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QUEZON PROVINCE TVET SECTOR'S RESPONSE TO AI-INDUCED DISRUPTIONS

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ABSTRACT

This research explored the introduction of artificial intelligence to the Technical-Vocational Education and Training (TVET) system in Quezon Province, Region 4A, Philippines. Given that AI has a transformative potential and brings in game changing implications for the future workforce, this research study explored the state of integration of AI among TVET institutions, evaluated the institutional readiness to integrate AI-related content and technologies, and analyzed how different stakeholders perceive challenges and opportunities associated with embedding AI. A mixed-method approach was employed in gathering data in the form of surveys among TVET trainers and structured interviews with TVET administrators. Quantitative data were analyzed descriptively while thematic analysis was employed to examine qualitative data. After thorough analysis, results revealed that the respondents were mostly familiar with AI tools utilized in education, showing their readiness to integrate such technologies into their teaching practices. However, there are different challenges facing TVET institutions, frequently on the lack of resources. On the other hand, AI presents the opportunity to enhance the teaching of skills in TVET courses.

KEYWORDS: *Artificial Intelligence, Curriculum Development, Educational Technology, Technical-Vocational Education and Training, TVET Institutions*

INTRODUCTION

The rise of artificial intelligence is profound as a technology, which in turn is changing industries and leading the balance of economic power globally. This transformation offers both opportunities and risks, especially for developing countries such as the Philippines where a large part of the labor force is working on sectors that are exposed to AI-driven automation (Faishal et al., 2023). Artificial intelligence has had a significant impact on the technical-vocational education and training sector as it has made life more comfortable in numerous fields. With AI taking over more work as time progresses, there is an imminent demand for educational institutions to adjust their educational program and teaching styles in a way where students acquire all the requisite skills to not only stay ahead but be very successful in this fast-changing landscape (Wang & Lester, 2023).

The world over AI has evoked concerns on losing jobs and dated skills due to the rapid progress and scaling of these technologies. Recent research revealed that low and middle-income countries where repetitive routine forms the main part of most workers' jobs might be especially at risk as this segment is one of the major parts that can be automated (Faishal et al., 2023). This trend is a case for being progressive about skill-building and getting workforces ready now to survive the AI era. There is emergence of the development in high-growth industries to become more relevant. The COVID-19 pandemic has only served to hasten this shift, highlighting the necessity for agile and resilient education and training systems that could provide young people with the competencies required to traverse the complex modern world of work (Asian Development Bank [ADB], 2021).

Educational country leaders have taken notice of the potential workforce repercussions just as they have in Quezon Province and elsewhere. The COVID-19 pandemic has further solidified the place of AI-powered tools within teaching and learning, underscoring the urgent necessity to capacitate educators with competencies essential for effective use of these new technologies to improve academic performance and ready learners for future workforce (Ng et al., 2023).

The Philippines, like many countries in the developing world, offers a mix of hope and fear around the impact of AI-driven disruption. AI might improve productivity and generate new jobs (Kumre, 2023). However, it also threatens job displacement due to skills obsolescence in sectors that are mainly dominated for manual and repetitive occupations (NTESDP 2018-2022, 2022). This still does not bridge the gap in skills mismatch and is made worse by many changes being accelerative ones, making it important for educational systems to be able to adapt (Kong, 2022).

Artificial intelligence (AI) technology's rapid development and integration into most industries will disrupt the global labor market, leading to both new developments and challenges for

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developing economies such as the Philippines (Faishal et al., 2023). Where AI holds enormous promise in terms of productivity gains and new job creation, it also has a darker side which could lead to the displacement or obsolescence of certain jobs especially those which are more manual and repetitive in nature (Faishal et al., 2033). This type of skills mismatch is also accelerated by the fast evolution of technological progress which underpins with several education system to adjust quickly to produce graduates who have significant knowledge and skills necessary for survival on an AI-driven economy (ADB, 2021).

