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Turning the PAGE: re-imagining the academic - employment nexus through the design and development of a supportive framework

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Abstract

Preparation of students for a job market that is characterised by rapid technological advancements and evolving industry needs, presents challenges for higher education institutions (HEIs). Institutions are increasingly called upon to adapt their teaching practices to produce graduates that are both knowledgeable and equipped with practical skills. This dual expectation places pressure on HEIs to balance the delivery of theoretical knowledge with cultivating competencies relevant for the workplace.

This research focuses on understanding and enhancing educational practice towards realising this dual expectation, in the context of a new Irish University, Technological University Dublin (TU Dublin), and in doing so offers a new approach to embedding graduate employability through the Pedagogy Assisting Graduate Employability (PAGE) conceptual framework. This framework was developed, iterated and evaluated through an investigative case study that sought to understand how pedagogical practice shapes and informs employability. In this study, key influences on teaching practice were identified via thematic analysis of purposefully sampled academic staff focus groups (n=4), combined with documentary analysis of purposefully sampled modules from a range of disciplines across TU Dublin. Transformative learning informed the PAGE framework connection-making between pedagogy and employability and served to underpin the discipline area, the desired skills, and the teaching and learning context. The PAGE framework aligns educational policy and strategy to day-to-day teaching practice to realise both the wider strategic needs of higher education and the personal employability expectations of students.

Keywords: graduate employability, pedagogy, transformative learning, investigative case-study, teaching practice

Introduction

Education and employability

The purpose of education is multifaceted and ranges from driving economic growth to delivering societal good (Hunt, 2011). The role of higher education institutes (HEIs) is equally entangled; however, with the United Nations definition of Sustainable Development Goal 4 – Quality Education (United Nations, 2022), the role of education is grounded in giving people the knowledge and skills they need to stay healthy, engage in lifelong learning and foster tolerance for all. Echoing that, the role of education is now seen as existing on a spectrum between general and vocational education, including aspects of knowledge development, preparation for the labour market and employability more generally (Brooks et al., 2021; Healey, 2023).

The concept of employability itself has undergone evolution, reflecting broader shifts in the expectations placed on graduates by employers and society at large. Initially, employability was narrowly defined as the ability of graduates to secure employment (Boden & Nedeva, 2010). This definition has expanded over time to include a broader range of attributes, skills and capabilities; ultimately concluding that these all contribute to graduates securing employment and sustaining and advancing one's career. Employability, therefore, involves more than just possessing subject-specific knowledge; it requires the integration of transferable skills, personal attributes, and a proactive approach to career development (Yorke, 2006). Despite this expanded understanding of employability, universities often face challenges in designing curricula that effectively bridge theoretical learning with workplace needs. Many academic programmes focus on discipline-specific knowledge without adequately integrating employability skills, leading to a gap between graduate capabilities and employer expectations (Boden & Nedeva, 2010).

To address this gap, higher education institutions are increasingly exploring innovative pedagogical strategies that combine theoretical knowledge with experiential and reflective learning opportunities. Such strategies emphasize active student participation, critical thinking, and the ability to adapt to dynamic work environments. This approach aligns with Humboldt's vision of education as a means to cultivate well-rounded individuals capable of transitioning between diverse career paths (Günther, 1988). Despite the evolution in the understanding of the scope of employability, pedagogical approaches have been slower to respond to the current understanding and have been critiqued for their limited focus on these broader dimensions of employability (Artess et al., 2017). A balance needs to be struck in academic programmes between theoretical knowledge, practical skills and employability attributes to prepare graduates for the demands of the workforce, including diverse and inclusive work-integrated learning experiences (Dalrymple et al., 2021). An integrated approach to teaching and learning; one that not only imparts disciplinary knowledge, but also supports students through appropriate pedagogy and equips them with the skills necessary to navigate complex and dynamic work environments, is therefore needed.

Pedagogical practice and employability

Implementing appropriate pedagogical practices that foster student and, ultimately, graduate employability is a complex challenge (Bennet et al., 2020). Centralising the learner in the learning process (Trinidad, 2020), through pedagogical practices grounded in experiential (Kolb & Kolb, 2017) and transformative (Mezirow, 1978) learning, can address the challenge of aligning higher education activity with the industry needs. Through transformative learning, learners engage in a process of critical reflection, questioning their existing assumptions and beliefs, resulting in a change in their perspective and understanding. This process is more than acquiring new information; it involves a profound, structural shift in how individuals understand themselves and their world. Within the context of employability, transformative learning encourages students to engage in experiential learning opportunities that challenge their ways of thinking and doing. Practical examples include work placements and industry-related projects that expose students to real-world problems and require them to apply their academic knowledge in practical settings (Wang et al., 2024). Such a pedagogical approach aligns with Yorke and Knight (2004), who argue that employability is not just about acquiring skills but also about developing a reflective and self-directed approach to learning.

