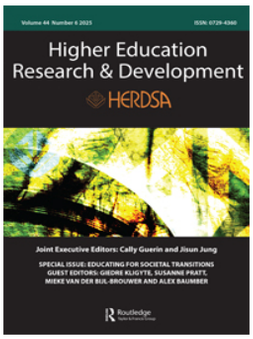

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Future-oriented capabilities impact framework: measuring transdisciplinary higher education programmes' contribution to societal transitions

Annabelle Lewis, Giedre Kligyte, Jacqueline Melvold and Fanny Salignac

Transdisciplinary School, University of Technology Sydney, Sydney, Australia

ABSTRACT

Higher education institutions play a vital role in fostering societal transitions towards sustainable and equitable futures, primarily, by equipping university graduates with future-oriented capabilities to address complex contemporary challenges. Despite their efforts, higher education institutions often lack consistent practices in assessing the impact of their educational programmes towards these goals. This paper introduces a framework designed to guide higher education institutions in evaluating the impact of their education programmes. The framework is based on a theory of change and applies an ecological perspective to articulate change mechanisms, including direct and indirect outcomes at individual, organisational, and societal levels over time. It elucidates the often-implicit assumptions about education programmes' contributions to societal transitions. The study aims to inspire action, inviting educators to consider the impact of their programmes in fostering long-term social and environmental sustainability beyond the boundaries of education institutions.

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Societal transitions; impact; impact framework; theory of change; capabilities; ecological; sustainability

Introduction

With the global society facing increasingly urgent social and ecological challenges, the need for sustainable development to ensure planetary and long-term social well-being is now widely recognised. Governments, non-governmental organisations and businesses across sectors publicly endorse the United Nations' Sustainable Development Goals (SDGs) to demonstrate their commitment to change. However, with only 17 per cent of SDGs being on track for achievement by 2030 (United Nations, 2024), more effective action is needed. Transition management scholars argue that in a complex, interconnected world facing rapid natural, social and technological change, such action must be taken at multiple levels by a range of system actors to accelerate the transition towards more sustainable and equitable futures (Loorbach, 2010; Scholz, 2017).

CONTACT Annabelle Lewis marie.a.lewis@student.uts.edu.au; https://www.linkedin.com/in/annabellelewis/

Higher education institutions have been identified as having a 'unique potential to catalyse and/or accelerate' these transitions (Stephens et al., 2008, p. 320), acting as change agents (Berchin et al., 2021; Koehn & Uitto, 2017; Loorbach & Wittmayer, 2024; O'Riordan et al., 2020; Stephens et al., 2008). Traditionally, higher education has been seen as fulfilling its societal role by providing essential sectors such as primary healthcare, energy and technology with skilled professionals (Koehn & Uitto, 2017; McCowan, 2023). However, many scholars now argue that addressing complex societal challenges—such as climate change, inequality, and social justice—requires more than transferring disciplinary knowledge to future professionals (Koehn & Uitto, 2017; McCowan, 2023; O'Riordan et al., 2020). Loorbach and Wittmayer (2024) propose that higher education must also develop the 'skills, attitudes and mindsets' that will lead learners to 'challenge, alter, and replace the status quo' (p. 25).

Transdisciplinary education emerges as one approach to addressing complex challenges in sustainable development and societal transitions (Hoinle et al., 2021; Kligyte et al., 2024; Koehn & Uitto, 2017; O'Riordan et al., 2020). It acknowledges that contemporary challenges demand transdisciplinary integration of professional expertise, academic knowledge, and local, practical, and Indigenous wisdom (Baumber, 2022; Klein, 2004; Polk, 2015). By bridging disciplinary boundaries, transdisciplinary education equips individuals with the skills and knowledge needed for collaborative, integrative responses, often sparking innovation and creativity (Miller, 2020). Additionally, it strengthens individuals' ability to translate their ideas and expertise into tangible outcomes, while working alongside diverse stakeholders (Kligyte et al., 2024). Crucially, it is argued that transdisciplinary learning helps shape individuals' values and attitudes, building competencies necessary to take meaningful action towards sustainability (Baumber, 2022; Kligyte et al., 2024).

