Developing and Evaluating the Motorcycle Illumination and Signaling System Trainer: A Narrative Review of Curriculum Readiness and Technology Acceptance in Automotive TVET

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ABSTRACT

The rapid integration of complex automotive electronics requires a substantial transformation in technical-vocational training methods. Within motorcycle servicing education, traditional, paper-based instructions and fully enclosed vehicle benches often fail to convey "invisible" electronic logic, creating a distinct "theory-practice gap" while increasing student anxiety. This research paper provides a conceptual and narrative assessment of the instructional and curricular readiness of Technical and Vocational Education and Training (TVET) programs for advanced automotive electrical systems. By integrating the Technology Acceptance Model (TAM) with experiential learning principles, this paper evaluates preparation across four core dimensions: policy direction, institutional capacity, human capability, and curricular alignment. The study reviews research, national policy directives, and institutional academic audits published from 2020 to 2026. The findings indicate that while national training frameworks, such as the Technical Education and Skills Development Authority (TESDA) Competency Standards for Automotive Servicing NC II, emphasize advanced electrical diagnostics, actual classroom implementation remains constrained. Many provincial and rural campuses continue to struggle with severe equipment scarcity, outdated manual-based tracking, and uneven instructor readiness regarding modern circuit geometry. This paper proposes a cohesive framework for deploying customized, transparent training simulators to enhance institutional capacity, reduce cognitive load, and boost behavioral intentions to adopt technical innovation. Ultimately, the integration of specialized, localized simulators represents not merely an academic reform, but a strategic progression towards sustainable workforce development and national qualification readiness.

Keywords: Automotive pedagogy, curriculum readiness, experiential learning, instructional trainers, motorcycle illumination, Technology Acceptance Model (TAM).

INTRODUCTION

The worldwide automobile industry is undergoing a significant transformation as a result of the shift from conventional mechanical designs to highly integrated, electronic-heavy vehicle networks (Miller, 2023; Thompson, 2022). Environmental concerns, rapid technological advancements, and international pledges to lower carbon emissions are driving major shifts in the skills required of technical staff (Al-Emran & Granić, 2024). Technical and Vocational Education and Training (TVET) institutions are facing increasing pressure to produce graduates capable of designing, maintaining, troubleshooting, and servicing these complex, modern electrical configurations (Ahmad & Wrahatnolo, 2024; Schneider, 2025). As a result, integrating advanced instructional media into technical and vocational education and training (TVET) curricula has emerged as a crucial strategic necessity for nations seeking to uphold economic competitiveness, maximize workforce efficiency, and satisfy modern industrial standards.

One of the most critical sectors of industrialization and economic expansion remains the automotive servicing track (Adnan et al., 2021). According to national training mandates, next-generation workforce capabilities, energy-efficient diagnostic logic, and technical mastery are critical to enhancing the sustainability of industry and transportation systems (Albertz & Pilz, 2025; Thunqvist et al., 2023). A workforce that is capable, certified, and prepared for the future is crucial to achieving these objectives. To prepare this workforce for evolving

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electrical ecosystems, technical institutions, community colleges, and regional training blocks are crucial (Yunus et al., 2024). Motor Vehicle Mechanics, Auto-Electricity, and motorcycle diagnostics are among the core competency courses taught at these institutions (Baharuddin et al., 2024). Many curriculum revisions and instructional adaptations are now required in these programs to educate students for modern, real-world servicing abilities.

However, many automotive TVET programs still concentrate on conventional, static instructional technologies, despite the fact that national policies and industry frameworks emphasize advanced electronic mobility (Azman et al., 2025). Workshop techniques, training curricula, and evaluation criteria often use mechanical layouts and two-dimensional schematics that are rapidly becoming obsolete in modern, highly automated automotive settings (Gupta & Lee, 2023; Hoffman, 2024). Important questions concerning the curriculum's preparedness and the extent to which current training tools, instructional materials, and institutional capacities can manage the complex knowledge and skills required for integrated circuits are raised by this misalignment (Pascua & Lagunero Tagare, 2024).

