Smart and Sustainable Built Environment

Cultivating sustainable architecture and built environments through cross-cultural education

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Abstract

Purpose – This paper examines the thrust, process and implementation of TNE programmes, using the TRANSABE-EDU collaborative project as a case study in architecture and built environment (ABE) postgraduate education. The project seeks to develop transdisciplinary, transnational education (TNE) programmes in ABE by integrating the educational strengths and cultural insights of British and Egyptian institutions.

Design/methodology/approach – This study employs a comprehensive methodology, integrating systematic literature reviews, stakeholder engagement, benchmarking analyses and content analysis to develop a framework for transdisciplinary TNE programmes. Data were gathered using bibliometric tools, qualitative content analysis and stakeholder workshops in Egypt and the UK.

Findings – The study identifies critical gaps, including the lack of interdisciplinary approaches and limited integration of emerging technologies. It highlights key opportunities for enhancing collaboration through TNE programmes, such as developing joint degree offerings, embedding sustainability throughout curricula and harnessing digital platforms for collaborative learning.

Research limitations/implications – As an insightful case study for the British Council, the TRANSABE-EDU project demonstrates practical methods for conceptualising and administering TNE programmes. The outcomes

Research Ethics approval has been granted by relevant committees at University. Further information will be added after the review of the paper. At this stage, we believe details of acknowledgement should be anonymised. Two AI tools VOSviewer and InfraNodus were used for conducting bibliometric analyses. VOSviewer assisted in visualising keyword networks, and InfraNodus was used for mapping discourse structures and identifying thematic patterns across the literature.

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would set benchmarks for establishing transdisciplinary courses in ABE, elevating future TNE initiatives' quality and long-term viability. The empirical validation of the curriculum is outside the scope of this paper and will be independently conducted, with results to be presented in a subsequent paper.

Practical implications – The practical implications of this study address diverse beneficiaries. Academic administrators and policymakers should prioritise investment in state-of-the-art learning management systems that support hybrid, flexible teaching methods tailored to diverse international student bodies. Institutions should implement continuous professional development programmes placing emphasis on enhancing digital literacy, cross-cultural communication and transdisciplinary teaching practices. Coordinated policy efforts, such as establishing global accreditation standards for TNE provisions and streamlining administrative processes, are crucial to sustain and expand high-quality TNE programmes.

Originality/value – This research connects cross-cultural collaboration with transdisciplinary approaches in ABE education. It offers a pioneering framework for TNE programmes that prioritise sustainability, cultural relevance and innovative pedagogical techniques.

Keywords Transnational education, Cross-cultural collaboration,
Architectural and built environment education, Sustainability, Curriculum development

Paper type Research paper

1. Introduction

By 2050, 68% of the global population will reside in urban areas – primarily in developing regions-posing unprecedented challenges for higher education in architecture and the built environment. (Bodycott and Walker, 2000; Memmott and Davidson, 2006; Salama, 2016). This demographic shift demands adaptable and context-sensitive curriculum frameworks that -equip students to address complex urban issues and ecological challenges. In response, cross-cultural collaboration has emerged as a promising approach to equipping future professionals with the transdisciplinary skills needed for such challenges.

Emerging research in the field of ABE education demonstrates the importance of integrating transdisciplinary and cross-cultural perspectives in educational curricula. Collaborations among institutions in different cultural contexts have proven effective in fostering comprehensive programs that reflect real-world professional environments (Cader, 2023; Stacey, 2023; Tsiligkiris *et al.*, 2023). Moreover, UNESCO's finding that 40% of cultural heritage sites are at risk highlights the critical need for educational programs that can bridge cultural divides and harness diverse international expertise (Lázaro Ortiz and Jiménez de Madariaga, 2022; Rössler Chief, 2006). Cross-cultural design methodologies have become necessary, providing students with the intellectual tools to understand and respect complex cultural landscapes while developing sustainable and contextually sensitive solutions to built environment challenges (Clarke *et al.*, 2020).

In this context, the TRANSABE-EDU project—funded by the British Council under the UK-Egypt Transnational Education Grants (2023–24)—serves as a practical model for implementing transdisciplinary, transnational education (TNE) programs. The project leverages the educational strengths of both UK and Egyptian higher education institutions to foster a holistic and culturally informed approach to Architecture and the Built Environment (ABE). International collaborative learning experiences, often facilitated by digital platforms and project-based methods, simulate the professional challenges that students will face in a globalised world (Gunarathna *et al.*, 2024; Stacey, 1999; Tang, 1993).

Despite the potential benefits, cross-cultural educational collaborations can be impeded by communication barriers, disparate educational systems, and technological disparities (Vladimirova and Le Blanc, 2016). However, these challenges also present opportunities for innovation, driving educational institutions to develop more flexible, adaptive, and technologically integrated learning environments.

This paper examines how cross-cultural collaborations in higher education—exemplified by the TRANSABE-EDU project—can advance transdisciplinary curricula in ABE. By analysing existing literature and best practices, the study aims to develop a theoretical framework for TNE programs that integrates the strengths of diverse educational systems, as demonstrated by comparative insights from the UK and Egyptian contexts. Such an approach

is critical for addressing rapid urbanisation, environmental challenges, and the need for sustainable development while simultaneously preparing a new generation of architects and built environment professionals who are both technically proficient and culturally astute (Salama, 2021; Burton and Salama, 2023).

Furthermore, this paper contributes to ongoing discussions on sustainable development, cultural sensitivity, and educational innovation, offering recommendations for preparing a new generation of architects and built environment professionals capable of addressing today's global challenges (Calikusu *et al.*, 2023; Dessouky, 2016; El-Kholei and Yassein, 2023).

2. Research design and methodology

This study adopts a holistic and iterative approach, grounded in transdisciplinary research and cross-cultural collaboration, to develop a robust theoretical framework for transnational education (TNE) in Architecture and the Built Environment (ABE) (Figure 1). As a case study, the TRANSABE-EDU project—funded by the British Council under the UK-Egypt Transnational Education Grants (2023–24)—provides a real-world model for this exploration. The proposed framework is designed to align with international standards by integrating key principles from established guidelines, including British Council TNE reports and transnational education classification frameworks for International Programme and Provider Mobility (IPPM) (Cader, 2023; Knight and McNamara, 2017; Tsiligkiris *et al.*, 2023). These guidelines inform how core elements of quality assurance, robust accreditation processes, and clear definitions of program delivery modes can be incorporated into the proposed framework to ensure the project meets global benchmarks while addressing local needs.

