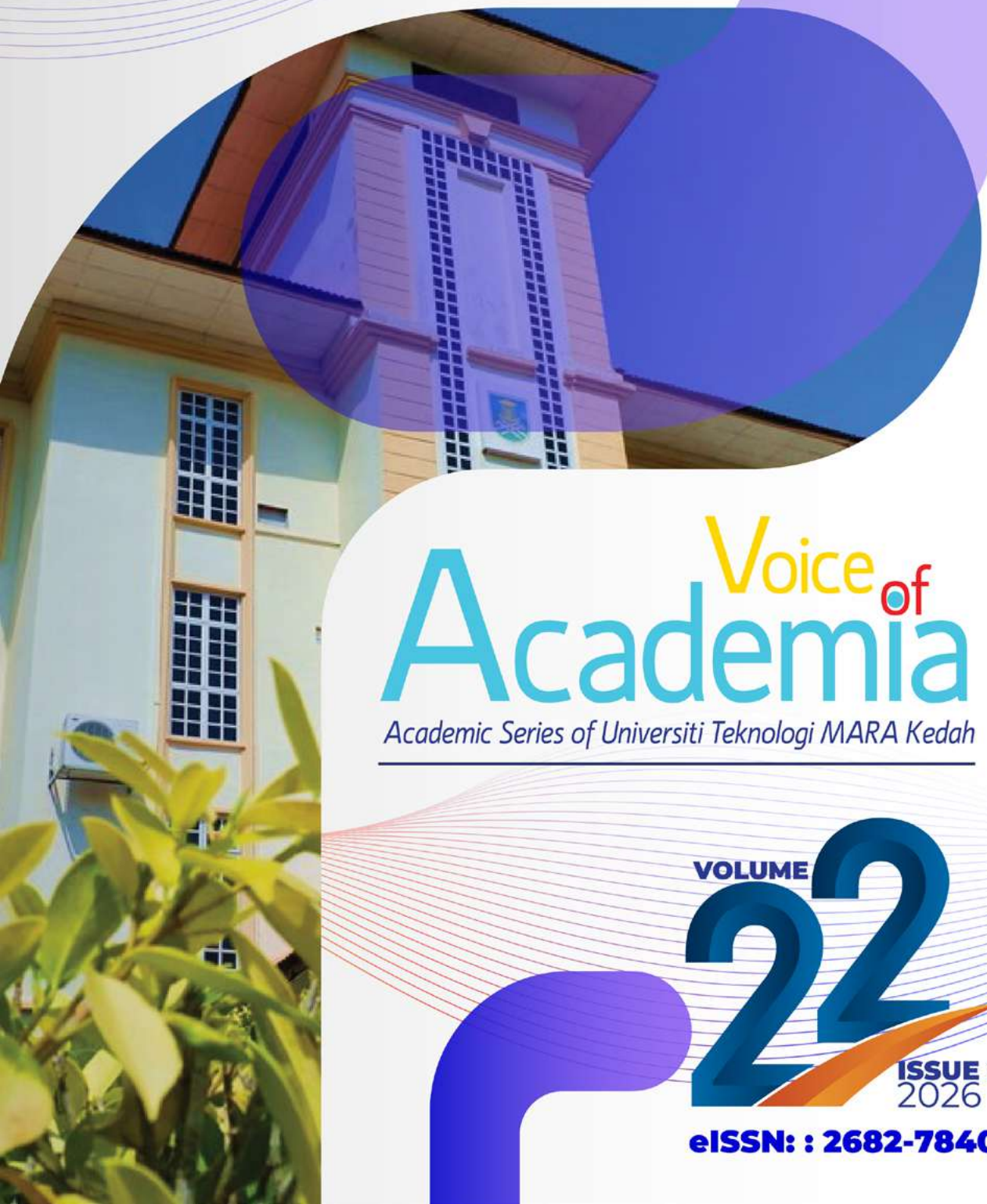

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Voice of Academia

Beyond Technical Competence: Aligning OBE And VBE For Future-Ready Engineering Technology Education

