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A Framework for Enhancing Work Fulfilment among Vocational College Welding Educators

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Abstract

This study explores work fulfilment among welding educators within Malaysia's Technical and Vocational Education and Training (TVET) system, focusing on challenges such as outdated infrastructure, limited access to advanced technologies, and insufficient professional development. These issues contribute to a growing gap between educational practices and industry expectations, particularly in sectors like manufacturing and oil and gas. The research was conducted using a qualitative design, involving in-depth interviews with welding educators and industry practitioners in Johor. Thematic analysis identified key drivers of work fulfilment, including institutional support, targeted professional development, and structured industry collaboration. Findings revealed that educators' motivation and teaching effectiveness are enhanced when they engage in curriculum co-design, receive recognition, and access modern equipment. Based on these insights, a conceptual framework was developed to address competency gaps, improve industry alignment, and strengthen institutional policies. This framework offers a strategic approach to enhancing educator satisfaction and student outcomes. The study's findings provide actionable recommendations for stakeholders to build a more resilient, inclusive, and industry-responsive TVET ecosystem, contributing to the advancement of vocational education in Malaysia.

Keywords: TVET, Welding Education, Work Fulfilment, Professional Development, Industry Collaboration

Introduction

Welding education plays a pivotal role in Malaysia's industrial development, particularly in sectors such as manufacturing, construction, and oil and gas. As the nation advances toward high-tech and sustainable production systems, the demand for skilled welders equipped with modern competencies has intensified. However, vocational institutions tasked with preparing this workforce face mounting challenges, including outdated infrastructure, limited access to emerging technologies, and misalignment between educational curricula and industry standards. These issues not only hinder the effectiveness of teaching but also affect the professional fulfilment of educators, who are central to shaping

the next generation of skilled workers. Addressing these gaps is critical to ensuring that Malaysia's Technical and Vocational Education and Training (TVET) system remains responsive, competitive, and capable of supporting national economic goals.

Recent studies have underscored the systemic misalignment between TVET curricula and evolving industry standards (Zhou et al., 2023; Tanaka et al., 2023; Ismail et al., 2017). However, little is known about how these misalignments affect the professional fulfilment of welding educators, particularly in contexts where infrastructure is outdated and access to modern technologies is limited. Educators often lack exposure to advanced welding techniques such as robotic welding and digital inspection systems, which are increasingly demanded by industries like the Pengerang Integrated Petroleum Complex (Yusop et al., 2023; Hu et al., 2020). Moreover, existing professional development programs tend to be generic and fail to address the specialized needs of welding educators. This creates a critical tension: educators are expected to prepare students for high-tech industrial environments while being constrained by limited resources and institutional support. The mechanisms through which these constraints impact educator motivation, teaching effectiveness, and industry alignment remain poorly understood. This study addresses these gaps by examining the lived experiences of welding educators and industry practitioners, and by proposing a conceptual framework that enhances work fulfilment through targeted interventions in professional development, institutional support, and industry collaboration.

To address these gaps, this study employs a qualitative research design focused on the lived experiences of welding educators and industry practitioners in Johor. Using semi-structured interviews as the primary data source, the research explores how institutional support, professional development opportunities, and industry collaboration influence work fulfilment and teaching effectiveness. Thematic analysis is used to identify patterns and insights that directly respond to the challenges outlined in existing literature, such as curriculum misalignment and limited access to modern technologies (Zhou et al., 2023; Yusop et al., 2023). The study culminates in the development of a conceptual framework that integrates these findings into a strategic model for enhancing educator fulfilment. By grounding the outcomes in both practitioner narratives and theoretical models, the research offers actionable recommendations for improving vocational education quality and workforce readiness in Malaysia's TVET system.

The specific objectives of this study are:

1. To explore TVET educators' experiences regarding factors influencing work fulfilment in welding education.
2. To examine industry practitioners' perspectives on the alignment between welding education and workforce demands.
3. To develop a conceptual framework that enhances work fulfilment among welding educators by bridging competency gaps, strengthening industry-academic collaboration, and improving institutional support.

By aligning TVET welding education with industry expectations, the research contributes to a more sustainable, responsive, and high-quality vocational training ecosystem in Malaysia.

Theoretical Framework

This study is underpinned by three interrelated theoretical models Cognitive Constructivism Theory, Self-Determination Theory (SDT), and the Job Demands–Resources (JD-R) Model which collectively provide a multidimensional lens for examining work fulfilment among welding educators in Malaysia's Technical and Vocational Education and Training (TVET) system.

