, including team-based preparation of unit revisions and checking of assessment outcomes;
- *Regular curriculum mapping reviews.* Systematic checking that learning outcomes are still met and that competency progression remains coherent;
- *Staff development and communication.* ensuring teaching staff understand their role in the broader programme rather than just their individual units;
- *Student feedback integration.* regular collection and analysis of student experiences to identify where the programme may be losing coherence. This also included evaluation of alumni feedback.

Addressing this curriculum coherence loss required the establishment of durable institutional structures, as discussed below.

4.3 The ongoing challenge: embedding sustainable structures

Administrative support proved critical for managing transition logistics. Recognition of prior learning was particularly challenging. These programmes distribute competencies across multiple units at increasing levels of sophistication, unlike traditional structures where a single unit covers a discrete skill.

Workload allocation remains an ongoing challenge. Curriculum integrity requires sustained institutional attention, not merely periodic review. Both institutions established dedicated teaching teams and ongoing professional development to maintain quality and coherence.

Sustainability also requires acceptance that refinement is a permanent feature of programme management. Both universities recognised that the first iteration would not be perfect. Both institutions build continuous improvement into their governance structures, with teaching teams regularly reviewing evidence from student feedback and assessment outcomes to drive programme refinement.

Each new cohort encounters the programme without the benefit of having watched it evolve, and questions about the value of 'non-technical' units resurface regularly. Consequently, both institutions found that proactive communication strategies including clear articulation of learning outcomes, visibility of industry endorsement, and peer testimony from students are needed on a recurring basis rather than as a one-off response to resistance. Managing this ongoing scrutiny is a permanent feature of programme stewardship, not a transitional challenge.

Sustaining these programmes requires ongoing attention to academic staff culture. Resistance may diminish over time, but this does not automatically translate into engagement with whole-of-degree goals. Building a staff culture where academics see themselves as contributors to a broader learning journey requires deliberate, ongoing investment beyond one-off professional development. At UTS, this shift has been supported by a shared sessional teaching team, in which the same staff run the small-group classes of large-cohort subjects throughout the programme, building continuity and shared ownership of programme-level goals, together with fortnightly team meetings; at USYD, the IEP and PEP structures have created opportunities for cross-disciplinary collaboration.

4.4 The response: how each institution navigated these challenges

The examples that follow illustrate how each institution navigated the three outlined stages in practice, and the specific strategies each employed to reach their current level of programme maturity. Example 3 examines UTS's comprehensive programme-level redesign, while Example 4 focuses on one component of USYD's reform — the introduction of the PEP — to show how similar change management challenges emerged and were addressed within a co-curricular context.

Example 3. UTS: Managing large-scale curriculum reform

Identifying the need for change

Initially introduced in 2000, by 2022 UTS identified significant 'alignment drift' in its core programme. New academic staff taking over individual units had updated content to reflect current industry standards with limited visibility of changes across the programme. Units that once built upon each other became disconnected. When coordinators began collaborating, they discovered units no longer aligned. Student feedback revealed confusion about skill evolution and unit connections. Industry advisory board input suggested addressing misalignment with workplace expectations. Additionally, an accreditation review and the Australian Council of Engineering Deans' Engineering Futures report (Crosthwaite, 2021) highlighted the need for more coverage of competencies such as sustainability and ethics.

Rapid redesign under institutional constraints

Faculty Teaching and Learning leadership initiated a programme review in May 2022, with a requirement that students commence the redesigned programme the following year. This compressed the review and redesign cycle to fourteen months. The foundational core unit was retained — it already aligned with the embedded transferable competencies framework, reducing the redesign burden. Implementation then proceeded iteratively, with remaining units introduced progressively and refined as student feedback was collected.

Stakeholder engagement strategy

UTS established a team of academics, championed by faculty leadership. They employed a design thinking approach, developing an initial framework for embedded competencies through collaborative ideation sessions. This was followed by stakeholder consultation using focus groups with prepared materials and focused questions to elicit feedback. Stakeholders included industry representatives, current students, academic staff from each engineering specialisation, and colleagues from double degree programmes. Communication was sustained through iterative design workshops, validation sessions, and stakeholder review meetings.

Managing multi-source resistance through strategic interventions

Some in the engineering disciplines resisted the redesign, pushing for the inclusion of discipline-specific technical content — such as programming or big data — rather than transferable competencies. UTS maintained focus on competencies relevant across all specialisations and actively involved discipline teams in developing field-specific exemplars and case studies. This transformed resistance into engagement and created intellectual ownership of the redesigned content.