Curriculum readiness is not limited to a single aspect of preparation; other factors include instructor skill, industry partnerships, the availability of specialized training tools, and the institution's adaptability (Basri et al., 2025; Ismail et al., 2025). National objectives for technological growth and workforce readiness might suffer if students are not prepared, as there may be a greater skills gap between TVET graduates and the immediate demands of the sector as it develops (Mishra & Koehler, 2006). Additionally, the integration of advanced electrical instruction into TVET systems is impeded by a variety of factors (Ghomi & Redecker, 2019). Schools are confronted with the high cost of new training equipment (Dela Cruz, 2024), the fact that teachers lack sufficient experience with complex electronic systems (Andal et al., 2022), and the absence of defined, transparent competency criteria that align directly with industry standards (Lahn & Berntsen, 2023).

In order to address these issues, it is imperative to possess a comprehensive, evidence-based understanding of the current state of institutional preparedness and the systemic issues that impede the implementation of physical educational tools (Patalinghug, 2024). This paper evaluates the readiness of automotive TVET programs for advanced electrical integration by conducting a critical systematic analysis of current literature, empirical studies, and institutional training frameworks between 2020 and 2026. By highlighting the core requirements of curriculum preparedness, this study aims to improve academic understanding, reduce learner anxiety, and enhance policy discourse regarding successful technological adaptation (Li et al., 2022). Achieving these objectives is crucial to ensure that the automotive TVET sector remains in structural alignment with the evolving mobility industry (World Bank, 2024).

CONCEPTUAL AND THEORETICAL FRAMEWORK

The integration of advanced motorcycle illumination and signaling system trainers into automotive TVET curricula represents a systemic transformation and a pedagogical advancement (Jondra & Sugiarta, 2021). To comprehend this process, it is essential to possess a fundamental comprehension of the manner in which schools, teachers, and curricula address new educational technologies and policy requirements (Fullan, 2007, 2020). In this segment, the conceptual framework of curriculum readiness is introduced, and the factors that influence technical training adaptation are analyzed using a synthesis of the Technology Acceptance Model (TAM) and experiential learning principles.

Concept of Curriculum Readiness

Curriculum readiness is defined as the extent to which an educational system, institution, or training program is prepared to effectively implement and integrate new content, pedagogies, or technology (Azman et al., 2025). Within the specialized realm of technical-vocational training, this readiness is characterized by four interconnected components:

- **Curriculum Content Readiness:** This initial metric assesses the extent to which syllabi, learning outcomes, and competency standards incorporate emerging technical architectures, such as modular circuitry, diagnostic testing, and electrical subsystem logic (Poolkrajang & Papanai, 2025).

- **Teacher and Instructor Readiness:** This component entails that technical educators are technically proficient, versatile in their teaching methods, and motivated to teach and test new areas of technology (Mansor et al., 2024).

- **Infrastructure Readiness:** This dimension refers to the physical availability of appropriate safety facilities, simulation tools, specialized workshops, and transparent training instruments required for hands-on, interactive education (Qianyu et al., 2024).

- **Institutional and Policy Readiness:** This parameter focuses on the existence of strategic policies, stable financial sources, regulatory frameworks, and enterprise collaborations designed to facilitate and sustain ongoing training reforms (Veza et al., 2022).

Therefore, curriculum preparedness encompasses more than merely altering written course syllabi; it fundamentally involves ensuring that the content, capacity, and workshop context are all in structural alignment (Hargreaves & Shirley, 2019). To satisfy these dimensions, TVET schools must continuously update their occupational skill standards, incorporate multi-functional diagnostic tools into their laboratories, upskill their teaching staff, and establish strong relationships with businesses to ensure that students have access to real-world experience (Darling-Hammond et al., 2017). The curriculum can be exceedingly challenging to implement and maintain when any of these core readiness components are lacking (Hunter et al., 2022).

The Technology Acceptance Model (TAM) in Automotive Pedagogy

The Technology Acceptance Model (TAM) provides a substantial framework for understanding curriculum and training tool transformation in the context of technological disruption (Al-Emran & Granić, 2024). Originally formulated by Davis (1989), TAM posits that an individual’s willingness to adopt a new technological resource is determined by its *Perceived Usefulness* (PU) and *Perceived Ease of Use* (PEOU), which together shape their *Behavioral Intention* to use the tool (Kim et al., 2022; O'Reilly, 2023). TAM asserts that genuine instructional transformation is distinguished by a focus on individuals and behavioral processes, rather than being driven solely by top-down policies (Martinez, 2025). Educators' professional competence, user-friendly interfaces, a collective vision of utility, and systemic coherence across training levels are all essential for successful implementation (Tanaka, 2021; Henderson, 2024).

