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OUTCOME BASE EDUCATION IMPLEMENTATION EDUCATION IN TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING: A CHALLENGE AND ISSUE

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Abstract:

This paper explores the intricate process of implementing Outcome-Based Education (OBE) in Technical and Vocational Education and Training (TVET), with a focus on three primary themes. The text emphasises the significance and complexity of integrating OBE principles into TVET institutions, emphasising the need to synchronise educational philosophies with vocational training objectives. The second point focuses on identifying and analysing the challenges in aligning OBE with the particular objectives of TVET programmes. This encompasses variations in curriculum design, assessment techniques, and engagement of interested parties. The paper utilises a thorough examination of current literature in TVET. Anticipated results involve a thorough understanding of the barriers hindering effective OBE implementation in TVET, along with recommendations for overcoming these challenges. The study aims to provide tailored practical recommendations and optimal strategies for the TVET environment, ultimately helping to enhance educational quality and outcomes in vocational training. This paper aims to inform policymakers, educators, and stakeholders in the TVET sector to improve decision-making and implement OBE strategies in vocational education settings.

Keywords:

OBE; TVET; Challenge; Education; Strategies

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Introduction

OBE is recognised as a transformative approach in the field of education, especially in TVET. OBE focuses on defining and evaluating the intended results, highlighting the knowledge, comprehension, and skills that learners should possess after their educational experience. This transition from traditional input-centered methods to outcome-centered ones is intended to advance competency-based learning and guarantee that graduates have the necessary skills for industries and society. Technical and vocational education is crucial for providing individuals with the requisite skills for the workforce, bridging the gap between education and employability. It is crucial to incorporate Outcome-Based Education (OBE) into Technical and Vocational Education and Training (TVET) because of the dynamic nature of industries, characterised by rapid technological advancements and evolving skill requirements. The objective of OBE is to enhance the job prospects of graduates and ease their entry into the workforce by harmonising educational results with industry requirements in TVET programmes. Implementing Outcome-Based Education (OBE) in the Technical and Vocational Education and Training (TVET) context presents various obstacles and concerns, despite its possible benefits. Creating specific and quantifiable learning objectives that effectively reflect the complex skill requirements in various vocational sectors is a major difficulty. Developing precise and consistent evaluation techniques to gauge these outcomes poses a significant difficulty, particularly in practical fields where traditional written exams may not be appropriate. To effectively implement Outcome-Based Education, educators must adopt student-centered strategies that focus on active learning, problem-solving, and competency building, necessitating a fundamental shift in teaching methods (Zamir et al., 2022)(Meng et al., 2023). Resistance from traditional teaching methods and institutional cultures may hinder this change, highlighting the necessity of comprehensive faculty development programmes to assist in implementing OBE principles. The success of incorporating Outcome-Based Education (OBE) in Technical and Vocational Education and Training (TVET) is greatly influenced by socio-cultural and contextual factors like socioeconomic disparities, regional employment patterns, and industry-specific requirements (Ag Damit et al., 2021; Ijeoma et al., 2020).It is essential to ensure equitable access to top-tier vocational education in scenarios where resources and infrastructure are scarce. Customised strategies are needed to implement Outcome-Based Education (OBE) effectively, taking into account the unique local requirements and situations.

The literature on Outcome-Based Education (OBE) implementation in Technical and Vocational Education and Training (TVET) examines the benefits it provides and the challenges linked to its implementation. Advocates of Outcome-Based Education (OBE) in Technical and Vocational Education and Training (TVET) argue that emphasising precise learning outcomes enables educational programmes to align with industry needs, enhancing graduates' employment opportunities and stimulating economic development (Savage & Sterry, 1990). Successfully implementing Outcome-Based Education in Technical and Vocational Education and Training relies on overcoming various obstacles. One of the main difficulties is developing assessment techniques that are valid and reliable in accurately evaluating complex vocational skills and competencies (Kember & Kwan, 2000). Traditional evaluation techniques, such as written exams, may not adequately assess the practical skills and real-world problem-solving abilities emphasised in Outcome-Based Education (OBE). Educators need to design genuine assessment tasks that mirror workplace standards and allow students to demonstrate their expertise in vocational skills (Perry et al., 1995). The transition to Outcome-Based Education (OBE) necessitates a shift in instructional strategies from

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teacher-centered to student-centered methodologies emphasising active learning and competency enhancement (Biggs et al., 2019). Implementing this educational change requires extensive faculty training to equip educators with the essential skills and knowledge to effectively implement OBE (Gibbs & Coffey, 2004). Cultural and contextual elements within TVET systems can significantly influence the practicality and success of OBE implementation (Gibbs * et al., 2004). When implementing OBE initiatives, it is crucial to take into account socioeconomic disparities, regional labour market dynamics, and industry-specific requirements to address local needs and realities (Billett, 2020). Outcome-Based Education could enhance the quality and applicability of TVET. Yet, its effective application in the TVET setting encounters numerous obstacles and intricacies. To address these challenges efficiently, educational policymakers, institutions, industry stakeholders, and educators need to collaborate to overcome obstacles, encourage innovation, and fully utilise the transformative potential of Outcome-Based Education (OBE) in preparing future generations for the demands of the global workforce.

