

Smart Skills, Smarter Futures: Advancing Technical and Vocational Education and Training through Intelligent Career Profiling

Lucila O. Bance^a, Richard D. L. C. Gonzales^b, and Sheila Marie G. Hocson^c

^aUniversity of Santo Tomas Graduate School, Philippines

^bInno-Change International Consultants, Inc., Philippines UST Graduate School / Cagayan State University, Philippines

^cFar Eastern University, Philippines

Abstract

Technical and vocational education and training (TVET) systems are under increasing pressure to prepare learners for labor markets shaped by digitalization, automation, and evolving employer expectations. However, many existing career assessment tools used in TVET remain narrow in scope and insufficiently aligned with contemporary employability demands. This article presents the conceptual and methodological basis of an intelligent career profiling tool (CPT) intended to improve learner guidance, program matching, and labor market alignment under TVET settings. The framework was derived from a nationwide review of assessment practices and focus group discussions with trainers, alumni, industry practitioners, and guidance counselors and was further informed by vocational psychology, employability research, socioemotional learning, and TVET policy literature. Recurring limitations were identified in current profiling practices, including overreliance on generic interest inventories, limited assessment of employability and socioemotional competencies, insufficient contextualization for Philippine TVET qualifications, and the absence of standardized tools across institutions. In response, the proposed CPT framework includes six interrelated domains: career interests, employability skills, 21st-century skills, socioemotional skills, trade skills, and literacy and numeracy skills. The use of a holistic, context-sensitive, and psychometrically rigorous CPT may strengthen career guidance, improve learner-program fit, inform targeted interventions, and enhance institutional responsiveness to labor market needs. Overall, this paper presents a practical and research-informed framework for advancing assessment innovation in TVET.

Introduction

Technical and vocational education and training (TVET) systems worldwide are undergoing rapid transformation as

industries demand workers who are not only technically proficient but also adaptable, digitally capable, and prepared to navigate increasingly complex work environments. In the Philippines, this need is especially urgent as the Technical Education and Skills

Development Authority (TESDA) is expanding access to technical programs while realigning competency standards and delivery systems to meet the demands of the Fourth Industrial Revolution (TESDA, 2022, 2024).

Recent Philippine labor market intelligence reports highlight an increasing need to combine trade-specific competencies with cross-cutting skills such as workplace safety, teamwork, communication, problem-solving, and digital readiness (TESDA, 2026). These trends mirror global evidence showing that globalization, technological disruption, demographic shifts, and climate pressures are reshaping the skills landscape, requiring TVET systems to strengthen employability and socioemotional capabilities and support lifelong learning alongside technical proficiency (World Bank et al., 2023; UNESCO, 2022).

The *Future of Jobs Report* (World Economic Forum, 2023) identifies analytical thinking, creativity, resilience, flexibility, technological literacy, leadership, and social influence as some of the fastest-growing competencies demanded by employers. Accordingly, the accelerating shift toward automation and digitalization has intensified the need for a workforce equipped with competencies that extend beyond traditional trade skills (OECD, 2019; ILO, 2015; Kaplan & Saccuzzo, 2017; Zytowski, 1985).

Within this context, career profiling has become a critical mechanism for improving learner guidance and strengthening the alignment between training provision and labor market demand. However, many TVET institutions continue to rely on outdated or narrow assessment tools, particularly Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (RIASEC)-based interest inventories, that do not adequately reflect the specific qualification

choices available within the TESDA. The absence of standardized instruments further contributes to uneven and often insufficient assessment practices across institutions.

Although traditional psychometric measures are useful for assessing selected cognitive constructs, they are insufficient for capturing the broader range of competencies required in contemporary workplaces. Noncognitive capabilities such as teamwork, adaptability, resilience, and communication are increasingly associated with workplace performance and long-term employability (Anastasi & Urbina, 1997; Hansen & Campbell, 1985).

A comprehensive, multidimensional **Career Profiling Tool** (CPT) is therefore both timely and necessary. Such an instrument should integrate cognitive, affective, and psychomotor domains to reflect a comprehensive view of learner readiness for training and employment. This article presents a conceptually integrated and context-responsive framework for an intelligent CPT tailored to Philippine TVET.

Literature Review and Problem Context

A nationwide review of existing assessment tools, complemented by focus group discussions with trainers, guidance counselors, alumni, and industry practitioners, revealed persistent limitations in TVET assessment practices. These findings align with international concerns regarding assessment systems that fail to capture the multidimensional competencies demanded by modern labor markets (World Bank et al., 2023; OECD, 2019).

Overreliance on RIASEC-Based Interest Tests

Many institutions rely on Holland's RIASEC model as their primary tool for career guidance. Although widely validated (Holland,

1997; Nauta, 2010), such instruments are ineffective in assessing the specific qualification choices available within the TESDA, and their results do not correlate with those of other interest measures. Generic inventories often fail to capture the occupational nuances of technical and vocational fields (Rounds & Su, 2014; Savickas, 2013).