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ABSTRACT

The development of holistic, future-ready graduates remains a key priority in higher education, particularly in engineering and technology, where technical proficiency alone is insufficient. This study examines the alignment of Outcome-Based Education (OBE) and Value-Based Education (VBE) at the University as a practical pathway for integrating cognitive, technical, ethical and humanistic dimensions within existing curricula. OBE serves as the structural driver for learning outcomes, teaching strategies and assessment, while VBE provides the ethical overlay through values such as dignity, justice, integrity, gratitude, resilience and altruism. Four Civil Engineering Technology courses encompassing field-related work scope, were reviewed based on their alignment with Programme Learning Outcomes. Findings show that values can be embedded explicitly through structured activities and reflection, and implicitly through institutional culture, mentorship and learning environments. This alignment strengthens technical competence with ethical reasoning, social responsibility and professional accountability. The OBE-VBE framework offers a replicable model for nurturing technically skilled, employable, morally grounded and socially aware graduates.

1. Introduction

Outcome-Based Education (OBE) is a learner-centred approach that prioritises what students are expected to achieve, aligning curricula, instruction and assessment with clearly articulated learning outcomes that reflect requisite knowledge, skills and competencies (Zamir et al., 2022). Over the past two decades, OBE has gained widespread global adoption across higher education systems, professional

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accreditation frameworks and discipline-specific programmes, including engineering, medicine and teacher education, often governed by the respective professional bodies via programme accreditation (Sumathi et al., 2024). This shift reflects increasing demands for accountability, transparency and graduate employability, with institutions expected to demonstrate how learning translates into professional capability and societal contribution.

OBE also aligns closely with the United Nations' Sustainable Development Goal 4 (Quality Education), which emphasises inclusive, equitable and relevant education that equips learners to address complex social, economic and environmental challenges (Doss & Poursharif, 2024). By focusing on demonstrable outcomes rather than content coverage alone, OBE supports flexible learning pathways, lifelong learning and the application of knowledge beyond the classroom. International studies have also shown that OBE-oriented curricula can enhance critical thinking, problem-solving, communication and collaborative skills among students, competencies widely regarded as essential for 21st-century graduates (Martins et al., 2021; Zamir et al., 2022).

Despite these strengths, the implementation of OBE has revealed important limitations. In practice, many outcome frameworks continue to prioritise cognitive achievement and technical proficiency, while humanistic dimensions such as ethical reasoning, interpersonal competence, social responsibility and values formation remain underrepresented or implicitly addressed (Martins et al., 2021). These attributes, although widely recognised as critical to holistic graduate development and societal well-being, are often difficult to quantify and therefore marginalised within outcome statements and assessment practices. As a result, graduates may demonstrate technical competence without being adequately prepared to navigate ethical dilemmas, social complexity and professional responsibility in rapidly changing environments.

This limitation is further amplified by the rapid expansion of digital and AI-supported learning. While technology enhances access, efficiency and personalised learning, enabling students to learn independently and beyond formal classrooms, it cannot adequately support values formation, ethical judgement and professional identity development, which rely on human interaction, reflection and mentorship (Davis, 2024; Dakakni & Safa, 2023). Davis (2024) argues that AI possesses inherent limitations in replicating human consciousness, empathy and moral capacities, concluding that AI can support but not replace human teachers in the moral and qualitative aspects of education. Empirical evidence further demonstrates that widespread student reliance on AI raises equity, privacy and trust concerns that undermine values formation and require pedagogical intervention (Dakakni & Safa, 2023). Yet, existing OBE frameworks offer limited guidance on how such humanistic dimensions should be intentionally embedded and evaluated.

Despite growing recognition of the need for holistic and future-ready graduates, a clear research gap remains in models that explicitly integrate OBE with Value-Based Education (VBE). Existing studies often treat OBE and VBE as parallel initiatives, with limited attention to their systematic alignment within institutional practice (Sukerti et al., 2024; Pitriani et al., 2025). This paper addresses this gap by presenting a case study from Universiti Tun Hussein Onn Malaysia (UTHM), where an established OBE framework has been intentionally aligned with VBE principles grounded in the National Education Philosophy for Malaysia, written in 1988 and revised in 1996, which reads: *"Education in Malaysia is an ongoing effort towards further developing the potential of individuals in a holistic and integrated manner, so as to produce individuals who are intellectually, spiritually, emotionally, and physically balanced and harmonious, based on a firm belief in and devotion to God. Such an effort is designed to produce Malaysian citizens who are knowledgeable and competent, who possess high moral standards, and who are responsible and capable of achieving high levels of personal wellbeing, as well as being able to contribute to the harmony and betterment of the family, the society, and the nation at large."*