The growing importance of sustainability and transdisciplinarity in higher education is evident in the significant increase in universities' engagement with sustainable development initiatives (Findler et al., 2019; Lozano et al., 2015), the number of sustainability-based assessment tools in education (Caeiro et al., 2020), and the growing adoption of transdisciplinary approaches by higher education institutions (Vienni-Baptista & Klein, 2022). This shift broadens the traditional focus on employability, which has historically prioritised preparing graduates for the labour market, towards a more comprehensive recognition of higher educations' role in addressing complex societal challenges (Comunian et al., 2023; Walker, 2022).

While higher education institutions' efforts toward sustainable and equitable societal transitions are promoted, evaluating the effectiveness of education programmes in generating societal impact remains an emerging and fragmented area of research and practice (Findler et al., 2019; Jones et al., 2017). There is limited guidance and no commonly accepted approaches, possibly due to difficulties in measuring and attributing efforts to impact (Koehn & Uitto, 2017; McCowan, 2023). Impact measurement in higher education typically focuses on counting activities and outputs—the 'how many' or 'what'—rather than measuring longer-term outcomes (Caeiro et al., 2020; Muir & Bennett, 2014). For example, while Times Higher Education impact rankings include an impact metric for universities providing sustainability or SDG-related courses, the metric considers the courses' existence, not their outcomes (Times Higher Education, 2023). Yet, as noted by McCowan (2023), challenges of measurement and the lack of attempts to gather concrete evidence of

impact should not lead to dismissing the transformative impacts that higher education institutions can have on society and the environment.

In this paper, we seek to clarify the links between the efforts of higher education institutions in equipping students with the capabilities required for societal transitions, and the impact of these efforts. Several definitions of social impact have been proposed in higher education contexts (Findler et al., 2019) and more broadly (Feor et al., 2023). Drawing on commonalities among these definitions, we conceptualise *social impact* as the extent to which an intervention is expected to generate positive or negative, intended or unintended, effects on individuals, society and the environment. We consider the individual (the student) as the primary beneficiary of the intervention (the education programme), and society and the environment as higher-order beneficiaries.

Building on the transdisciplinary 'future-oriented capabilities' model—which includes the skills, attitudes and mindsets required to address urgent challenges, as well as the capacity to enact them (Kligyte et al., 2024)—we propose a framework for assessing how higher education institutions contribute to societal transitions and sustainability. Based on a theory of change model that explicitly maps the change mechanisms linking activities to outcomes (Rogers & Weiss, 2007), our framework clarifies the pathways to impact and provides a robust approach for measuring a higher education institution's progress over time.

We begin by examining published research on social impact evaluation in higher education. We then describe our framework, starting with the summary of the transdisciplinary future-oriented capabilities that form its basis, and outlining the theoretical underpinnings and key elements of our framework. Next, we provide guidance on its applicability and measurement. Finally, we discuss the benefits and limitations of using the framework and conclude with recommendations for higher education scholars and practitioners.

Our paper makes two key contributions to both theory and practice. First, it reconceptualises the impact of higher education institutions to include not only formal education programmes, but also graduates' contributions to societal transitions in their professional contexts after graduation. Second, by proposing a framework that explicitly links these capabilities to their specific pathways to impact outside academic contexts, it enables the evaluation of the effectiveness of higher education programmes in meeting their long-term objectives. Ultimately, we propose that consistent application of this framework could help higher education institutions develop a more comprehensive picture of their collective impact in fostering successful societal transitions.

Impact measurement in higher education

Current approaches to evaluating the impact of higher education programmes primarily focus on economic metrics such as graduate employment and earnings, driven by labour market needs (Comunian et al., 2023; Nusche, 2008). These outcomes are typically used as proxies for education quality (Koehn & Uitto, 2017). However, such measures fail to recognise longer-term outcomes, intangible effects on individual students (such as mindsets and attitudes) and indirect effects beyond graduation (such as graduates leading change in their professional practice) (Comunian et al., 2023; Norström et al., 2020; Sandri et al., 2018).