Literature Review

Introducing OBE in Technical and TVET institutions is essential for cultivating a proficient workforce prepared to fulfil the requirements of contemporary industries. Three primary themes emerge from the literature review: the difficulties of integrating OBE principles into the TVET framework, emphasising the significance of aligning educational objectives with industry requirements for pertinence and effectiveness. Moreover, there are obstacles that need to be overcome to achieve this alignment, including challenges with curriculum design, assessment methods, faculty readiness, and institutional support. Several strategies and solutions have been proposed to tackle these challenges. These involve fostering collaborations between academia and industry, enhancing faculty, and utilising creative teaching approaches to enhance the integration of Outcome-Based Education in Technical and Vocational Education and Training.

The Implementation of Outcome-Based Education (OBE) in Technical and Vocational Education and Training (TVET) Institutions

OBE is gaining recognition in different educational settings, such as TVET institutions, for its ability to improve learning results and equip students for the changing requirements of the job market(Phuc et al., 2020). Research examines the factors affecting the implementation of OBE, including students' perceived value and practical application skills. This was demonstrated in a study conducted on Economic Management programmes in Vietnam (Alamsyah et al., 2022). Additionally, initiatives in Indonesia highlight the importance of aligning pre-service and in-service TVET teacher training programs to meet the evolving needs of vocational schools, emphasizing the necessity for synergy to foster the development of professional vocational teachers. Furthermore, in the South Asian region, particularly in Bangladesh, engineering universities are exploring students' readiness towards OBE implementation, recognizing its significance in preparing students for the Fourth Industrial Revolution (4IR). While findings underscore the positive effects of factors like students' awareness and perceived easiness on readiness, they also underscore the need for institutional support to facilitate successful OBE implementation. These studies collectively emphasize the pivotal role of various stakeholders, including students, teachers, and institutions, in driving effective OBE implementation within TVET and engineering education contexts (Khan et al., 2023).

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Partnerships between TVET institutions and industries are essential in tackling youth unemployment and the skills gap in Southeast Asia. A thorough examination of these collaborations was carried out, with the participation of 129 respondents from different TVET institutions (Widiastuti et al., 2021). The study found that public-private partnerships have had a positive effect on workforce skills as perceived by TVET institutions. The study also analysed how well partnerships performed in meeting evolving skills requirements, engaging the industry in TVET development, and receiving regulatory assistance (Yaacob et al., 2023). The COVID-19 pandemic caused a transition from in-person to online delivery of embedded industrial seminars (EIS) in TVET higher institutions. An initial investigation into this transition, utilising the perceptions of undergraduate students, revealed a notable influence of COVID-19 on EIS implementation and the possibility of future online delivery. At Universiti Teknologi MARA, Malaysia, a problem-based learning approach utilising a robotic project was introduced to tackle challenges in offering mechatronic modules in single-discipline degree programmes. The project showed significant learning results, proving its effectiveness in improving outcome-based education in mechatronics for undergraduate mechanical engineering students (Ayub et al., 2023).

Within TVET institutions, different aspects of education delivery and assessment are being examined to improve students' employability and learning results (Abdullahi & Othman, 2022). Supervisors in industrial attachment programmes in Nigeria are crucial in facilitating students' real work experiences by connecting workplaces and TVET institutions. Research indicates that collaboration between institution-based and industrial-based supervisors improves attachment experiences and readies students for the workforce (Sharma & Dwivedi, 2020). Moreover, OBE approaches are examined globally to improve educational effectiveness, focusing on assessing predetermined outcomes aligned with program objectives and student expectations. Studies highlight the need for efficient implementation of OBE to ensure alignment with student-centered learning models and individual learning outcomes. Additionally, challenges persist in classroom assessment processes in TVET, particularly in Design and Technology subjects in Johor, Malaysia, where teachers face issues such as insufficient resources and time management. Despite efforts to incorporate digital resources, teachers require additional support to align classroom assessment processes with Ministry of Education goals, indicating the ongoing need for resource enhancement to achieve desired learning outcomes (Hashim et al., 2021).