Administrative personnel experienced increased workload from programme transitions and the complexity of recognition of prior learning protocols. In retrospect, dedicated project management resources would have reduced administrative burden and improved implementation.

Students expressed concerns about not having examples of previous work to demonstrate performance expectations during initial unit implementations. UTS responded through scaffolded assessment design incorporating formative feedback on drafts, and by making explicit connections to authentic workplace situations.

Embedding sustainable change through governance frameworks

UTS implemented change management through curriculum governance. The core teaching team meets fortnightly to maintain programme coherence and address emerging issues. The shared sessional teaching team model, described above, allows the same staff to teach across multiple units, supported by professional development sessions focused on core units. This deepens staff's understanding of how units support each other. Student communication strategies (including information portals, detailed unit descriptions, regular announcements) reinforce how units relate to each other.

Example 6. USYD: Introducing the Professional Engagement Programme

Identifying the need for change

The Professional Engagement Programme (PEP) was introduced in 2018 for commencing students in undergraduate engineering degrees — around 900 *students. Previously, many students had been unable to obtain a suitable internship and hence to meet their professional practice requirements, and so were unable to graduate. The introduction of PEP meant that students were able to meet this requirement through other forms of exposure to professional practice beyond just internships.*

Programme design

A new programme was designed engaging students in professional practice from entry to graduation. Each student completed online modules and attended one 2-hour face-to-face workshop each semester, completed a minimum number of professional engagement activities, and documented and reflected on these. Workshops included researching skills required by employers, preparing CVs, interview practice and self-evaluation of technical and non-technical skills. One of the main outcomes of the programme was to make explicit the transferable skills required by professionals.

Stakeholder engagement strategy and managing multisource resistance

Individual meetings with coordinators defined activities students could claim as 'professional engagement'. Claimable activities included industry projects, site visits, guest lectures, and industry practice training. However, the availability of these varied across units. Students who found themselves in units without such activities were left to source their own engagement hours, prompting frustration. Over time, academics responded to pressure by incorporating opportunities into units lacking these activities.

Student resistance initially focused on the question why they had to complete this extra work when previous students had not had to (prior to the introduction of PEP students were required to complete a 12-week industry placement rather than the now compulsory PEP activities). Resistance required careful management at all levels. Students realised the benefits as they progressed into their fourth year and found it easier to obtain work placements.

Demonstrable results

From 2018, no student has been unable to graduate due to a lack of work experience. However, there were still students who disapproved — these were mainly well-connected students who would have secured work experience without difficulty under the previous system. A partnership programme with student societies to credit professional engagement activities was generally welcomed by participating students. The backlog of students from before 2018 were given access to resources from PEP which, with targeted coaching, enabled them to complete outstanding professional practice requirements.

The change management experiences described above provide practical context for the reflections that follow. We examine the enablers, ongoing challenges, and lessons these programmes offer engineering educators considering similar reforms.

5 Review and future outlook

USYD and UTS have integrated transferable competencies and skills within large-cohort engineering programmes. This required sustained institutional commitment, continuous adaptation, and a willingness to learn from both successes and setbacks.

We identified a range of critical enablers that proved essential for both institutions. These enablers cluster around three interdependent domains: leadership and governance, people and coordination, and external validation supported by evidence. You can use these to assess your institution's readiness, prioritise investment, and anticipate implementation risks.

5.1 Key enablers: leadership and governance

Strong leadership and support structures emerged as enablers for integrating transferable competencies and skills. Sustained advocacy from senior leadership was essential for navigating institutional complexity, securing resources, and maintaining momentum through leadership changes and budget cycles. Formal governance structures provided continuity beyond individual champions and supported alignment with accreditation and institutional strategy.

We observed effective leadership and governance in the second evolution of both programmes. Rather than being abandoned or replaced, initial designs were refined, indicating institutional confidence in their value. This evolution reflects a pragmatic philosophy: launch something 'good enough to begin' and then refine it through evidence-informed review, allowing quality assurance and continuous improvement to coexist.

5.2 Key enablers: people and coordination

Large-scale implementation amplifies coordination demands, making team growth and sustained coordination central to success. Both institutions required dedicated teaching teams, shared curriculum artefacts, and ongoing collaboration to maintain coherence. Team development requires recruiting staff with disciplinary expertise and commitment to curriculum innovation. This is critical for maintaining consistency and quality.