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Indeed, VBE in higher education is increasingly recognized as essential for cultivating ethically grounded, socially responsible and reflective graduates (Sukisno & Nurtjahyani, 2024). Beyond knowledge transmission, VBE emphasizes the development of ethical agency, civic engagement and moral reasoning, equipping students to address complex societal and professional challenges. Research demonstrates that value clarification learning significantly improves students' moral development and supports classroom methods that foster ethical reasoning and values integration. Effective VBE requires a whole-institution approach, embedding values across leadership, learning environments, discipline-specific and general academic programmes, as well as co-curricular activities (Doss & Poursharif, 2024). Contemporary trends further highlight holistic pedagogy, culturally responsive teaching, experiential learning, technology integration and multi-stakeholder collaboration as key strategies to enhance student engagement and personal growth (Pitriani et al., 2025).

In parallel, Denissova et al. (2025) emphasizes that amid rapid technological transformation and the accelerating cycle from knowledge creation to innovation, engineering education must go beyond technical competence to intentionally cultivate value-based learning and essential soft skills, such as ethical judgment, adaptability, collaboration and social responsibility, to prepare graduates as proactive architects of sustainable and future-ready societies. In a timely manner, the Malaysian Qualifications Framework (MQF) provides a national mandate for embedding VBE within academic programmes, ensuring graduates meet both professional standards and societal expectations (Rahimullah et al., 2020; Abidin et al., 2024). These developments underscore the importance of aligning the well-established OBE learning approach with VBE framework, creating new or refining existing curricula that integrate technical competence with humanistic values and preparing graduates to be truly holistic and future-ready.

Responding to Malaysia's national VBE mandate for holistic learner development through values-integrated curricula and participatory pedagogy, this study presents Universiti Tun Hussein Onn Malaysia (UTHM) as a practical case demonstrating systematic OBE-VBE integration within engineering technology education. Focusing on UTHM's Civil Engineering Technology programme, the research examines how learning outcomes can be reframed to integrate cognitive, technical, ethical and humanistic dimensions, providing an actionable pathway that aligns outcome-based education with values formation while preserving existing programme structures and accreditation compliance. The UTHM model operationalizes national educational philosophy within discipline-specific contexts, ensuring graduates are not only technically competent and employable but also ethically grounded, socially responsible and prepared for meaningful professional and societal contribution. While rooted in the Malaysian context, this framework offers transferable implementation strategies for higher education institutions globally seeking to cultivate holistic, future-ready graduates who embody both professional excellence and humanistic values.

2. Baseline Investigation

This study examines the intersection of Outcome-Based Education (OBE) and Value-Based Education (VBE) within the context of Universiti Tun Hussein Onn Malaysia (UTHM), a public technical university renowned for its engineering and technology programmes. Guided by Malaysia’s National Education Philosophy, UTHM aspires to develop graduates who are intellectually, morally, socially and professionally competent in response to national and global educational priorities (Ab–Rahman et al., 2022; Hamidi et al., 2024). The integration of VBE within the OBE framework addresses the Ministry of Higher Education’s mandate to ensure that graduates possess not only cognitive and psychomotor skills but also essential affective competencies, which are increasingly recognized as fundamental for quality education and societal contribution (IES, 2008; Mahrishi et al., 2025). In technical fields, the imperative

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for values integration is reinforced by accreditation requirements; for example, professional bodies such as the Board of Engineers Malaysia expect engineering programmes to encompass professional skills, including ethical conduct and complex problem-solving, alongside technical depth.

