THE PHILOSOPHICAL ESSENCE OF TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING IN THE DIGITAL ERA: A SYSTEMATIC LITERATURE REVIEW

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Abstract: *This study aims to provide a comprehensive philosophical justification for Technical and Vocational Education and Training (TVET) by examining how ontological, epistemological, and axiological foundations can strengthen its role in the modern era. This study addresses growing concerns that TVET is increasingly dominated by a market-driven instrumental paradigm that neglects its humanistic, reflective, and ethical dimensions. A Systematic Literature Review (SLR) was conducted following the PRISMA protocol. This review synthesized 34 Scopus-indexed journal articles published between 2020 and 2025, identified through Boolean-based keyword searches focusing on philosophical, conceptual, and theoretical perspectives in TVET. The selected studies were analyzed using qualitative thematic analysis to explore the philosophical justifications and their implications for TVET. This review reveals an intense philosophical urgency in redefining TVET amid rapid digitalization, Industry 4.0 demands, social inequality, and widening skill gaps. The philosophical foundations collectively shift TVET from a mechanistic skills training model to a holistic human development system. A philosophical approach contributes to character building, work ethic, and social awareness through virtue ethics, practical wisdom (phronesis), and spiritual workability. This study presents a comprehensive philosophical framework for reevaluating the essence and direction of TVET. By integrating ontology, epistemology, and axiology, this research offers a new conceptual lens to strengthen TVET as a transformative, humanistic, and socially responsive education system.*

Keywords: *Technical and Vocational Education and Training (TVET); Philosophy of education; Vocational knowledge; Ethical competence; Systematic Literature Review*

Abstrak: Penelitian ini bertujuan untuk memberikan pembenaran filosofis yang komprehensif untuk Pendidikan dan Pelatihan Teknis dan Kejuruan (TVET) dengan mengkaji bagaimana landasan ontologis, epistemologis, dan aksiologis dapat memperkuat perannya di era modern. Studi ini membahas kekhawatiran yang berkembang bahwa TVET semakin didominasi oleh paradigma instrumental yang digerakkan oleh pasar yang mengabaikan dimensi humanistik, reflektif, dan etisnya. Tinjauan Literatur Sistematis (SLR) dilakukan mengikuti protokol PRISMA. Tinjauan ini mensintesis 34 artikel jurnal terindeks Scopus yang diterbitkan antara tahun 2020 dan 2025, diidentifikasi melalui pencarian kata kunci berbasis Boolean yang berfokus pada perspektif filosofis, konseptual, dan teoretis dalam TVET. Studi yang dipilih dianalisis menggunakan analisis tematik kualitatif untuk mengeksplorasi pembenaran filosofis dan implikasinya terhadap TVET. Tinjauan ini mengungkapkan urgensi filosofis yang intens dalam mendefinisikan ulang TVET di tengah digitalisasi yang cepat, tuntutan Industri 4.0, ketidaksetaraan sosial, dan kesenjangan keterampilan yang melebar. Fondasi filosofis secara kolektif menggeser TVET dari model pelatihan keterampilan mekanistik menuju sistem pengembangan manusia yang holistik. Pendekatan filosofis berkontribusi pada pembentukan karakter, etika kerja, dan kesadaran sosial melalui etika kebajikan,

kebijaksanaan praktis (phronesis), dan kemampuan kerja spiritual. Studi ini menyajikan kerangka filosofis yang komprehensif untuk mengevaluasi kembali esensi dan arah TVET. Dengan mengintegrasikan ontologi, epistemologi, dan aksiologi, penelitian ini menawarkan lensa konseptual baru untuk memperkuat TVET sebagai sistem pendidikan yang transformatif, manusiawi, dan responsif secara sosial.