With the increased recognition of the critical role of higher education institutions in sustainable development, there is growing interest in the broader, longer-term impacts of universities (Findler et al., 2019; Lozano et al., 2013). Various definitions of impact have been proposed in this context (Findler et al., 2019), generally referring to the effects created by higher education institutions on the environment, economy and society. In addition to the focus of SDG 4.7 on inclusive and equitable access to education (Hoinle et al., 2021; McCowan, 2023), universities have been shown to contribute to sustainability transitions mostly through campus operations (Findler et al., 2019), as well as through research, public engagement and education (Berchin et al., 2021; Findler et al., 2019; Koehn & Uitto, 2017; McCowan, 2023). Despite the clear benefits of measurement for demonstrating accountability and informing decisions, the impact of these actions is currently under-researched (Findler et al., 2019; Koehn & Uitto, 2017; Lozano et al., 2013). In particular, the consideration of university education impacts beyond graduation has been identified as a critical gap (Koehn & Uitto, 2017; Nusche, 2008; Sandri et al., 2018).

Research on educational impacts has largely concentrated on academic development (Chalmers & Gardiner, 2015; Jones et al., 2017), while the more intangible and indirect effects of education—such as changes in graduates' behaviours and mindsets (Kazemier et al., 2021; Meth et al., 2023) and the enactment of certain attributes in practice (Comunian et al., 2023; Thomas et al., 2020)—have been considered to a much lesser extent. A notable exception is Koehn and Uitto (2017), who holistically examine the impact of all aspects of higher education in the context of sustainable development. Their comprehensive review of evaluation literature and practice across domains identifies a range of questions and methods for consideration when assessing impact. We leverage these insights alongside broader impact evaluation literature to inform the development of our impact measurement framework.

While multiple tools aimed at assessing and benchmarking higher education institutions' implementation of sustainability exist—spanning campus operations, education, research and community engagement—most social impact assessments tend to measure organisational processes and efforts rather than their actual impact (Vanclay, 2002). A systematic review of 27 higher education assessment tools by Caeiro et al. (2020) concluded that these tools were 'too operational', with their weakness being 'the lack of the assessment of the impact of the sustainability performance of the university in the society and their real contribution for a sustainability transition' (p. 26). To address these gaps, we build on evaluation literature to conceptualise a framework that assesses the broader societal impact of higher education through its education programmes. This framework focuses on the development of future-oriented capabilities, as a key pathway to societal transitions, extending evaluation efforts beyond the boundaries of the university.

The future-oriented capabilities impact measurement framework

Future-oriented capabilities

Seven transdisciplinary future-oriented capabilities (Kligyte et al., 2024; Melvold et al., 2024) described in Table 1, serve as the 'reference scheme' for evaluating education programmes designed to support societal transitions (Wiek et al., 2011, p. 218). Identified through extensive engagement with academic literature, these capabilities are deemed

Table 1. Future-oriented capabilities.

Capability	Description
Systems thinking and foresight	Holistic analysis of complex problems and working across different time horizons.
Creativity and innovation	Generating original insights and opportunities to problems as well as responding to change.
Collaboration and integration of diverse perspectives	Bringing together people of different backgrounds and skillsets when addressing complex challenges.
Agency, change-making and leadership	Initiating, influencing and leading change, often, under constraints and inspiring and mobilising others to take action.
Ethical, sustainable and socially responsible practice	Taking personal responsibility for own actions and their impacts and making ethical and values-led decisions.
Self-awareness and reflexivity	Reflection on own assumptions, biases and worldviews, alongside colleagues', clients' and partners' assumptions about complex problems, to deepen awareness and understanding.
Practical and technical know-how	Breadth and depth in technical ability and specialist knowledge.

to be essential for advancing sustainable and equitable futures in uncertain and complex environments (Kligyte et al., 2024). Unlike traditional capability frameworks that define capabilities as knowledge, skills or dispositions held by individuals, this framework conceptualises capabilities as individuals' capacity to enact them in contexts of practice. While originally developed through research on transdisciplinary education at a specific university, the framework is designed to be broadly applicable across higher education programmes seeking to drive long-term social and environmental sustainability.