Moreover, transformative learning fosters a deeper understanding of the interconnectedness between academic theory and practical application. By engaging students in reflective activities and collaborative projects, lecturers can help learners develop metacognitive skills essential for lifelong learning. Meta-cognitive skills relate to how we regulate our thinking, learning, and problem-solving processes and

these skills not only enhance employability but also prepare graduates to contribute meaningfully to their communities and industries (Yorke & Knight, 2006). The emphasis on critical reflection ensures that students not only acquire skills but also understand their relevance and application in diverse contexts, further bridging the gap between education and employment.

Practical application in enhancing employability

While transformative learning is well-supported in educational theory (Mezirow, 1978; 1997), its practical application within higher education is still being explored, specifically in the context of employability. A significant challenge lies in moving beyond the theoretical and into the practical application, through strategies that can be implemented in diverse educational settings, to develop employability as part of a programme of study (Barnett, 2000). Several models have been developed to address this gap, including the Understanding, Skills, Efficacy and Metacognition model (USEM) (Yorke & Knight, 2006) and the CareerEDGE model (Pool & Sewell, 2007). The USEM model emphasises four key elements; (U) understanding of subject knowledge, (S) skills for workplace readiness, (E) efficacy beliefs to build confidence and motivation, and (M) Metacognition for self-awareness and lifelong learning. It is a non-hierarchical overview of how the self, subject understanding and skills connect and interact to foster employability. The CareerEDGE model focuses on five core components: career development learning, experience, degree subject knowledge, generic skills, and emotional intelligence. It is grounded in a clear hierarchy and uses reflection to incorporate the career skills, degree knowledge and emotional intelligence through the graduates' personal values. These models offer practical guidance on how to integrate employability into a programme of study; however, they can be further enhanced through integrating a learning theory that can transcend discipline-based learning and connect pedagogical practice and employability.

Turning the PAGE

The constantly evolving concept of employability requires a shift in pedagogical approaches within higher education. Traditional teaching methods that prioritise theoretical knowledge need to be supplemented with strategies that foster the development of practical skills and reflective practices. Grounded in learning theory, transformative learning offers a promising avenue for achieving this balance, however, integrating transformative learning into the curriculum in a way that aligns with the needs of both students and employers is challenging. The Pedagogy Assisting Graduate Employability (PAGE) framework, detailed in this study, represents this required step forward.

The PAGE framework translates transformative learning theory into a process that enhances employability through embedding critical reflection and experiential learning opportunities into the curriculum. This creates a seamless connection between academic study and workplace demands delivering on the importance of experiential learning in developing the transferable skills critical for employability (Hager & Holland, 2006). Furthermore, the framework acknowledges the role of educators in facilitating transformative learning experiences. The effectiveness of transformative learning is significantly dependent on the ability of educators to create a supportive environment that encourages critical reflection and dialogue (Mezirow, 1997). In the context of the PAGE framework, this involves designing a curriculum incorporating real-world applications and providing students with the guidance and feedback necessary to help them navigate the transformative learning process.

The development of the PAGE framework was driven by a need to enhance the employability of TU Dublin graduates through a structured approach to curriculum development that aligned educational outcomes with capabilities sought by employers. This research was shaped by the following three research questions:

RQ1. What are the current, and desired, educational practices within the TU Dublin curriculum that develop transformative learning and graduate employability?

RQ2. How can the current, and desired, educational practices be used to establish and underpin a transformative learning and graduate employability framework within TU Dublin?

RQ3. How can a transformative learning and employability framework be embedded into day-to-day practice, and the overall strategic direction, of TU Dublin?

Methodology

The development, iteration and evaluation of the PAGE framework was conducted as an investigative case study grounded in a mixed-methods approach (Schoonenboom & Johnson, 2017). This approach was chosen as it provided the best fit for a detailed and intensive analysis of a particular organisation within a defined timeframe (Schoch, 2019). This approach, and research questions, subsequently influenced the research method; evaluating the teaching practice required engagement with the current pedagogical design (i.e. module descriptors and quantitative analysis of programme documentation) as well as those involved in teaching (i.e. qualitative insights from focus groups with lecturers). A mixed methods approach provided a holistic and nuanced foundation for creating, as well as refining, the PAGE framework.

Crafting the PAGE framework

Quantitative analysis of program documentation

A quantitative analysis of program documentation involved a thematic analysis of purposefully selected curricular materials across nine programmes, over seven disciplines, to quantify the extent to which employability-related outcomes, and employability skills, were embedded within the academic programs at TU Dublin. The documentation was initially subject to deductive, and subsequently, inductive, thematic analysis (see Tables S1 – S3 in Supplementary Information for deductive and inductive codes and their definitions). To aid coding consistency an inter-rater reliability process was conducted. Consequently, the code frequency per programme was calculated through the NVivo software and trends identified. The documentation analysed included details of module descriptors, course syllabi, assessment strategies and reading lists. Only validated modules, that comprised validated programmes, were chosen as the definitive data source.

