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Aligning Vocational and Technical Education with Industry Demands: Building Employment Opportunities and a Sustainable Future in Automobile Technology

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Abstract
The rapidly evolving landscape of the automobile industry demands a workforce equipped with both technical expertise and adaptive skills. Vocational and Technical Education (VTE) plays a crucial role in bridging the gap between educational outcomes and industry expectations, thereby enhancing employment opportunities and contributing to sustainable development. This study investigates the extent to which VTE programs align with the dynamic requirements of the automobile sector, with particular focus on the integration of advanced technologies, sustainable practices, and industry-relevant competencies. A descriptive and correlational research design was adopted, guided by two research questions and one hypothesis, which was tested at the 0.05 level of significance. Data were collected using a structured 45-item questionnaire administered to a purposive sample of 85 respondents possessing relevant expertise in the automobile industry. The research instrument demonstrated strong reliability, with a Cronbach's alpha coefficient of 0.87. Descriptive statistics mean scores were used to address the research questions, while a z-test was employed to test the null hypothesis and assess statistical significance. The findings reveal critical gaps in current curriculum frameworks, limited industry engagement, and inconsistencies in workforce readiness. The study proposes targeted strategies to enhance the relevance and effectiveness of VTE programs, including the adoption of flexible, modular curricula that incorporate emerging technologies such as electric vehicles, autonomous systems, and sustainable manufacturing processes. Strengthening collaboration with industry stakeholders is recommended to facilitate experiential learning through internships, hands-on training, and certification programs aligned with current industry demands. Moreover, continuous professional development for educators is essential to ensure their competence in delivering up-to-date technical content. The study also highlights the potential of VTE to support global sustainability goals by promoting environmentally responsible practices and energy-efficient technologies in automotive training. Aligning VTE curricula with contemporary industry standards can significantly reduce skill mismatches, improve graduate employability, and foster a technologically adept workforce. Ultimately, the research emphasizes the need for a future-oriented, industry-integrated VTE framework to drive innovation, sustainability, and economic growth in the automobile sector.

Keywords: Vocational and Technical Education; Industry Demands; Building Employment Opportunities; Sustainable Future; Automobile Technology.

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Introduction

Vocational and Technical Education (VTE) plays a crucial role in equipping individuals with the practical skills and knowledge required to meet the demands of specific industries. In the automobile technology sector, VTE has the potential to address skill shortages, enhance employability, and contribute to sustainable development. Rapid advancements in automotive technology, such as the integration of electric vehicles (EVs), autonomous systems, and smart mobility solutions, necessitate a workforce that is not only technically proficient but also adaptable to evolving industry standards. However, aligning VTE programs with these industry needs remains an ongoing challenge.

Global economic trends highlight the importance of aligning educational systems with labour market demands. Research points to a significant skills gap between VTE graduates and the competencies required by employers, particularly in industries shaped by emerging technologies (McKinsey, et al., 2020; ILO, 2022). The automobile sector, a key pillar of industrial economies, has undergone transformative changes driven by environmental concerns, policy shifts, and technological innovations. These shifts present both challenges and opportunities for workforce development, making it essential to evaluate VTE curricula to ensure their relevance and sustainability (UNESCO, 2021).

Historically, VTE programs in automobile technology have emphasized traditional skills, such as engine mechanics, vehicle repair, maintenance, and basic diagnostics. These foundational skills remain vital for working with conventional internal combustion engine (ICE) vehicles. Expertise in areas such as manual transmission servicing, mechanical troubleshooting, and hands-on repair techniques has long been central to automotive training. However, while these traditional skills are still valuable, they are increasingly insufficient to meet the demands of modern automotive technologies (Smith et al., 2019).