A study was conducted to analyse the implementation of OBE in Higher Education Institutions (HEIs) in Panay Island, Philippines. The survey involved 120 permanent faculty members from 17 HEIs that provide graduate school programmes. The Accreditation Survey Instrument (ASI) indicated satisfactory practices in implementing OBE, especially in the domains of faculty, curriculum, instruction, and student support(Hapinat, 2023). Challenges arose in research and extension activities due to insufficient funding, affecting community involvement and connections. The study revealed that the accreditation level directly impacted the implementation of OBE practices, highlighting the crucial role of accreditation in upholding quality standards in OBE. In Thailand, attempts to implement the dual education system, such as the German-Thai Dual Excellence Education (GTDEE) project, are hindered by legal constraints and inadequate regulatory structures, despite past endeavours that trace back to the founding of the Thai-German Technical School in 1959. Comparing traditional Thai-German technical education with modern projects such as GTDEE could help identify readiness challenges in implementing the dual system (Ode-sri et al., 2022). The German Federal

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Ministry for Economic Cooperation and Development (BMZ) places high importance on TVET as a crucial sector, with a substantial rise in funding to aid TVET projects worldwide. BMZ prioritises collaborating with the private sector to improve the qualifications of TVET teachers and trainers in order to enhance the quality of vocational education and training. This effort is in line with the German dual TVET system principles and is tailored to meet the specific needs and circumstances of partner countries (Edel, 2022).

Several studies in the field of TVET systems emphasise the key factors that impact educational results and the challenges in implementation. In Nigeria, problem-based learning (PBL) is being investigated as a method to improve graduate outcomes. Research indicates that PBL has the potential to combine theory and practice, stimulate learning, and enhance students' self-efficacy (Okolie et al., 2021). Nevertheless, obstacles like insufficient resources and misconduct in the education field impede successful execution. In the Philippines, the implementation of OBE presents challenges, but studies show that faculty members in the Computing and Information Communication Technology field have significant expertise and experience in applying OBE practices (Tungpalan & Antalan, 2021). In India, a meta-analysis evaluates the implementation of OBE in engineering institutes. The analysis indicates a lack of empirical validation and consistent understanding of outcome mapping, highlighting the necessity for additional research to validate results and enhance assessment techniques (Bhat et al., 2022). The text delves into the concept of outcome-based education, highlighting its goal-oriented approach and benefits like clarity and adaptability. It also recognises challenges such as assessment difficulties and lower student engagement when compared to traditional education models. These studies emphasise the significance of efficient implementation strategies and continuous research to tackle obstacles and improve educational results in TVET systems (Shama, 2020).

Within TVET, there is an increasing acknowledgment of the necessity for teachers to possess thorough competence, especially in light of digitalization. Research investigates different facets of TVET and suggests models to improve teaching proficiency (Diao & Qu, 2024). A training programme in China, following a teaching competence framework, shows notable enhancements in teacher competence based on pretest and posttest evaluations, with favourable responses from teachers involved (George et al., 2023). In Nigeria, there is a strong focus on TVET as crucial for societal progress, underscoring the significance of a well-established curriculum execution. OBE is transforming medical education in Japan's pharmacology field by focusing on explicit learning outcomes and aligning the curriculum accordingly(Tanabe, 2023). In India, challenges remain in shifting from traditional to OBE systems in higher education institutions, with issues including stakeholder participation, curriculum design, and evaluation methods. The studies highlight the continuous work and difficulties in improving the quality and significance of education in TVET and higher education sectors (Venkatesh & King, 2020).

Figure 1 depicts the key components involved in implementing OBE in TVET institutions. Starting with identifying the factors that influence OBE implementation, such as public-private partnerships and sectoral initiatives. This is followed by establishing the learning objectives and subsequently creating a curriculum based on these objectives. The subsequent actions entail executing the curriculum, which involves adjusting to modifications and surmounting obstacles. Assessment is essential for ensuring quality and meeting accreditation standards

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throughout the process. The model emphasises the significance of integrating global perspectives during the implementation process.