Qualitative focus groups with lecturers

Focus groups (n=4) were facilitated with academic staff (n=12) drawn from a purposefully selected range of disciplines within TU Dublin (n=4). The primary objective of these focus groups was to elicit in-depth insights into existing pedagogical practices related to employability and explore lecturers' perceptions of the alignment, or lack thereof, between academic curricula and industry requirements. Participants for these focus groups were purposefully selected to ensure a representative cross-section of disciplines, thus capturing a broad spectrum of perspectives reflective of TU Dublin's varied academic landscape. The discussions within these focus groups were semi-structured, permitting exploration of predetermined topics and enabled the emergence of unanticipated insights through open-ended dialogue. The discussions were structured around curriculum, transformative learning, graduate employability, and skills. Within the focus group, participants were asked to discuss six key skills for graduate employability; global & cultural skills, leadership & teamwork, emotional intelligence, research & entrepreneurship, discipline knowledge, and civic engagement. These key skills arose from comparing existing frameworks for employability skills, the USEM model (Yorke & Knight, 2006) and the CareerEDGE model (Pool & Sewell, 2007), and the graduate attributes of TU Dublin. Participants were asked to reflect on the importance of these skills in the context of graduate employability and their presence or absence in the programme. Participants were also encouraged to suggest additional skills if they felt they were required. Overall, this methodological choice facilitated a rich and detailed exploration of the challenges and strategies for integrating employability skills into academic teaching.

Research ethics

Data collection was conducted following the British Educational Research Association ethical guidelines (BERA, 2024) as approved by the TU Dublin (Blanchardstown Campus) Ethics Committee (Ref: 0611_20). The principles of transparency (including informed, written consent by participants to partake in data gathering with subsequent reporting and dissemination), volunteer participation (including the right to withdraw), and appropriate data storage (including digitisation of any paper-based data) were employed in this study.

Thematic analysis

Thematic analysis was the primary data analysis approach, a method well-suited to elucidate patterns and insights within a multifaceted data set. The Braun and Clarke (2022) process was followed where, in brief, data were coded based on recurring inductive or deductive terms, these codes were subsequently used to build themes. Data reporting was structured based on particular topics related to the research questions and synthesised under themes found across data sets.

Emergent PAGE framework

Initial thematic analysis of Program Documentation and Focus Groups with Lecturers was instrumental in informing the development of the initial PAGE framework (See Figure S4 in the Supplementary Information for the emergent PAGE framework). The identified themes were systematically mapped onto the emergent framework's core components, ensuring that it was both responsive to the critical issues identified during the data collection phase and capable of addressing the diverse needs of TU Dublin's academic community.

PAGE framework implementation - iterative development and evaluation

The PAGE framework was iteratively refined through a considered process which involved multiple rounds of feedback from focus groups (n=4) and one-on-one consultations with educators across different disciplines (n=12) following pilot implementations of the framework. The focus of these iterations was a critical analysis of the framework's applicability in varying disciplinary contexts, and subsequent framework refinement to better align with the pedagogical challenges specific to each discipline.

Findings and discussion

PAGE Framework development – insights from current practice

Programme documents and focus group discussions analysis provided a comprehensive understanding of the current state of curriculum design and its alignment with industry requirements. These findings revealed a disconnect between current practice and labour market expectations. The quantitative code frequency analysis revealed significant variability in how employability skills were embedded within different programs. The documentary analysis also highlighted the degree to which specific disciplines exhibited a more advanced integration of industry-relevant skills, often facilitated through formal collaborations with external stakeholders. Disciplines such as business and engineering, for example, were found to align more closely with industry demands, incorporating practical elements such as case studies, internships, and project-based assessments that mirror real-world professional environments. In contrast, programs with a more theoretical orientation, although vital in fostering critical thinking and analytical capabilities, offered fewer opportunities to apply these skills in practical contexts, indicating potential areas for curricular development (see Table 1).

Subsequent documentary analysis identified several key themes, beyond the deliberate emphasis on employability skills, across different academic disciplines. These included the predominance of traditional pedagogical approaches that prioritise the transmission of theoretical knowledge over the development of practical skills, and the inconsistent incorporation of industry feedback into curriculum design. It was observed that while specific programs explicitly articulated employability outcomes within their learning objectives, others adopted a more implicit approach, concentrating primarily on disciplinary content with less discernible connections to workplace competencies. To address this variability, and ensure all students experience equal opportunities to develop their employability, a structured and coherent strategy to ensure that employability skills are consistently embedded across all academic programs is needed. Such a framework would need to be adaptable to meet the specific needs of different academic contexts.

The focus groups, comprising lecturers from diverse disciplines, provided complementary qualitative insights. Analysis of the semi-structured focus group discussions identified similar perspectives on the current state of employability integration into the curriculum, in particular the challenges and opportunities of integrating employability skills within existing pedagogical practices. Recurrent themes included the critical importance of reflective learning, the pressing need for enhanced collaboration with industry partners, and the potential of interdisciplinary approaches to enrich the educational experience. Lecturers articulated the limitations inherent in current pedagogical frameworks and expressed a collective aspiration for increased resources and institutional support to foreground employability in their teaching effectively. Lecturers consistently acknowledged that while their courses effectively deliver in-depth theoretical content, there is often a deficiency in the systematic integration of practical skills essential for employability. This gap is particularly evident in teamwork, leadership, and other critical skills in

professional settings. The type of assessment can exacerbate this disconnect with the wide-spread use of individual assessment methods, which may not adequately develop or assess collaborative skills, problem-solving abilities, and leadership potential. Finally, echoing the findings from the documentation analysis, existing practices to enhance employability were cited during the focus group and these included integrating industry-based projects into the curriculum, using reflective learning exercises, and the development of interdisciplinary modules designed to simulate real-world professional challenges.