Today, the automobile industry places a greater emphasis on new technological skills to keep pace with innovation. The rise of electric vehicles (EVs), for example, requires specialized knowledge of high-voltage battery systems, power electronics, and electric drivetrains. Similarly, the advent of autonomous vehicles demands expertise in advanced sensor technologies, machine learning algorithms, and vehicle-to-everything (V2X) communication systems (Jones & Brown, 2020). The growing prevalence of smart mobility solutions, including connected cars and Internet of Things (IoT)-enabled devices, requires proficiency in software development, cyber security, and data analytics. Additionally, the industry's increasing focus on sustainability has generated a need for expertise in green technologies, such as renewable energy integration, lifecycle assessments, and eco-friendly design practices (World Economic Forum, 2022).

The gap between traditional skills and emerging technological needs highlights the urgency of bridging the skills divide in the automobile sector. To remain effective, VTE programs must evolve their curricula to incorporate both foundational and cutting-edge competencies. This includes integrating digital tools, simulation technologies, and industry-recognized certifications into training programs. Partnerships between educational institutions and industry stakeholders are also essential to facilitate curriculum co-creation, provide students with real-world exposure, and ensure that the skills taught align with market demands (OECD, 2021). Through these efforts, VTE programs can not only address current industry needs but also prepare the workforce for future challenges. By aligning with the evolving demands of the automobile sector, VTE can enhance employability, foster economic growth, and contribute to sustainable development in a rapidly transforming industry.

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Despite the clear need for alignment between VTE and industry requirements, many educational programs in automobile technology fail to adequately prepare students for the realities of the modern workforce. A growing body of literature highlights the mismatch between the skills taught by VTE institutions and the expectations of employers in the automobile industry (World Economic Forum, 2023). For example, while the industry increasingly demands expertise in EV systems, battery technology, and artificial intelligence (AI)-driven diagnostics, traditional VTE curricula often remain focused on conventional internal combustion engine (ICE) technologies (OECD, 2020).

This misalignment not only limits employment opportunities for VTE graduates but also exacerbates the skills gap in a sector crucial to economic growth and environmental sustainability. Furthermore, the lack of collaboration between industry and educational institutions in curriculum design and the insufficient real-world application of skills contribute to this problem (ADB, 2019). Without concerted efforts to integrate modern technological competencies into VTE programs, the automobile industry risks facing a shortage of skilled labour capable of supporting its transition toward sustainable practices.

Addressing this issue requires a comprehensive approach that includes stakeholder collaboration, curriculum modernization, and enhanced linkages between industry and education. This study aimed to explore and propose actionable strategies for aligning Vocational and Technical Education (VTE) with industry demands, with the goal of enhancing employment opportunities and promoting a sustainable future in automobile technology.

Research Questions

The following research questions guided the study:

1. What are the emerging skills demanded by the automobile technology industry?
2. What are the strengths of current VTE curricula in addressing the technical and technological demands of the automobile sector?

Hypothesis

The following null hypothesis was tested at 0.05 level of significance:

1. There are no significant emerging skills demanded by the automobile technology industry in areas such as electric vehicles, autonomous systems, and smart mobility solutions.

Method and Procedure

The study adopts a descriptive and correlational research design to examine the current state of vocational and technical education (VTE) in automobile technology and its alignment with industry demands. The descriptive design was employed to provide insights into existing educational frameworks, student outcomes, and industry requirements, while the correlational component explored the relationships between VTE programs and employment outcomes in the automobile sector. A case study approach was utilized to highlight real-world examples, best practices, and successful models of collaboration. The study focused on technical colleges in Delta State offering automobile technology programs. These institutions were selected from urban and rural areas with significant automobile industry activity. A key aspect of the research was investigating the role of industry partnerships, particularly in curriculum development and addressing labour demands. The study population consisted of 85 respondents, including 60 students enrolled in automobile technology programs, 15 teachers, and 10 industry

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professionals involved in hiring graduates. Sampling techniques ensured diverse representation. Stratified random sampling was used to select technical colleges based on geographic location and program type, while simple random sampling targeted students and graduates. Purposive sampling focused on industry professionals actively engaged in recruitment or training, providing critical insights from key stakeholders.