Kata kunci: Pendidikan dan Pelatihan Teknis dan Kejuruan (TVET), Filsafat pendidikan, Pengetahuan vokasi, Kompetensi etika, Tinjauan Literatur Sistematis
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INTRODUCTION

Technical and Vocational Education and Training (TVET) plays a crucial role in improving employability by aligning educational outcomes with the demands of the labour market and encouraging innovation. TVET provides vocational skills that are essential for creating a skilled workforce, which is increasingly important in the context of rapid technological advancement and globalization (Hassan et al., 2021). The integration of Information and Communication Technology (ICT) into TVET is essential to modernize the provision of teacher training, curriculum, and training, thereby overcoming the challenges of the current era (Hassan et al., 2021). However, amid the demands of the dynamic labor market, vocational education is often stuck in a pragmatic orientation that solely emphasizes technical proficiency competencies, without regard for the democratic, philosophical, and humanistic dimensions that should be at the heart of the educational process itself (Biesta, 2022).

This overly instrumental paradigm has the potential to reduce the meaning of education to merely a labor production process, rather than a means of comprehensive human development. In fact, vocational education aims not only to form skilled workers but also to cultivate individuals who possess a reflective awareness of the meaning of work, social responsibility, and the moral values that underlie professional practice (Trede & Jackson, 2021). Without a strong philosophical foundation, TVET risks losing its way in the face of increasingly complex social, economic, and technological changes. Therefore, philosophical justification is a crucial foundation for reaffirming the essence, direction, and purpose of vocational education, ensuring it aligns with human values and social sustainability (Albert, 2025).

Philosophical studies in the context of TVET provide an in-depth framework for reviewing the nature of vocational knowledge (epistemology), the meaning of human work existence (ontology), and the ethical values that guide vocational practice (axiology) (Hayati & Dalimunthe, 2024). Through this approach, TVET can be understood as an education system that not only transfers technical skills but also forms individuals who think critically, ethically, and possess social sensitivity. The philosophy of education helps redefine the relationship between humans, technology, and work, so that the vocational education process is not confined to industrial determinism, but instead becomes a vehicle for human empowerment in addressing global challenges (Mora et al., 2024).

Furthermore, philosophical justification is also relevant for strengthening the direction of TVET policies and practices in Indonesia, especially in addressing national employment challenges that are still characterized by skills gaps, low social mobility, and weak integration between the education and industry sectors (Ali et al., 2020). With a solid philosophical foundation, TVET can be directed to produce not only a ready-made workforce but also a reflective, adaptive, and ethical-thinking citizen in a fast-changing world

of work. In this context, the study of the Justification of Philosophical-Based Education in TVET is important for presenting a new understanding that vocational education is, in fact, a humanization process that places humans as subjects of learning and drivers of social change, rather than just objects of economic production.

This research is conducted to address the problems previously formulated by examining the philosophical foundations in depth that can strengthen the direction and essence of vocational education in the modern context. In general, the purpose of this research is to provide a solid philosophical justification for the implementation *of Technical and Vocational Education and Training* (TVET), so that vocational education can function not only as a means of mastering technical skills, but also as a process of forming knowledgeable, ethical, and socially responsible human beings.

Through the achievement of these goals, this research is expected to make a theoretical contribution in expanding the understanding of the nature of vocational education from a philosophical point of view, as well as offering a conceptual basis for the development of vocational education policies and practices that are more balanced between the needs of the world of work and the formation of students' human character. Theoretically, this research is expected to enrich the body of knowledge in educational science, particularly in the field of vocational education, by providing a comprehensive philosophical perspective on the essence, goals, and direction of TVET development. Practically, the results of this study are expected to serve as a reference for policymakers, vocational educators, and curriculum developers in designing an education system that strikes a more balanced balance between technical and philosophical aspects. In addition, conceptually, this paper also contributes to the development of a new paradigm in

vocational education that places the philosophical dimension as the primary foundation in the educational process in shaping the TVET paradigm as a forum for the formation of character, values, and the meaning of life, in addition to the job training process.