Recent literature indicates that while OBE structures effectively support cognitive and technical domains, the intentional integration of affective and value dimensions remains inconsistent and often depends on deliberate instructional design and assessment alignment to bridge technical proficiency with ethical and social character development (Pitriani et al., 2025; Sobry et al., 2024). Consequently, this baseline investigation adopts a qualitative, course-level review approach to examine how Course Learning Outcomes (CLOs) within four Civil Engineering Technology programmes can be critically mapped against core VBE dimensions, ensuring that values such as integrity, justice, and altruism are meaningfully embedded within existing technical competencies (Pitriani et al., 2025; Cai & Kosaka, 2024). By foregrounding constructive alignment—where learning activities and assessment tasks are designed to coherently target intended outcomes—the study illustrates how values can be operationalized through measurable student performance rather than remaining abstract ideals (Buckley et al., 2021). Furthermore, systematic alignment supported by continuous quality enhancement processes enables objective measurement of student attainment and informs ongoing curriculum improvement efforts (Khan et al. 2025; Shockley et al., 2024; Sun & Lee, 2020).

The paradigm shift toward OBE emphasizes student achievement through clearly defined outcomes, requiring that curriculum design, teaching–learning activities, and assessment tools are systematically structured to support programme outcomes and continuous improvement—especially in engineering education where international and national standards intersect (Hazmin et al., 2025; Sunra et al., 2024).

3. Integrating OBE and VBE: Framework and Implementation

The alignment of Outcome-Based Education (OBE) and Value-Based Education (VBE) is conceptualised as an institution-wide strategy for developing holistic, future-ready graduates (Figure 1). OBE serves as the structural driver by defining measurable learning outcomes, competencies and assessment criteria, while VBE provides the overarching ethical and humanistic framework that shapes students' moral, social and reflective capacities for professional practice; within this values-based orientation, initiatives such as SDG integration function as strategic components that operationalize sustainability and social responsibility, thereby aligning outcome attainment with broader societal and ethical imperatives (Kordi et al., 2025; Biggs & Tang, 2011; Lovat et al., 2010).

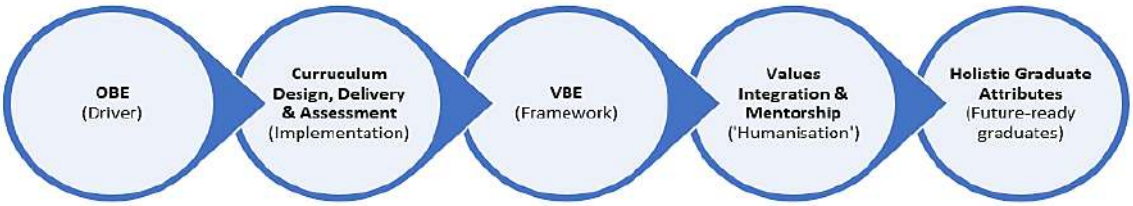

Figure 1: Integration of OBE and VBE as a seamless, wholesome educational scaffold

Integration is implemented across multiple levels, as explained in the following:

1. **Programme Educational Objectives (PEOs).**
   Programme objectives are formulated through systematic curriculum alignment, mapping intended outcomes to content, learning activities, and assessment strategies. Curriculum mapping and cross-

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disciplinary coordination ensure the intentional integration of technical competencies and value-oriented outcomes at the programme level (Harden, 2001; Spady, 1994).

2. **Course Learning Outcomes (CLOs).**
   Courses operationalise PEOs by embedding values into structured learning activities, including reflective tasks, case studies, service-learning, ethical problem-solving, and collaborative work. Learning is sequenced to progressively develop disciplinary knowledge, practical skills, and ethical reasoning in authentic contexts (Mann & Bowen, 2021; Prince & Felder, 2006).
3. **Assessment and Evaluation.**
   Assessment strategies are designed to evaluate both technical achievement and value-based outcomes using project-based tasks, peer assessment, reflective journals, and rubric-based evaluations. These methods enable systematic measurement of ethical reasoning, teamwork, and community engagement alongside conventional examinations (Andrade & Brookhart, 2016; Boud & Falchikov, 2007).
4. **Faculty and Mentorship.**
   Faculty members function as facilitators and mentors, guiding students through experiential learning, reflective practice, and real-world problem-solving. Structured feedback and mentoring support self-directed learning and the practical integration of knowledge and values (Hattie & Timperley, 2007; Schön, 1983).

In essence, the UTHM framework exemplifies how outcome-based curricula can embed value formation systematically, ensuring that graduates are not only competent professionals but also ethically grounded, socially responsible, and equipped to contribute meaningfully to society in a rapidly changing world.