Framework theoretical underpinnings

There is no single conceptual framework for valuing social impact, but most existing frameworks share common elements and converge on similar practices (OECD Global Action, 2021). Theories of change and logic models are consistently recommended in social impact literature, including in sustainability domains (Schneider et al., 2019), and they are commonly applied in policy, development and not-for-profit contexts (Feor et al., 2023; OECD Global Action, 2021; Rogers & Weiss, 2007). While these models are not widely used in higher education (Alach, 2016; Coldwell & Maxwell, 2018), their adoption has been encouraged in areas such as academic development (Bamber & Stefani, 2016) and academic research (Morton, 2015). Following these recommendations, our impact measurement framework builds upon a theory of change model, supplemented by sector-agnostic impact measurement guidance (Muir & Bennett, 2014; OECD Global Action, 2021; Ramia et al., 2021) and insights from impact evaluation literature.

Koehn and Uitto (2017) assert that a theory of change approach 'powerfully illuminates how and why activities shape outcomes and under which conditions', providing 'insights that can guide evaluative investigation of academic programmes devoted to sustainable development' (p. 124). However, impact pathways are rarely linear (Jones et al., 2017; Norström et al., 2020). Therefore, a theory of change model is best considered as a 'temporary mental map' (Koehn & Uitto, 2017, p. 95) that can inform measurement and guide future action (Koehn & Uitto, 2017; OECD Global Action, 2021). Since education programmes operate within broader systems where many interrelated factors combine to produce impact (Schneider et al., 2019), we assume a contribution rather than a causal attribution relationship between education programmes and societal impact (Earl et al., 2001; Koehn & Uitto, 2017; Morton, 2015).

In theories of change, 'impact' refers to longer-term societal transformations sought by a programme or intervention, while 'outcomes' encompass the intermediary changes—direct and indirect—experienced by a range of stakeholders over time, that occur as a result of the programme and are expected to lead to longer-term impact (Earl et al., 2001; Koehn & Uitto, 2017; Muir & Bennett, 2014; Ramia et al., 2021). The term 'outputs' refers to the immediate, quantifiable results of programme activities that are intended to lead to outcomes over time (Rawhouser et al., 2019; Vanclay, 2002). Education evaluations often track outputs, because they are easier to measure. However, they are not sufficient, as they do not necessarily demonstrate meaningful changes and may lead to short-term focus (Bamber & Stefani, 2016; Koehn & Uitto, 2017).

Theories of change typically consider changes at multiple system levels: micro (programme or individual level), meso (community or organisation level), and macro (sectoral or societal level) (Muir & Bennett, 2014; Ramia et al., 2021). In developing our impact measurement framework, we adopt an ecological systems lens (Bronfenbrenner, 1977, 1994), which recognises the interplay between individual development and broader social contexts. This systemic approach enables us to consider the effects of education efforts at the micro level (individual students), the meso level (organisations where graduates operate), and the macro level (the overarching societal systems in which these subsystems evolve). The ecological systems lens also highlights the interrelationships between these levels through feedback loops – interactions across different levels of the system that generate intended and unintended effects (Salignac et al., 2019).

Building on these approaches, our impact measurement framework aims to capture both direct and indirect, as well as tangible and intangible outcomes of education programmes (Bamber & Stefani, 2016; Koehn & Uitto, 2017). These outcomes are mapped over different time horizons and system levels, linking contributions to longer-term impact (Figure 1). Although represented in a linear manner, our framework does not imply a unidirectional view of impact or direct causality. We recognise inter-relatedness, recursiveness, uncertainty and emergence—elements that are difficult to represent visually —as core properties inherent in complex systems (Coldwell & Maxwell, 2018).