Cognitive Constructivism Theory

Cognitive Constructivism, as proposed by Piaget (1964), posits that individuals actively construct knowledge through experiential learning and reflective practice. In the context of welding education, this theory is particularly relevant as educators continuously adapt their instructional strategies based on hands-on engagement with evolving technologies and industry practices.

For example, welding educators at Vocational College Kota Tinggi often integrate real-world industrial experiences such as robotic welding and hybrid laser-arc techniques into classroom instruction. Through reflective teaching, they identify gaps in student understanding and revise their pedagogical approaches to improve learning outcomes. This process not only enhances instructional effectiveness but also contributes to educators' professional growth and satisfaction.

Self-Determination Theory (SDT)

Self-Determination Theory, developed by Deci and Ryan (1985), emphasizes three fundamental psychological needs autonomy, competence, and relatedness as essential drivers of intrinsic motivation and job satisfaction. Welding educators experience greater work fulfilment when they are empowered to innovate in their teaching, receive opportunities to enhance their technical competencies, and engage in meaningful collaboration with peers and industry stakeholders.

In practice, educators who participate in curriculum co-design with industry partners such as the Pengerang Integrated Petroleum Complex (PIPC) report increased motivation and a stronger sense of professional identity. These collaborative efforts not only improve curriculum relevance but also foster a supportive environment that reinforces educators' sense of purpose and belonging.

Job Demands–Resources (JD-R) Model

The JD-R Model, introduced by Bakker and Demerouti (2007), provides a framework for understanding how job demands and resources interact to influence employee well-being and performance. In the TVET context, welding educators face significant demands, including outdated infrastructure, curriculum misalignment, and limited access to professional development. When these demands are not balanced by adequate resources such as institutional support, modern equipment, and training opportunities educators are at risk of burnout and disengagement.

Conversely, educators who receive support for attending industry workshops or accessing advanced welding simulators report higher levels of engagement and teaching

effectiveness. The JD-R model thus underscores the importance of resource allocation in sustaining educator motivation and enhancing instructional quality.

Integration of Theoretical Models

The integration of these three theories offers a comprehensive framework for analyzing the factors that influence work fulfilment among welding educators:

- Cognitive Constructivism explains how educators construct and adapt knowledge through reflective practice.
- SDT highlights the motivational drivers of professional satisfaction.
- JD-R addresses the structural and institutional dynamics that affect educator performance.

Together, these models inform the development of a conceptual framework aimed at enhancing work fulfilment through targeted interventions in professional development, industry alignment, and institutional support.

Research Methodology

This study employed a qualitative research design to explore the factors influencing work fulfilment among welding educators in Malaysia's Technical and Vocational Education and Training (TVET) system. The research was conducted through a five-phase procedure: identifying gaps in educator competencies and industry expectations, conducting a preliminary literature review and informal consultations, collecting data through semi-structured interviews, analyzing the data thematically, and developing a conceptual framework based on the findings. This design was chosen to allow for an in-depth understanding of participants' lived experiences and to generate insights grounded in both theory and practice.

The research population consisted of two key groups: welding educators and industry practitioners. Five senior welding instructors from Vocational College Kota Tinggi, Johor, were purposively selected based on their active involvement in curriculum development, professional training, and collaboration with industry. In addition, four industry experts from the oil and gas sector particularly those affiliated with the Pengerang Integrated Petroleum Complex (PIPC) were included for their extensive experience in welding operations, quality assurance, and workforce development. The sample size was determined based on the principle of data saturation, ensuring that the data collected was sufficiently rich and diverse to address the research objectives.

Instrumentation for this study involved the use of semi-structured interview protocols, which were developed and validated by academic and industry experts. These instruments were designed to align closely with the research objectives and included thematic questions on competency gaps, professional development opportunities, curriculum relevance, and institutional support. The interview guides were tailored for each participant group and pilot-tested to ensure clarity, relevance, and consistency. This approach allowed for flexibility in exploring emerging themes while maintaining a structured focus on the study's core inquiries.

Data collection was conducted through in-depth interviews, both face-to-face and via online platforms, depending on participant availability. Each interview lasted between 45 to 60 minutes and was audio-recorded with informed consent. Transcriptions were anonymized to ensure confidentiality. Ethical approval was obtained from Universiti Teknologi Malaysia, and all participants were briefed on their rights, including voluntary participation and the option to withdraw at any time.