The methodology integrates a systematic literature review conducted using bibliometric analysis, stakeholder engagement through workshops, and iterative curriculum development using content analysis, with an emphasis on feedback loops for integrating diverse perspectives and emerging trends This study addresses a critical gap in the literature on TNE in ABE by developing a unified framework and a contextual approach that integrates transdisciplinary curriculum with cross-cultural collaborations between UK and Egyptian institutions. The study is structured around three key research objectives:

Objective 1: Assessing the Impact of Cross-Cultural Collaborations in Education: To examine how cross-cultural and transdisciplinary collaborations influence ABE education through TNE, the study employs three main methodological components:

(1) *Systematic Literature Review:* A comprehensive analysis of key documents and academic articles, including British Council reports on TNE initiatives in the UK and

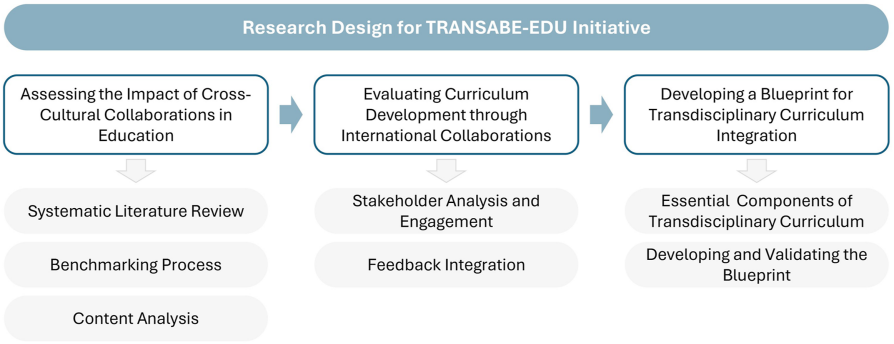

Figure 1. A three-phase mechanism illustrating the development of a transdisciplinary TNE master's program, progressing from cross-cultural collaborations to framework creation and validation. Source: The authors

Egypt, is conducted. Bibliometric tools such as VOSviewer and Infranodus are used to analyse approximately 500 academic articles, identifying prevalent themes and research gaps in TNE (van Eck and Waltman, 2010; Paranyushkin, 2019; Wong, 2018).

(2) *Benchmarking Process:* An inventory of existing master's programs in ABE in the UK and Egypt is compiled, followed by a detailed comparative analysis of teaching methodologies, assessment criteria, and specialisation areas to identify best practices.

(3) *Content Analysis:* Qualitative techniques evaluate core curriculum components—focusing on areas such as conservation, heritage, and sustainability—to highlight best practices and identify areas for enhancement (Hsieh and Shannon, 2005; Zhang and Wildemuth, 2009).

Objective 2: Evaluating the Role of International Partnerships in Curriculum Development: To analyse the influence of cross-cultural collaborations within TNE on curriculum development, the methodology includes:

(1) *Stakeholder Analysis and Engagement*: Ascertain current expectations and needs through a rigorous analysis of enrolment data, industry trends, and professional standards. Interactive in-person workshops are conducted at partner institutions to foster peer-to-peer learning, and online workshops are facilitated by collaborative software (e.g. Miro), to enable effective brainstorming and idea exchange.

(2) *Feedback Integration:* A structured process incorporates feedback from online and in-person workshops, with tools such as Microsoft Forms collecting data for qualitative analysis to inform curricular refinement.

Objective 3: Proposing a Conceptual Framework for Transdisciplinary Curriculum Integration: To adapt and integrate existing ABE curricula into a new transdisciplinary model, the study follows these steps:

(1) *Identification of Essential Curriculum Components:* Key elements for a transdisciplinary curriculum are defined, including specialised modules (e.g. health, sustainability, urban resilience), sustainable financial models, robust partnership structures, preferred TNE program types (joint and dual degrees), and flexible learning and delivery models (asynchronous and blended learning). This step is informed by comprehensive benchmarking and content analysis.

(2) *Development and Validation of the Curriculum Framework:* A framework is developed and validated through a comprehensive survey. This survey will engage key stakeholders, including academic staff, industry partners, and prospective students. Survey findings will be presented in -forthcoming outputs, providing empirical validation and guiding further refinement of the framework.

By using the TRANSABE-EDU project as a case study, this multi-layered research design comprehensively addresses the challenges of developing cross-cultural, transdisciplinary ABE programs that meet both local needs and international standards.

3. Findings and educational impacts

This section summarises the key findings on cross-cultural collaborations in transnational education (TNE) for architecture and the built environment. They are as follows:

3.1 Assessing the Impact of Cross-Cultural Collaborations in Education

The findings for the first objective, which aimed to examine the impact of cross-cultural and transdisciplinary collaborations through TNE in ABE, reveal several key insights:

(1) *Bibliometric Insights:* Analysis of 500 academic articles exported from the Web of Science and selected using specific keywords related to transnational education (TNE) and Architecture Built Environment (ABE) revealed a growing emphasis on multinational educational models and the impact of immigration policies. This exercise reflected broader trends in global educational strategies and the expanding scope of TNE programs in ABE education.

(2) *Educational Mobility and Quality Assurance:* The review of the British Council's reports and case studies highlighted educational mobility as vital for TNE initiatives. Recent years focused on expanding dual and joint degree programs to access internationally recognised programs locally. Notably, several quality assurance standards are being implemented, by key validation and accreditation bodies, through rigorous accreditation processes to align the ABE curriculum with national and international standards.

(3) *TNE Types and Models:* Diverse TNE models recognised by the British Council were identified and examined, including branch campuses, distance learning, online courses, and dual/joint degree programs. Each model presents unique conditions for integration into ABE education, particularly in adapting to local needs while maintaining international standards.

(4) *Diverse Educational Themes:* The study identified foundational themes crucial for modern ABE education, including retrofitting, heritage conservation, global urbanism, and sustainability. These themes strongly emphasise integrating global perspectives with local contexts in TNE programs.

(5) *Influence of TNE on Local Educational Practices:* The investigation underlined that TNE programs often catalyse educational innovation within host countries. These programs influence local educational policies and practices, fostering an environment of international academic exchange and collaboration in architectural education.