In this case, there is a need to investigate how the area of technical-vocational education and training in the Province of Quezon, Philippines has responded to both challenges and opportunities brought on by artificial intelligence in the workplace. More specifically, there is a need to examine the current rate of AI adoption and its implications on employment in Quezon Province, specifically with a consideration for industries with high presence of TVET graduates, the salient strategies and interventions of TVET institutions in Quezon in their reconfigurations of curricula, pedagogies, and student support services to evolving skill demands propelled by AI, and the effectiveness of those policies at ensuring the workforce coming from TVET will have what it takes to endure and be successful in an AI-driven economy. This could provide recommendations to enhance the resilience and responsiveness of the TVET sector in Quezon Province against the disruptive effects of AI to policymakers, TVET administrators and industry stakeholders.

The study therefore aimed to explore how the TVET sector responds to AI-induced disruption in the Province of Quezon, Philippines. Quezon is of particular interest as it is an agricultural and manufacturing province where AI technologies will impact local labor markets and where the TVET sector adapts to provide the graduates with skills that are required. This is premised on the fact that there is a demand for an effective TVET system to facilitate inclusive and sustainable economic growth in a period of technological change (Jacob & Ndubuisi, 2020).

Purpose of the Research

The study aimed to examine how the technical-vocational education and training sector in Province of Quezon, Philippines has responded to AI-induced disruption.

Specifically, the study sought to answer the following questions:

1. What is the demographic profile of the respondents in terms of:
   a. Age?
   b. Gender?
   c. Educational Attainment?
   d. Occupation?
2. What is the level of familiarity of the TVET trainers with AI technologies in terms of:
   a. Their understanding of AI applications?
   b. The frequency of AI usage in their respective fields?
3. What are the perceived impacts of AI on the TVET sector in terms of:
   a. Curriculum Development?
   b. teaching and learning methodologies?
   c. industry alignment of skills training?
4. What are the key strategies and initiatives being implemented by TVET institutions in Quezon to adapt their curricula, teaching methodologies, and student support services to the changing skill demands driven by AI?
5. What are the challenges and opportunities among TVET institutions in adapting to AI-driven changes?
6. How prepared are TVET institutions in Quezon Province in integrating AI-related skills into their programs?
7. How is the adoption of AI impacting the labor market in Quezon Province?

Significance of the Research

Several interest groups could largely benefit from this study. Results of this study would be useful to the *Government*, particularly labor and education agencies such as the *Department of Labor and Employment (DOLE)*, *Technical Education and Skills Development Authority (TESDA), and the Department of Education (DepEd)* in crafting policy directions. The results would also inform policymakers on how to formulate programs and policies that promote the interjection of AI technology in technical-vocational education, ensuring the country's edge is maintained amid Industry 4.0 era.

TVET schools and *training centers* would benefit by learning about the changes in TVET brought by AI. The findings could support practical advice on the reform of curricula, methodological innovation, and program concordance with AI industry demands. Addressing identified gaps in AI readiness could help TVET institutions enhance their relevance and consequently increase employability of students while helping them to be competitive in the labor market.

Educators in the TVET sector would benefit by learning and teaching AI which can enhance their teaching pedagogy. This research could provide an understanding on the good practices of integrating AI in technical training, which allows teachers to bring students a competitive advantage for all the future industries. It could also recommend professional development opportunities to help them level up their own skills in AI work.

To the *Manuel S. Enverga University Foundation*, this paper could add to the limited resources about the topic, provide knowledgeable background of the concept, and serve as additional reference for students and faculty.

For the researcher of this study, this would help expand the researcher's capabilities and abilities in undertaking and designing the study. Through this study, the researcher could use his own experiences performed, which could be relevant in his field of specialization.

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Further, the issue tackled in the research might spur the interest of a larger pool of future researchers particularly education students since it is an ongoing concern.

METHODS

Research Design/Research Instrument/Data Gathering Procedure

The study involved a mixed-method research design combining both qualitative and quantitative measures to address the research objectives (Saputra et al., 2023; Owoc et al., 2021). This study followed the sequential explanatory design where the first stage is quantitative data collection and analysis, after which a second phase is done to investigate further into these outcomes subsequently (Vinayan et al., 2020; Mohamad et al., 2023). Since AI incorporation in TVET is a multifaceted phenomenon, it needs sufficient depth and range of understanding of the field to interpret more informed actions that would enable the mitigation of challenges and the seize opportunities, thus using a mixed-methods approach that includes both quantitative and qualitative information appeared reasonable and balanced.