Table 1 The total reference count for deductive and inductive skills shown per Book of Modules. Skills are noted per coding category: Employability Skills (Em), Transformative Learning (TL), and General (Gen). The data underlined and bold are the lowest and highest two skills as per coding reference counts respectively, as viewed per Programme (on the Vertical Column). Programmes are shown by their TU Dublin campus abbreviation Blanchardstown (BN), City Campus (CC), or Tallaght (TT). The respective ISCED (International Standard Classification of Education) discipline number as also used to categorise as follows: 1. Education, 2. Arts and Humanities, 4. Business, Administration and Law, 5. Natural Sciences, Mathematics and Statistics, 6. Information and Communication technologies (ICTs), 7. Engineering, Manufacturing and Construction, 10. Services.

	Number of References	**BN_7**	**CC_1**	**TT_4**	**CC_6**	**CC_2**	**CC_2(2)**	**CC_10**	**CC_5**	**CC_7**
Em	Global and Cultural Skills	1	17	**51**	9	3	16	19	5	5
	Leadership and Teamwork	**44**	42	41	53	53	65	**77**	12	29
	Emotional Intelligence	4	11	8	13	2	25	11	4	0
	Research and Entrepreneurship	21	27	37	77	53	49	50	29	44
	Discipline Knowledge	**137**	**109**	**161**	**336**	**116**	**102**	**113**	**133**	**83**
	Civic Engagement	10	8	1	20	4	8	16	3	26
TL	Autonomous Thinking	11	8	11	48	68	23	51	53	**57**
	Reflective Practice	2	**58**	16	16	8	8	11	6	24
	Facilitating Learning	21	39	27	**191**	**104**	50	58	**109**	54
	Discourse and Discussion	4	43	15	36	46	27	34	6	7
Gen	Presenting	19	23	32	32	65	**92**	41	25	14
	Career-based Learning	2	35	6	61	18	24	54	18	22
	General Soft skills	2	1	1	0	2	0	0	0	0
	Ethics	12	11	3	12	3	0	11	1	3
	Software Skills	6	1	6	2	21	0	13	16	23
	Writing Skills	23	14	27	48	52	27	37	46	26

Combined, these findings provided a critical baseline against which to craft an adaptable framework, offering a clear indication of the starting point for employability integration within programmes. These findings suggest that lecturers may need help designing a balanced learning experience, where the depth of theoretical instruction and the need to incorporate practical skills development is appropriate. This issue is particularly acute in disciplines where the curriculum is densely packed or those with professional accreditation requirements. Understanding the lived experience and integrating examples of enhanced

practice provided a valuable basis in the development of the PAGE framework, ensuring that it was theoretically sound and practically grounded in existing pedagogical strategies at TU Dublin.

PAGE Framework – foundational components

The PAGE Framework was conceived as response to the evolving demands of an increasingly competitive, competency-oriented workforce and the recognition that effective pedagogy extends beyond the transmission of disciplinary knowledge; it must also foster the critical skills and competencies that students require to navigate the complexities of their professional lives. Building on the previous section - insights from current practice - and the complementary literature review, the PAGE framework established an alignment between teaching methods, curriculum development, and the integration of employability skills. The primary aim was to ensure TU Dublin graduates are knowledgeable and capable of applying their knowledge in real-world contexts; however, the adaptable framework is applicable more broadly in further and higher education.