3.1.1 Bibliometric Insights. The bibliometric analysis involved the selection of 500 academic articles on Transnational Education (TNE) from the Web of Science involved a systematic approach. Initially, a search query was formulated using keywords related to Transnational Education, such as "transnational education", "cross-border education", "transnational education in the UK", "transnational education in Egypt", "transnational education by British Council", "cross-cultural collaborations", "architecture", "built environment", and "international higher education". The search was refined by setting specific filters to include only peer-reviewed articles published in English.

To ensure relevance and quality, filters were applied to select articles published within the last ten years, capturing the most current trends in TNE. Articles not focused primarily on TNE, or its direct implications were excluded. The remaining articles were bulk-downloaded from Web of Science, with metadata—including titles, abstracts, keywords, and citation information—exported for bibliometric analysis. This dataset was then imported into VOSviewer and Infranodus. VOSviewer generated bibliometric maps that visualised key themes, authors, and interrelationships within TNE research. Infranodus provided a detailed thematic analysis of textual data in titles and abstracts, revealing prominent discourse patterns and thematic structures.

Analysis of 500 articles indicates a shift toward multinational educational models and highlights the influence of immigration policies on TNE, particularly in architectural ABE education. TNE frameworks are characterised by quality assurance, global education initiatives, international collaboration, institutional status, diverse delivery models, and tertiary partnerships (Figure 2) (Dessouky, 2016; Stacey, 2023; Zejnilovic *et al.*, 2023).

Quality assurance in TNE ensures that educational standards meet both international benchmarks and local needs, underscored by rigorous accreditation and evaluation processes

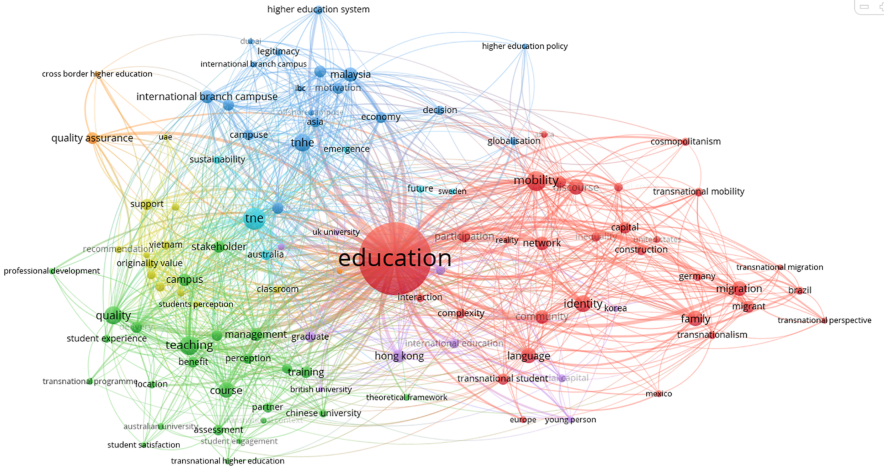

Figure 2. A bibliometric network visualisation highlighting the main thematic clusters and interconnections in transnational education research, illustrating how concepts such as mobility, quality assurance, and teaching converge around the central theme of "education". Source: The authors

(British Council). Global education initiatives are critical for preparing students for a globalised society by facilitating access to UK-accredited qualifications locally, thus broadening horizons and improving employability (Beine *et al.*, 2014; Cader, 2023).

International collaboration, as seen through joint and dual degree arrangements—such as those offered by the University of Huddersfield—integrates UK and Egyptian strengths, enriching academic offerings and promoting cross-cultural teaching innovations. Additionally, the institutional status of UK universities often elevates educational quality and enhances curriculum development at host institutions.

TNE programs utilise various delivery models, including dual/joint degrees, validation programs, franchised programs, and branch campuses, each with unique benefits and challenges. For example, branch campuses provide direct access to UK higher education in Egypt without requiring relocation (Knight, 2015; de Souza-Daw *et al.*, 2019). Finally, tertiary partnerships between UK and Egyptian institutions are vital for creating a sustainable TNE ecosystem, fostering knowledge exchange, and supporting research initiatives that address local challenges (de Wit and Altbach, 2021).

3.1.2 Educational mobility and quality assurance. The British Council's reports and academic literature emphasise that educational mobility is crucial for the success of TNE. This mobility exposes students to diverse educational systems and cultures—primarily through UK-Egypt partnerships—allowing them to earn UK-accredited qualifications locally, broaden their horizons, and enhance global employability (Knight, 2015; McBurnie, 2013).

Furthermore, focusing on quality assurance measures is essential for maintaining high educational standards across diverse geographical and cultural contexts. The review of British Council reports emphasises the need for robust accreditation processes and regular evaluations in TNE programs to ensure curricula meets both local needs and international standards. For example, University of Huddersfield in the UK offers Dual degree programs which undergo external quality assurance reviews conducted by bodies like the Quality Assurance Agency for Higher Education (QAA). These reviews ensure that the programs meet national academic standards. Similarly, TNE initiatives in collaboration with the Arab Academy for Science, Technology, and Maritime Transport in Egypt integrate local quality assurance offered by

National Authority for Quality Assurance and Accreditation of Education (NAQAAE) to uphold the high standards set by their home campuses (Ahamer, 2014; Coleman, 2003; McBurnie and Ziguras, 2006; Smith, 2010; Woodhouse, 2006).

Overall, the combined emphasis on educational mobility and quality assurance benefits students and drives local educational innovation. TNE programs introduce global teaching methodologies and curricula that catalyse academic collaboration and improve pedagogical practices in host countries (Brooks and Waters, 2010; Mellors-Bourne *et al*., 2014; Moutsios, 2009 Yang and Cheng, 2018).

3.1.3 TNE Types and Models. TNE programs between UK universities and Egyptian institutions employ mainly dual and joint degree programs to enable the sharing of resources and expertise. They foster academic collaboration while integrating curricula that maintain both international standards and local requirements. For instance dual degree program, by the University of Huddersfield in collaboration with the Arab Academy for Science, Technology and Maritime Transport that allows students to earn degrees recognised in both the UK and Egypt (Cader, 2023). Similar dual degree arrangements exist at the University of Hull and the University of Northampton, which offer engineering and computing degrees.

Branch campuses, as exemplified by Coventry University, allow direct access to UK education within Egypt. In validation programs, UK universities, such as London South Bank University, validate courses at local institutions, ensuring that students receive UK-accredited qualifications while studying locally (Cader, 2023).