As the study employed a mixed-methods approach, both quantitative and qualitative data collection instruments were utilized to gain a comprehensive understanding of AI integration in TVET institutions in Quezon Province. The following instruments were used:

Survey: Structured survey questionnaire was used to collect quantitative data from TVET educators of the randomly selected institutions. This survey measured educators' perceptions of AI integration. It measured the educators' knowledge on what is AI and current state of AI integration to give an overview and insight on how much educators are currently making use of AI content, tools or technologies in their teaching; perceived barriers and enablers to AI integration to identify what educators perceive as challenges to using AI, such as lack of resources/training/institution support and elements that are felt to increase the likelihood that educators can successfully integrate AI into their practice.

TVET trainers from different institutions in Quezon Province validated the research questionnaire. A pilot testing was performed to establish its validity and reliability and yielded a Cronbach's alpha of .975 which implied that the items in the questionnaire are highly correlated. Thus, the pilot testing performed ensured that the measurements on the research questionnaire were reliable.

Interview: An interview guide was prepared to gather responses from TVET administrators as part of qualitative approach. Unique perspectives from institutional leaders about the readiness of their institutions to embrace AI, infrastructure, resources and support systems available were sought.

Instruments were created based on an extensive literature review and was adapted to the Philippine TVET system. Following content validity, as well as alignment with research questions, experts from TVET reviewed the interview protocols. References were used to develop all tools in the Philippine TVET context.

The gathering of data started by obtaining all the permissions and ethical clearances. This research was conducted upon the approval of the Technical Education and Skills Development Authority and the head of the selected TVET institutions. The researcher also submitted a research proposal and data collection tools to the Research Ethics Review Committee for approval, furthering the role of ethical research practices during implementation.

Two primary instruments were used in a data collection phase: survey questionnaire and interview guide. A user-friendly online platform was used to distribute the structured survey instruments among the TVET educators. To optimize the response rates, the researcher also developed an email campaign to gently remind the valued educators about taking part. Meanwhile, the structured interview guided facilitated in-depth conversations with TVET administrators. These interviews took place in-person and through online platforms, based on the preferences of the participants and practicality to explore their experiences, insights, and perspectives about AI implementation.

The researcher respected the principles of informed consent and confidentiality in the data gathering process. Participants were well informed about the purpose, the procedures of study, and their right to withdraw from participating in study at any time. Everything was done in strictest confidence, and responses were all anonymized to guarantee the privacy of the participants.

Respondents/Subjects of the Study

The respondents for the survey in this study consisted of TVET trainers from various institutions (public and private) in Quezon Province. These trainers are directly involved in the delivery of technical-vocational education and training programs and are well-positioned to provide insights into the current curriculum, the skills being taught, and how AI-induced disruptions are affecting the training landscape. A total of 100 trainers were surveyed. Inclusion criteria for this group include current teaching job in a recognized TVET institution in Quezon Province and having at least one year of teaching experience. Trainers with less than a year of experience or those not actively teaching were excluded. Trainers who chose to withdraw from the survey not included in the final analysis.

For the interview component of the study, the participants were public and private TVET institution administrators in Quezon Province. The participants were program developers and decision-makers and, as such, offer rich information on how institutions are responding to artificial intelligence-related challenges. The participants were 6 TVET administrators. Inclusion criteria include holding an administrative or decision-making role in a TVET institution and having at least two years of experience in educational management. Administrators with

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less than two years of experience or those who are not actively involved in program management were excluded. This approach ensured that the study gathered focused and appropriate information regarding the response of the TVET sector towards AI-driven change in Quezon Province.

Sampling Design and Procedures
The research used stratified random sampling for the survey of TVET trainers and purposive sampling for the interview of TVET administrators. Stratified sampling was utilized to portray the whole subgroups involved in the TVET sector. Purposive sampling offered data collection with every subgroup using a fixed criterion.