Framework development

Drawing on the social impact literature review, we engaged in extensive discussions about the theory of change and impact of university programmes designed to contribute to long-term social and environmental sustainability. This process led us to identify the specific, measurable knowledge, skills, practices, and behaviours we expected graduates of our transdisciplinary education programmes to demonstrate across diverse professional contexts. Building on a contextualised concept of impact and the future-oriented capabilities framework (Kligyte et al., 2024; Melvold et al., 2024), we articulated our assumptions about how graduates might influence organisations and how organisational contexts, in turn, might shape their ability to create change. This reflexive process prompted us to critically examine our implicit beliefs about the programme's direct and indirect outcomes and hypothesise about mechanisms for systems change. The draft theory of change was further refined through iterative dialogue with colleagues in other faculties and transdisciplinary scholars exploring similar topics.

Building future-oriented capabilities	Outputs (Micro) *Immediate*	Outcomes (Micro) *Short to medium term*	Outcomes (Meso) *Medium to long-term*	Impact (Macro) *Long-term*
Systems thinking and foresight	• Number of graduates employed in roles that involve innovation, creative design and complex problem-solving • Number of graduates employed in government, not-for-profits or social enterprises	Graduates • analyse complex problems holistically • make sense of the interconnectivity within and between systems • work across different time horizons: past, present and future • understand the future as a range of possibilities and navigate uncertainty	Changes in organisational practices • Future-oriented methods and practices are enacted in day-to-day activities • Future-oriented capabilities are recognised and sought-out	Social change and transformed communities through education and practice • Increased contribution to public good • Increased social mobility and equity • Enabling environment for communities to thrive • A healthy, sustainable and socially just society
Creativity and Innovation		Graduates • generate original insights, responses and solutions • translate creativity into viable and successful solutions • respond to change and adapt to emerging opportunities and challenges		
Collaboration and integration of diverse perspectives		Graduates • bring together people of different backgrounds and skillsets when examining complex challenges • have empathy and openness to different perspectives when developing proposals or solutions • create safe and inclusive spaces where people feel comfortable and respected		
Agency, change-making and leadership		Graduates • initiate, influence and lead change, often, under constraints • understand how decisions and change may impact large and complex networks of stakeholders • experiment, seek feedback and test ideas to steer initiatives • inspire and mobilise others to take action		
Ethical, sustainable and socially responsible practice		Graduates • take personal responsibility for their own actions and their impacts • focus on meaningful work seeking to benefit all stakeholders and the environment • make decisions based on ethics and values		
Self-awareness and reflexivity		Graduates • reflect on past decisions and feedback from others to inform practice and future actions • reflect on their own assumptions, biases and worldviews • consider unintended consequences • challenge colleagues' and clients' assumptions about complex problems		
Practical and technical know-how		Graduates • have broad and deep technical ability and specialist knowledge • draw from core expertise to devise a plan or methodology to approach complex challenges • 'read' the context and know when to act and when to step back to achieve greater longer-term impact		
		Key contextual condition Organisational environment enables enactment of capabilities		

Figure 1. Future-oriented capabilities impact measurement framework.

Framework element: impact

As recommended in evaluation literature, we started building the impact measurement framework at 'the end' (Ramia et al., 2021, p. 16) by defining the programme's intended impact (Jones et al., 2017; Muir & Bennett, 2014). A review of publicly stated goals of top-ranked Australian universities in social impact rankings (Times Higher Education, 2024) revealed common themes: service to communities, healthy

people and planet, and transitions to sustainable and equitable societies. Based on this review, we adopted the University of Technology Sydney's social impact goals (2024) as a representative benchmark for higher education institutions committed to social justice and sustainable development.

Framework element: outcomes

Working backwards, we identified programme outcomes as the changes in graduates' knowledge, attitudes and behaviours as well as changes in their environments that might contribute to societal impact (Bamber & Stefani, 2016; Koehn & Uitto, 2017; Ramia et al., 2021). At the micro level, we identified and mapped the specific changes in individuals associated with each future-oriented capability, which we theorised as plausible contributors to longer-term impact (Koehn & Uitto, 2017). We included the observable and practice-based changes, such as graduates' expected actions and behaviours in professional contexts, as well as the internal cognitive and non-cognitive changes, such as individuals' motivations, values and attitudes (Blömeke et al., 2013; Nusche, 2008). Assessing both tangible and intangible outcomes is important, because sustained behavioural change is more likely when aligned with intrinsic outcomes (McNeil et al., 2012; Zappala, 2020).