Additional models include franchised programs, where institutions like the University of Central Lancashire, adapt UK-designed curricula to the local context under strict quality assurance. Finally, collaborative partnerships without formal dual or joint degrees—such as King's College London's program in economics with New Giza University—further enhance academic collaboration. Overall, these diverse TNE models reflect a commitment to quality education that meets local needs and international standards, emphasising continuous collaboration to adapt curricula to local contexts.

3.1.4 Diverse educational themes. The British Council reports and review of offered courses available on university websites indicate a diverse range of transnational education (TNE) programs offered by the UK and Egyptian universities in architecture and related fields. The majority of programs in Architecture, Urban Planning, and Construction Management indicate high-demand fields, whereas Heritage and Conservation, BIM and Digital Modelling and Sustainable Architecture highlight emerging programs. In the UK context, in the field of Architecture and Urban Planning, notable offerings include the Architecture BArch (Hons) program, which is RIBA-accredited and emphasises creative projects, sustainability, and urban design through comprehensive design studios and interdisciplinary studies. Another significant program is the BA/MA Architecture, which combines architectural education with a strong emphasis on integrated practice in immersive design projects and optional courses that explore architectural histories or digital culture.

Additional examples include the MSc Sustainable Mega-Buildings program which integrates sustainable development principles into architectural practices. The Architecture – BA (Hons) along with sustainable design principles explores structural design, and climate emergency concerns. The Urban Data Science and Analytics MSc, reflects a growing emphasis on data-driven approaches in urban planning and management, aligning with global trends towards smart cities.

In contrast, TNE programs in Egypt, predominantly focus on Architectural Engineering and reflect local priorities and foundational engineering needs. Specialised fields such as Sustainability in Architecture, Environmental Design and Heritage and Conservation remain comparatively limited. Programs focusing exclusively on Heritage Conservation integrate historical contexts and preservation techniques. Lastly, in Professional Practice and Industry Integration, the MPhil in Architecture and Urban Studies aims to bridge academic learning and industry and real-world needs, preparing students for professional careers in architecture through practical engagement.

3.1.5 Influence of TNE on local educational practices. The analysis suggests that Transnational education (TNE) programs are emerging as catalysts for educational innovation in Egypt, reshaping local policies and practices while fostering international academic exchange in architectural education. For example, dual degree programs between UK institutions— facilitate the integration of UK-accredited qualifications with locally adapted curricula, enabling Egyptian institutions to upgrade their academic framework in line with global benchmarks.

TNE further enriches local educational frameworks by introducing international perspectives aligning with global best practices. Stakeholder insights reveal that TNE programs can promote curriculum redesign by adopting transdisciplinary approaches, integrating technology and addressing contextual challenges. Additionally, TNE influences institutional governance and policymaking by fostering the alignment of administrative structures, quality assurance mechanisms and accreditation standards among partner institutions. This infusion of global expertise enriches student learning experiences and drives institutional reforms, encouraging universities to adopt modern practices and robust regulatory frameworks (Keay *et al.*, 2014; Ottley, 2023; Owusu-Agyeman and Amoakohene, 2020).

Moreover, these TNE initiatives promote academic development and capacity building by providing local academics with opportunities to engage in international training, collaborative research, and exposure to advanced pedagogical methods (Hajirasouli *et al.*, 2024). This professional growth strengthens local academic networks and encourages the creation of research clusters that drive innovation in ABE. Engaging students with the industry through internships, practitioner-led workshops, and collaborative projects offers the opportunity to gain valuable real-world experience and improves their global employability outlooks.

3.2 Benchmarking process

The benchmarking process for TNE initiatives in the UK and Egypt has become a strategic tool for assessing master's programs in architecture and the built environment. Identifying curricular gaps and opportunities enables highlighting the need to integrate transdisciplinary approaches while balancing local needs and global standards. On the one hand, TNE initiatives offered by UK institutions include master's programs in architecture and specialisations in construction management, urban planning, sustainable architecture, and building information modelling (BIM) (see Figure 3). For example, the University of Liverpool offers MSc in Climate Resilience and Environmental Sustainability in Architecture, the University of

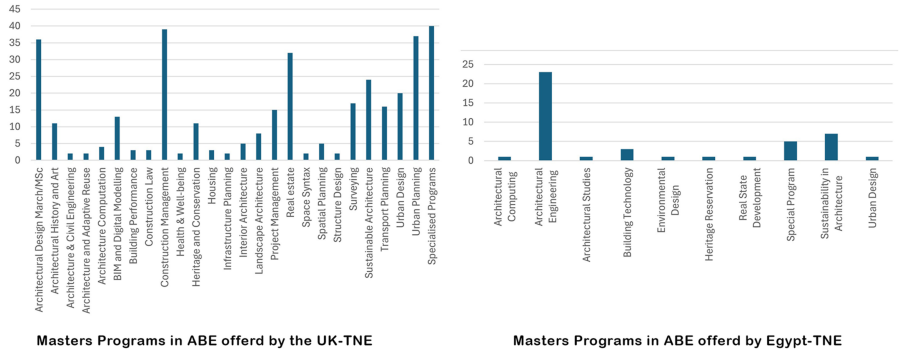

Figure 3. Charts compare the distribution of master's programs in architecture and the built environment in the UK and Egypt institutions, illustrating prominent areas such as construction management, urban planning, sustainable architecture, and architectural engineering across different institutional contexts. Source: The authors

Sheffield's MSc offers Sustainable Architecture Studies, and the University of Westminster's Master of Architecture runs a program with modules in digital media. This demonstrates a proactive integration of technology and sustainability.

On the other hand, Egypt's TNE initiatives prioritise context-specific challenges such as programs on Architectural Engineering and Sustainability that address local developmental challenges while preserving cultural heritage. These programs maintain cultural relevance and foster the development of regional expertise. Programs such as Architectural Engineering, Heritage Conservation, and Sustainability in Architecture are specifically designed to address the unique environmental and urban planning of Egypt's urban landscape.

The benchmarking analysis identified three limitations in curriculum design. First, a lack of transdisciplinary approaches, which limits a graduate's ability to address interconnected real-world challenges such as climate resilience across multiple disciplines. Second, while the adoption of BIM is increasing, the curricula often lack robust integration of emerging technologies, such as artificial intelligence, big data, and virtual reality, which are essential skills in contemporary architectural practices. On the other hand, programs in Egypt focus on sustainability and heritage conservation and could benefit from broader alignment with international architectural discourse, particularly in integrating digital technology to visualise and simulate the challenges of urbanisation. Third is the flexibility of customising learning and delivery models where the need for more part-time and modular courses, that can cater to the diverse needs of working professionals and international students, are on the rise.