Thematic analysis was employed to analyze the qualitative data, following Braun and Clarke's six-step process: familiarization, coding, theme identification, theme refinement, theme definition, and interpretation. NVivo software was used to assist in organizing and coding the data. Themes were derived both inductively from participant narratives and deductively based on the theoretical framework. To enhance the credibility and trustworthiness of the findings, triangulation with existing literature, member checking, and peer validation were incorporated throughout the analysis process.

Findings and Discussion

This study explored the factors influencing work fulfilment among welding educators in Malaysia's Technical and Vocational Education and Training (TVET) system. Through thematic analysis of semi-structured interviews with five welding educators from KV Kota Tinggi and four industry practitioners from the oil and gas sector, eight key themes emerged. These themes reflect the multifaceted challenges and opportunities within the TVET ecosystem and provide a foundation for strategic improvements in welding education.

The first theme, Preparation of TVET Graduates for Industry, revealed that while graduates possess strong theoretical knowledge, they often lack practical skills and soft competencies such as communication and teamwork. This gap limits their readiness for real-world industrial environments. The second theme, Challenges Faced by Educators, highlighted systemic issues including outdated infrastructure, insufficient funding, and limited access to professional development programs. These constraints hinder educators' ability to deliver effective, industry-relevant training.

The third theme, Industry Collaboration, emphasized the importance of structured partnerships between TVET institutions and industry stakeholders. Joint curriculum design, apprenticeships, and mentorship programs were identified as critical strategies for aligning education with workforce needs. The fourth theme, Technological Advancements, underscored the urgency of integrating emerging technologies such as robotics, automation, and digital tools into welding curricula to ensure relevance and competitiveness.

The fifth theme, Work Fulfilment and Professional Development, explored the intrinsic and extrinsic factors that influence educator satisfaction. While educators found motivation in mentoring students, they also expressed a need for recognition, career advancement opportunities, and institutional support. The sixth theme, Student Motivation and Engagement, revealed that societal perceptions of welding as a low-prestige career and the lack of structured career guidance contribute to low student interest and engagement.

The seventh theme, Institutional and Policy Barriers, identified structural challenges such as inconsistent policy implementation and the absence of standardized evaluation

frameworks. These issues create disparities in resource allocation and hinder the effectiveness of TVET programs. Finally, the eighth theme, Sustainability in Welding Practices, emphasized the need to incorporate environmentally responsible practices into welding education, including green technologies and energy-efficient equipment.

Summary of Thematic Findings

The table below summarizes the key findings from the thematic analysis:

Table 1

The Summary of Thematic Findings

Theme	Key Insights	Representative Quote
Preparation of Graduates	Graduates possess strong theoretical knowledge but lack practical skills and soft competencies.	"Graduates have the theoretical base but struggle with the practical applications required in real-world settings." – Respondent 3
Challenges Faced by Educators	Outdated infrastructure and limited access to professional development hinder teaching effectiveness.	"We need more access to advanced welding tools and training programs to stay current with industry trends." – Respondent 5
Industry Collaboration	Joint curriculum design and apprenticeships are essential for aligning education with workforce needs.	"Collaborations with companies help students understand industry challenges and improve their readiness for jobs." – Industry Expert 2
Technological Advancements	Integration of robotics, automation, and sustainable practices is critical for curriculum relevance.	"Welding education must evolve with trends like automation and sustainability to remain relevant." – Respondent 4
Work Fulfilment	Recognition, career advancement, and institutional support are key to educator satisfaction.	"Recognition for our contributions and opportunities for personal growth would improve our overall job satisfaction." – Respondent 6
Student Motivation	Societal perceptions and lack of career guidance reduce student interest in welding careers.	"It's challenging to keep students motivated when they don't see welding as a promising career." – Respondent 2
Institutional Barriers	Inconsistent policies and limited funding affect program quality and educator morale.	"We need more government support and a standardized system to evaluate the success of TVET programs." – Respondent 4
Sustainability	Green welding technologies and energy-efficient practices should be embedded in training.	"Sustainability should be a part of every welding program because it's where the industry is heading." – Industry Expert 3

To address these interconnected challenges, the study proposed a conceptual framework centered on work fulfilment, supported by four interrelated components: Experiences and Perceptions, Professional Development Opportunities, Industry Alignment, and Teaching Effectiveness in Figure 1.