METHODS

This study employs the Systematic Literature Review (SLR) approach to identify, evaluate, and synthesize scientific findings related to the justification of philosophy-based education in *Technical and Vocational Education and Training* (TVET). This approach was chosen because it provided a comprehensive and structured understanding of the development of philosophical studies in TVET, while minimizing bias in the process of identifying and analyzing the literature. The SLR process is conducted in accordance with the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) to ensure transparency, accountability, and scientific reproducibility of the research.

The literature is collected from reputable scientific databases to ensure the quality of the articles analyzed. The search strategy uses a combination of Boolean-based keywords, namely:

("Technical Vocational Education and Training" OR "TVET" OR "vocational education" OR "skills development") AND ("philosophy" OR "philosophical foundation" OR "ontology" OR "epistemology" OR "axiology" OR "philosophical justification")

The search filter is applied to articles from reputable scientific journals indexed by Scopus, published between 2020 and 2025, or within the last five years. The selection of the year aims to ensure the novelty and relevance of the reference in the current context of the modern era.

Data Extraction

Data from selected articles were extracted using a table format that contained the following information: author name and year, research title, research objectives, methods used, variables, primary findings, and research recommendations. The data was then analyzed qualitatively using a thematic analysis approach to identify patterns based on the number of articles analyzed, publication trends (year, country, academic impact).

RESULT & DISCUSSION

Based on the results of the literature selection using the PRISMA model, as many as 34 documents were produced that will be used as the primary reference to be discussed in this study. The analysis of the data is presented in two main aspects: distribution by year of publication and distribution by country of origin, as well as the number of citations. When viewed by year of publication, the identified literature shows an increasing trend in publications over the last five-year period. 2023 will be the year with the highest number of publications, namely 10 documents, and 2022 (8 documents). The early years in this range, namely 2020 and 2021, contributed 1 and 4 documents, respectively. For more details, you can see Figure 2.
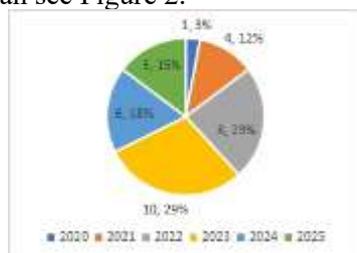

Figure 1 Distribution of literature by year

When viewed by country and number of citations, the geographical coverage of the literature covers 17 different countries, with a cumulative total of 670 citations (references). The United States (USA) is the most significant contributor of literature with seven documents, followed by the United Kingdom with six documents.

Table 1 Distribution of Literature and Citations by Country

Country	Count	Citation
Australia	1	12
Cambodia	1	7
China	2	42
Germany	2	37
India	1	24
Inggris	6	147
Japan	2	16
Malaysia	1	6
Netherlands	3	69
New Zealand	1	37
Norwegia	1	1
Pakistan	1	74
Singapore	1	6
south Korea	1	2
Spanyol	2	1
Swedia	1	52
USA	7	137
Jumlah	**34**	**670**

Although the USA has the highest number of documents, the UK dominates the total cumulative citations with 147 references. The USA is in second place with 137 citations. Three countries exhibit a high level of citation influence: the United Kingdom (147 citations), the USA (137 citations), and Pakistan (74 citations). Notably, one piece of literature from Pakistan has been referenced 74 times. Other countries that contributed substantially included the Netherlands (3 documents with 69 citations), China (2 documents with 42 citations), and Sweden (1 document with 52 citations)
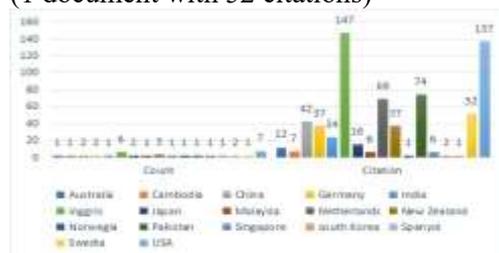

Figure 2 Citation Distribution by Country

This data clearly maps the academic landscape related to the justification of philosophy-based education in TVET, showing the modern focus of publication time as well as the geographic sources of globally influential literature.