Nevertheless, the opportunities for enhancement are substantial. There is tremendous potential to develop joint and dual degree programs that facilitate more profound cultural exchanges and provide a holistic educational experience by combining resources and strengths from UK and Egyptian institutions. Furthermore, there is a crucial opportunity to embed sustainability more thoroughly across all programs through curriculum innovation and practical projects that partner with industry leaders. Using digital collaboration platforms and virtual learning environments could offer new models for transnational studio work and shared projects, revolutionising the learning experience and providing diverse educational exposures. Additionally, aligning future programs with global standards to address challenges such as climate change, urban density, and heritage conservation can significantly boost the impact of TNE initiatives.

3.3 Content analysis

The content analysis for developing new master's programs in architecture and the built environment was conducted through a systematic review of existing course materials, delivery models, learning methodologies, and assessment criteria. Approximately 30 programs in architecture and allied disciplines offered by UK TNE institutions were analysed as a part of this study. Those programs that closely align with the four proposed programs were subjected to content analysis to identify key components for developing the transdisciplinary curriculum.

Initially, objectives for the new courses were defined based on gaps identified via bibliometric analysis and benchmarking (see Figure 4). For instance, if public health considerations emerged as a critical gap in urban design, the course content was tailored to address these intersections. This foundational step ensured that courses targeted the most relevant areas within the field. Subsequently, a diverse array of credible sources was gathered—including academic journals, industry reports, textbooks, and curricula from leading institutions—to build a comprehensive content base. This extensive collection process guaranteed that the materials were diverse, current, and well-suited for further analysis and development.

The collected data was rigorously analysed to confirm coverage of all essential topics. For example, a course on Sustainable and Resilient Urbanism comprised modules on sustainable materials, urban planning laws, case studies on resilient cities, and emerging sustainable

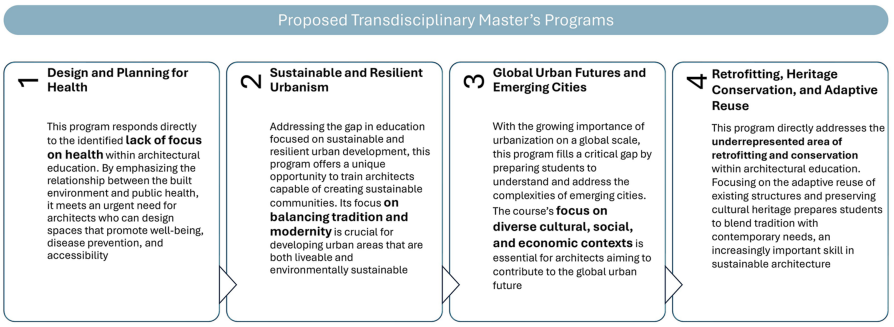

Figure 4. An overview of four proposed transdisciplinary master's programs in architecture and the built environment, each addressing a critical gap in current education: health-focused design, sustainable and resilient urbanism, global urban futures, and heritage conservation with adaptive reuse. Source: The authors

technologies, ensuring robustness and alignment with program goals. Multiple delivery models were evaluated to determine the most effective teaching methods. Traditional lectures, blended learning, workshops, and collaborative projects with external organisations, are considered in the proposed programs as instructional approaches. Learning models were structured to foster active engagement and critical thinking. For example, project-based learning was integrated into courses like Global Urban Futures and Emerging Cities, where students tackled real-world urban planning scenarios through team-based projects. Finally, assessment criteria were developed to measure both theoretical understanding and practical application. Courses such as Retrofitting, Heritage Conservation, and Adaptive Reuse used practical design projects, presentations, and written exams to evaluate students' abilities to translate concepts into real-world solutions.

A practical example of this process is presented in the course "Design and Planning for Health." The content for this course was collected from sources detailing health-promoting design principles, urban planning case studies, and research on the impact of built environments on health. The course was structured to cover essential topics such as walkability, green spaces, pollution control, and accessibility within urban design. A mixed delivery model combining theoretical lectures and practical studio sessions was chosen to enable students to apply health considerations in urban design mock-ups. A collaborative learning approach was implemented, allowing students to tackle design challenges in groups based on real-world scenarios. Assessment criteria were crafted to require students to design projects that integrated health considerations and to critically analyse urban spaces from a public health perspective.

Through these systematic steps, the content analysis ensured that each course was comprehensive, applicable, and directly aligned with both identified educational needs and current industry demands, effectively bridging the gap between academic learning and practical application.

4. Evaluating curriculum development through International Collaborations

The findings for the second objective reveal several critical insights based on stakeholder feedback regarding the development of master's programs in architecture and the built environment:

(1) Feedback on Learning and Delivery Models: Stakeholders supported hybrid learning environments that blended online and face-to-face interactions. This model is essential for accommodating diverse student access needs while ensuring consistent engagement and inclusivity.

(2) Assessment Strategies: A clear consensus emerged among stakeholders on the need for flexible assessment frameworks that fairly evaluate learning outcomes across both online and in-person delivery models. Curriculum Content and Design: Stakeholders emphasised the importance of balancing theoretical knowledge with practical skills. Stakeholders highlighted that curricula should incorporate up-to-date technological competencies and soft skills, such as critical thinking and adaptability, to prepare graduates for the evolving demands of the profession. Cultural and Contextual Relevance: Stakeholders highlighted the need for curricula that are both culturally relevant and contextually adapted and the local environments of Egypt and the UK This approach ensures that educational content is both globally applicable and locally relevant.

The insights are systematically presented under two distinct headings: “Insights from Stakeholder Workshops” and “Feedback Integration.”

4.1 Insights from stakeholder workshops

Key insights resulting from stakeholder workshops in Egypt and the UK which enabled academics, educators, administrators, and industry partners to exchange ideas (see Figure 5). As a result, strategies for embedding transdisciplinary approaches into architectural education have been identified. Participants addressed critical issues, including curriculum revisions, flexible program structures, learning models and the assessment criteria. These insights contributed to shaping the proposed framework for transnational education in architecture and the built environment.

4.1.1 Egypt workshop. The first in-person workshop was hosted by Galala University in Egypt on May 20, 2024, and focused on examining strategies to integrate transdisciplinary approaches into the ABE curriculum. Approximately 27 participants, including academics, administrators, faculty members, key stakeholders and experts from institutions such as Ain Shams, Cairo University, BUE, and Coventry-Egypt participated in this workshop. Invitations were circulated through existing academic networks and institutional partnerships, allowing the team to engage with a wide spectrum of participants. The session further addressed operational deficiencies in Egyptian architecture programs and emphasised the need for stronger administrative and legal frameworks, alignment with international standards, and the impact of cultural differences on program development.