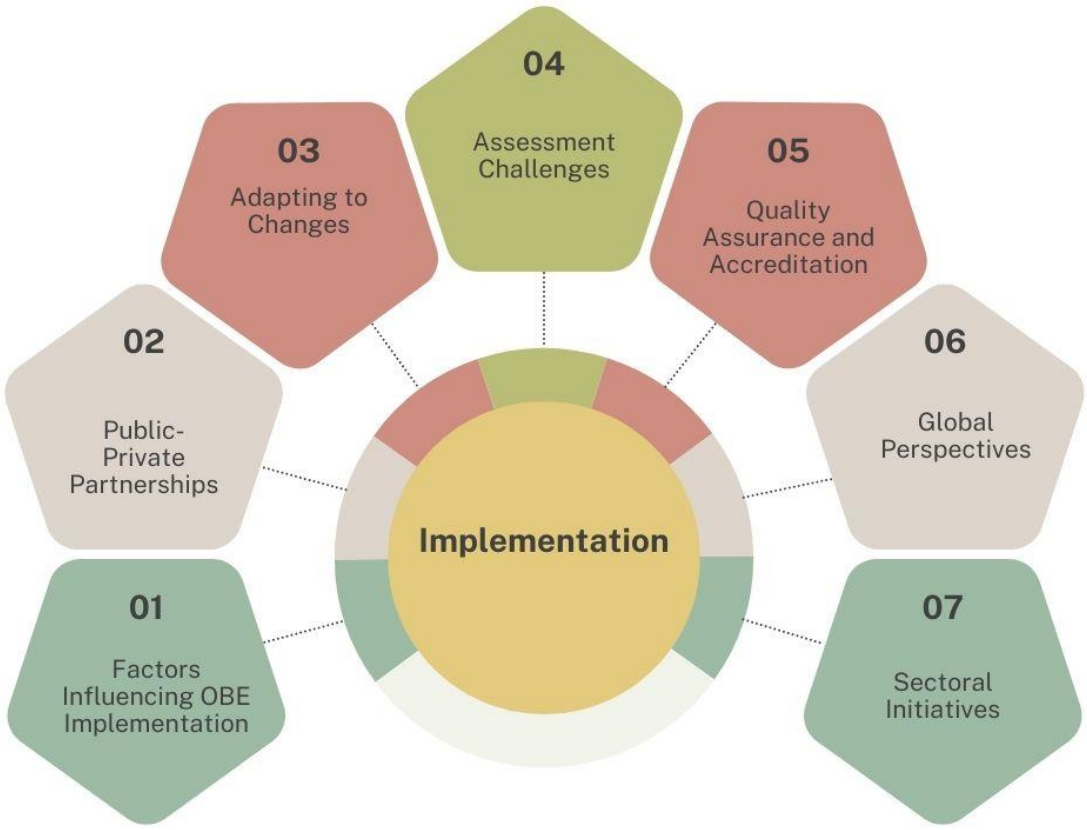

Figure 1: Key Component On Implementation Of OBE In TVET Institutions

Challenges and Issues Faced in Aligning OBE with TVET Goals and Objectives

Aligning OBE with the goals and objectives of TVET poses significant challenges in the changing education environment. The COVID-19 pandemic accelerated the transition to online learning, worsening inequalities in digital access and economic resources, particularly evident in India's challenges with online exams (Shakeel et al., 2021). Efforts to enhance sustainable competitiveness in economies such as Hong Kong SAR, China, focus on addressing challenges related to innovation, green growth, and skills development (Pavlova & Askerud, 2023). The challenges encountered in industry and their implications for TVET are closely aligned, despite contextual differences between countries such as Denmark and Hong Kong SAR. In Pakistan, the Pakistan Engineering Council (PEC) enforces OBE in engineering education to prepare engineering students for professional practice as per the Washington Accord. The transition encounters philosophical, theoretical, and practical obstacles, emphasising the overall difficulties in effectively incorporating OBE principles into TVET frameworks (Shaheen, 2019).

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When analysing how socio-economic conditions and policies intersect with TVET, different global contexts pose unique challenges and opportunities. In Sudan, socio-economic challenges and governance issues have led to a weakened TVET system, marked by financial limitations, insufficient resources, and lack of attention to rural regions and female students (Abdelkarim, 2019). In Singapore, the development of TVET under the SkillsFuture programme shows conflicts between acquiring knowledge and skills, affecting ideas about the importance of education, social advancement, and continuous learning (Abu Bakar et al., 2020). Pakistan is facing an increasing shortage of skilled labour despite the implementation of TVET programmes. Challenges consist of obsolete infrastructure, inadequate funding, restricted industry connections, and gender inequalities, especially noticeable in female involvement. The studies emphasise the significant impact of socio-economic factors on TVET outcomes and stress the importance of specific policy interventions to tackle systemic issues and encourage comprehensive skill development (Bano et al., 2022).

TVET encounters various complex obstacles that impede its efficiency and significance, especially in areas such as agriculture and industry integration. In Nigeria, the lack of resources, equipment, and infrastructure hinders the transfer of practical knowledge and skills necessary for agricultural graduates, underscoring the necessity for enhanced institutional support and resource distribution (Daniel et al., 2022). In South Africa, Technical and Vocational Education and Training (TVET) lecturers frequently lack industry experience, which hinders their capacity to deliver pertinent instruction. Studies emphasise the significance of Work-Integrated Learning (WIL) in addressing this issue. It provides chances for exposure to the industry while also highlighting obstacles like insufficient supervision and practical involvement (Mesuwini & Mokoena, 2023). The global landscape highlights the crucial role of Information and Communication Technology (ICT) in improving TVET. However, challenges remain in terms of ICT infrastructure, skills availability, and cybersecurity. To tackle these challenges effectively, it is essential to make strategic investments in resource allocation, curriculum modification, and teacher education to guarantee that TVET can adapt to changing labour market demands and promote sustainable workforce growth (Badawi & Drăgoicea, 2023).