Individual-level outcomes 'can pave the way for larger-scale and longer-term changes' (Norström et al., 2020, p. 188). Thus, at the meso level, we define outcomes as changes in organisational practices driven by graduates' evolving mindsets and practices, which influence broader organisational processes. These process-based outcomes are believed to be essential steps towards the desired impact (Meagher & Martin, 2017). Empirical research on the impact of teaching sustainability supports this perspective. Meth et al. (2023) found that students experienced not only personal transformations, as a result of engaging with sustainability topics as part of design education, but also flow-on effects on wider systems through their professional practice. We do not articulate direct causal links between specific capabilities and meso-level outcomes, as we recognise that capabilities combine in complex ways to create outcomes, driving broader organisational shifts (Meagher & Martin, 2017; Wiek et al., 2011).

Framework element: outputs

Traditional education evaluations often rely on employment rates and academic performance measurement as the direct, quantitative outputs of education programmes (Comunian et al., 2023). However, we argue that these generic metrics are insufficient and lack meaning for assessing impact towards societal transitions. While we acknowledge that graduates might be able to enact future-oriented capabilities in any organisational context, we define the outputs of our education programmes more specifically as the number of graduates working in roles or contexts that demonstrably contribute to societal transitions. In doing so, we assume that graduates with future-oriented capabilities would naturally be drawn to positions requiring sustainability and social justice mindsets.

Framework element: key contextual condition

Evaluation literature calls out the critical role of contextual factors in enabling and constraining impact (Coldwell & Maxwell, 2018; Vanclay, 2002). Adopting an ecological systems approach, we recognise that graduates both shape and are influenced by their organisational contexts through feedback loops, with professional contexts positioned as the key contextual condition facilitating graduates' ability to create impact (Kligyte et al., 2024; Melvold et al., 2024). Research on graduate sustainability practices in the construction industry (Thomas et al., 2020) found that most graduates were not able to put their sustainability knowledge and inclinations into practice, due to leader behaviours. Factors such as organisational climate, profit-driven objectives and resource availability have been found to thwart sustainability-focused behaviours in the workplace (Meth et al., 2023; Sandri et al., 2018). Therefore, in line with common logic model representations (Coldwell & Maxwell, 2018), we position context as a foundational element at the bottom of our impact measurement framework (Figure 1), serving as a reminder to consider external influences and contextual conditions when evaluating impact. We also acknowledge the dynamic nature of contexts – graduates applying sustainability knowledge and skills in resistant environments may, over time, nudge climate to an enabling one.

Framework application

The framework is designed for education programmes aimed at contributing to societal transitions and fostering positive social or environmental outcomes through their graduates. Rather than being linked to specific education programme outcomes, it is grounded in a broad transdisciplinary capability framework, which can be applied across contexts. Although standardised evaluation frameworks are often criticised for ignoring critical contextual factors (Coldwell & Maxwell, 2018; Vanclay, 2002; Zappala, 2020), our impact measurement framework explicitly incorporates context as a key element.

Table 2 outlines proposed methods for measuring framework elements to assist other education scholars and practitioners in their evaluation planning. Selecting appropriate methods requires careful consideration of many factors. Measuring impact becomes increasingly challenging as the distance between an education activity and its long-term impact grows. Evaluation scholars acknowledge that systemic impact is 'extremely difficult to gauge' (McCowan, 2023, p. 3; Muir & Bennett, 2014), due to attribution challenges in complexity (Morton, 2015). Nonetheless, in alignment with these scholars, we argue that identifying change pathways enables a deeper understanding of an education programme's effectiveness. If a programme can reasonably establish a contribution (Morton, 2015)—what Koehn and Uitto (2017, p. 95) describe as a 'credible link to a meaningful effect'—those changes are worth measuring. These measures are not intended to be precise but rather to provide evidence of cumulative progress toward long-term impact and to inform programme improvements with their ultimate goal in mind (Earl et al., 2001).