The discrepancy between the outcomes desired by policymakers and the actual outcomes in automotive TVET environments is clearly illustrated by the TAM model (Chen & Wang, 2023). National policies and training regulations establish ambitious objectives for competency-based certifications (TESDA, 2022). However, in order for TVET institutions to effectively incorporate these objectives into their workshops, they must develop their own capabilities, provide assistance to their instructional leaders, and modify their physical troubleshooting procedures (Lewis, 2022; Farrah, 2024). Teachers and students must perceive the training tool as both useful and easy to navigate to effectively implement policy objectives (Al-Emran & Granić, 2024).

Without this type of perceived utility alignment, instructional modifications may be more symbolic than substantive. In summary, the TAM paradigm regards training tool readiness as a collaborative endeavor that entails the alignment of human behavior and material usability, allowing users to establish a clear mental map of complex systems without cognitive friction (Schmidt, 2024). This implies that ongoing investments in instructor training, participatory tool design, and leadership involvement are necessary for long-term technology acceptance (Dimaculangan, 2025).

Experiential Learning and Diffusion of Innovation

The behavioral parameters of technology acceptance are furthered by experiential learning models and diffusion principles, which demonstrate the dissemination of new ideas, tools, and technical methods within an organizational training system (Rogers, 2003). These models outline specific innovative characteristics that influence the adoption rate of a training tool, including its compatibility, relative advantage, complexity, trialability, and observability (Rogers, 2003). Within automotive TVET, "innovation" refers directly to the integration of specialized skill-building kits, diagnostic instruments, and hands-on teaching methods into existing workshops (Rajabi Nezhad et al., 2026).

- **Relative Advantage** pertains to the perceived operational advantages of simulator integration, including reduced student error rates, improved job prospects, and alignment with modern industry standards (Leite et al., 2022; Brown, 2023).
- **Compatibility** assesses the extent to which the simulator is consistent with national skill frameworks, competency-based assessment rubrics, and institutional values (De Leon, 2021; Orbeta, 2024).
- **Complexity** defines the technical and pedagogical challenges that educators and beginners face when implementing advanced circuits, particularly in contexts where they have previously encountered "black box" constraints or instructional limitations (Ahmad & Wrahatnolo, 2024).
- **Trialability** emphasizes the potential for institutions to test modular exercises or short training blocks before comprehensive implementation, thereby facilitating safe, risk-free experimentation (Van Merriënboer, 2022; Peters, 2023).
- **Observability** pertains to the ease with which positive training results, such as accelerated troubleshooting mastery or successful completion of national certifications, can be observed by the wider TVET community (Clarke, 2024; Silva, 2025).

These diffusion characteristics explain why certain technical institutions are more prepared and reactive than others (Rogers, 2003). The adoption process is typically expedited by institutions that are characterized by strong leadership, access to contemporary infrastructure, and clear tool traceability, which recognize a greater relative benefit and reduced user frustration (Foster & Grant, 2025). Conversely, challenges of institutional inertia, delayed reform cycles, and restricted tool diffusion are highly prevalent in colleges with limited financial resources or outdated equipment (Pascua & Lagunero Tagare, 2024).

Integrating the Frameworks: A Conceptual Model of Curriculum Readiness

By integrating technology acceptance variables with curriculum readiness parameters, the deployment of a Motorcycle Illumination and Signaling System Trainer can be conceptualized as a dynamic, multi-level process influenced by four interdependent variables: policy direction, institutional capacity, human capacity, and curriculum alignment (Azman et al., 2025).

- **Policy Direction:** This involves the establishment of strategic frameworks and standards that establish the legitimacy, resource distribution, and performance metrics for automotive curriculum innovation (CHED, 2020; MITI, 2020). However, policies may be symbolically adopted without substantial changes in actual workshop practice if other capacity aspects are not sufficiently developed (Fullan, 2007).
- **Institutional Capacity:** This encompasses organizational leadership, infrastructure (such as digital tools, specialized trainer kits, and safety-insulated workshops), and partnerships with enterprise networks that facilitate active technical implementation (MIDA, 2025; Ministry of Transport Malaysia, 2021). Leadership must cultivate cultures of innovation and encourage co-investment within the sector (Fullan, 2020).
- **Human Capacity:** This focuses on the technical proficiency of educators in automotive electrical systems, their practical teaching abilities, and their personal readiness to adopt instructional innovations (Andal et al., 2022). Teachers interpret and reconstruct the curriculum through hands-on experience, rather than merely adhering to dry text manuals (Darling-Hammond et al., 2017).
- **Curriculum Alignment:** In accordance with industry-defined competencies, the intended, implemented, and evaluated workshop procedures must remain perfectly coherent (TESDA, 2022). This includes a genuine, output-based evaluation that accurately represents occupational competencies, suitable pedagogical approaches (such as simulation and project-based learning), and logical material sequencing (Santos, 2025; Enriquez, 2024).