When analysing TVET paradigms globally, various significant challenges become apparent in diverse settings. A study in Norway examines the work-based training aspect of TVET, focusing on plumbing apprentices and how they navigate their training in a shifting demographic environment influenced by an increase in foreign construction workers (Lensjø, 2021). In Afghanistan, there is a transition towards OBE and student-centered learning, as indicated by policy adjustments. However, obstacles remain in implementing these changes due to curriculum focused on content, inadequate infrastructure, and high teacher workloads (Katawazai, 2021). In Malaysia, there is a focus on incorporating Industry 4.0 (IR4.0) components into vocational college (VC) programmes to align with the changing industrial environment. Challenges identified in virtual classroom education include adapting the curriculum, preparing teachers, providing infrastructure, collaborating with industries, and engaging students. These challenges highlight the necessity for a thorough reform to align virtual classroom education with the demands of the Fourth Industrial Revolution and to guarantee the preparedness of the national workforce (Ngatiman et al., 2023).

Three studies examine the challenges encountered in aligning OBE with TVET goals and objectives in various contexts (Delubom et al., 2020). Identified challenges in implementing inclusive education for students with disabilities in TVET colleges, including inadequate

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infrastructure, funding, lecturer training, and staff shortages. They recommended establishing Disability Service Units and providing training for lecturers to improve support for disabled students. Furthermore, in Trinidad and Tobago's TVET sector, concerns such as stigma, dropout rates, and the quality of teaching were highlighted. Research findings emphasised the necessity of government intervention to tackle overarching issues that impede TVET institutions from effectively addressing these challenges (Mack & White, 2019). A survey at the Federal Polytechnic Ede, Osun State, Nigeria, identified the preferences and challenges encountered by engineering students when accessing TVET information resources. Although individuals prefer electronic formats and depend on personal collections and the internet, challenges such as high information access costs, negative library staff attitudes, and limited awareness of TVET resources were identified. This calls for enhancements in resource accessibility, staff training, and student information literacy programmes to improve information retrieval processes (Odumade-Salako & Amusan, 2019).

Figure 2 outlines several challenges that can hinder the successful implementation of OBE in TVET institutions. TVET institutions can devise strategies to address these challenges and effectively implement OBE, thereby enhancing the employability and career opportunities of their graduates. Developing a flexible curriculum that can adapt to industry needs and strengthening partnerships between TVET institutions and industry stakeholders. This could involve industry professionals working together on curriculum development, giving guest lectures, or providing internship opportunities for students. Enhancing resource availability and accessibility through investments in information resources and technological infrastructure to aid in the development and delivery of OBE programmes. Tasks may involve creating online educational resources, providing technology integration training for educators, or establishing partnerships with other organisations to share resources. Supporting government policies that promote the implementation of OBE and resolving any philosophical differences between government policies and OBE principles. This could involve conducting research and pilot programmes to demonstrate the effectiveness of OBE, or working with policymakers to establish a shared understanding of the benefits of OBE. Creating plans to tackle socio-economic barriers that may put certain learners at a disadvantage, like offering financial assistance or academic support services, and addressing obstacles associated with work-integrated learning. TVET institutions can partner with employers to establish meaningful work-integrated learning experiences accessible to all students.

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Figure 2: Key Component On Challenges And Issues Faced In Aligning OBE With TVET

Strategies and Solutions for Overcoming Challenges in OBE Implementation within TVET

Implementing OBE in TVET faces distinct challenges, but different strategies provide solutions to address them. Utilising cooperative learning methods like the jig saw model promotes successful peer teaching and learning, leading to a notable achievement of anticipated cognitive results (Ragupathy et al., 2023). Furthermore, consistent assessment using tools such as frequent quizzes, assignments, and alternative assessment techniques (AAT) guarantees the assessment of learning outcomes (Namratha et al., 2023). Implementing AAT in a cryptography and network security course increased student engagement, resulting in improved programme outcomes in coding skills and real-time application comprehension. During the pandemic, incorporating computer-assisted instruction (CAI) into a flipped classroom-case method approach was effective in enhancing problem-solving skills and learning outcomes for TVET students. This novel approach improves comprehension of materials, boosts student involvement and contentment, and serves as a useful resource for TVET curriculum advancement (Wulansari et al., 2023).