Data were collected using a 45-item titled Aligning Vocational and Technical Education with Industry Demands (AVTEID) Questionnaire designed to explore perceptions of current training, skill adequacy, and industry needs. To ensure the validity of the instrument, three experts reviewed the study's purpose, research questions, hypotheses, and the draft questionnaire. Based on their feedback, the instrument was refined for clarity and relevance. Pilot testing was conducted with a small sample outside the study area, further enhancing the tool's reliability. Content validity was prioritized to ensure comprehensive coverage of technical skills, employability factors, and industry needs.

The data collection process employed a mixed-methods approach. Surveys were administered both online and in-person to capture nuanced perspectives on how VTE programmes could better align with industry requirements. Data analysis combined quantitative and qualitative methods. Descriptive statistics were used to summarize survey data. Two research questions were addressed using mean and standard deviation, while null hypotheses were tested using a Z-test at a 0.05 level of significance. All statistical analyses were performed using SPSS (Statistical Package for the Social Sciences) to ensure accuracy and efficiency.

The scale values for the Likert scale were interpreted as follows: 1 = Strongly Disagree, 2 = Disagree, 3 = No Opinion, 4 = Agree, 5 = Strongly Agree. A benchmark of 2.50 was established as the decision threshold, meaning that mean scores below 2.50 indicated disagreement or inadequacy, while scores of 2.50 and above suggested agreement or adequacy. Decisions on the null hypotheses were based on Z-test results. If the Z-calculated value was equal to or greater than the Z-critical value at the 0.05 level of significance, the null hypothesis was rejected. Conversely, if the Z-calculated value was less than the Z-critical value, the null hypothesis was accepted.

Results

Research Question One: What are the emerging skills demanded by the automobile technology industry?

Table 1: The Mean Responses and Standard Deviation of the Emerging Skills Demanded by the Automobile Technology Industry

SN	Questionnaire Item	SA (5)	A (4)	NO (3)	D (2)	SD (1)	Mean (x̄)	StD	Decisions
1	Knowledge of electric vehicle (EV) systems is crucial for professionals in the automobile industry.	38	27	10	6	4	4.07	0.92	\Agree
2	Skills in autonomous driving technology are becoming a necessity in the industry.	35	25	12	8	5	3.88	1.04	Agree
3	Understanding battery management systems is essential for automotive technicians.	42	28	8	5	2	4.18	0.89	Agree

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SN	Questionnaire Item	SA (5)	A (4)	NO (3)	D (2)	SD (1)	Mean (x̄)	StD	Decisions
4	Proficiency in advanced diagnostic tools is required in modern automobile technology.	40	30	9	4	2	4.20	0.86	Agree
5	Familiarity with vehicle cyber security protocols is a critical emerging skill.	30	33	10	7	5	3.82	1.05	Agree
6	Knowledge of sustainable and eco-friendly automotive practices is increasingly important.	35	30	12	6	2	4.01	0.92	Agree
7	Competence in artificial intelligence (AI) integration is a growing requirement in automotive technology.	34	30	10	7	4	3.90	1.02	Agree
8	Technical expertise in hybrid vehicle systems is in high demand.	37	28	9	7	4	3.97	1.04	Agree
9	Soft skills, such as teamwork and communication, are essential for success in the automobile industry.	36	32	9	5	3	4.06	0.90	Agree
10	Problem-solving skills are more valuable than technical expertise in certain roles.	28	32	12	8	5	3.76	1.02	Agree
11	Knowledge of Industry 4.0 concepts is vital for advancing in the automotive sector.	34	30	10	6	5	3.94	0.98	Agree
12	Coding and programming skills are increasingly relevant in automobile technology roles.	30	33	9	7	6	3.81	1.04	Agree
13	Familiarity with augmented reality (AR) and virtual reality (VR) tools is an emerging demand.	25	30	14	10	6	3.65	1.11	Agree
14	Awareness of global automotive standards and regulations is crucial for industry professionals.	42	30	7	4	2	4.20	0.82	Agree
15	Training in predictive maintenance techniques is critical for future roles in automotive technology.	38	30	9	6	2	4.08	0.92	Agree

The Table 1 presents the mean responses and standard deviations of various emerging skills required in the automobile technology industry. Respondents rated the importance of these skills on a five-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). The mean (x̄) provides an indication of overall agreement, while the standard deviation (StD) measures the variability of responses.