Mixed method approaches are typically recommended for evaluating impact (Koehn & Uitto, 2017; OECD Global Action, 2021; Tomasella et al., 2022). Quantitative surveys provide a broad overview, while qualitative methods, such as interviews and focus groups, can capture nuanced outcomes that quantitative means might overlook (Findler

Table 2. Measuring framework elements.

Element	Summary (details in Figure 1)	Measurement methods
Micro outputs (immediate)	Quantifiable outputs of programme, relevant to the social impact context	• Alumni surveys requesting demographic data to determine types of roles/sectors post graduation • Social media, e.g., LinkedIn (same objective) • Higher education institution's records (same objective)
Micro outcomes (short to medium term)	Changes at the individual graduate level, resulting from future-oriented capabilities. These may be internal (knowledge, values/attitudes) or external (behaviour/action) changes	• Alumni surveys and/or interviews eliciting perceptions of personal changes • Surveys and/or interviews of alumni's colleagues to obtain external perceptions • Focus groups (alumni or alumni and colleagues) to explore perceptions • Alumni journals to elicit deeper reflections
Meso outcomes (medium to long term)	Changes in organisational practices, influenced by changes at the micro level	• Alumni surveys and/or interviews eliciting perceptions of organisational or broader outcomes they have influenced • Surveys and/or interviews of alumni's colleagues to obtain external perceptions • Focus groups (alumni, other employees including alumni's leaders and teams, as applicable) to explore perceptions • Case studies of organisations where graduates are employed
Macro impact (long term)	Changes at the societal level, influenced by changes at the micro and meso levels	• Narrative of plausible contribution of outcomes to impact
Key contextual factors (meso level)	The environmental conditions for action: organisational characteristics that enable or constrain the enactment of capabilities by individuals (e.g., culture, objectives, resources)	• Alumni surveys and/or interviews eliciting perceptions of organisational barriers and enablers of capability enactment • Surveys and/or interviews of other employees to elicit further perceptions of organisational barriers and enablers • Case studies of organisations where graduates are employed

et al., 2019). Although surveys and interviews are sometimes critiqued for relying on self-reported perceptions, they can offer valuable insights into changes perceived as relevant by individuals (Muir & Bennett, 2014). Vanclay (2002) highlights that impact is often felt or experienced rather than being directly observable and quantifiable. While corroboration is desirable (Bamber & Stefani, 2016), narratives and stories—including reflexive journalling (Earl et al., 2001) —are recommended to evidence outcomes (Bamber & Stefani, 2016; OECD Global Action, 2021; Wenger et al., 2011). Koehn and Uitto (2017) describe these as 'a particularly revealing means of identifying impacts' (p. 147). Case studies are also widely used (Findler et al., 2019; Ramia et al., 2021) and are considered an 'excellent means of pulling all available information, data, and evidence together, allowing a comprehensive summary of the impact within context' (Penfield et al., 2014, p. 30). Recognising that macro impact cannot be directly measured, rich descriptions can help clarify what impact means in a given context and how interventions contribute to it (Jones et al., 2017). Koehn and Uitto (2017) provide further guidance on measurement methods based on extensive reviews of impact evaluation tools and literature.

Recognising the lag between interventions and their effects (Coldwell & Maxwell, 2018; Rawhouser et al., 2019), the evolving nature of contexts (Coldwell & Maxwell, 2018), and the development and erosion of capabilities over time (Koehn & Uitto, 2017), impact measurement strategies should incorporate temporal factors. Longitudinal

studies (Blömeke et al., 2013; Comunian et al., 2023; Koehn & Uitto, 2017; McNeil et al., 2012; Nusche, 2008) or periodic reviews can help track changes over time. Additionally, in dynamic complex systems, unanticipated outcomes are likely to emerge (Jones et al., 2017; Norström et al., 2020), requiring flexible and iterative evaluation approaches.