4. Conceptual Framework for Holistic Graduate Development

Building on the principles of VBE discussed earlier, the conceptual framework demonstrates how VBE can be systematically integrated into an OBE structure to produce graduates who are both technically competent and ethically grounded (Figure 1). In this framework, OBE continues to provide the structural driver, defining Programme Educational Objectives (PEOs), Course Learning Outcomes (CLOs), and aligned instructional and assessment strategies, while VBE operates as the ethical and humanistic overlay, ensuring that human values, moral reasoning and social responsibility permeate every aspect of the learning experience.

4.1 OBE as *Driver*

OBE sets the foundation by specifying measurable learning outcomes that articulate knowledge, technical skills and professional competencies. These outcomes guide curriculum design, teaching activities, and assessment methods, creating a clear roadmap for what graduates are expected to achieve. Also, aligned assessment ensures that what is taught, learned and evaluated is consistently interconnected, enabling students to demonstrate the knowledge, skills and competencies acquired. Constructive alignment ensures that programme and course learning outcomes are linked with instructional activities and assessments, while authentic tasks and projects allow students to apply their knowledge and skills in meaningful contexts, promoting deeper learning and mastery. However, technical proficiency alone is insufficient to produce holistic, future-ready graduates, highlighting the need for an intentional integration of values.

4.2 VBE as *Humanistic Framework*

VBE introduces ethical, social, and personal dimensions into the outcome-driven structure. It shapes learning outcomes, teaching methods, and assessments to cultivate attributes such as integrity, empathy,

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civic responsibility, and reflective thinking. Importantly, VBE is embedded not as an optional add-on but as a core element of curriculum design, influencing project-based learning, case studies, collaborative tasks, and community engagement activities. Through this integration, students are encouraged to reflect on the societal impact of their work, internalize ethical principles, and practice decision-making that balances professional and social responsibilities. In VBE, students learn explicitly through deliberate activities such as ethical case studies, guided dialogues or structured service-learning reflections. They also learn implicitly through the lived environment, everyday interactions and institutional culture, which shape attitudes and dispositions as powerfully as formal instruction.

4.3 Integration Layer

The integration layer operationalizes the connection between OBE and VBE. Alignment between PLOs and curriculum content is achieved through vertical integration, where values are developed progressively from foundational theory to real-world application; and horizontal integration, which embeds consistent themes such as ethics or sustainability across multiple disciplines within the same academic year. Together, these strategies ensure that students experience both depth and breadth in value-based learning throughout their programme. Implementation-wise, faculty act as facilitators and mentors, guiding students in self-directed learning and reflection, while course and programme assessments evaluate not only technical competence but also the demonstration of ethical behaviour, collaboration and civic engagement. This layer ensures that values are not abstract ideals but actionable, observable competencies that reinforce both learning and character development.

4.4 Holistic Graduate Outcomes

As a leading public university with a strong emphasis on technical and vocational education and training (TVET), offering programmes that are predominantly engineering- and technology-driven, UTHM's academic portfolio naturally prioritizes applied learning, hands-on practice and industry relevance, preparing students to meet the evolving demands of Malaysia's industrial and technological sectors. While technical proficiency and practical skills form the foundation of its programmes, the University integrates humanistic and value-based dimensions to develop graduates who are not only competent professionals but also ethically and socially responsible individuals. Graduates emerging from this integrated framework are equipped with multi-dimensional competencies as illustrated in Table 1.

Table 1. Multi-Dimensional Competencies Developed From The OBE-VBE Integrated Learning Model

Components	***Competencies***
Intellectual	Critical thinking, problem-solving and professional expertise.
Ethical	Integrity, moral judgment and responsible decision-making.
Social	Teamwork, empathy, civic engagement and contribution to society.
Personal	Self-awareness, resilience and commitment to lifelong learning.