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Various approaches and interventions are utilised to address challenges in implementing OBE in TVET. Improving teachers' capacity to instruct in a technology-driven setting is essential. This includes recognising factors that affect teacher motivation and self-efficacy, school environment, and policy training, and enacting strategies to strengthen these areas (Jia, 2024). Furthermore, enhancing youth employability and addressing skills mismatches requires crucial collaboration between TVET institutions and industries. The collaboration should concentrate on synchronising curricula with labour market needs, improving practical aspects, and supplying up-to-date equipment and technology (Muchira et al., 2023). Increasing awareness among young people about the advantages of TVET and promoting career preparedness through activities such as skills competitions and collaborations with industries can improve the appeal and significance of TVET. Utilising mixed-method research and stakeholder input, these strategies provide ways to tackle obstacles and improve career prospects for youth in TVET, ultimately aiding in the socioeconomic progress of countries such as Kenya and the Maldives (Sunny & Ismail, 2023).

Strategies and solutions for addressing challenges in implementing OBE in Technical and Vocational Education and Training (TVET) involve different elements of educational reform and pedagogical innovation. It is important to comprehend how OBE principles relate to individual psychological factors that influence students' aspirations and tendencies, as demonstrated in research on entrepreneurial intentions among English majors. Customised talent development strategies based on the OBE framework can effectively tackle the obstacles in nurturing the particular skills and mindsets essential for entrepreneurship. These strategies involve aligning the curriculum, enhancing faculty skills, and implementing rigorous assessment techniques (Tian, 2023). Furthermore, when implementing alternative and online assessment methods in OBE, it is crucial to carefully assess factors such as constructive alignment, validity, reliability, and preventing plagiarism (Sapawi et al., 2023). Finally, it is crucial to innovate curriculum design by integrating OBE principles and sustainable development perspectives to develop students' sustainability skills. The teaching model "One Centre, Two Platforms, and Three Education" focuses on student-centered learning, virtual platforms, and holistic education. It has shown positive results in enhancing learning motivation, academic performance, and overall quality. The strategies enhance talent training, encourage entrepreneurial thinking, and support sustainable development in TVET institutions, improving the educational experience and preparing students for future challenges (Hu et al., 2023).

Implementing OBE in TVET institutions involves complex strategies and solutions that necessitate thorough evaluation and intervention. Studies in the Philippines highlight the necessity of establishing mandatory accreditation for Higher Education Institutions (HEIs) to guarantee the successful execution of OBE. HEIs show satisfactory practices in implementing OBE, but face challenges in research and extension activities due to insufficient funding and weak connections (Hapinat, 2023). Accreditation is a practical system that monitors and upholds higher standards using the OBE typology, emphasising its importance in ensuring quality and enhancing programmes. Investigations in Saudi Arabia show that English teachers are favourably disposed towards incorporating OBE in their courses. They highlight its student-centered approach and its potential relevance in higher education. Biodemographic factors do not affect teachers' inclination towards OBE, suggesting its suitability across different professional backgrounds (Al-Saqqaf, 2023). In the Philippine context, evaluations of TVET trainees' twenty-first-century skills highlight the necessity of a systemic approach to tackle

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deficiencies in competency-based training, work-based delivery, and administrative support processes. Suggestions involve organising professional development, enhancing administrative processes, and offering prompt feedback to improve the efficiency of TVET programmes. The research highlights the significance of accreditation, teacher preparedness, and systemic enhancements in promoting successful OBE implementation in TVET institutions (Sumaya & Cruz, 2023).

Various studies provide effective strategies and solutions for implementing OBE in TVET institutions. Investigations in the Philippines demonstrate the efficacy of OBE in a university environment using open and distance learning. This emphasises the significance of clearly defining learning outcomes, providing assessment evidence, and designing teaching and learning activities. The results highlight the importance of providing ongoing support to faculty members through training and scholarships to maintain the successful implementation of OBE, establishing the university as a benchmark for other institutions (Cresencio, 2023). A qualitative study conducted in Vietnam examines the implementation of OBE in higher education. The study reveals a transition towards OBE due to external demands, but notes that the changes are mostly superficial, especially in terms of aligning curriculum design. Additional analysis is required to comprehend how external quality assurance systems affect quality enhancement in the Vietnamese setting (Pham & Nguyen, 2023). A proposal for a new student recruitment system utilising Course Outcome attainment to integrate OBE principles into student selection processes, using text mining to identify top candidates based on their course outcomes performance. The studies highlight the significance of aligning curriculum design with OBE principles, offering faculty support for successful implementation, and incorporating OBE into institutional practices to address challenges in Technical and Vocational Education and Training (TVET) OBE implementation (Thirumoorthy & Muneeswaran, 2023).