Survey Sampling Procedure (TVET Trainers) - Research procedure for the survey implemented stratified random sampling to recruit 100 TVET trainers across a range of institutions within Quezon Province's four legislative districts. The total population of TVET trainers were first stratified according to Quezon Province legislative districts, creating four strata. After strata formation by the population, available and cooperating respondents were chosen for analysis. This made the selection of sample representative by institution type, technical fields, and locations easier and manageable.

Interview Sampling Procedure (TVET Administrators) - The qualitative interviews utilized purposive sampling to select 10 TVET administrators from various institutions in Quezon Province. This purposive sampling method ensured that the selected participants have the most suitable experiences and data concerning the effects of AI-driven disruptions on the TVET industry.

Administrators were selected based on their educational administration experience, as well as a minimum of two years' experience in an administrative role. The selection ensured representation from different institutional types (public and private) and different geographical areas.

Research Locale/Study Site
The study was conducted in Quezon Province, Region 4A, Philippines with four legislative districts that have different public and private TVET schools. The study was conducted among schools within the districts that are divided into four strata according to their respective legislative districts.

Assumptions
The current TVET system in the Philippines is adequately equipped to integrate AI-related skills and technologies into its curriculum and training programs.

TVET institutions in Quezon Province have the necessary resources, infrastructure, and faculty expertise to effectively incorporate AI-related content and training into their programs.

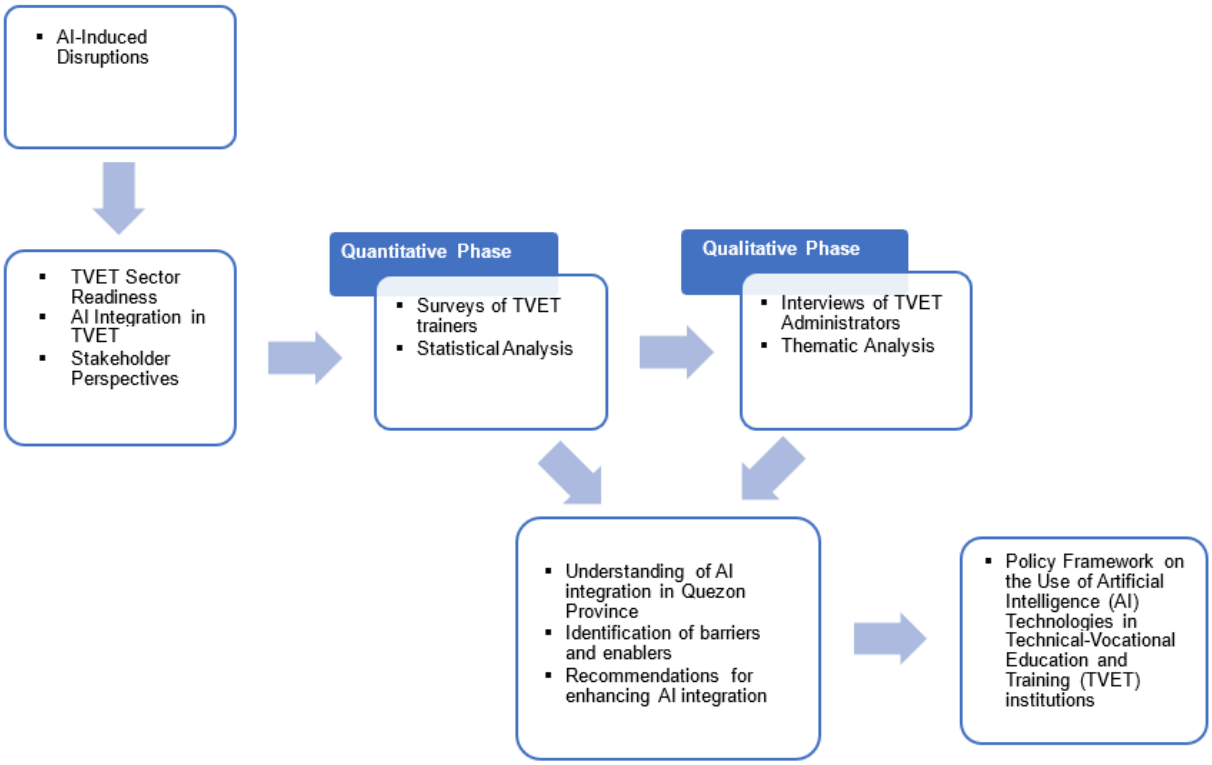
TVET educators in Quezon Province possess the knowledge, skills, and confidence to effectively integrate AI-related content and technologies into their instructional practices, enabling students to develop the necessary competencies for the evolving job market.

