Beyond Technical Competency: Aligning MBOT Professional Standards with Value-Based Education in a Bachelor of Technology Programme at UTeM

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ABSTRACT

The growing complexity of industrial systems requires technologists to combine technical capability with sound professional judgement, safety awareness and ethical conduct. This article examines how values-based education (VBE) can be embedded in the Bachelor of Technology in Electrical System Maintenance with Honours (BELS) programme at Universiti Teknikal Malaysia Melaka (UTeM), with reference to the Malaysia Board of Technologists' accreditation framework and the Malaysian Qualifications Agency's 2026 guidelines on VBE. A descriptive, curriculum-focused case-study approach is used to examine the programme's 2.5u1i delivery structure, 52-week work-based learning (WBL) placement, academic–industry dual mentorship and final-year project (PSM) co-assessment. The documented PSM assessment arrangement allocates 50% of the overall grade to industry coaches and 50% to faculty assessors. The manuscript also considers opportunities to make safety, integrity, responsibility and professional behaviour more explicit in learning outcomes and assessment evidence. Programme indicators show first-choice applications increasing from 18 in 2022 to 146 in 2025, while the supplied cohort summary reports graduate outcome rates of 90.48%, 75.86% and 84.00% for three cohorts. These descriptive figures indicate programme demand and reported graduate outcomes but do not establish a causal effect of VBE. A four-part Technical–Value Integrity Framework is proposed to align policy, pedagogy, assessment and industrial placement. The framework offers a practical basis for developing observable values-related assessment evidence in higher TVET.

Keywords: Values-Based Education (VBE), Work-Based Learning (WBL), TVET (Technical and Vocational Education and Training), Curriculum Development, and Professional Ethics.

INTRODUCTION

2.1 Institutional and Policy Context

Malaysia's higher Technical and Vocational Education and Training (TVET) sector seeks to prepare technologists for increasingly complex industrial operations. Degree-level technology programmes contribute to this agenda by integrating discipline knowledge, practical capabilities and professional attributes. At the national level, the Malaysian Technical University Network (MTUN) provides several pathways into technology-oriented higher education.

The Malaysia Board of Technologists (MBOT), established under the Technologists and Technicians Act 2015 (Act 768), provides a professional regulatory context for technology and technical practitioners. Its Technology and Technical Accreditation Council (TTAC) evaluates programmes against curriculum, assessment and quality assurance requirements. Of particular relevance to the present study are programme design and delivery, student assessment and the alignment of learning outcomes with professional competencies (MBOT, 2021).

At Universiti Teknikal Malaysia Melaka (UTeM), the Bachelor of Technology in Electrical System Maintenance with Honours (BELS) provides a pathway for students preparing for electrical system maintenance, facility management and energy-related work. The programme integrates campus-based practical learning with a full-year industrial learning period. Its curriculum is structured around three Programme Educational Objectives (PEOs) and nine Programme Learning Outcomes (PLOs), encompassing discipline, applied and professional competencies. Table 1 summarises the PEO–PLO groupings reported in the programme profile.

Table 1. Programme educational objectives and associated learning-outcome groupings

PEO	Programme objective (summarised)	PLO grouping	Broad emphasis
PEO1	Produce electrical system maintenance technologists competent in maintenance, facilities and energy-related practice.	PLO1–PLO3	Technical knowledge, practical application and problem-solving
PEO2	Develop technopreneurial capabilities in electrical-related technology and management.	PLO4, PLO5, PLO7	Communication, management and enterprise
PEO3	Develop respected professionals in electrical maintenance technology.	PLO6, PLO8, PLO9	Professionalism, teamwork and continuing development

The BELS 2.5u1i model combines approximately two and a half years of campus-based instruction with a 52-week WBL period in industry. The WBL component includes Maintenance Management System, Project Planning and Execution, Final Year Project I (PSM1), Final Year Project II (PSM2) and Industrial Training. These components provide opportunities to evaluate professional behaviour in real operational settings alongside technical outcomes.

Table 2. Student demand and intake reported for BELS, 2022–2025

Indicator	2022	2023	2024	2025
Projected intake	30	30	30	60
First-choice applications	18	41	27	146
Actual student intake	27	31	34	69

Based on the endpoints reported in Table 2, first-choice applications rose from 18 in 2022 to 146 in 2025—an increase of approximately 711%. The intermediate-year application figures require confirmation against the original intake records before publication. Growth in applications signals demand for the programme but is not, by itself, evidence of the effectiveness of values-based instruction.