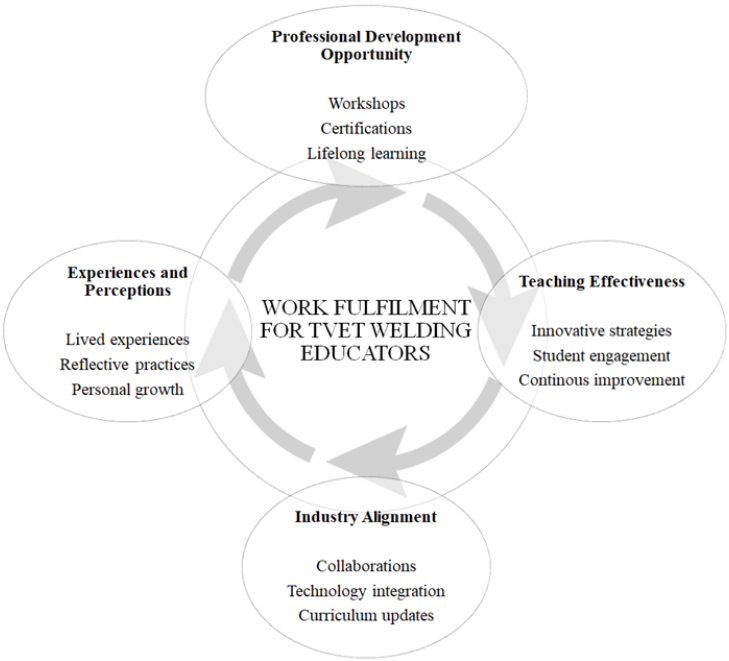

Figure 1: Representation of Conceptual Framework to Enhance Work Fulfilment for TVET Welding Educators

This framework provides a strategic pathway for enhancing educator satisfaction, improving instructional quality, and aligning vocational training with workforce demands.

i. Experiences and Perceptions serve as the foundation for understanding how educators' lived experiences and reflective practices influence their professional growth and motivation.
ii. Professional Development Opportunities equip educators with the technical and pedagogical skills needed to remain effective in a rapidly evolving field.
iii. Industry Alignment bridges the gap between education and workforce requirements, ensuring that curricula and teaching practices reflect current industrial standards.
iv. Teaching Effectiveness reinforces educator fulfilment by enabling impactful instruction that prepares students for success in the labour market.

Together, these components form a dynamic and responsive framework that addresses the core issues identified in the study. By implementing this framework, stakeholders can foster a more resilient, inclusive, and industry-aligned TVET system that supports both educator development and student achievement.

Discussion of Results

The findings underscore a significant gap between TVET training and industry expectations. While educators are committed to student success, they face systemic barriers that limit their effectiveness. The lack of modern equipment and structured professional development programs restricts their ability to teach advanced welding techniques, such as robotic welding and digital inspection.

Industry practitioners emphasized the need for stronger collaboration with TVET institutions. Joint curriculum development, internships, and mentorship programs were identified as critical strategies for improving graduate readiness. These partnerships also offer opportunities for resource sharing and curriculum innovation.

Work fulfilment among educators is influenced by both intrinsic factors (e.g., mentoring satisfaction) and extrinsic factors (e.g., recognition, career progression). Addressing these dimensions through institutional policies can improve educator retention and motivation.

Student engagement remains a challenge due to negative societal perceptions of vocational careers. Structured career guidance and exposure to successful industry pathways can help shift these perceptions and inspire students.

Finally, sustainability emerged as a forward-looking theme. Educators and industry experts agreed on the importance of integrating green technologies and eco-friendly practices into welding education to align with global environmental goals.

Implications for Practice and Policy

The findings of this study carry important implications for multiple stakeholders within the TVET ecosystem, including educators, institutions, industry partners, and policymakers. Addressing the challenges identified such as competency gaps, outdated infrastructure, and limited collaboration requires coordinated efforts to improve both teaching effectiveness and workforce readiness.

For educators, access to continuous professional development is essential to maintain motivation, confidence, and instructional quality. Training programs that focus on emerging technologies, such as robotic welding and AI-driven inspection tools, can empower educators to stay current with industry standards. For example, educators who participated in AWS certification programs reported increased competence and engagement in their teaching roles. Equipping educators with modern teaching tools and opportunities for lifelong learning fosters a culture of innovation and adaptability, which is critical in a rapidly evolving industrial landscape.

Institutions play a pivotal role in supporting educator fulfilment and student success. Investment in infrastructure such as upgrading welding labs with advanced equipment and simulation technologies can significantly enhance the learning experience. Additionally, recognition programs that celebrate educator contributions, such as teaching excellence awards or career advancement pathways, can improve morale and retention. These institutional supports not only benefit educators but also translate into improved student outcomes and stronger institutional reputation.