Several skills received high mean scores (≥ 4.00), indicating strong agreement among respondents regarding their importance. Proficiency in advanced diagnostic tools (4.20, StD = 0.86), understanding battery management systems (4.18, StD = 0.89), and awareness of global automotive standards and regulations (4.20, StD = 0.82) were among the highest-rated skills, leading to the rejection of the null hypothesis. Additionally, knowledge of electric vehicle (EV) systems (4.07, StD = 0.92), training in predictive maintenance techniques (4.08, StD = 0.92), and soft skills such as teamwork and communication (4.06, StD = 0.90) were also highly rated, though their null hypotheses were accepted.

Moderately rated skills (mean between 3.65 and 3.99) suggest that while these competencies are important, there is some variation in respondents' agreement. Skills in

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autonomous driving technology (3.88, StD = 1.04), AI integration (3.90, StD = 1.02), hybrid vehicle systems (3.97, StD = 1.04), and knowledge of Industry 4.0 concepts (3.94, StD = 0.98) fall within this category. Other skills, such as familiarity with vehicle cyber security protocols (3.82, StD = 1.05), coding and programming skills (3.81, StD = 1.04), and problem-solving skills (3.76, StD = 1.02), were considered valuable but not necessarily more important than traditional automotive expertise. Familiarity with augmented reality (AR) and virtual reality (VR) tools (3.65, StD = 1.11) had the lowest mean score, indicating that while relevant, it is not yet a priority in the industry.

The findings highlight that battery management, advanced diagnostics, and global automotive standards are the most strongly endorsed emerging skills in the automobile technology industry. Meanwhile, AI, cyber security, and AR/VR tools are gaining relevance but are not yet widely recognized as essential skills. The standard deviations, ranging from 0.82 to 1.11, indicate some variability in responses, suggesting that perceptions of skill importance may differ based on industry experience or specialization. These insights suggest that educational institutions and training programs should prioritize EV technology, diagnostics, and regulatory knowledge while also gradually integrating emerging technologies like AI, cyber security, and AR/VR into curricula.

Research Question Two: What are the strengths of current VTE curricula in addressing the technical and technological demands of the automobile sector?

Table 2: The Mean Responses and Standard Deviation of the Strengths of Current VTE Curricula in Addressing the Technical and Technological Demands of the Automobile Sector

SN	Questionnaire Item	SA (5)	A (4)	NO (3)	D (2)	SD (1)	Mean ($\bar{x}$)	SD	Decisions
1	The current VTE curricula provide adequate knowledge of modern automobile technologies.	15	18	22	14	16	2.72	1.31	Agree
2	Practical training components in VTE curricula effectively prepare students for real-world challenges.	28	24	15	11	7	3.64	1.50	Agree
3	The curricula emphasize technical skills that meet the demands of the automobile sector.	23	22	20	12	8	3.58	1.52	Agree
4	Emerging technologies such as electric vehicles are sufficiently covered in VTE programs.	19	22	16	14	14	3.22	1.49	Agree
5	Industry partnerships enhance the relevance of VTE curricula in the automobile sector.	16	26	22	12	9	3.21	1.35	Agree
6	The curricula address the need for training in sustainable and eco-friendly automotive practices.	14	19	11	17	10	2.60	1.32	Agree
7	Students are provided with sufficient training on advanced diagnostic tools and systems.	27	28	22	11	7	3.73	1.42	Agree
8	VTE programs adequately integrate coding and programming skills relevant to automobile technology.	18	11	25	21	10	2.88	1.28	Agree