Table 3. Reported graduate outcome figures by BELS cohort

Cohort	Graduates	Reported positive graduate outcomes	Reported rate
Cohort 1	21	19	90.48%
Cohort 2	29	22	75.86%
Cohort 3	25	21	84.00%
Total	75	62	82.67%

The figures in Table 3 are reproduced as descriptive programme indicators. The outcome definition, survey coverage and collection dates should be specified by the authors in the final submission. They should not be interpreted as a direct measure of professional integrity or of VBE effectiveness.

2.2 Problem Statement: The Skill–Value Paradox

A technically proficient graduate may still face decisions that require ethical judgement. During electrical system maintenance, practitioners may encounter pressure to accelerate commissioning, under-report faults, bypass safety precautions or dispose of waste inappropriately. Digitalised production environments introduce additional responsibilities relating to data integrity, industrial control-system security and confidentiality. These are plausible workplace dilemmas rather than documented incidents among BELS students.

The term "skill–value paradox" is used here to describe the risk of evaluating technical task completion without equally examining the professional decisions surrounding that task. The central educational question is therefore not whether technical training should be reduced, but how values can be made explicit in existing laboratory, project and workplace assessment.

i. Safety decisions: documenting hazards, isolating equipment appropriately and refusing unsafe shortcuts.

ii. Data integrity: recording original test results, reporting deviations and maintaining traceability of technical records.

iii. Environmental responsibility: managing batteries, oils and electrical/electronic waste in accordance with applicable procedures.

iv. Digital responsibility: protecting operational information and maintaining appropriate access to industrial control systems.

Authentic work-integrated learning assessment can be difficult when university requirements, workplace activities and student experiences are insufficiently aligned. Research on assessment in work-integrated learning therefore emphasises the need to connect assessment with genuine professional activity and involve workplace supervisors meaningfully in the process (Ajjawi et al., 2020).



Figure 1. Conceptual relationship between technical capability, values-integrated practice and observable assessment evidence.

2.3 Research Objectives

This article pursues three objectives: (1) to examine opportunities for aligning values-related learning outcomes with BELS technical and WBL activities; (2) to describe the academic–industry dual-mentorship and 50:50 PSM co-assessment arrangement and its relevance to professional conduct; and (3) to formulate an actionable Technical–Value Integrity Framework for use in curriculum review and assessment enhancement.

3. THEORETICAL AND POLICY FOUNDATIONS

3.1 MBOT TTAC Accreditation and Professional Competence

The MBOT TTAC framework places programme design, assessment and graduate attributes within a structured quality assurance system. Both technical and professional competencies are relevant when

determining whether graduates are prepared for responsible practice. This study therefore treats values as observable dimensions of technical performance rather than as a separate, stand-alone subject (MBOT, 2021).

The technology services considered in the programme analysis include development, manufacturing, testing, commissioning and maintenance. Although the extent of practical learning is an important design characteristic, no universal 60:40 practical-to-theory rule is asserted here for all MQF Level 6 programmes. The precise ratio depends on the applicable accreditation-sector provisions and programme structure.

3.2 Values-Based Education and Professional Responsibility

The Malaysian Qualifications Agency's Guidelines on Values-Based Education provide a national reference point for embedding values within higher education practice (MQA, 2026). The National Education Philosophy also supports holistic development beyond academic knowledge (Dzulkifli, 2019). In the context of electrical maintenance, four complementary ethical ideas are considered as interpretive lenses, rather than presented as a mandatory list of official programme outcomes.

i. Amanah (trustworthiness): truthful recording and reporting of test results and maintenance information.

ii. Ihsan (excellence and care): diligent execution, quality checks and responsible completion of assigned work.

iii. Khalifah and Mizan (stewardship and balance): resource efficiency, waste control and environmental responsibility.

iv. Hifz al-Nafs (protection of life): prioritisation of occupational safety, appropriate risk control and protection of others.

These values are meaningful for assessment only when translated into actions that an assessor can observe, document and discuss with the learner. The framework is intended to be applicable to learners irrespective of personal background by focusing on shared professional duties such as honesty, safety, care and responsibility.

3.3 Constructive Alignment, Moral Judgement and Authentic Assessment

Constructive alignment requires intended learning outcomes, teaching activities and assessment tasks to reinforce one another (Biggs, 1996). In the affective domain, Krathwohl, Bloom and Masia (1964) distinguish progressively internalised orientations to values, but the assignment of an A3, A4 or A5 level must be justified by the wording of the actual course learning outcome and by supporting evidence.