From an industry perspective, structured collaboration with TVET institutions is vital to ensure curriculum relevance and graduate employability. Joint initiatives such as co-designed training modules, apprenticeships, and mentorship programs allow industry experts to share insights and resources, bridging the gap between classroom instruction and workplace expectations. For instance, partnerships with the Pengerang Integrated Petroleum Complex (PIPC) have enabled educators to align their teaching with real-world welding standards, enhancing both student preparedness and industry satisfaction.

Policymakers must prioritize the development of standardized evaluation frameworks and targeted funding mechanisms to support sustainable improvements in vocational

education. Consistent policy implementation across institutions can ensure equitable access to resources and training opportunities. Moreover, funding allocations should focus on modernizing facilities, supporting educator development, and fostering industry-academic partnerships. These policy interventions are essential for building a resilient and responsive TVET system that meets national workforce goals and global competitiveness standards.

In summary, the implications of this study underscore the need for a holistic and collaborative approach to reforming welding education. By addressing the specific needs of educators, institutions, industry, and policymakers, stakeholders can collectively enhance work fulfilment, teaching effectiveness, and graduate readiness ultimately contributing to the advancement of Malaysia's vocational education landscape.

Conclusion and Recommendations

This study explored the factors influencing work fulfilment among welding educators within Malaysia's Technical and Vocational Education and Training (TVET) system. Using a qualitative research design, semi-structured interviews were conducted with welding educators and industry practitioners to gain insights into the challenges and opportunities shaping vocational education. The analysis revealed eight key themes: preparation of graduates for industry, challenges faced by educators, industry collaboration, technological advancements, work fulfilment and professional development, student motivation, institutional and policy barriers, and sustainability in welding practices. These themes reflect a complex interplay between systemic constraints, evolving industrial demands, and the personal and professional aspirations of educators.

The findings indicate that welding educators face significant challenges, including outdated infrastructure, limited access to professional development, and insufficient recognition of their contributions. These issues not only hinder teaching effectiveness but also negatively impact educator motivation and job satisfaction. Industry stakeholders emphasized the need for stronger collaboration with TVET institutions to ensure curriculum relevance and graduate readiness. Furthermore, the integration of advanced technologies and sustainable practices into welding education was identified as essential for maintaining alignment with global industrial trends and preparing students for future workforce demands.

To address these challenges, the study proposed a conceptual framework centered on work fulfilment, supported by four interrelated components: experiences and perceptions, professional development opportunities, industry alignment, and teaching effectiveness. This framework offers a strategic pathway for enhancing educator satisfaction, improving instructional quality, and aligning vocational training with workforce needs. It also serves as a guide for institutions and policymakers to implement targeted interventions that support educator development and student success.

Based on the findings, several recommendations are proposed. First, continuous professional development must be prioritized. TVET institutions should implement structured training programs that equip educators with both technical and pedagogical competencies. Certifications such as the AWS Certified Welding Educator and exposure to emerging technologies including robotic welding and AI-driven inspection tools are essential to ensure educators remain current and confident in their roles. Second, collaboration between TVET

institutions and industry stakeholders should be formalized through joint curriculum design, apprenticeships, and mentorship programs. These partnerships will ensure that training remains relevant, responsive, and aligned with real-world expectations.

Third, investments in modernizing facilities and resources are critical. Upgrading workshops with advanced equipment and simulation technologies will enhance both teaching and learning experiences, allowing students to gain hands-on exposure to industry-grade tools. Fourth, innovative teaching strategies such as project-based learning, gamification, and adaptive instruction should be adopted to foster student engagement and improve learning outcomes. These methods not only enrich the classroom experience but also empower educators to deliver more impactful instruction.

Fifth, inclusivity and career awareness must be promoted through targeted outreach, career guidance, and the celebration of success stories. Shifting societal perceptions of vocational careers is essential to attract and retain motivated students in welding programs. Sixth, institutional support and policy alignment must be strengthened. Government agencies should provide adequate funding, develop standardized evaluation frameworks, and ensure consistent policy implementation across TVET institutions. Finally, sustainability should be embedded into welding education through the integration of green technologies, energy-efficient practices, and environmentally conscious curricula. This will prepare students to contribute to environmentally responsible industries and support Malaysia's broader sustainability goals.

In conclusion, this study contributes to the advancement of welding education by offering a comprehensive framework and practical recommendations to enhance work fulfilment among educators. By addressing the identified challenges and leveraging opportunities for innovation and collaboration, stakeholders can build a more resilient, inclusive, and industry-aligned TVET system. This transformation is essential for preparing skilled graduates, supporting educator development, and driving sustainable economic growth in Malaysia.

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