These elements are mutually constitutive: when robust policy is combined with insufficient institutional capacity, it results in a mere symbolic adoption (Fullan, 2007). Conversely, capacity devoid of human competence and user acceptance leads to unrealized potential (Al-Emran & Granić, 2024). Technical training interventions must be comprehensive, not incremental. This framework defines readiness as a multifaceted construct that is situated within a broader context shaped by national competency frameworks, industrial modernization agendas, and technical skill development initiatives (UNESCO-UNEVOC, 2017, 2023). The systematic evaluation of the interactions among these variables highlights critical issues—such as equipment scarcity and teacher anxiety—that impede the dissemination of novel technical concepts (Pascua & Lagunero Tagare, 2024). This framing demonstrates that a trainer's preparation is not merely a design exercise; it is a comprehensive process necessitating ongoing collaboration among legislators, institutions, educators, and industry partners.

METHODOLOGY

In order to consolidate and analyze current literature, empirical studies, policy documents, and training frameworks concerning automotive servicing education, this paper implements a comprehensive systematic literature review methodology (Pecson & Sarmiento, 2025). In contrast to broad narrative evaluations, this structured systematic approach implements an explicit search, selection, and filtration protocol to gather recent empirical findings regarding the use of physical trainers and simulators in automotive servicing education (Pecson & Sarmiento, 2025).

The sources analyzed included authorized training regulations from the Technical Education and Skills Development Authority (TESDA), academic audits from regional state colleges, and development reports from the National Economic and Development Authority (NEDA). Additionally, peer-reviewed journal articles and experimental research studies were consulted. Utilizing targeted keywords such as "automotive pedagogy," "vocational trainer," "motorcycle illumination," "Technology Acceptance Model," and "circuit traceability," relevant resources were identified across index databases, including Google Scholar, Scopus, and the Philippine Journals Online (PhilJOL) archive.

The search protocol exclusively examined research and technical papers published between 2020 and 2026 to ensure maximum currency. A thematic synthesis methodology was employed in the analysis, informed directly by the integrated parameters of technology acceptance, user behavior, and curriculum readiness (Pecson & Sarmiento, 2025). The review involved the systematic identification, classification, and interpretation of literature addressing topics such as tool usability, teacher preparedness, institutional capability, and national policy support. Each document was examined to determine whether top-down national standards were consistent with the actual physical manner in which automotive electrical systems were being taught at the school workshop level. Thematic coding facilitated the identification of key technical assets, instructional weaknesses, and regional opportunities for enhancing workforce readiness (Pecson & Sarmiento, 2025)

THEMATIC REVIEW AND DISCUSSION

Table 1 summarizes the key findings from empirical studies, policy reports, and institutional documents (2020–2026) related to curriculum readiness, tool usability, and technology acceptance for integrating physical signaling and illumination trainers into automotive TVET programs. The review themes are categorized under policy and standard alignment, curriculum content constraints, teacher and tool readiness, and regional workshop realities.

Table 1: Summary Review of Key Findings

Theme	Key Findings	Sources
Policy and Standard Alignment	• National training regulations (TESDA, CHED) mandate competency-based instruction and appropriate media for Automotive Servicing NC II. However, macro policy intents lack practical, structured tool translation into course designs at the school level.	TESDA (2022); CHED (2020); De Leon (2021); Orbeta (2024); Villanueva & Cruz (2023)