Personality Tests Not Suited to TVET Contexts

Imported personality assessments designed for clinical or corporate settings do not capture traits directly linked to performance in occupational fields such as welding, automotive repair, electronics, or hospitality. Safety consciousness, precision, persistence, and stress tolerance are predictive of success in these domains (Bremer & Madzar, 2020; Kaplan & Saccuzzo, 2017).

Absence of Standardized Tools

Counselors reported that the absence of a standardized test resulted in fragmented practices and inconsistent learner profiling. Similar challenges have been observed in other developing TVET systems (UNESCO, 2022; World Bank et al., 2023).

Lack of Assessment of Employability and Socioemotional Skills

Existing instruments rarely assess communication, teamwork, adaptability, resilience, and initiative, all of which have consistently been identified as essential for job success (ILO, 2015; World Economic Forum, 2023). Socioemotional skills strongly predict workplace performance and long-term career advancement (Kautz et al., 2014; Durlak et al., 2011).

Limited Assessment of Literacy and Numeracy

Foundational skills in reading, writing, and mathematics are essential for interpreting manuals, diagrams, and measurements (OECD, 2016; Hanushek et al., 2015). However, these domains are rarely assessed, even though deficiencies in these aspects constitute major barriers to TVET completion.

These gaps underscore the need for a comprehensive, standardized, and contextually grounded CPT.

Framework of the CPT

The CPT is grounded in a holistic framework integrating cognitive, affective, and psychomotor domains. It comprises six major domains:

Career Interests

This domain is grounded in Holland's RIASEC typology (Holland, 1997; Nauta, 2010) and contextualized for TVET through items reflecting hands-on work, applied problem-solving, creativity, teamwork, leadership, and organization.

Employability Skills

This domain assesses communication, teamwork, problem-solving, adaptability, and initiative, all of which are essential for workplace success (ILO, 2015; Bremer & Madzar, 2020).

Twenty-First-Century Skills

This domain assesses digital literacy, critical thinking, creativity, innovation, and global awareness, all of which are central to Education 2030 (Trilling & Fadel, 2009; UNESCO, 2022).

Socioemotional Skills

This domain evaluates self-awareness, self-management, social awareness, relationship skills, and responsible decision-making (CASEL, 2020).

Trade Skills

This domain assesses technical proficiency, adherence to safety and quality standards, precision, workplace efficiency, and continuous learning (Simons & Ruijters, 2014; TESDA, 2020).

Literacy and Numeracy Skills

This domain assesses reading comprehension, writing proficiency, vocabulary, arithmetic, measurement, estimation, and data interpretation (OECD, 2016; UNESCO, 2021).

Together, these domains form a comprehensive structure that captures the competencies required for success in TVET and the workplace.

Methods

Test Conceptualization

The CPT was conceptualized to support evidence-based career guidance, identify learner strengths, align trainees with appropriate programs, and generate actionable data for curriculum improvement. It draws on RIASEC theory, Bloom's taxonomy, socioemotional learning frameworks, and employability skills models (Anderson & Krathwohl, 2001; Hansen & Campbell, 1985; ILO, 2015; Savickas, 2013).

Test Construction

Item development prioritized clarity, neutrality, and contextual relevance. The CPT employs Likert-type scales, forced-choice items, behavioral scenarios, checklists, and open-ended questions. Scoring procedures include cumulative, class, and ipsative scoring (Anastasi & Urbina, 1997; Kaplan & Saccuzzo, 2017).

Pilot Testing and Item Analysis

Pilot testing assesses reliability and comparability. Item analysis includes endorsement indices, Cronbach's alpha,

exploratory factor analysis, and confirmatory factor analysis (AERA et al., 2014; Fabrigar & Wegener, 2012; Tavakol & Dennick, 2011).

Test Revision

Items with poor discrimination or weak factor loadings are revised or removed. The iterative refinement process strengthens psychometric robustness (DeVellis, 2017).

Discussion and Implications for TVET Practice

The CPT is not merely an assessment tool but a system-level innovation for enhancing TVET quality, relevance, and learner support. It strengthens

- **career guidance** by aligning learners with suitable pathways;
- **program placement** through evidence-based matching;
- **skills development planning** via the identification of strengths and gaps;
- **curriculum enhancement** using aggregated learner data; and
- **employer engagement** by providing structured competency profiles.

This multidimensional approach extends TVET assessment beyond narrow interest testing toward a holistic model aligned with contemporary labor market demands.

Study Contribution and Limitations

This paper presents a conceptually integrated framework for career profiling aligned with Philippine TVET contexts. However, the CPT requires large-scale field testing, psychometric validation, and implementation research. Future studies should examine construct validity, reliability, fairness, predictive utility, and operational feasibility.

Conclusion

Narrow, interest-only profiling approaches should be replaced with a multidimensional assessment framework aligned with the realities of contemporary TVET and the future of work. By integrating career interests, employability, socioemotional competencies, digital and 21st-century skills, trade readiness, and foundational literacy and numeracy, the CPT provides a sound basis for learner guidance, institutional decision-making, and system responsiveness. Future research should prioritize pilot implementation, psychometric validation, and policy-oriented evaluation.

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