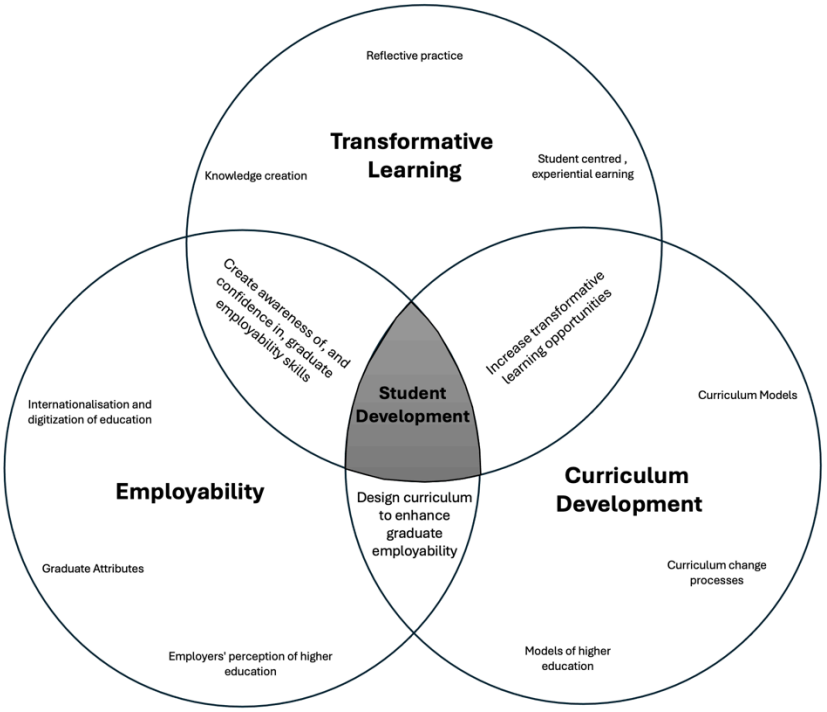

Figure 1 The PAGE Framework detailing the three core components; Employability, Transformative Learning and Curriculum Development. Topics of specific interest to each component are noted around the outside of each corresponding circle. The overlapping areas between each component define the actions required to achieve the components. The central, grey, hub centralises the development of the student within the PAGE Framework (see Figure 2 for more detail).

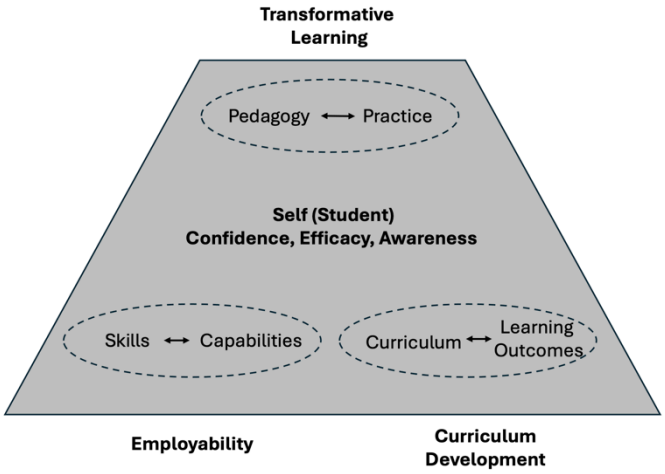

Figure 2 This represents the central, grey, hub in Figure 1 and places the student at the centre of the PAGE Framework. The PAGE Framework focuses on developing student self-confidence, self-efficacy and self-awareness through aligning pedagogy with practice, curriculum with learning outcomes and skills with capabilities.

PAGE Framework - Pedagogy

The pedagogical foundation of the PAGE framework is transformative learning (Mezirow, 1978) and is distinguished by its focus on critical reflection, autonomous thinking, and active engagement, which collectively enable students to reconceptualise their understanding of knowledge and its application. Within the PAGE framework, these principles are operationalised through pedagogical practices that encourage students to critically examine their assumptions, apply their learning to authentic problems, and engage in self-directed and experiential learning activities. A critical aspect of the PAGE framework's pedagogical component is the promotion of active learning strategies that facilitate deeper cognitive engagement; including, for example, challenge- and problem-based learning. These strategies foster students to develop higher-order thinking skills such as analysis, synthesis, and evaluation—essential for academic success and professional competency. A strong emphasises is placed on reflective practices such as learning journals, structured reflective essays, and peer feedback mechanisms as a means of internalising learning and connecting it to future professional roles. Such practice enables students to identify their strengths and areas for development, fostering a continuous process of self-improvement that is vital for lifelong learning and adaptability in the workplace.

PAGE framework – employability

Deliberate and systematic development of graduate employability skills recognises that employability is not a static attribute but a dynamic and evolving set of skills and capabilities that must be nurtured throughout a student's academic journey. Systematic integration of key employability skills, such as leadership, teamwork, communication, emotional intelligence, and discipline-specific expertise, is enabled by the PAGE framework. Seamless incorporation into course content and assessments ensures that students can develop and refine these competencies in a relevant and meaningful way. For instance, teamwork and communication skills are cultivated through group projects and collaborative learning activities, which

require students to work effectively with others, negotiate tasks, and communicate ideas clearly and persuasively. On the other hand, leadership skills are developed through opportunities that require students to take initiative, manage projects, and make decisions that impact their peers or the outcomes of collaborative tasks. The PAGE framework also acknowledges the importance of discipline-specific knowledge in enhancing employability. The framework strongly advocates for including industry-relevant content within the curriculum, utilising real-world examples, case studies, and problem-solving scenarios that are directly aligned with the demands of specific industries. This approach enhances the relevance of academic learning and ensures that graduates are equipped with the specialised knowledge and skills required in their chosen fields.

PAGE framework – curriculum development

Maintaining a dynamic and responsive curriculum, informed by ongoing consultation with industry stakeholders, is critical. Through active and consistent engagement with employers and professional bodies, academic staff gain valuable insights into current industry trends and expectations, which can subsequently be incorporated into curriculum design and delivery. The PAGE framework advocates for an iterative and collaborative curriculum development process. Through curriculum iteration, the integration of industry-based learning opportunities, such as internships, allows students to apply their academic learning in real-world settings, bridging the gap between theoretical knowledge and practical application. These experiential learning opportunities also allow students to develop professional networks, gain insights into industry practices, and enhance their employability upon graduation. Equally, the framework underscores the importance of continuous professional development for academic staff. As industry standards and practices evolve, lecturers must remain current with these developments to prepare students for the challenges of the modern workplace effectively. The PAGE framework encourages academic staff to engage in professional development activities, including industry placements, participation in professional networks, and attendance at relevant conferences and workshops. This engagement ensures that lecturers are equipped with the knowledge and skills necessary to deliver a curriculum that is both academically rigorous and professionally relevant.