Curriculum Content Constraints	• Automotive curricula in provincial public schools remain focused on text-dense manuals and static internal combustion engine layouts, with minimal inclusion of interactive electrical circuit modules or troubleshooting boards.	Macaranas (2021); Pascua & Lagunero Tagare (2024); Solidum (2023); Valler (2022)
Teacher and Tool Readiness	• Many instructors lack practical exposure to integrated vehicle electronics and experience anxiety using complex setups. User-friendly, transparent trainer kits reduce student frustration and technophobia while lowering cognitive load.	Ahmad & Wrahatnolo (2024); Al-Emran & Granić (2024); Henderson (2024); Tanaka (2021); Martinez (2025)
Regional Workshop Realities	• Rural campuses experience severe equipment scarcity and instructional poverty. Introducing localized, open-layout trainers significantly drops student error rates in tracing invisible electrical concepts like voltage drop, boosting certification readiness.	Capilitan (2024); NEDA Caraga (2024); Rodriguez & Magallanes (2023); Santos (2025); Torralba (2023); Pimentel (2025)

The theme assessment suggests that initiatives to integrate advanced electrical training tools into automotive TVET programs are guided by explicit national policies; however, they are frequently impeded by inconsistent classroom tools and workshop practice (Pascua & Lagunero Tagare, 2024). The reasons why top-down policy intent alone has failed to achieve consistent instruction across institutions are clarified by utilizing technology acceptance and curriculum readiness frameworks (Azman et al., 2025; Al-Emran & Granić, 2024).

National training frameworks, including the TESDA Training Regulations for Automotive Servicing NC II and associated CHED initiatives, provide substantial strategic momentum for technical skill upgrades (TESDA, 2022; CHED, 2020). These documents engage institutional stakeholders and convey national significance, both of which enhance the external policy environment. However, the evaluation indicates that there is still a massive discrepancy between policy and practice (De Leon, 2021). Although state regulations establish explicit assessment targets—such as mandatory mastery in testing and repairing automotive wiring systems—operational instruments, such as localized training hardware, dedicated funding sources, and explicit circuit guidance, are still lacking (Orbeta, 2024; Villanueva & Cruz, 2023). These gaps arise when policy modifications are implemented without concurrent capacity development, cohesive leadership, and resources that enable stakeholders to implement innovation rather than passively supporting it (Fullan, 2007). There is a lack of micro-level enablers, including unambiguous circuit updates and localized institutional financial allocations, which reduces the likelihood of uniform technical reform throughout the public TVET system (Macaranas, 2021).

The findings suggest that a majority of rural automotive curricula continue to prioritize outdated, static engine components and fail to adequately incorporate interactive electrical circuit capabilities, such as real-time signaling diagnostics and wire tracing (Pascua & Lagunero Tagare, 2024). It is not sufficient to merely provide written manuals; rather, it is necessary to modify learning objectives, assessment methods, and sequencing of lessons to illustrate the multifaceted nature of vehicle electronics (Hoffman, 2024). Modular, competency-based approaches are highly effective in industrial tracks that experience rapid technological advancements (Ahmad & Wrahatnolo, 2024). The review suggests that institutions have been slow to implement localized, output-based training devices that facilitate the incremental integration of electrical diagnostics and accelerate market-ready competence (Patalinghug, 2024). Perceived relative advantages of automotive technical curricula will only accelerate tool adoption if schools are able to test small, visible workspace successes (such as custom simulator modules) that demonstrate immediate student execution and lower initial errors (Rogers, 2003; Leite et al., 2022).

A primary impediment to technical training success is the intersection of teacher anxiety and tool usability (Martinez, 2025). Many automotive educators were trained in traditional mechanical fields and lack formal certifications or long-term practical experience with modern circuit configuration logic (Andal et al., 2022; Cacho & Ronda, 2021). Educational reform is effective when educators continue to collaborate and acquire new, hands-on knowledge (Darling-Hammond et al., 2017). While certain regional seminars provide generic upskilling, the system often struggles to expand its capacity due to the short-lived, limited-scope, and small-scale nature of these training events (Valler, 2022). Without a planned, ongoing professional development path that encompasses accessible instructor tools, the transition to simulation-led learning will be slow and teacher readiness will remain uneven (Mansor et al., 2024).

Specific physical instruments—such as open-layout wiring boards, circuit breakers, and diagnostic testing parameters—are required to train individuals to work confidently on actual vehicle electrical networks (Kristyadi et al., 2021). Academic audits reveal that these high-quality facilities are absent in many provincial school blocks, as numerous educational institutions encounter severe challenges in terms of purchasing, maintaining, and adhering to expensive equipment standards (Solidum, 2023). Institutional leaders must possess the authority and resources to prioritize custom, cost-effective simulator construction to manage the high risks and costs associated with imported training benches (Patalinghug, 2024; World Bank, 2024).