In this holistic approach, students develop intellectual competencies through critical thinking, analytical reasoning and problem-solving applied to real-world engineering challenges such as sustainable infrastructure design, industrial process optimisation and technological innovation, reinforced through hands-on laboratories, simulations as well as project-based learning (Felder & Brent, 2016; Male et al., 2011). Ethical competencies are cultivated as students engage with case studies, sustainability dilemmas and professional codes of conduct, learning to navigate engineering decisions with societal and environmental consequences while integrating moral judgment with technical expertise (Muraleedharan et al., 2020; Zhu et al., 2024; Tormey et al., 2025). Social competencies are strengthened through team-

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based projects, industry collaboration and community-engaged learning, fostering communication, teamwork, empathy and civic responsibility, and enabling graduates to contribute meaningfully to society through engineering practice (Jesiek et al., 2018; Passow & Passow, 2017). Finally, personal competencies, including self-awareness, resilience, adaptability and lifelong learning,are nurtured through reflective practice, mentoring and self-directed learning supported by digital platforms and AI-enabled tools, preparing graduates to navigate complex technological and societal challenges with balance and integrity (Crompton & Burke, 2023; OECD, 2019).

Recognising that VBE operates through both explicit and implicit mechanisms, effective implementation requires these approaches to be deliberately interwoven within the OBE-VBE learning ecosystem. Explicit VBE involves the intentional teaching of values through formal curriculum components, such as dedicated courses in ethics, civics or moral education, with clearly articulated learning outcomes, structured content and allocated instructional time (UNESCO, 2021; Veugelers, 2021). In contrast, implicit VBE is conveyed through the hidden curriculum, encompassing institutional culture, educators' professional conduct, pedagogical choices, interpersonal relationships and the broader learning environment, which collectively shape students' values and dispositions over time (Hafferty & O'Donnell, 2015; Lovat et al., 2011). Together, explicit and implicit VBE reinforce the internalisation of ethical, social and personal values, ensuring that students' professional identities are formed not only through formal instruction but also through lived educational experiences. This integration ensures that graduate outcomes extend beyond employability, embedding values and judgment essential for responsible innovation and societal impact in the complex 21st-century engineering and technology landscape.

5. A Course Review of OBE-VBE Integration

Taking into account the MQF Proposed Core Values as the basic VBE framework for holistic student development (MQA, 2025), emphasizing ethical conduct, civic responsibility and personal integrity, it is mainly referred to to ensure precise alignment of the OBE-VBE integration exercise. Comprised of dignity (D), justice (J), integrity (I), gratitude (G), resilience (R) and altruism (A), these values align with the MQF Academic Learning Domains and offer a humanistic foundation for higher education. In this context, they guide the integration of OBE within VBE, informing course design, learning outcomes and assessments to cultivate graduates who are ethically grounded, socially responsible and professionally competent.

4 Civil Engineering Technology (Construction) courses were examined in this review: Site Investigation, Construction Contract & Procurement, Construction Engineering Technology & Management, and Soil Mechanics & Foundations. The learning outcomes were categorized across the cognitive, practical, and affective domains, while the core values discussed earlier were integrated to guide holistic student development.

5.1 Relating Learning Outcomes with Core Values

The relationship between designated learning outcomes and core values for courses are presented in Table 2. The learning outcomes highlight application of mathematics, science and specialized knowledge to analyze, design and execute engineering procedures, processes, systems and solutions. Students are also expected to identify, formulate and investigate broadly-defined problems, using appropriate analytical and modern IT tools while considering societal, health, safety, legal, cultural and environmental impacts. They are trained to communicate effectively, manage projects and work collaboratively in multidisciplinary teams too. Equally important is the ability to integrate principles of sustainability, ethical responsibility and lifelong learning into professional practice. For the core values,

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Dignity (D) recognizes the inherent worth of every individual, fostering respect and compassion for oneself and others regardless of background or status. *Justice* (J) embodies fairness, equity and moral rightness, ensuring that rights are protected and responsibilities and opportunities are allocated impartially. *Integrity* (I) reflects honesty and consistency in principles, words and actions, upholding ethical norms even when unobserved. *Gratitude* (G) cultivates appreciation for the support and blessings received, promoting humility, generosity and contentment. *Resilience* (R) represents the inner strength and adaptability to overcome challenges while maintaining growth and ethical commitment. *Altruism* (A) is the selfless concern for the well-being of others, expressed through genuine acts of care, compassion, and service without expectation of personal gain. Through the integration of targeted learning outcomes and core values, students cultivate the technical, cognitive and professional competencies required to navigate the evolving engineering landscape with the responsibility, integrity and accountability expected of professional civil engineering technologists.