PAGE framework evaluation

The emergent PAGE framework was evaluated across different academic disciplines and with different academic staff (n=12) and sought to understand the framework's applicability and adaptability in the context of the study for which it was developed (Research Question 3). Thematic analysis was used to identify the key evaluation themes; challenges and opportunities, adaption, 'business as usual' integration.

Different disciplines identified specific challenges for their integration of the PAGE framework into day-to-day practice. For example, in STEM disciplines, the integration of reflective practices was perceived as a challenge, this was primarily due to the technical nature of these disciplines and the lack of previous use of reflective practice. Lecturers in these disciplines also note that the extensive curriculum content requirements, often driven by accreditation bodies, leave little room for incorporating reflective activities (Mello and Wattret, 2021), despite longitudinal evidence demonstrating the benefits of reflective learning (Chan and Lee, 2021). In this study, where there was known use of reflective practices, specifically in laboratory work and project-based learning, students benefitted significantly from the opportunity to contextualise their technical skills. Conversely, disciplines such as Health and Service industries alluded to a

smoother integration of the PAGE framework's principles, particularly with respect to reflective learning and teamwork. These fields, which inherently require strong interpersonal skills and empathy, found the framework's focus on reflective practices particularly beneficial. For example, in nursing and social work programs, a structured reflection on clinical placements and case studies has been instrumental in developing students' ability to apply theoretical knowledge in complex, real-world scenarios echoing recent research (Phenwan, 2024). These disciplines also placed a strong emphasis on industry engagement suggesting a good alignment of their existing pedagogical focus on experiential learning within this case study, further reinforcing the framework's value in these contexts. Extending this, the evaluation participants provided nuanced insights into how the framework could be adapted to further accommodate their respective disciplines' unique educational objectives and constraints. The framework's flexibility was particularly appreciated by evaluation participants, with staff noting that the framework was sufficiently agile to allow for adaptation to their respective fields' specific pedagogical and disciplinary needs.

The framework is purposefully aligned with TU Dublin's strategic intent which seeks to produce graduates who demonstrate both academic proficiency and high employability and supports the university's commitment to fostering a dynamic and responsive educational environment that effectively prepares students for the challenges of the modern workforce (Anonymous, 2024). At the national level, the framework resonates with Ireland's National Strategy for Higher Education, which prioritises the development of generic skills necessary for effective engagement in society and the workplace (Hunt, 2011). The national strategy calls for a curriculum that imparts discipline-specific knowledge and fosters critical thinking, problem-solving, and interpersonal skills. The framework also echoes the goals articulated in the European Union's education policies, particularly those outlined in the European Education Area initiative (Collective Council, 2018). The framework's emphasis on employability skills is consistent with the EU's focus on fostering skills development to promote sustainable growth and employment opportunities across member states. The European Commission has stressed the need for higher education institutions to enhance curricula to ensure that graduates possess the skills required in a rapidly changing labour market.

As the final step in an iterative development process, the constructive feedback obtained during the evaluation and pilot implementation ensured that the PAGE framework remained responsive to the evolving needs of TU Dublin's academic community. By incorporating feedback from multiple stakeholders and adapting to emerging challenges, the framework was refined to a point where it was both theoretically robust, practically viable, and capable of being adapted to a wide range of disciplinary contexts.

Recommendations for practice and future development

The PAGE Framework was designed to bridge the gap between academic teaching and learning and industry needs by providing a structured and coherent approach to curriculum development that integrates transformative learning principles and essential employability skills. The PAGE Framework's design is based on the premise that enhancing employability requires more than standalone skills modules. Instead, a holistic approach where practical skills are embedded throughout the curriculum, and developed in conjunction with disciplinary knowledge, is required. The PAGE Framework is, therefore, applicable beyond the investigative case study presented here. With this in mind, recommendations for practice are coupled with future development areas to assist those wishing to adopt, adapt and enhance the PAGE Framework in order to address emerging challenges and opportunities in higher education. Areas for consideration include; embracing technological advancements, adapting to the evolving educational landscape, incorporating global employability skills, fostering student student-centred learning and co-design, and

developing robust evaluation methods. Combined, the PAGE framework has the potential to significantly enhance graduate employability whilst concurrently contributing to the broader goals of higher education.

Embracing technological advancements

As technological advancements continue to shape the workforce, future iterations of the PAGE Framework could further integrate digital literacy and technological skills into curricula (Di Battista et al., 2023). Here the focus may be on emerging technologies, such as artificial intelligence, machine learning, and data analytics, and their incorporation into transformative learning practices to further enhance employability by ensuring graduates have the necessary skills to thrive in a technology-driven world. This adaptation will also require collaboration with industry partners to identify the specific digital skills in demand and develop curriculum components that reflect these needs.