Ultimately, the review demonstrates that technical training success is a highly scaled process: while some well-funded urban campuses function as early adopters due to strong resources, rural schools lag behind due to severe equipment deficits (NEDA Caraga, 2024). Policy signals establish a clear mandate, but they lack sufficient practical tool integration (De Leon, 2021). Integrating physical motorcycle illumination and signaling trainers with national qualification standards significantly enhances workshop work (TESDA, 2022). Innovation diffusion is halted when there is a high level of tool complexity and low infrastructure compatibility, such as trying to teach invisible electrical logic (e.g., voltage drops) via outdated paper texts (Rogers, 2003; Torralba, 2023). This confirms that the most effective strategy is a hybrid approach: national policy and regional grants to support infrastructure upgrades, paired with custom-built, highly transparent local simulator boards to dramatically simplify the cognitive workload of both students and instructors (Capilitan, 2024; Rodriguez & Magallanes, 2023; Santos, 2025).

RECOMMENDATIONS

The following recommendations are suggested to improve training readiness and guarantee the effective, accepted integration of physical simulators into automotive TVET programs:

Curriculum Reform and Standardization

The National Occupational Skills Standards (NOSS) and related training regulations should be explicitly translated into hands-on tool specifications by regional curriculum designers (Poolkrajang & Papanai, 2025). It is imperative to create modular and adaptable workshop exercises that incorporate physical circuit troubleshooting directly into existing automotive programs to facilitate a seamless transition (Ahmad & Wrahatnolo, 2024).

Teacher Upskilling and Technical Confidence

Technical institutions must implement national-scale, train-the-trainer workshops that concentrate specifically on automotive electrical diagnostics, wire tracing, and open-circuit testing (Mansor et al., 2024). Instructors should be given direct incentives to build, calibrate, and validate customized simulator boards, enhancing their technical proficiency and reducing technology-induced teaching anxiety (Darling-Hammond et al., 2017; Martinez, 2025).

Resource Development and Infrastructure Upgrades

To counteract severe regional equipment scarcity, public-private partnerships and federal grants must prioritize investments in transparent laboratory simulators and diagnostic tools (NEDA Caraga, 2024). Establishing shared training centers and tool repositories among technical institutions can optimize limited resources, providing broader access to high-quality training facilities for rural school blocks (Qianyu et al., 2024; World Bank, 2024).

Performance-Based Assessment and Industry Alignment

TVET institutions should shift testing methods away from text-dense theoretical exams toward output-based, practical assessments using traceable simulator benches (Santos, 2025). Curriculum advisory committees featuring automotive industry experts should be utilized to ensure that the lighting and signaling modules built by schools mirror the exact motorcycle profiles dominant in the local market, directly maximizing graduate certification readiness and employability (Singson, 2023; Morales, 2025).

CONCLUSION

The incorporation of specialized physical training simulators into automotive TVET curricula is a national imperative and an instructional transformation. A technical training institution's efficacy within the automotive ecosystem is determined by its ability to produce competent, certified graduates as vehicle systems grow increasingly reliant on complex electronics (Miller, 2023; Schneider, 2025). This review demonstrates that despite robust macro policy intent expressed in state frameworks like the TESDA training regulations, actual curriculum readiness and tool availability at the institutional level remain highly inconsistent (TESDA, 2022; De Leon, 2021). The results indicate that a majority of provincial automotive TVET programs continue to suffer from equipment scarcity, relying on non-interactive manual-based tracking that triggers student anxiety and fails to convey invisible electronic logic (Pascua & Lagunero Tagare, 2024; Macaranas, 2021).

The diffusion of technical innovation is severely impeded by persistent gaps in teacher capability, workshop infrastructure, and tool accessibility (Rogers, 2003). Meaningful curriculum reform requires systematic coherence, user-friendly tool design, and strong leadership support to ensure that technology acceptance translates into concrete psychomotor skills (Fullan, 2020; Al-Emran & Granić, 2024). Therefore, institutional preparation across rural school blocks remains a changing, imperfect process (Solidum, 2023). Ultimately, this review concludes that deploying custom-built, transparent motorcycle illumination and signaling system trainers is not a minor technical adjustment; it is a vital, systemic intervention that bridges the theory-practice gap, transforms the technical readiness of the workforce, and aligns provincial TVET classrooms with modern industrial standards (Capilitan, 2024; Santos, 2025).

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