Table 2. Mapping Of Learning Outcomes And Core Values For The Selected Courses

	Learning Outcomes									
	Knowledge	Problem Analysis	Design of Solutions	Investigation	Tool Usage	Engineering Technologist & Society	Environment & Sustainability	Communications	Project Management & Finance	Teamwork
Learning Domain	*C*	*C*	*C*	*P*	*P*	*A*	*C*	*A*	*A*	*A*
Core Values										D | J | I | G | R | A
Course	J | I | G | R	J | I | G | R	J | I | G | R	I | R	I | R	I | G	I | G	D | J | I | G | R | A	I | A	
Site Investigation (SI)		**O**	**O**		**O**				**O**	
Construction Contract & Procurement (CCP)	**O**			**O**		**O**				
Construction Engineering Technology & Management (CETM)	**O**	**O**			**O**		**O**			**O**
Soil Mechanics & Foundations (SMF)		**O**			**O**		**O**	**O**		

Note: C - cognitive domain, P - practical domain and A - affective domain (Learning Domains)
D - dignity, J - justice, I - integrity, G - gratitude, R - resilience, A - altruism (Core Values)
o - adopted in CLO

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5.2 Value-Infused Learning Outcomes

Expanding on Table 1, the intended learning outcomes for each course are further examined to identify their alignment with the proposed core values, regardless of whether they fall within the cognitive, practical or affective domain.

5.2.1 Knowledge & Understanding

Students in CCP examine issues in contract management and procurement using relevant fundamentals and specialist knowledge, while CETM students analyze technical aspects of construction processes and standards. This learning reinforces justice by emphasizing fair and equitable decision-making in contracts and resource allocation, integrity through accurate, principled application of technical knowledge, gratitude by recognizing the contributions of colleagues, stakeholders and prior lessons, and resilience by preparing students to navigate challenges and adapt to complexities inherent in construction and procurement processes (e.g. Male et al., 2011).

5.2.2 Problem Analysis

In SI, students analyze the technical fundamentals of subsurface works using current standards and advanced technology; while in CCP, they evaluate conflicting constraints in contract procurement and resolve them using established approaches. These activities cultivate justice through fair and transparent resolution of technical and contractual issues, integrity through ethical and standards-based professional judgment, gratitude by recognising the contributions of peers, mentors and prior learning, and resilience by strengthening the ability to navigate uncertainty, complexity and challenging problem-solving situations (Passow & Passow, 2017).

5.2.3 Design of Solutions

In SI, students design solutions that address the needs of stakeholders while ensuring sustainable development, relating subsurface processes to environmental, public health and safety considerations. This process instills a sense of justice by ensuring fair consideration of stakeholder interests and integrity through adherence to ethical and professional standards. It also cultivates gratitude by valuing the contributions of colleagues and the broader community, while strengthening resilience in implementing effective and responsible solutions despite technical or environmental challenges, consistent with the professional formation principles discussed by Felder and Brent (2016).

5.2.4 Investigation

In CCP, students conduct investigative work in contract management through systematic engagement with relevant literature, and perform quantity measurement and estimation in accordance with established standards such as the Malaysian Standard Method of Measurement (SMM2: 2000). This process upholds integrity through accurate, transparent and standards-compliant analysis. As highlighted by Khan et al. (2025), it also strengthens resilience by cultivating the perseverance and adaptability required to manage complex data, reconcile discrepancies and respond effectively to evolving contractual challenges.

5.2.5 Tool Usage

In SI, CETM and SMF, students organize and apply appropriate equipment, technologies and measurement techniques while accounting for site-specific conditions and practical constraints. Crompton

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and Burke (2023) affirm the importance of adaptive technical competence in complex environments, where this outcome reinforces integrity through responsible tool selection, accurate data handling and adherence to professional and technical standards, while building problem-solving maturity by preparing students to adapt methods, troubleshoot challenges and sustain performance amid variable field conditions and technical uncertainties.

5.2.6 Engineering Technologist & Society

In CCP, students manage contract and procurement issues in accordance with ethical conduct and professional standards, while addressing stakeholder needs from socio-economic, environmental and sustainable development perspectives. This outcome upholds integrity by promoting ethically grounded, transparent and accountable decision-making, and cultivates gratitude by encouraging recognition of the contributions, trust and interests of diverse stakeholders involved in the construction process (Cai & Kosaka, 2024).