Adapting to the evolving educational landscape

The COVID-19 pandemic induced significant changes in the educational landscape, including a shift towards online and hybrid learning models, in a very short period of time (Tang, 2023). Effectively learning through these modalities will be essential for preparing graduates for a workforce increasingly relying on digital communication, dispersed work patterns and remote collaboration. The PAGE framework can be evolved to these learning environments and with a focus on understanding the implications for employability, including the long-term impact of remote learning on employability skills and to develop strategies for balancing online and in-person learning to maximise student outcomes.

Incorporating global employability skills

As globalisation continues to influence job markets, there is an increasing need for graduates to possess global employability skills (OECD, 2021). Adapting the PAGE framework could include a specific focus on cross-cultural communication, global awareness, and international collaboration skills. This may involve developing partnerships with institutions abroad and creating opportunities for students to engage in international projects or exchanges. Integration of the specific employability skills required in different regions and industries to ensure the framework remains relevant and comprehensive will provide not only a global perspective but also better prepare graduates to navigate the complexities of working in an interconnected world.

Fostering student student-centred learning and co-design

Increasing student engagement in curriculum design and pedagogical practices can lead to more effective learning outcomes (Fasco et al., 2024), with the inclusion of student feedback and participation in developing employability skills a practical realisation of this. Engaging students as active partners in their education can enhance their motivation and ownership of the learning process, ultimately leading to better employability outcomes. This may take the form of involving students in the co-design of learning experiences, allowing students to contribute their perspectives on what skills are most relevant to their future careers.

Developing robust evaluation methods

To ensure the sustained evolution of the PAGE framework, it will be essential to develop robust metrics and evaluation tools to measure its effectiveness in enhancing employability. These will be context specific, however, embracing both qualitative and quantitative perspectives will give a more holistic understanding of the impact. Areas to consider include establishing clear benchmarks for employability skills and longitudinally tracking the career trajectories of graduates who have experienced the PAGE framework. By systematically evaluating the framework's impact, institutions can make informed decisions about its implementation and ongoing development, ensuring that it continues to meet the needs of students and employers alike.

Conclusion

The PAGE Framework represents a comprehensive, integrated and flexible approach to curriculum development that aligns teaching methods, graduate employability, and industry needs. Developed, enhanced and evaluated through an investigative case study, the PAGE framework visualises the connections between pedagogical approaches and graduate employability where lecturers are encouraged to reflect on their teaching methods and make intentional choices that develop students' employability. It is grounded in the principle that employability is not solely about securing employment after graduation; it encompasses a broader set of attributes that enable graduates to be successful and adaptable in their career with a focus on attributes such as critical thinking, problem-solving, teamwork, communication skills, and applying knowledge in real-world contexts. By embedding transformative learning pedagogies, emphasising the development of both general and discipline-specific employability skills, and ensuring that the curriculum remains responsive to the demands of the workforce, the framework seeks to enhance the employability of graduates and prepare them for successful careers in their respective fields. This holistic approach ensures that students are academically prepared and equipped with the practical skills and professional attributes required to thrive in an increasingly complex and competitive global job market. However, the dynamic nature of the job market necessitates that educational institutions remain responsive to the skills and competencies employers seek and continuous refinement and adaptation of the PAGE framework will be essential to address emerging challenges and opportunities in higher education regarding employability.

Biographies

Ms Ellen Kampinga is an Education Support Officer at Trinity College Dublin and has completed her MPhil research in TU Dublin and her MChem in Rijksuniversiteit Groningen. Enabled by her background in instructional design and adult education, she is passionate about developing and delivering high-quality learning programmes.

Dr Fionnuala Darby is a Senior Lecturer at the Faculty of Business, is currently on secondment with the University Education Model Team and has achieved Senior Fellowship recognition from Advance HE.

Dr Barry Ryan is passionate about the practical implementation of research informed teaching and in supporting others in their personal development in this area. He is concurrently a Principal Fellow of the Higher Education Academy, a National Forum Teaching and Learning Research Fellow and a chartered science teacher.

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Supplementary Information

Table S1 Employability skills used for deductive coding.

Employability Skills Type	Definition used for coding
Global and Cultural Skills	Any mention of international knowledge, collaboration and/or awareness. And any mention of inter-cultural skills, communication, or awareness.
Leadership & Teamwork Skills	Any mention of group work, teamwork and or collaboration skills or project assignments. And any mention of leadership skills like planning and managing a project.
Emotional Intelligence	Any mention of emotional intelligence development for the graduate during the programme or as a learning outcome. Any mention of sensitivity, communication skills, and any knowledge about self-development.
Research & Entrepreneurship	Any mention about research projects and assignments or learning outcomes that focus on understanding how to undertake research, how to learn about the level of current knowledge and how to develop that further.
Discipline Knowledge	Any mention of skills that are specific to the discipline of study, that are equally as important as more generic soft skills.
Civic Engagement	Any mention of collaboration with the local community, and or outreach. The development of the idea that we are all part of our community and our part in the world. Collaboration with local industry can also be civic engagement.