Research Paradigm/Conceptual Framework
Figure 2 shows the flowchart of the research that served as a guide throughout the study. Key factors included the extent of TVET sector readiness to adopt AI technologies, AI integration in TVET curricula, and the perspectives of stakeholders such as TVET trainers and administrators. These data prioritized the evaluation of how prepared TVET institutions are to respond to the needs of AI industries and the challenges of using AI-related programs. Data collection was carried out using surveys of TVET trainers and interviews with administrators. Surveys provided quantitative data related to trainers' views toward the implementation of AI, and interviews yielded qualitative data regarding institution's strategies, challenges, and opportunities. Statistical analysis was utilized to quantify results from the survey while thematic analysis was utilized to determine dominant themes from interviews to explain or elaborate on the observed trends.

Outcomes of this study provided a detailed description on the development of a Policy Framework of the integration of AI in TVET courses of Quezon Province, determining major barriers, such as technological ability and lack of trainer expertise, and facilitators of institutional support. Based on the findings, recommendations were developed to improve the uptake of AI, enabling the alignment of TVET with changing requirements of industries impacted by AI disruptions.

Figure 2
Conceptual Framework of the study

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RESULTS AND DISCUSSION

Part I. Demographic Profile of the Respondents

Table 1 shows the demographic distribution of the respondents. As shown by the data, most of them were 25-34 years old, suggesting that they were mostly in the younger age group. According to Vogels (2019), this age group is usually more ready to accept new technologies and training tools, which is important as AI continues to change how teaching is done in many sectors.

As to gender, majority or 60% was male, indicating that they dominate the population of TVET trainers in the province. This kind of ratio is not surprising in TVET, especially in programs related to trades and technology, which are still often dominated by men. However, the number of female trainers is not low. It shows that gender inclusion is becoming more common in training institutions, especially in parts of Asia. This matches what Dietz (2021) said in its reports about gender and technical training workforces. Having both men and women involved helps make training programs more balanced and relevant.

Majority or 71% was college graduate while 27% has postgraduate degrees. This implies that many trainers are well-educated and likely capable of understanding complex topics, such as the use of artificial intelligence in teaching. It also fits what Trainin et al. (2018) found in their study where trainers with higher education were better at using new learning technologies and adjusting their lessons when needed.

Likewise, eighty-four percent (84%) of them were TVET trainers and only 16% was senior high school teachers. This kind of insight is useful for understanding how well the current curriculum prepares students for jobs that involve or are affected by artificial intelligence. The World Bank (2023) emphasized how important active trainers are in shaping effective vocational programs, especially during times of rapid technology change.

Table 1

Distribution of the Respondents as to Demographics

A. Age	Percentage
18-24	1
25-34	48
35-44	27
45-54	19
55 and above	5
Total	**100**

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B. Gender	Percentage
Male	60
Female	40
Total	**100**
C. Educational Attainment	**Percentage**
TVET graduate	2
College graduate	71
Postgraduate	27
Total	**100**
D. Occupation	**Percentage**
TVET trainer/instructor	84
Senior high school teacher	16
Total	**100**

Part II. Level of Familiarity with AI

Table 2 illustrates the AI technologies which are familiar to the respondents. As can be seen, AI-powered chatbots which include ChatGPT, IBM Watson Assistant, etc. were most familiar with them, with a frequency of 82. This implies that the respondents were mostly exposed to word processing AI tools. Trainers likely find these tools easy to access and helpful for tasks like answering questions, giving instant feedback, or creating lessons. Being exposed to such chatbots regularly may explain why so many are familiar with them already.