A key benefit of developing theories of change is their ability to make underlying assumptions about change mechanisms explicit. When expected outcomes are not achieved, flawed assumptions may be the cause (Coldwell & Maxwell, 2018; Koehn & Uitto, 2017), making it essential to regularly test and refine them. One core assumption implicit in our impact measurement framework is that our education programmes are effective at developing future-oriented capabilities. To test this assumption, surveys or interviews can be used to elicit graduates' perceptions of how well they believe the programme developed these capabilities. While self-reported assessments of capabilities are widely used, they may not be reliable (Sandri et al., 2018). Triangulating results with other sources, such as feedback from graduates' managers or team members, could provide a more meaningful picture (Redman et al., 2021).

Discussion

Building evidence-based practices is essential for education to contribute meaningfully to societal transitions. To achieve this, we need a deeper understanding of 'what works' in teaching and learning, which requires robust assessment tools (Redman et al., 2021, pp. 127–128). Our proposed impact measurement framework addresses key shortcomings in existing approaches to evaluating the impact of higher education programmes. Specifically, it focuses on evaluating the outcomes of education programmes post-graduation, taking into account the complex systems in which graduates operate (Findler et al., 2019; Koehn & Uitto, 2017). To our knowledge, this is the only framework that explicitly sets out the multi-level, tangible and intangible, direct and indirect pathways to impact, along with methods for evaluating them.

Although the primary objective of our framework is to evaluate the impact of education programmes and guide decisions for improving their effectiveness, we found that the process of engaging deeply with the concept of impact itself offered significant value. Through scholarly exploration and reflexive conversations, we developed a deeper appreciation of our role and potential impact as educators in facilitating societal transitions. Even before undertaking an evaluation, our discussions revealed numerous opportunities for curriculum improvement – a 'side benefit' noted by others (Rogers & Weiss, 2007, p. 78). For this reason, we do not advocate a 'plug and play' approach to using the framework. Instead, we encourage educators committed to systems transformation to engage reflexively with each framework element, aligning it with their programme's objectives and anticipated outcomes. This approach may lead to further enhancements in programme design. Although our framework is focused on transdisciplinary capabilities, we believe that educators in diverse fields may find value in a similar process. By engaging critically with the concept of impact and adapting the framework to their institutional goals, higher education institutions can deepen their understanding of their contribution to long-term social and environmental change.

While our framework has strong theoretical foundations, it requires validation through practical application. Implementing the framework in practice will help identify

areas for refinement. One key area is the identification of unintended outcomes—both positive and negative—which can offer deeper insights into change mechanisms in complex systems and opportunities for improvement (Jones et al., 2017; Koehn & Uitto, 2017). Other underlying assumptions, such as the assumptions about the effectiveness of programme implementation, may also surface. Future research could further explore macro-level factors that shape impact, such as institutional or national contexts and societal discourses, as well as micro-level factors such as self-efficacy beliefs and motivation. Other interesting research questions include whether future-oriented capabilities evolve over time beyond formal education contexts, and if so, how, and whether organisation-level outcomes can be sustained over time, and in what conditions. The enactment of capabilities outside organisational contexts, for example through civic engagement, and related impacts could also be explored.

Conclusion

As higher education institutions are increasingly called upon to facilitate societal transitions, the proposed impact measurement framework fills a critical gap. It offers a structured approach to conceptualising and evaluating the impact of higher education programmes designed to develop graduates who can contribute to sustainable and equitable futures. By adopting an ecological framing of change mechanisms, the framework articulates the often-implicit assumptions about how higher education programmes contribute to societal transitions. It provides a practical guide for assessing the direct and indirect outcomes of educational programmes at individual, organisational and societal levels over time. If consistently applied, it could enable benchmarking progress across institutions.

Beyond providing a structure for collecting and evaluating evidence of impact, the framework encourages deeper reflection on programme design and higher education institutions' long-term role in fostering societal transitions. Most importantly, the study aims to inspire action, inviting higher education institutions to re-imagine the impact of their education programmes beyond university boundaries, and consider how they can more effectively contribute to long-term social and environmental sustainability.

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ORCID

Annabelle Lewis http://orcid.org/0009-0006-9203-3302
Giedre Kligyte http://orcid.org/0000-0003-1422-2504
Jacqueline Melvold http://orcid.org/0000-0003-4387-6523

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