Table S2 Transformative Learning Skills used for deductive coding

Transformative Learning Skills	Definition used for coding
Autonomous thinking	Any mention of a development of thinking skills that lead to making independent critical analysis, judgement, and decisions.
Reflection	Any mention of reflective practice, whether that be personal or professional.
Facilitating learning	Any mention of more actively engaged learning for students facilitated by the lecturers and the programme.
Discourse/discussion	Any mention of communication skills, discussion, collaboration. Possibility to overlap with the employability skill teamwork. But focusing on the essence of communication skills and deciding together.

Table S3 General Skills used for Inductive Coding

Inductive Codes	Definition used for coding
Presenting	Any mention of presentations performed as part of continuous assessment or examination. Also, presentation skills that were not captured in discourse and discussion.
Career-based learning	Any mention of knowledge provided about how to develop a career and get skills to obtain a job. Any skill mentioned can be connected to your future career. Career-based learning is specifically about building a career in general and what working as a professional would be like.
General soft skills	Any mention of general soft skills is used when the skills listed above don't quite catch the description.
Ethics	Any mention of the importance of ethical knowledge. Sometimes this is connected to civic engagement and sometimes to research.
Software knowledge	Depending on the context software knowledge can be connected to discipline knowledge, as well as to research knowledge. This separate code describes any mention of essential knowledge of software (e.g. to be able to graph or analyse data using an appropriate software).
Writing skills	Any mention of assignments that are based on writing skills, such as essays, reports, and written examination. Like presenting, writing skills were not specifically captured in discourse and discussion.

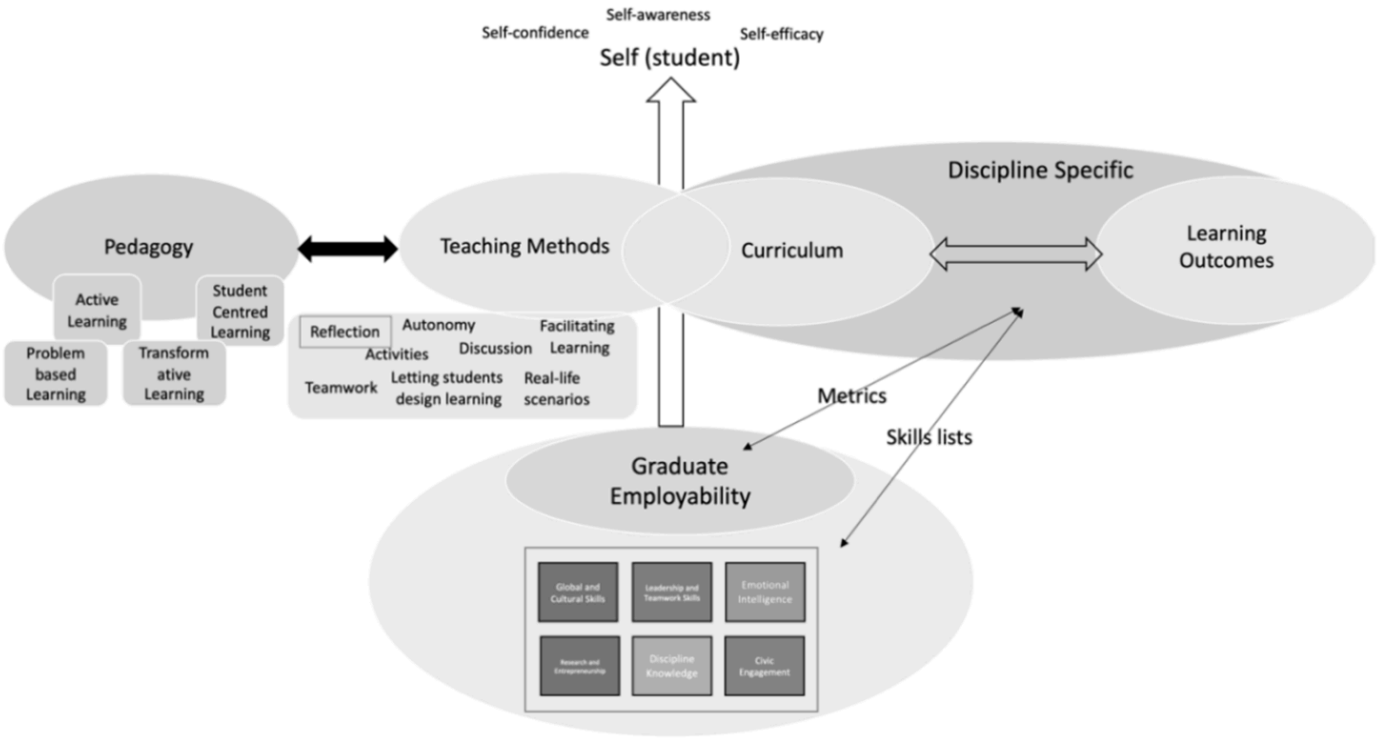

Figure S4 The emergent PAGE Framework – informed by content analysis and literature review, but prior to evaluation and evolution.