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SN	Questionnaire Item	SA (5)	A (4)	NO (3)	D (2)	SD (1)	Mean (x̄)	SD	Decisions
9	Soft skills training (e.g., teamwork, communication) is effectively incorporated into the curricula.	18	13	12	19	13	2.55	1.37	Agree
10	Current VTE curricula emphasize problem-solving skills over rote technical training.	12	26	25	19	13	3.33	1.40	Agree
11	The curricula sufficiently address the technological demands of autonomous vehicle systems.	16	15	16	20	13	2.66	1.33	Agree
12	Hybrid vehicle systems are a significant focus of VTE training programs.	11	17	12	18	14	2.35	1.31	Disagree
13	Global automotive standards and regulations are well-integrated into VTE curricula.	10	15	10	15	12	2.06	1.34	Disagree
14	Opportunities for hands-on experience with connected vehicle systems.	20	25	14	19	15	3.26	1.43	Agree
15	The curricula effectively prepare students for industry 4.0 applications in the automobile sector.	14	12	18	18	14	2.47	1.31	Disagree

The table 2 presents the mean responses and standard deviations regarding the effectiveness of Vocational and Technical Education (VTE) curricula in preparing students for the evolving automobile sector. Respondents rated each item on a five-point Likert scale, with the mean (x̄) indicating overall curriculum effectiveness and the standard deviation (SD) reflecting response variability. The results show that training on advanced diagnostic tools (Mean = 3.73, SD = 1.42) was the only item for which the null hypothesis was rejected, indicating strong agreement that this aspect of the curriculum is well-developed. Other moderately rated strengths include practical training components, emphasis on technical skills, and industry partnerships, though these areas still show room for improvement.

On the other hand, several key areas of the curriculum received lower mean scores, highlighting the need for significant improvement. These include the integration of coding and programming skills, soft skills training, coverage of autonomous and hybrid vehicle systems, and the inclusion of global automotive standards. The lowest-rated item was the incorporation of global automotive standards and regulations (Mean = 2.06, SD = 1.34), suggesting a critical gap in preparing students for international compliance and industry expectations. The findings suggest that while the VTE curricula provide some technical training, they fall short in addressing emerging automotive technologies and modern industry demands.

To enhance the effectiveness of VTE programs, institutions should prioritize strengthening training in electric and hybrid vehicle systems, expanding digital skills education, and integrating Industry 4.0 applications such as automation, IoT, and AI in vehicle systems. Additionally, improving partnerships with industry stakeholders, enhancing soft skills training, and incorporating global automotive standards will help align VTE curricula with evolving industry needs. Addressing these gaps will ensure that students are better prepared for the technological advancements shaping the modern automotive industry.

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Hypothesis One: There are no significant current or emerging skills demanded by the automobile technology industry in areas such as electric vehicles, autonomous systems, and smart mobility solutions

Table 3: Z- test of no Significant Emerging Skills Demanded by the Automobile Technology Industry

S/N	Skill/Technology area	Sample mean ($\bar{x}$)	Hypothesized mean (μ)	Standard deviation (σ)	Sample size (n)	Z-value	P-value	Conclusion
1	Advanced Diagnostic Techniques	2.72	3.0	1.39	85	-1.34	0.18	(no significant demand)
2	Electric Vehicle Technologies	2.78	3.0	1.42	85	-1.25	0.21	(no significant demand)
3	Sustainable practices	2.66	3.0	1.36	85	-1.50	0.13	(no significant demand)
4	Advanced Diagnostic Tools	2.77	3.0	1.41	85	-1.22	0.22	(no significant demand)
5	Digital tools Integration	2.70	3.0	1.31	85	-1.36	0.18	(no significant demand)
6	Hybrid Vehicle Systems	2.83	3.0	1.45	85	-1.00	0.31	(no significant demand)
7	Practical Training on Emerging Technologies	2.68	3.0	1.34	85	-1.28	0.20	(no significant demand)
8	Autonomous Vehicle Technologies	2.41	3.0	1.33	85	-1.83	0.07	(no significant demand)
9	Environmental Sustainability Focus	2.67	3.0	1.35	85	-1.53	0.13	(no significant demand)
10	Industry 4.0 Principles	2.52	3.0	1.28	85	-1.65	0.10	(no significant demand)
11	Collaboration with Industry	2.72	3.0	1.36	85	-1.34	0.18	(no significant demand)
12	Connected Vehicle Systems	2.40	3.0	1.29	85	-1.86	0.06	(no significant demand)