5.2.7 Environment & Sustainability

In CETM and SMF, students propose and manage solutions that address conflicting factors affecting construction progress while aligning practices with the United Nations' Sustainable Development Goals. This outcome reflects integrity through responsible, standards-aligned professional judgment and practice that prioritizes environmental stewardship, and encourages gratitude by deepening respect for natural resources, communities and the long-term societal benefits of sustainable engineering solutions (e.g. OECD, 2019).

5.2.8 Communications

In SMF, students communicate geotechnical and geo-environmental engineering concepts effectively to both experts and non-experts, with emphasis on field implementation, problem-solving and clear explanation of causes, impacts and solutions. As Jesiek, Shen, and Haller (2018) point out the importance of inclusive and context-sensitive engineering communication, this outcome respects dignity by valuing diverse audiences, advances justice through fair and accessible information, while upholding integrity through accurate and honest discourse. It further entails expressing gratitude through recognition of collaborative contributions, strengthening resilience by thoughtfully adapting messages across varied contexts, and reflecting altruism by prioritizing public understanding, safety and the broader well-being of society.

5.2.9 Project Management & Finance

In SI, students assemble and lead project teams by optimizing available talent and resources while applying sound engineering management principles in the safe and innovative execution of subsurface works. This outcome demonstrates integrity through responsible resource management, open and accountable professional practice, alignment with professional standards, and embodies altruism by prioritizing collective well-being, safety and long-term societal benefits in project delivery (e.g. Biggs & Tang, 2011).

5.2.10 Teamwork

In CETM, students contribute responsibly as team members and assume leadership roles to complete assigned tasks in a planned and harmonious manner. As Shockley, Wall, and Pettit (2024) draw attention to the value of ethical and collaborative teamwork, this outcome respects dignity by valuing each member's contributions, advances justice through fair role allocation and decision-making, upholds

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integrity through accountable and ethical conduct, expresses gratitude by recognizing collective effort, builds resilience through collaborative problem-solving under pressure, and reflects altruism by prioritizing team success and shared goals over individual interests.

Taken together, the alignment of learning outcomes across knowledge, design, investigation, tool usage, societal engagement, sustainability, communication, project management and teamwork demonstrates that effective education is not defined by whether an outcome falls in the cognitive, practical or affective domain. Rather, the emphasis lies in crafting appropriate teaching-learning materials and approaches that embed core humanistic values, through both explicit instruction and the implicit learning environment. As summarised in Figure 2, this integrated OBE-VBE approach ensures that engineering technologists develop not only technical competence but also ethical awareness, social responsibility and the reflective capacity to act responsibly in complex professional and societal contexts.

Figure 2: Value-infused learning outcomes for the selected civil engineering technology courses

Motivated by this national higher education initiative, this study illustrates how learning outcomes can be reframed to integrate cognitive, technical, ethical and humanistic dimensions, providing a practical pathway to align outcome-based education with values formation while minimizing disruption to existing programmes. Although situated within the University's context, the approach offers transferable insights for higher education institutions seeking to cultivate graduates who are not only technically competent and employable but also ethically grounded, socially responsible and prepared to contribute meaningfully to society.

6. Conclusion

Motivated by this national higher education initiative, this study illustrates how learning outcomes can be reframed to integrate cognitive, technical, ethical and humanistic dimensions, providing a practical pathway to align outcome-based education with values formation while minimizing disruption to existing programmes. Although situated within the University's context, the approach offers transferable insights for higher education institutions seeking to cultivate graduates who are not only technically competent and employable but also ethically grounded, socially responsible and prepared to contribute meaningfully to society.

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Authors Contributions

C-M Chan led the study, including the design, data collection, analysis, interpretation and drafting of the manuscript. Azeanita Suratkon contributed to the review of data analysis and ensured alignment with the OBE-VBE framework. Alina Shamsuddin performed critical revisions of the manuscript, adding necessary references and enhancing clarity. All authors reviewed and approved the final version of the manuscript.

Conflict of Interest

The authors declare that there are no conflicts of interest, financial or otherwise, associated with the work presented in this study.

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