The philosophical urgency of TVET in the development and implementation of TVET in the Modern Era

The philosophical urgency in developing and directing Technical and Vocational Education and Training (TVET) organizations in the modern era is driven by the need to align educational outcomes with the demands of the rapidly growing Industry 4.0 and digital economy. The integration of digital technologies into TVET is essential to prepare a competent workforce in new technologies such as IoT, robotics, data science, and artificial intelligence, which are essential for the Industrial Revolution 4.0 (Hassan et al., 2021; Leonard Chukwualuka Nnadi et al., 2025; Raihan Tahir & Zuraidah Abdullah, 2024). The COVID-19 pandemic has further accelerated the adoption of online and distance learning, highlighting the need for TVET systems to embrace digitalization to remain relevant and practical (Raihan Tahir & Zuraidah Abdullah, 2024). In addition, the philosophical foundation of TVET reform encompasses not only technological adaptation but also the addressing of ethical issues and social justice, as emphasized by the Confucian perspective on global competence, which advocates for a balance between critical thinking and empathy (Charlene Tan, 2024). In countries such as India and China, the urgency is exacerbated by demographic pressures and the need for industrial upgrades, which require skilled labor that the current TVET system struggles to produce due to bureaucratic and systemic inefficiencies (Srabani Maitra et al., 2022; Xinmiao Song & Duoduo Xu, 2024). The German vocational education model, which emphasizes sustainable cooperation between schools and industry, offers a framework to address these challenges by increasing the attractiveness and adaptability of TVET programs (Cheng-Hsing Yang et al., 2023). Furthermore, the role of vocational education in innovation systems is increasingly recognized, with technicians and vocational training providers playing a crucial role in driving innovation and addressing system failures (Paul Lewis, 2023). Therefore, the philosophical urgency lies in creating a TVET system that is not only technologically advanced but also ethically based and socially responsive, in order to be able to produce a workforce that can navigate the complexities of an interconnected digital world (Jim Hordern et al., 2022; S. Carlsson & Sara Willermark, 2023).

Ontological, epistemological, and axiological foundations can strengthen the existence and relevance of vocational education.

The ontological, epistemological, and axiological foundations significantly strengthen the existence and relevance of Technical and Vocational Education and Training (TVET) by providing a comprehensive framework that integrates diverse knowledge systems, practical skills, and value-based education. Ontologically, TVET is grounded in the reality of vocational knowledge and expertise, which is essential for coping with the practical demands of a wide range of jobs. This is evident in the debates surrounding the role of systematically organized knowledge versus informally organized expert practice, highlighting the importance of academic knowledge and the knowledge that lies within vocational training (Jim Hordern et al., 2022). Epistemologically, TVET benefits from a constructivist approach that emphasizes the integration of practical skills with theoretical knowledge, encouraging innovation and adaptability in the workforce. This is particularly relevant in the context of ICT-enabled TVET, where the

incorporation of technologies such as IoT, robotics, and data science is essential to develop a digitally equipped workforce (Hassan et al., 2021). Furthermore, the three epistemological concepts of technology education, which include technical skills, technological scientific knowledge, and socio-ethical understanding, provide a robust framework for curriculum development and international comparisons (Charlotta Nordlöf et al., 2021). Axiologically, TVET is aligned with the humanistic values of education by focusing on the holistic development of individuals, preparing them not only to be job-ready but also to become responsible citizens. This is supported by an emphasis on humanistic narratives in management learning, which teaches about dignity, balance, and creativity for the common good (Michael Pirson, 2020). In addition, the integration of sustainable development principles into TVET underscores the importance of balancing instrumental and humanistic values, ensuring that education contributes to economic and social well-being (Hongfeng Zhang & Yumeng Zeng, 2022). Collectively, these ontological, epistemological, and axiological considerations underscore the crucial role of TVET in cultivating a skilled, innovative, and ethically grounded workforce capable of addressing the challenges of the modern economy.