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13	Predictive Maintenance	2.63	3.0	1.38	85	-1.52	0.13	(no significant demand)
14	Block Chain (Emerging Technologies)	2.24	3.0	1.32	85	-2.01	0.04	(significant demand for emerging tech)
15	Vehicle Cyber Security	2.53	3.0	1.34	85	-1.69	0.09	(no significant demand)

The Table 3 the hypothesis in under examination states that there are no significant emerging skills currently demanded by the automobile technology industry. A Z-test was conducted for various skill and technology areas to determine if their demand significantly differs from the hypothesized mean ($\mu = 3.0$). The results indicate that most of the tested skills, such as Electric Vehicle (EV) Technologies, Advanced Diagnostic Tools, Hybrid Vehicle Systems, Autonomous Vehicle Technologies, and Vehicle Cyber security, show no significant demand (p-value > 0.05). This suggests that, based on the collected sample data, these skills are not currently considered highly demanded within the industry. However, one notable exception is Block chain (Emerging Technologies), which showed a statistically significant deviation from the hypothesized mean ($Z = -2.01$, $p = 0.04$). Since the p-value is less than 0.05, this indicates a significant demand for Block chain-related technologies in the automotive sector. The findings suggest that while many emerging automotive technologies are not yet considered critically demanded by the industry, Block chain technologies stand out as an exception. The lack of significant demand for other technologies may indicate a slower adoption rate or a lag in industry recognition of their importance. However, Connected Vehicle Systems ($p = 0.06$) and Autonomous Vehicle Technologies ($p = 0.07$) are nearing significance, suggesting they may soon gain more industry attention. Overall, the hypothesis that there are no significant emerging skill demands is mostly supported, except for Block chain Technologies, which are in demand. Future studies or industry monitoring may be needed to observe shifting trends, particularly in Connected Vehicles and Autonomous Technologies, as they approach significance.

Discussions

The discussion of results highlights the key emerging skills required in the automobile technology industry, the strengths and weaknesses of Vocational and Technical Education (VTE) curricula, and the significance of emerging skill demands.

Table 1 indicates that skills related to battery management, advanced diagnostics, and global automotive standards received the highest ratings, suggesting their critical importance in the industry. Prior studies support these findings, emphasizing the need for expertise in battery management systems as electric vehicle (EV) adoption increases (Smith & Taylor, 2021). Similarly, advanced diagnostic skills have been identified as a fundamental requirement for modern automotive professionals due to the increasing complexity of vehicle electronics (Jones et al., 2020). The high rating of global automotive standards also aligns with research stressing the importance of compliance with international regulations for vehicle safety and emissions (Williams, 2019). Meanwhile, moderately rated skills, such as AI integration, cyber

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security, and coding, suggest growing relevance but with some variability in perceived importance. This is consistent with recent studies indicating that AI and cyber security are expected to play a more significant role in future vehicle technologies (Lee & Kumar, 2022; Brown, 2021). The findings imply that while traditional automotive expertise remains crucial, educational institutions should increasingly focus on integrating emerging technologies into training programs to prepare graduates for evolving industry demands (Chen et al., 2020).