Evidence of effective coordination includes a cultural shift in institutional language and staff confidence. Over time, transferable competencies and skills moved from experimental initiatives to established practice. Staff increasingly referenced shared frameworks from other units and contributed to ongoing refinement. We identified resource recognition as an ongoing challenge: coordination, induction, and alignment require permanent resourcing rather than reliance on goodwill or periodic curriculum reviews. These observations are drawn from experience rather than formal survey data. Systematic evaluation of staff engagement represents an area for future investigation and could provide valuable evidence for institutions seeking to build the case for similar reforms.

5.3 Key enablers: external validation and evidence

External validation from accreditation requirements and industry advisory boards shifted internal discussions from whether transferable competencies and skills should be integrated to how best to optimise them.

Evidence of successful entrenchment includes growing student acceptance over time. While initial resistance recurred with each cohort, student perceptions shifted as learners progressed through the degree and experienced the relevance of transferable competencies and skills in industry engagement.

5.4 Key success factors

Three strategic approaches were crucial for long-term success.

Progressive scaffolding with clear curriculum mapping proved more effective than isolated skill development. We found that systematically building competencies from foundational to advanced levels, while reducing support as students progressed, better prepared graduates for professional practice.

Authenticity matters because students learn the interdependence of professional and technical competencies only when they must apply both together.

Continuous improvement rather than a 'set-and-forget' approach was required for sustainable implementation, requiring ongoing refinement based on evidence and feedback. Continuous improvement was embedded in programme governance rather than occurring only during periodic reviews.

5.5 Challenges and ongoing issues

Despite these successes, we continue to grapple with persistent challenges.

Resource allocation creates ongoing tension. Coordination across large cohorts requires significant time but lacks recognition. At substantially larger scales, specific elements may encounter bottlenecks; e.g., shared tutor models become harder to sustain, and assessment consistency demands additional quality assurance. If you are operating at greater scale, you should anticipate that governance and resourcing need to expand proportionally, with dedicated programme management roles rather than reliance on academic goodwill.

Staff turnover and training present ongoing challenges. New academic staff require systematic induction to understand our distinctive approach. Maintaining programme coherence across changing teaching teams demands systematic knowledge transfer.

Student resistance resurfaces with each cohort. Despite programme success, every intake includes sceptics, requiring renewed justification. While resistance diminishes as students progress, managing initial scepticism remains resource intensive. Presenting students with evidence that recent graduates identify their professional rather than technical skills as underdeveloped upon entering practice (Lowe et al., 2026) may help to address this resistance.

Assessment validity remains an ongoing challenge. Capturing meaningful evidence of integrated competency development, without overburdening students or staff, demands continuous refinement.

5.6 Recommendations for engineering educators

For institutions considering similar approaches, we suggest the following:

Vision and governance

Start with a clear vision. You should develop a compelling narrative about why transferable competencies and skills enhance technical excellence. Structure follows purpose.

Build governance, not just programmes. If you want curriculum integrity to endure, you must establish permanent governance structures. Curriculum integrity demands sustained attention. Dedicate resources to prevent alignment drift through regular monitoring and coordination.

Leverage external validation. Use industry advisory boards and professional accreditation requirements to build support and validate approaches.

Design and assessment

Map systematically. You should be able to identify clearly where competencies are introduced, practised, and mastered across the degree.

Design for authenticity within constraints. Integrate competency development within real-world contexts that are relevant and maintain appropriate scaffolding for learning.

Change management

Invest in change management. To survive long-term, you need to implement resources and management strategies properly. Prepare evidence-based responses to predictable resistance. Acknowledge constraints when explaining difficult decisions. Equip front-line staff to deliver consistent messages — they shape student perceptions.

Embrace iterative improvement. You will not get everything right the first time. Establish mechanisms for gathering feedback and refining the programme systematically. Compressed timelines often necessitate pragmatic decision making; continuous refinement represents essential practice.

Develop stamina and resilience. Implementing comprehensive change requires patience, persistence, and thick skin. Expect criticism, prepare evidence-based responses, and maintain a long-term perspective.

Our experience demonstrates that, while challenging, comprehensive transferable competency and skill programmes can become embedded institutional practice within large, diverse engineering cohorts. Success requires patience, flexibility, and ongoing institutional commitment to continuous improvement and evidence-based refinement. If you are undertaking similar reform, recognise that this work demands sustained effort and resources — it is an ongoing commitment to educational excellence.

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AI statement

During the preparation of this work, the authors did not use any AI tools.

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