The influence of applying philosophical principles on policies, curricula, and learning practices in the TVET system in the modern era?

The application of philosophical principles in the Technical and Vocational Education and Training (TVET) system can significantly influence learning policies, curricula, and practices by fostering a more holistic and transformative educational experience. Philosophical frameworks such as Critical Rationalism emphasize student autonomy and democratic organization in the learning environment, which can lead to

more inclusive and participatory educational policies (Raphael Sassower, 2022). Similarly, the integration of Freirean pedagogy, which advocates education as a tool for social justice, can foster critical awareness in addressing social justice issues in learning activities. The concept of Student Agency, as highlighted by the OECD's Education 2030 project, underscores the importance of student freedom and subjectivity, suggesting that the curriculum should be reformed to empower students as active participants in their learning journey (Sang Eun Lee, 2024). Furthermore, philosophical discourses on the nature of vocational knowledge, which debate the balance between academic and practical knowledge, can inform the development of curricula that better prepare students to navigate the complexities of the modern work environment (Jim Hordern et al., 2022).

Implications of philosophical approaches to character formation, work ethics, and social awareness of TVET students in the modern era?

Philosophical approaches to character building, work ethic, and social awareness in Technical and Vocational Education and Training (TVET) learners have significant implications in the modern era, as they integrate various educational philosophies and ethical frameworks. The integration of virtue ethics and Bourdieu's sociology, as discussed by Walker, emphasizes the importance of understanding individual and social contexts in character education, promoting a reflexive capacity to address community practices that can hinder human development (David Ian Walker, 2023). This aligns with the concept of Bildung, which Küpers et al. describe as a transformative civic education approach that fosters practical wisdom and sustainable practices in business and management, thereby addressing ecological, economic, and social challenges (Wendelin Küpers et al., 2024). Furthermore, Brendan W. Case

and Tyler J. VanderWeele (2025) focus more on intellectual virtues, such as courage and honesty, which underscore the need for moral character to achieve academic success and fulfill a broader educational mission in an ever-evolving society. Furthermore, Olson's exploration of human development in education reveals that character and virtue are crucial to achieving happiness, health, and meaningful social relationships, which are particularly important for TVET learners as they prepare for the workforce (Roger E. Olson, 2025). The integration of spiritual values into employability, as discussed by Joshi et al., introduces the concept of "spiritual employability," which balances personal and organizational values, thereby enhancing career development and adaptability in a rapidly changing job market (Gunjan Joshi et al., 2025).

Discussion

The results of the research, conducted through a Systematic Literature Review (SLR), demonstrate that the philosophical justification in TVET has an increasingly urgent need in the context of modern social, economic, and technological developments. This discussion reiterates the main findings by linking the thematic patterns of the literature to the framework of the research questions, as well as critically integrating the references presented in the introduction and literature review.

The study's findings confirm that the orientation of TVET over the past two decades has tended to be dominated by instrumental paradigms that prioritize education in response to the needs of the labor market, as criticized by (Biesta, 2022) and (Trede & Jackson, 2021) Although this approach is relevant to increasing employability, the dominance of economic logic reduces the role of TVET as a vehicle for forming people who are reflective, independent, and ethical.

In the context of digital transformation and the pressure of Industry 4.0, the integration of technology, ICT, IoT, robotics, and data science is indeed a must (Hassan et al., 2021) However, various cutting-edge studies demonstrate that modern challenges require not only technical competence but also a philosophical understanding of the relationship between people, technology, and work (Mora et al., 2024) Therefore, the philosophical urgency in TVET needs to be understood as an effort to restore the balance between the relevance of the industry and the formation of human values, as affirmed by Albert (2025).