Rest's (1986) four-component model offers a complementary account of moral sensitivity, judgement, motivation and action. For WBL, this suggests that acknowledging an ethical issue is not equivalent to demonstrating responsible action under workplace constraints. In addition, authentic assessment literature highlights alignment among the student, university and employer as a condition for meaningful work-integrated learning assessment (Ajjawi et al., 2020).

3.4 Case-Study Scope and Analytical Approach

This is a descriptive curriculum-focused case study, not an experimental impact evaluation. It synthesises the programme structure, tables of cohort-level indicators, the PSM grade distribution and the assessment descriptions included in the supplied BELS manuscript. The analysis compares existing or reported practices with potential values-related learning evidence to develop a practical framework. No student-level dataset, inter-rater reliability analysis, comparison group or statistical test is available in the manuscript; consequently, the findings describe mechanisms and reported outcomes without claiming that VBE caused those outcomes.

4. CURRICULUM ARCHITECTURE AND OPPORTUNITIES FOR VALUES INTEGRATION

4.1 Campus-Based and Industrial Learning Structure

The BELS programme uses the 2.5u1i structure: campus-based technical and practical learning is followed by a 52-week industrial WBL period. Practical activities described in the programme include solar photovoltaic systems, electrical switchboards, building electrical maintenance, renewable energy applications, generator systems and electrical drives. The laboratory contexts create opportunities to assess both procedural competency and the professional decisions associated with it.

The reported WBL course package comprises five course components and 30 credits in total: BELS3664 Maintenance Management System (4 credits), BELS3674 Project Planning and Execution (4 credits), BELS3684 PSM1 (4 credits), BELS3696 PSM2 (6 credits) and BELP41112 Industrial Training (12 credits). The course periods can overlap; their learning and assessment responsibilities should therefore be interpreted in accordance with the approved study plan.

4.2 Affective Learning Outcomes and Evidence

Affective-domain assessment should begin with the exact approved CLO and mapped PLO. Examples of professionally relevant behaviour can then be associated with each learning setting. Table 4 distinguishes an identified PSM1 CLO relationship from suggested values-related assessment opportunities; the latter are not presented as verbatim official CLO statements or approved mappings.

Table 4. Examples of values-related learning evidence across BELS settings

Learning setting	Illustrative observable evidence	Affective-level interpretation	Mapping status
Professional Practices (BELS1263)	Explains safety responsibilities and applies relevant procedures during tasks.	Potential A3	Illustrative; verify approved CLO/PLO
Energy Efficiency Optimisation (BELS2415)	Records audit data honestly and justifies compliance decisions.	Potential A3	Illustrative; verify approved CLO/PLO
Maintenance Management System (BELS3664)	Documents maintenance risks, priorities and decision rationale.	Potential A3–A4	Illustrative; verify approved CLO/PLO
PSM1 (BELS3684)	Demonstrates professional ethics and teamwork during project planning and supervision.	A3	CLO3 → PLO6; confirm final approved wording
PSM2 (BELS3696)	Justifies data integrity, safety and technical decisions in an industrial project.	Potential A4	Illustrative; verify approved CLO/PLO
Industrial Training (BELP41112)	Consistently demonstrates safe and responsible behaviour across workplace tasks.	Potential A5	Illustrative; verify approved CLO/PLO

A developmental sequence across A3–A5 may be a useful curriculum-design objective. Nevertheless, it should be assessed from actual course CLO statements, suitable tasks and repeated behavioural evidence; it cannot be inferred from course year or location alone.

4.3 Proposed 4P Integration Matrix

The Technical–Value Integrity Framework is organised around four mutually reinforcing dimensions: Policy, Pedagogy, Assessment and Placement (4P). The matrix below is proposed as a mechanism for reviewing and strengthening BELS implementation, rather than as evidence that every listed intervention has already been adopted.

Table 5. Proposed 4P integration matrix for BELS values-based education

Dimension	Practical mechanism	Evidence for monitoring
Policy	Review CLO–PLO alignment and clarify the values-related scope of assessments.	Approved mapping and curriculum review minutes
Pedagogy	Integrate safety decisions, data-integrity scenarios and reflective discussion into laboratory and project tasks.	Learning task sheets, scenario records and feedback
Assessment	Use observable indicators and moderation for professional behaviour; retain transparent co-assessment roles.	Rubrics, individual evidence and moderation records
Placement	Support JI–TPF mentoring with clear observation, escalation and reflective-feedback arrangements.	Visit records, mentoring logs and site feedback