Participants emphasised the benefits of integrating transdisciplinary teaching approaches, such as solution-oriented approaches, problem-solving exercises, real-world problems, effective communication, and teamwork by utilising innovative technologies. Participants recognised that these enhancements could significantly improve educational outcomes and prepare students for a competitive global market.

Figure 5. Glimpses from the two in-person workshops in Egypt and the UK Image on the left: Workshop at Galala University, Egypt. Image on the right: Workshop at Northumbria University. Source: The authors

The workshop reviewed opportunities for UK-Egypt collaborations in transdisciplinary master's programs and emphasised how shared resources and international exposure can enhance adaptability to various professional contexts. It was agreed that a comprehensive approach to curriculum reform and program development is needed to address significant deficiencies, such as outdated curricula, insufficient practical training, and a lack of interdisciplinary approaches.

Participants discussed cultural influences on educational models, strategies for aligning master's programs with UK and Egyptian qualification frameworks, and the role of virtual learning environments in supporting transnational education. Building on this discussion, potential collaboration platforms have been identified. This includes annual international conferences, joint research projects, and shared digital learning platforms, along with overcoming obstacles such as funding constraints and curricular resistance. Overall, this workshop laid a solid foundation for the project's further development, setting administrative, legal, and operational strategies to advance transdisciplinary master's programs effectively within both local and international contexts.

4.1.2 UK workshop. The UK workshop, conducted at Northumbria University on 16 July 2024, brought together 15 participants from Galala University, the UK teams, and Northumbria University to refine the master's program structure. The session began with a presentation summarising key insights from the Egypt workshop, framing discussions for the UK session. The primary aim was to enhance the transdisciplinary educational framework for architecture and the built environment by evaluating teaching models and integrating financial and curriculum considerations.

The consensus on program duration and mode emphasised flexibility. While some favoured a one-year intensive program for quicker professional readiness, others preferred a 1.5- to 2-year duration for a deeper educational experience. Stakeholders suggested offering multiple options to cater to the diverse needs of students. The teaching model preferences revealed mixed reactions to blocked teaching, with some supporting its focused approach and others expressing concerns about potential student overload. A balanced approach combining intensive sessions with more spread-out learning was proposed.

Discussions on the fee structure supported dividing costs based on each university's role in teaching and resources, ensuring fairness. There was strong support for a curriculum that blended UK educational excellence with Egypt's cultural heritage, offering a global perspective while maintaining local relevance. Emerging teaching methods such as MOOCs, virtual mobility, and work-integrated learning were seen as valuable additions, reflecting a shift toward more dynamic and accessible learning environments.

The workshop emphasised the importance of ongoing collaboration through online forums and workshops for long-term success. Preferences for a hybrid teaching model reflected a trend towards accessible and inclusive learning. Different assessment methods (e.g. written exams, design projects, group work, presentations and reports) can be aligned with diverse learning styles and meet the evolving demands of the architectural profession.

Overall, the workshop provided a framework for a flexible, innovative master's program that aligns with global standards while meeting the educational needs of the student and the demands of the architectural profession.

4.2 Feedback Integration

Integrating feedback from the two TRANSABE-EDU workshops—one in Egypt and the other in the UK—was pivotal in refining the transdisciplinary master's programs. A structured, multi-stage approach was employed to incorporate stakeholder insights effectively. In Egypt, detailed notetaking during discussions on transdisciplinary integration and international standards was supplemented by structured responses collected via Microsoft Forms. In the UK, similar notetaking was combined with real-time interactive polls to gather immediate feedback on program structures and teaching models. All collected data were analysed using

NVivo for thematic and gap analyses, revealing recurring themes such as the need for flexible program structures and the integration of cultural contexts.

Post-workshop meetings between the Egyptian and UK project teams were crucial for discussing the feedback in depth and developing action plans. These meetings led to curriculum adjustments that better addressed local and global environmental challenges and enhanced virtual learning environments through more effective hybrid models. To ensure transparency and continued engagement, the feedback results and subsequent adjustments were communicated to stakeholders via online meetings, providing a platform for further input and clarification.

5. Developing a framework for Transdisciplinary Curriculum Integration

The findings from Objective 3 reveal several key insights regarding the development of master's programs in architecture and the built environment:

(1) Identification of framework Components: Defined essential elements for the transdisciplinary curriculum, including specialised modules (health, sustainability, urban resilience), sustainable financial models, robust partnership structures, preferred TNE program types (joint and dual degrees), flexible learning and delivery models (asynchronous and blended learning), and aligned assessment criteria. These components were derived from comprehensive benchmarking and content analysis to ensure the curriculum meets global and local stakeholder needs.

(2) Framework Development and Validation: Developed a detailed curriculum framework based on the identified components and planned its validation through a comprehensive survey targeting key stakeholders such as faculty, industry partners, and prospective students. The survey findings will be presented in a subsequent paper, providing empirical validation and further refinement of the curriculum framework to ensure its effectiveness and relevance.

5.1 Development of curriculum framework components

The comprehensive analysis conducted through the TRANSABE-EDU project highlights the need for a detailed framework to develop transdisciplinary master's programs in architecture and the built environment. This framework ensures coherence and alignment by strategically integrating specialised modules such as health, sustainability, and urban resilience, identified through rigorous benchmarking and content analysis. By providing a clear roadmap, the framework (Figure 6) will facilitate structured curriculum development that addresses global challenges and the specific urban, environmental, and cultural contexts of the UK and Egypt (Caniglia *et al.*, 2018; Clarke *et al.*, 2016; Tian and Martin, 2014). Additionally, it incorporates

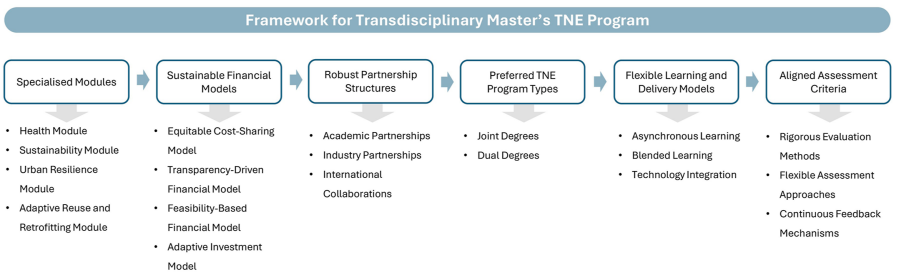

Figure 6. Framework for developing a transdisciplinary Master's TNE Program, highlighting key components such as specialised modules. Source: The authors

financial models and robust partnership structures, ensuring the program's longevity and effectiveness. These elements are crucial for creating a cohesive educational experience that meets stakeholder expectations and industry standards.