Regarding the impact of philosophical principles on learning policies, curricula, and practices, the results of the literature analysis suggest that the application of philosophical principles can substantially alter the face of TVET policies and practices. In the policy aspect, approaches oriented towards the democratization of education and the formation of subjects, as discussed by Raphael Sassower (2022) and Sang Eun Lee (2024), encourage the formulation of policies that are more participatory, responsive, and oriented towards the holistic development of students. TVET is no longer positioned as a system that serves the market alone, but also as an institution for the formation of critically thinking citizens. In the curriculum aspect, the debate regarding the distribution of knowledge between theory and practice (Jim Hordern et al., 2022) highlights the need for an integrative, reflective, and contextual curriculum. This approach is coherent with the global criticism of the overly technical dominance of competency standards (Stephanie Allais, 2023) Meanwhile, the aspect of learning practice, which involves the integration of Freirean critical pedagogy, ethical learning (Rachel Buchanan et al., 2021), and civic-critical thinking (Anouk Zuurmond et al., 2023), demonstrates that vocational learning can be a space for the formation of social-transformational agents, not just as technology operators.

Overall, the application of philosophical principles yields TVET that is more humanistic, critical, and adaptable to socio-technological changes.

In the context of work ethics, the spiritual concept of employability (Gunjan Joshi et al., 2025) expands the understanding of career success, encompassing not only technical competence but also integrity, moral exemplarity, and reflective ability. Meanwhile, the social awareness aspect is strengthened by the concept of global competence, which is based on empathy and social justice (Charlene Tan, 2024) This approach shifts TVET from just a skill-setting institution to a global citizen-forming institution that is sensitive to social and humanitarian contexts. It can be concluded that the philosophical implications of TVET not only enhance the quality of graduates in a professional aspect but also lay the foundation for the character and morality necessary to navigate the complex world of work.

CONCLUSION

The study emphasizes that the philosophical underpinnings of Technical and Vocational Education and Training (TVET) are crucial for strengthening its direction, relevance, and sustainability in the modern era. Findings derived from a systematic review of 34 scientific papers published between 2020 and 2025 show that TVET cannot be based solely on an economic-instrumental paradigm that prioritizes workplace responsiveness. Instead, a philosophical foundation is needed to ensure that TVET functions as a comprehensive human development system that integrates technical competence, ethical awareness, and social responsibility. The analysis reveals that the philosophical urgency in TVET stems from global challenges, digitalization, industrial transformation, widening skills gaps, and social inequalities, underscoring the limitations of today's market-driven educational models. The philosophical foundation allows TVET to transcend its role as a supplier of labor and instead reclaim its identity as an educational means that shapes reflective, autonomous, and morally responsible human beings. Furthermore, this study concludes that the ontological, epistemological, and axiological foundations play a crucial role in strengthening the existence of TVET as a coherent education system. Ontologically, TVET requires a clear understanding of the nature of vocational knowledge and the meaning of work. Epistemologically, TVET must integrate theoretical reasoning, practical experience, and socio-technological understanding. Axiologically, TVET must prioritize values such as human dignity, sustainability, justice, and ethical practices. Overall, this dimension elevates TVET from a mechanistic training platform to a holistic educational framework. The study also concluded that philosophical principles have a significant influence on TVET learning policies, curricula, and practices. Combining critical pedagogy, democratic rationality, and ethical reasoning reshapes TVET into a more inclusive, participatory, and value-based system. The philosophically informed curriculum integrates theoretical and practical knowledge, shaping students as agents of change and encouraging critical engagement with social realities, thereby making it more responsive to the complexity of the contemporary world of work. Ultimately, this study confirms that philosophical approaches make a substantial contribution to character formation, work ethic, and social awareness among TVET students. Concepts such as virtue ethics, practical wisdom (phronesis), and spiritual workability enrich the moral and psychological foundations necessary for personal and professional development.

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