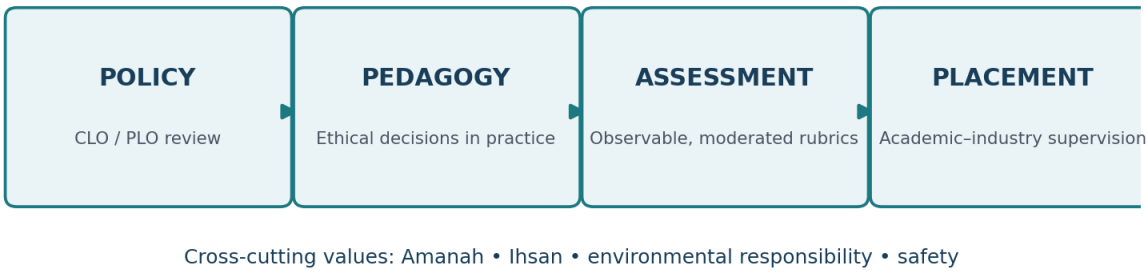

Figure 2. Proposed 4P architecture linking curriculum governance, learning activities, assessment and workplace experience.

5. ASSESSMENT INNOVATION: DUAL MENTORSHIP AND PSM CO-ASSESSMENT

5.1 Academic–Industry Dual Mentorship

The BELS WBL model assigns two complementary mentoring roles. The Tenaga Pengajar Fakulti (TPF), or faculty supervisor, supports academic expectations, project methodology, reporting and structured supervision. The Jurulatih Industri (JI), or industry coach, oversees workplace-based technical tasks, daily performance, operational constraints and professional conduct. Together, these roles create opportunities to triangulate academic evidence with workplace observations.

Dual mentorship alone does not guarantee valid assessment of ethical behaviour. Its contribution depends on clearly specified learning outcomes, comparable rubric descriptors, a record of individual observations and procedures for resolving scoring differences between assessors.

5.2 PSM1 and PSM2 Assessment Weightages

The PSM assessment summary allocates 50% of the overall grade to the industry coach and 50% to faculty assessors (TPF and panel) for both PSM1 and PSM2. The grade components reproduced in Table 6 represent the supplied manuscript's assessment breakdown and should be cross-checked against the current approved rubrics before submission.

Table 6. PSM co-assessment weights reported in the supplied manuscript

Evaluator	Component	PSM1 (%)	PSM2 (%)
JI	Project organisation / implementation	40	40

JI	General conduct	10	10
TPF	Proposal / thesis assessment	25	20
TPF	General conduct	5	5
Faculty panel	Report and oral presentation / defence	20	25
TOTAL	Overall assessment	100	100

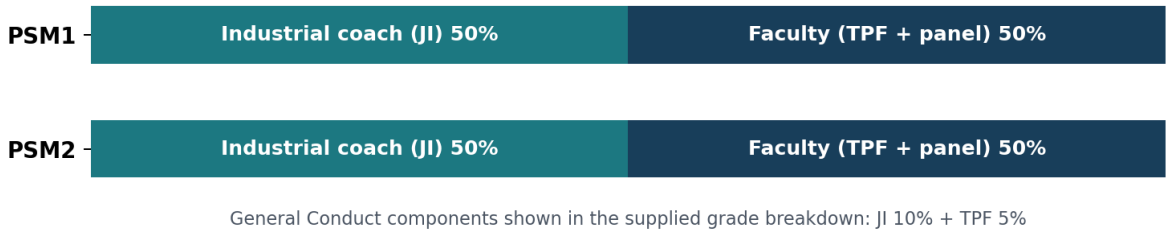

Figure 3. Reported academic–industry co-assessment distribution for PSM1 and PSM2.

5.3 Interpreting General Conduct for Values-Based Assessment

In the reported assessment breakdown, 10% is assigned to JI General Conduct and 5% to TPF General Conduct, equivalent to 15% of each project grade. The manuscript describes four criteria with relative weights summing to 10.00: problem identification (2.75), practical application and independence (2.75), decision-making maturity (2.50) and attitude, commitment and discipline (2.00). These weights should be checked against the approved current assessment forms.

Each criterion has potential relevance to VBE, but the relationship is not automatic. For example, identifying a problem reflects technical analysis unless honesty, traceability or responsible reporting is explicitly included in its performance descriptor. Likewise, good punctuality does not, by itself, prove moral integrity. To strengthen validity, assessors should document specific behaviours, such as truthful recording of test data, adherence to isolation procedures, responsible escalation of hazards and transparent communication about project constraints.