Various studies have identified innovative strategies for addressing the challenges of implementing OBE in TVET. A nursing workshop that combines creativity theory and OBE has been shown to enhance new nurses' creativity, practice demonstration effects, teaching satisfaction, and research output. This integration of theory and practice improves problem-solving skills and teamwork (Yang et al., 2023). A study conducted in China examines how OBE effectiveness impacts tourism and hospitality students' perceived VUCA (volatility, uncertainty, complexity, and ambiguity) skills. The study shows a significant connection between students' view of OBE effectiveness and their cognitive self-concept, highlighting OBE's role in enhancing students' adaptability in VUCA environments (Guo et al., 2023). In Vietnam, efforts to address the skills mismatch gap focus on improving general skills training in TVET institutions to promote inclusive skills development and reduce the widening gap between professional and intermediate worker career paths. The importance of combining OBE principles with creative teaching methods to prepare students for success in various and changing work environments is emphasised by these findings (Mori, 2023).

Diverse studies reveal innovative strategies for addressing challenges in implementing OBE in TVET. A study conducted in Malaysia has identified crucial career planning indicators among high-income entrepreneurs with TVET backgrounds. The study highlights the significance of focus and self-efficacy in attaining career goals (Muridan et al., 2023). An examination of OBE implementation in educational policy documents and institutions emphasises the importance of understanding OBE in a detailed manner by considering the concept of 'travelling theory'. This

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concept underscores the fluid process of adapting OBE across various educational settings and epistemological perspectives (Sarkar & Kurup, 2023). A study assesses how communication skills impact the employability of engineering students in the context of Industry 4.0, emphasising the importance of both verbal and non-verbal communication skills. The study emphasises the significance of combining OBE principles with creative strategies to tackle current challenges and improve the efficiency of TVET programmes (Wu et al., 2023).

In the field of TVET, addressing challenges in implementing OBE necessitates innovative strategies. An Indian study emphasises the significance of evaluating programme outcomes based on students' co-curricular activities. It suggests using rubrics to measure programme outcomes aligned with these activities to enhance higher education (Suji Prasad et al., 2023). An analysis of Philippine Technology and Livelihood Education (TLE) teachers' assessment practices in the Philippines shows issues like ambiguous learning objectives and insufficient utilisation of assessment methods in line with OBE principles. This highlights the necessity for a systematic approach to harmonise teacher assessment practices with educational reforms (Alonzo et al., 2023).A study from Vietnam examines university lecturers' assessment preferences for implementing OBE, revealing a strong preference for formative assessments, project-based assessments, and reflective practices. This highlights a notable change in assessment practices in higher education. The study emphasises the need to incorporate new assessment methods and align teacher practices with OBE principles to improve the effectiveness of Technical and Vocational Education and Training (TVET) programmes and enhance educational quality (Yen et al., 2023).

Figure 3 illustrates various essential strategies and solutions to tackle the challenges related to implementing OBE in TVET institutions. Developing a flexible curriculum that can adapt to meet the changing needs of the industry and strengthening collaborations between TVET institutions and industry stakeholders. This may involve industry professionals working together on curriculum development, giving guest lectures, or providing internship opportunities to students.Enhancing the availability and accessibility of resources: Investing resources and technology to improve the development and execution of OBE programmes. Possible choices consist of creating digital educational resources, providing training for educators on incorporating technology into teaching, or establishing partnerships with other institutions to share resources. Promoting government policies that facilitate the implementation of OBE and addressing any philosophical differences between government policies and OBE principles. This could involve conducting research and pilot programmes to demonstrate the effectiveness of OBE, or working with policymakers to establish a shared understanding of the benefits of OBE. Creating plans to tackle socio-economic barriers for specific groups of students, like offering financial assistance or academic support, and addressing obstacles related to work-based learning. Additionally, TVET institutions can partner with employers to develop meaningful work-integrated learning experiences accessible to all students. By implementing these strategies and solutions, TVET institutions can tackle the challenges associated with OBE implementation and create programmes that more effectively prepare students for the workforce.

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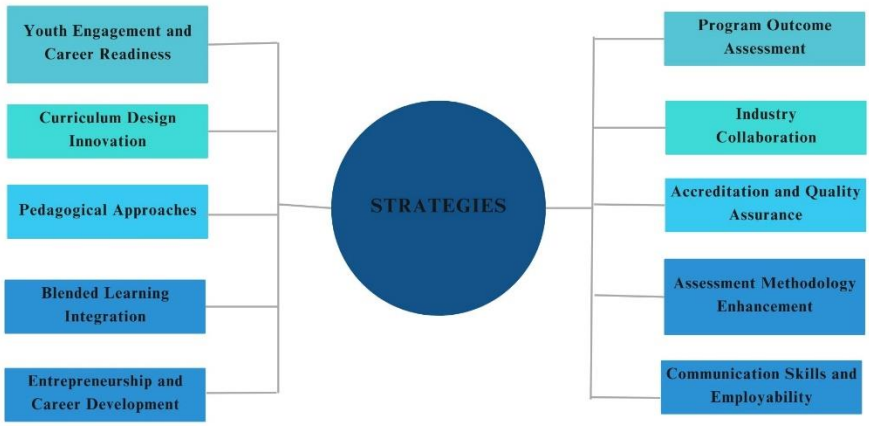