5.1.1 Specialised modules. The proposed MSc suite incorporates specialised modules that address critical areas such as Health, Sustainability, Urban Resilience, and Adaptive Reuse. These modules were developed through comprehensive benchmarking and content analysis to ensure they address current global challenges and align with stakeholder expectations.

For instance, the Health Module aims to integrate public health considerations into urban design offering courses on health-promoting design principles, walkability, accessibility, green spaces, pollution control, and the overall impact of built environments on physical and mental well-being. The outcome is to equip students with the skills to design urban spaces that enhance public health and well-being, addressing issues such as obesity, mental health, and chronic diseases through thoughtful architectural solutions.

The Sustainability Module emphasises the use of sustainable materials, energy-efficient design, renewable energy integration, waste management, and sustainable urban infrastructure. This module prepares graduates to develop strategies and designs to reduce environmental footprints and promote long-term ecological balance in their projects.

The Urban Resilience Module develops strategies for disaster risk reduction, climate adaptation, and resilient infrastructure design, through case studies of resilient cities that successfully withstand adverse events. The goal is to enable students to design urban systems that are adaptable, robust, and capable of sustaining functionality during and after adverse events such as natural disasters and climate change impacts.

Additionally, the Adaptive Reuse and Retrofitting Module equips students to transform and repurpose existing buildings to extend their life cycle. It incorporates using energy-efficient retrofitting techniques, and adaptive reuse design strategies, to improve resilience, reduce waste, and optimise energy performance in the built environment.

5.1.2 Sustainable financial models. In the context of the TRANSABE-EDU project, sustainable financial models revolve around transparent and equitable cost-sharing arrangements between Northumbria University and Galala University. This Equitable Cost-Sharing Model distributes program revenue and expenses directly in proportion to each university's contributions, including teaching, facilities, administrative support, and curriculum development. For example, if one institution takes on a larger share of the instructional load or invests more in delivering specialised modules, it would receive a higher percentage of the tuition revenue.

A Transparency-Driven Financial Model ensures open financial planning, regular reporting, and precise resource allocation documentation to maintain stakeholders' trust. Ongoing negotiations help ensure that the agreed-upon percentage split remains equitable as the program evolves. The model aligns with the Feasibility-Based Financial Model, where each institution commits only to costs within its capabilities, minimising the risk of financial strain. Over the long term, this model fosters sustainability by allowing each partner to expand or adjust its investment based on shifts in student enrolment, market demand, or academic priorities. The adjustment in the investment, exemplifies the Adaptive Investment Model. These models ensure the long-term viability and responsiveness of the TNE program.

5.1.3 Robust partnership structures. Robust partnership structures are fundamental to enhancing the quality and relevance of TNE programs. For example, academic partnerships are formed with leading universities and research institutions to foster joint research projects, faculty exchange programs, and collaborative teaching initiatives, enhance academic quality, provide access to a broader range of expertise, and foster innovation. Similarly, industry partnerships developed by collaborating with leading industries and professional organisations support the creation of internship programs, industry-led projects, guest lectures, and advisory boards. These opportunities align the curriculum with real-world demands, provide students with practical experience and improve job placement outcomes. International Collaborations engage global partners to incorporate diverse perspectives into

the curriculum through exchange programs, international conferences, and integrating global case studies. This promotes cross-cultural understanding, expanding students' global networks, and preparing graduates for international careers.

5.1.4 Preferred TNE program types. Stakeholders show a strong preference for joint and dual degree programs, reflecting a trend towards qualifications that integrate diverse perspectives and expertise. In joint degrees programs partner institutions from the UK and Egypt collaboratively design the curricula and co-award a single degree ensuring mutual recognition of credits and standards. This model offers students a comprehensive educational experience and leverages the strengths of both institutions, enhancing the degree's prestige and recognition.

Similarly, dual degrees programs allow partner institutions, to independently confer its own qualifications. Requiring coordinated course schedules, credit transfers, and administrative processes to facilitate a seamless dual degree graduation process. Graduates benefit from enhanced marketability as they earn credentials from both institutions, broadening their career opportunities. The benefits of joint and dual degrees also include rich cultural exposure through different academic traditions and practices.

5.1.5 Flexible learning and delivery models. Flexible learning is the foundation of the TNE approach designed to accommodate diverse student needs and schedules. Asynchronous learning enables students to access and engage with course materials (interactive modules), view recorded lectures, and complete assignments at their own pace, utilising online platforms. This type of learning accommodates students from different time zones and those with multiple personal and professional commitments, increasing accessibility and enrolment.

Blended learning combines online instructions and face-to-face sessions to maximise learning flexibility and engagement. This model integrates virtual lectures, in-person workshops, and collaborative projects, by leveraging the strengths of both online and traditional teaching methods. Additionally, technology integration is critical, with advanced technologies such as Building Information Modelling (BIM), virtual reality (VR), and data analytics being embedded into coursework and projects. Utilising tools like BIM and VR equips students with state-of-the-art skills essential for modern architectural practices, fostering innovation and practical competence.

5.1.6 Aligned assessment criteria. Developing aligned assessment criteria ensures that student performance is evaluated rigorously and fairly across various teaching and learning styles. The approach employs diverse evaluation methods including practical design projects, presentations, written examinations, and critical analyses. These assessment types ensure a comprehensive evaluation of students' knowledge, skills, and real-world application of concepts.

To accommodate diverse learning preferences, flexible assessment strategies are integrated. This includes combining individual and group evaluations, offering multiple project options, and incorporating formative assessments to provide insights into student progress. This flexibility caters to students' diverse needs, promoting fairness and inclusivity in evaluation.

Continuous feedback mechanisms utilising online forms, peer reviews, and instructor evaluations are embedded throughout the curriculum; this ensures that students receive timely, constructive guidance through which they can build on their strengths and address areas for improvement.