The proposed enhancement is to use common descriptors and examples for JI and TPF assessors, retain individual evidence, and moderate discrepant observations. Aggregated marks could then be analysed over several cohorts to examine consistency and attainment. No such analysis is claimed in the present manuscript.

6. PROGRAMME INDICATORS, CHALLENGES AND RECOMMENDATIONS

6.1 Programme Demand and Graduate Outcome Indicators

First-choice applications reported for BELS increased from 18 in 2022 to 146 in 2025, while actual intake increased from 27 to 69 over the same endpoints. The application increase is approximately 711%, calculated as (146 − 18) / 18 × 100. These indicators describe changing programme demand and intake; they are not direct measures of students' professional values.

For the first three cohorts, the reported graduate outcome rates are 90.48%, 75.86% and 84.00%, respectively, with an aggregate of 62 positive outcomes among 75 graduates (82.67%). The supplied manuscript also reports a 51.7% direct employment-absorption figure associated with WBL host companies. Because the denominator, survey timing and operational definition of that 51.7% measure are not stated consistently, it is presented as a reported indicator pending confirmation rather than as a verified employability estimate.

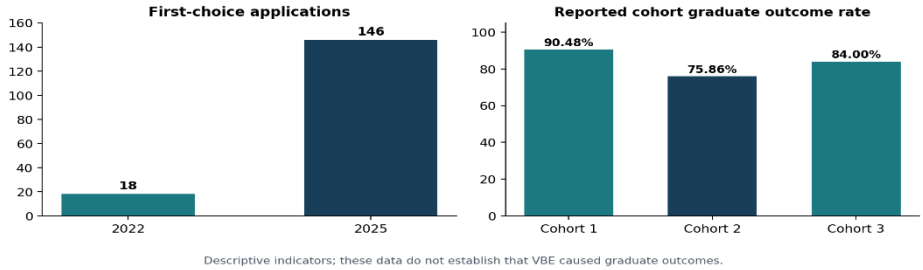

Figure 4. Descriptive demand and cohort outcome indicators reported for BELS; not a causal evaluation of VBE.

6.2 Operational and Pedagogical Challenges

The proposed integration model faces three principal implementation challenges. First, values-related behaviours require clear performance descriptors so that assessors do not mistake technical success or general enthusiasm for ethical competence. Second, industrial workplaces differ in tasks, safety culture and access to evidence, which complicates comparisons across placements. Third, JI and TPF assessors may interpret the same behaviour differently unless trained and moderated using shared assessment expectations.

These challenges support a cautious interpretation of existing programme outcomes. Higher application numbers or favourable graduate indicators cannot demonstrate that values instruction has improved integrity, safety behaviour or ethical decision-making without direct and appropriately collected measures.

6.3 Recommendations for Curriculum and Assessment Enhancement

i. Strengthen JI–TPF assessor alignment. Provide structured training in outcome-based assessment, observation records, rubric interpretation and moderation; consider delivering this through the university's academic development functions.

ii. Use an evidence-based VBE audit trail. Map selected values to actual CLOs, teaching tasks, individual assessment records, site observations and CQI actions, while distinguishing implemented practices from proposed enhancements.

iii. Clarify workplace safeguards. Document reporting routes for safety and ethical concerns, data confidentiality expectations and procedures to protect students from inappropriate pressure when reporting observed risks.

iv. Improve outcome reporting. Validate year-by-year intake data, cohort completion dates, survey denominators and the definition of graduate employability before interpreting temporal trends.

7. CONCLUSION AND IMPLICATIONS

7.1 Synthesis

BELS offers a useful setting for examining the relationship between technical preparation and values-based professional education because it combines extensive practical learning, industrial placement and academic–industry co-assessment. The analysis identifies potential integration points in laboratory practice, project supervision and workplace evaluation, and it proposes a Technical–Value Integrity Framework organised through Policy, Pedagogy, Assessment and Placement.

The principal contribution is a curriculum and assessment design proposition, not a demonstration that existing programme arrangements have already produced stronger ethical outcomes. Future evaluation should link approved CLO–PLO mappings, individual behavioural evidence, moderated rubric scores and carefully defined graduate indicators.

7.2 Implications for Higher TVET

For programme leaders, the framework offers a structured way to convert professional values into observable learning and assessment evidence. For accreditation and quality assurance stakeholders, it illustrates how curriculum alignment, industry involvement and continual quality improvement can be reviewed jointly. For industrial partners, it highlights the importance of consistent mentoring expectations, fair assessment and documented safety-related decisions. Adaptation to other technology programmes should take account of local industry requirements and the applicable programme accreditation standard.

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