Figure 3: Key Component On Strategies And Solutions For Overcoming Challenges In OBE Implementation Within TVET

Discussion

Implementing OBE in TVET institutions is a complex effort that affects educational quality and workforce readiness. Studies from Vietnam and Indonesia demonstrate the importance of factors affecting the implementation of OBE, including students' perceived value and practical application skills. Furthermore, efforts in Bangladesh and Malaysia highlight the significance of matching educational strategies with the changing requirements of the Fourth Industrial Revolution (4IR) and tackling obstacles in offering specialised modules in degree programmes. Public-private partnerships in Southeast Asia have demonstrated potential in addressing the skills gap and improving workforce preparedness. The COVID-19 pandemic has led to a transition to online educational content delivery, affecting the execution of integrated industrial seminars. Efforts to enhance assessment processes in TVET, specifically in Design and Technology subjects, underscore the continuous requirement for resource improvement and teacher support to attain desired learning outcomes. Effective implementation of OBE in TVET institutions necessitates collaboration among students, teachers, industries, and policymakers to overcome challenges and optimise educational results in accordance with workforce needs.

Harmonising OBE with the goals and objectives of TVET faces significant challenges in the changing educational environment. The COVID-19 pandemic has highlighted pre-existing inequalities in digital access and economic resources, making tasks like online exams more challenging in places like India. In places such as Hong Kong SAR, China, efforts to enhance sustainable competitiveness require addressing challenges associated with innovation, green growth, and skills development. Challenges in industry alignment are evident in the difficulties faced in implementing OBE in engineering education in Pakistan, despite contextual variations. Challenges in integrating OBE principles into TVET frameworks are highlighted by philosophical, theoretical, and practical obstacles. Further analysis of global contexts reveals unique challenges and opportunities influenced by socio-economic conditions and policies. Sudan's TVET system faces financial constraints and neglects rural areas and girls, while Singapore's SkillsFuture initiative highlights the tensions between acquiring knowledge and skills. Pakistan is experiencing a growing shortage of skilled workers due to outdated

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infrastructure and gender inequalities, requiring specific policy actions to promote comprehensive skill development. Challenges affecting TVET effectiveness include resource constraints in Nigeria's agriculture sector and lack of industry experience among TVET lecturers in South Africa. This highlights the need for targeted investments in resources, curriculum adjustments, and teacher training. To maintain TVET's relevance to labour market demands and promote sustainable workforce growth, it is crucial to tackle these complex challenges.

To address challenges in implementing OBE in TVET, a multifaceted approach and comprehensive interventions are necessary. Cooperative learning methods, continuous evaluation using alternative assessment techniques (AAT), and blended learning models are effective strategies to improve learning outcomes and engage students. Enhancing teachers' capacity to adjust to technology-driven settings, promoting cooperation between TVET institutions and industries, and increasing youth understanding of the advantages of TVET are essential measures. Customised talent training models, creative assessment methods, and curriculum designs that support sustainable development perspectives help overcome challenges and enhance the educational experience in TVET. Establishing accreditation, improving teacher preparedness, and embracing a systemic perspective are crucial for successful OBE implementation and enhancing programme quality in TVET institutions. The strategies highlight the significance of collaboration, innovation, and systemic enhancements in managing the complexities of OBE implementation and promoting sustainable development in TVET.

Conclusion

In summary, the implementation of Outcomes-Based Education (OBE) in Technical and Vocational Education And Training (TVET) is an exciting prospect but a challenging task. Our study emphasized the importance of educational philosophies appropriate to the aims and objectives set out for or following vocational education, as this is crucial in order to obtain an optimal pedagogical outcome. Literature identified lack of alignment in curriculum design, assessment methodologies and stakeholder involvement among significant barriers to effective OBE implementation. The first essential is the provision of intensive training programs for TVET educators and managers at all levels to provide a well-grounded knowledge of OBE concepts in respect to their use within the framework of education. The second point is that curricula design should give more consideration to the adaptability and strength of how VET can be developed. Improving assessment techniques will help to properly evaluate student competencies and results in line with OBE goals. To initiate and facilitate a successful integration of OBE into TVET, all stakeholders (industry partner or their representative organization) need to be in the middle. The input of employers can shed light on the skills and competencies that are needed to fulfill ordinary workforce demand, thereby helping educational providers develop curriculum and instructional approaches. In conclusion, this study presents a set of recommendations that can be used by TVET institutions to supplement current practices for facilitating the transition from traditional methods into OBE-based approaches.

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