5.2 Framework validation

To validate the framework's effectiveness and relevance, the project conducted a comprehensive survey targeting key stakeholders, including faculty, industry partners, and prospective students. The survey gathered comprehensive feedback on curriculum components, teaching methodologies, and assessment strategies through quantitative and qualitative questions. Distributed via academic networks, industry forums, and online platforms, the survey ensured broad and diverse participation. Responses will be analysed

using tools like NVivo to identify common themes and pinpoint areas for improvement, enabling the project team to refine the framework based on stakeholder input. The survey findings will be presented in a subsequent paper, providing empirical validation and further refining the curriculum framework. This iterative validation process ensures that the master's programs remain academically rigorous, aligned with industry standards, and responsive to stakeholder needs, ultimately equipping graduates to excel in a dynamic and interconnected global landscape.

6. Discussion and conclusion

The TRANSABE-EDU project has advanced the understanding of how TNE programs in architecture and the built environment can integrate cross-cultural and transdisciplinary approaches to address urbanisation and environmental sustainability. The project demonstrates that well-designed TNE models can effectively bridge differences between academic systems, encouraging innovative approaches to curriculum that are informed by global perspectives while remaining grounded in local contexts.

Key findings from bibliometric analyses, benchmarking, and stakeholder workshops highlight the importance of robust cross-cultural partnerships in supporting educational mobility and quality assurance. The rise of TNE models such as dual/joint degrees, branch campuses, and validation programs reflect the capacity of these initiatives to align with international standards while responding to local needs. These results highlight the transformative potential of TNE in creating sustainable educational ecosystems that can adapt to rapid demographic and technological changes.

6.1 Challenges in cross-cultural integration

Cross-cultural integration in TNE poses significant challenges arising from differences in pedagogical traditions. For example, educational methodologies in the UK may differ significantly from those in Egypt, creating divergent teaching styles and varying student expectations. These discrepancies can lead to challenges in student engagement and potentially compromise the learning process and outcomes. Furthermore, maintaining consistent quality assurance standards across distinct regulatory and accreditation systems is challenging. However, this is crucial not only for the legitimacy of the programs but also for ensuring that degrees are globally recognised and valued.

Additionally, hybrid learning l models, which combine online instructions and in-person sessions, face several logistical challenges (Abbasnejad *et al.*, 2024). These include managing time zone differences, and technological disparities, and coordinating the synchronous sessions that require thoughtful and innovative management. Beyond these issues, disparities in language and academic terminology can hinder effective communication between academic staff and students. This necessitates enhanced support services and curriculum adaptation. Furthermore, varying expectations for student-teacher interactions and collaboration due to cultural differences may impede the establishment of an inclusive learning environment.

6.2 Opportunities for future development

The rapidly evolving landscape of TNE in ABE offers significant opportunities for growth and expansion, though not without challenges. Emerging technologies such as artificial intelligence, virtual reality, and augmented reality hold the potential to revolutionise and transform architectural and built environment education by creating immersive, interactive learning environments. These initiatives transcend traditional classroom boundaries and allow students to virtually explore complex urban environments and historical sites.

Moreover, there is considerable scope to extend these cross-cultural, transdisciplinary educational models to other ABE disciplines within the built environment, such as civil engineering, construction management, heritage conservation and urban design. This

expansion forges a more integrated approach to addressing the complexities of urban development. In addition, leveraging collaborative research initiatives through TNE can drive innovation while enhancing global networking opportunities. TNE programs can facilitate cross-country industry partnerships that can offer internships that can boost TNE graduate's employability. Lastly, longitudinal studies tracking the career trajectories of TNE graduates could provide valuable insights into the effectiveness of these educational models, offering a robust basis for future curriculum development and program structuring.

6.3 Policy recommendations

The proposed framework assists in identifying the key components necessary for the successful development and implementation of transdisciplinary TNE programs in ABE. Strengthening quality assurance is the key. It necessitates the development of international accreditation standards alongside ongoing evaluations by national and regional bodies to ensure the unique components of TNE are retained while maintaining academic excellence. This can also lead to the establishment of bilateral agreements between participating countries or creating specialised global accreditation bodies dedicated to overseeing TNE initiatives.

Furthermore, policies should facilitate the growth of joint and dual degree programs by streamlining administrative processes, such as visa provisioning for students and recognising dual degrees within national qualification frameworks. Additional policy implications include investing in robust data collection systems to monitor TNE program effectiveness and guide future policy development. Lastly, encouraging research collaboration and investing in advanced technologies will drive continuous improvement and position TNE as a vital component of national higher education strategies.

6.4 Practical implications

The practical implications of this study are far-reaching. Academic administrators and policymakers should prioritise investment in state-of-the-art learning management systems that support hybrid, flexible teaching methods tailored to diverse international student bodies. Institutions should implement continuous professional development programs placing emphasis on enhancing digital literacy, cross-cultural communication, and transdisciplinary teaching practices. Coordinated policy efforts, such as establishing global accreditation standards for TNE provisions and streamlining administrative processes, are crucial to sustain and expand high-quality TNE programs. Such measures will increase the adoption of joint and dual degree programs and promote effective quality assurance practices. The proposed framework equips policymakers with a robust tool to assess and enhance TNE initiatives, guiding reforms in architectural education and urban planning while effectively managing trade-offs between competing priorities. Its adoption can drive policies that integrate global best practices with local sustainability, resilience, and cultural needs.

Future research should build on these insights by employing longitudinal studies to derive metrics to track the impact of TNE on graduate success and institutional performance. Expanding the scope of analysis beyond the UK-Egypt context will be critical to validate and refine the framework in diverse international settings. Further research should also explore the scalability of the TRANSABE-EDU model across various disciplines within the built environment and examine the integration of emerging technologies—such as artificial intelligence, virtual reality, and augmented reality—to enhance TNE delivery. Comprehensive studies addressing these areas will not only deepen our understanding of TNE's impact but also inform the development of adaptive, responsive educational policies and practices.

6.5 Limitations

The proposed framework offers valuable insights into TNE and cross-cultural collaborations; however, its generalisability is limited. The data derived from stakeholder workshops,

bibliometric analyses, and benchmarking specific to the UK and Egypt may not capture the diversity of regulatory frameworks, institutional capacities, and cultural contexts in other regions. Therefore, a comprehensive understanding of the collaborating countries is essential before applying the proposed framework to different international settings. Future research should incorporate findings from the British Council's ongoing case and emerging TNE database, extending the analysis to a broader range of contexts to further validate and refine these findings.

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