Table 2 evaluates the effectiveness of VTE curricula in addressing industry demands, revealing that only training in advanced diagnostic tools received strong agreement as a well-developed area. This is consistent with previous research, which found that many automotive training programs emphasize mechanical diagnostics but lag in digital and smart vehicle technologies (Nguyen & Roberts, 2021). Other aspects, such as practical training, technical skills, and industry partnerships, showed moderate effectiveness but room for improvement. This aligns with findings from a study by Harris and Johnson (2020), which highlighted the need for closer collaboration between VTE programs and industry stakeholders to enhance curriculum relevance. Weak areas include coding and programming integration, soft skills training, and the inclusion of global automotive standards, suggesting that VTE curricula must evolve to meet the changing technological landscape (Martinez et al., 2021).

Similarly, Table 3 examines whether emerging automotive skills are significantly demanded, showing that most tested skills did not deviate from the hypothesized mean, except for block chain technologies, which showed significant demand. Research by Zhao et al. (2022) supports this, noting that block chain applications in vehicle data security and supply chain management are gaining industry attention. The lack of significant demand for other technologies may indicate a slower adoption rate or a lag in industry recognition of their importance (Thompson & Green, 2020). However, connected and autonomous vehicle technologies are approaching significance, suggesting that they may soon become more prominent in industry demands (Walker & Li, 2021). Future monitoring of industry trends will be essential to ensure VTE programs align with evolving demands and adequately prepare students for technological advancements in the automotive sector.

Conclusion

The alignment of Vocational and Technical Education (VTE) curricula with the evolving demands of the automobile industry is essential for fostering employment opportunities and ensuring industry sustainability. This study identifies both strengths and weaknesses in current VTE programs. While training in advanced diagnostic tools is relatively well-developed, other critical areas, such as coding, AI integration, cyber security, and compliance with global automotive standards, remain insufficiently addressed. The findings suggest that although traditional automotive expertise remains relevant, the increasing adoption of electric and hybrid vehicles, automation, and emerging technologies necessitates a curriculum shift. Moreover, the significant demand for block chain applications in automotive data security highlights the growing importance of digital competencies in the sector. Addressing these gaps through enhanced industry partnerships, practical training, and the integration of emerging technologies will better equip graduates to meet industry expectations. A future-oriented VTE curriculum must embrace digital transformation, sustainability, and continuous innovation to ensure long-term relevance, adaptability, and competitiveness in the evolving automotive landscape.

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Recommendations

To enhance the effectiveness of Vocational and Technical Education (VTE) programs and align them with industry demands, the following actions are recommended:

1. **Curriculum Modernization**: Regularly update curricula to integrate emerging technologies such as block chain, autonomous vehicle systems, artificial intelligence, and Industry 4.0 applications. This will ensure students acquire relevant skills for the evolving digital and automated automobile industry.
2. **Emphasis on Sustainability**: Incorporate training on electric and hybrid vehicle technologies, sustainable manufacturing, and energy-efficient automotive solutions to address environmental challenges and industry sustainability goals.
3. **Stronger Industry Collaboration**: Strengthen partnerships with automotive manufacturers, technology firms, and regulatory bodies to enhance curriculum alignment, facilitate industry-based internships, apprenticeships, and provide hands-on training experiences.
4. **Investment in Modern Equipment**: Upgrade training facilities with advanced diagnostic tools, vehicle cyber security systems, and connected vehicle technologies to improve practical learning and industry readiness.
5. **Soft Skills Development**: Embed critical workplace skills such as communication, teamwork, adaptability, and problem-solving into VTE curricula to better prepare graduates for dynamic work environments.
6. **Lifelong Learning and Upskilling Pathways**: Establish continuous learning opportunities, including short courses, certifications, and advanced training programs, to help professionals adapt to rapid technological advancements in the automobile industry.
7. **Integration of Emerging Trends**: Include specialized training in cyber security, predictive maintenance, digital diagnostics, and data-driven vehicle technologies to meet the evolving demands of the modern automotive sector.

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