Second in rank are speech and image recognition (e.g., Google, Lens, Siri, Alexa, Face ID) with 53 responses. It is followed by AI-powered data analytics tools (e.g., Google AI, Microsoft Power BI). These tools are part of many smartphones and devices, so it is not surprising that they are also present in the trainers' daily lives, whether in teaching or personal use. Even if they are not used for formal teaching, their influence on communication and tech comfort is clear.

On the other hand, they were least familiar with machine learning algorithms (e.g., TensorFlow, Scikit-Learn). This reveals that very few trainers are engaging with the more technical or developmental side of AI. Without a basic understanding of machine learning, it is harder to fully understand how AI works or how to teach it.

Table 2
AI Technologies the Respondents are Familiar With

AI Technologies Used or Familiar With	Frequency	Rank
AI-Powered Chatbots (e.g., ChatGPT, IBM Watson Assistant)	**82**	**1**
Speech and Image Recognition (e.g., Google Lens, Siri, Alexa, Face ID)	**53**	**2**
AI-Powered Data Analytics Tools (e.g., Google AI, Microsoft Power BI)	**41**	**3**
AI-Based Personalized Learning Platforms (e.g., Coursera AI, Duolingo AI, adaptive learning systems)	37	4
Automated Grading or Assessment Tools (e.g., Turnitin AI, Gradescope)	32	5
AI-Based Design and Manufacturing Software (e.g., AutoCAD AI, SolidWorks AI)	15	6
AI-Assisted Virtual Simulations (e.g., VR/AR training platforms)	14	7
Predictive Maintenance Systems (e.g., AI-powered diagnostics in industries)	11	8
AI-Driven Robotics (e.g., collaborative robots in manufacturing, robotic automation)	10	9
Machine Learning Algorithms (e.g., TensorFlow, Scikit-Learn)	5	10

Table 3 discloses the respondents' understanding of AI applications. In general, they are considered very familiar with them as it obtained an average mean of 3.53. This level of familiarity indicates their level of understanding on AI applications.

Based on the data, they were very familiar on how AI can be used for personalized learning and adaptive training in education, which obtained the highest mean of 3.75. This score implies that many trainers recognize how AI can tailor learning content based on individual student needs and pace. According to Rosyadi et al. (2023), the ability of AI to customize instruction helps vocational

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learners build strong and job-relevant competencies through tailored pathways.

Also, they were very familiar with the basic concepts of Artificial Intelligence (AI), with a mean of 3.72, and on how AI impacts job roles, skill requirements, and workforce demand in the field, with a mean of 3.67.

Meanwhile, it is interesting to note that they revealed lower level of familiarity on the differences between AI, automation, and machine learning (M=3.20). Trainers appeared to be less confident about how these concepts differ from each other, despite being interrelated. This gap in understanding is important as the distinctions directly affect how content is developed and explained to learners.

They were also least familiar with how AI is being applied in different industries relevant to TVET fields (M=3.35). Trainers may have general ideas about industry uses but might lack detailed awareness of sector-specific technologies. This indicates an area where closer collaboration with industries could be beneficial to update trainers about current AI tools used in the field.

The standard deviation values ranging from 0.867 to 1.083 shows moderate variation in their responses. It means that most of them answered that they were very familiar with AI applications. This supports the argument by Onyango and Kelonye (2022) that for TVET programs to stay relevant, they must embed AI knowledge not only at a surface level, but also in ways that directly mirror industry usage.

The findings also affirm Amdan and Janius (2024) who noted that AI tools can significantly enhance instructional quality, but only if educators are fully prepared to use them. Familiarity alone is insufficient without the skills to modify teaching strategies and assessment methods accordingly.

Furthermore, Rosyadi et al. (2023) emphasized that AI's value in vocational training lies in its capacity to support personalized education and close the gap between school learning and workforce expectations. The data from this study show that TVET trainers are on the path toward this alignment, but further investment in technical training and exposure is necessary to achieve meaningful outcomes.

Table 3
Respondents' Understanding of AI Applications

	Indicators	Mean	Standard Deviation	Verbal Interpretation
1.	**How AI can be used for personalized learning and adaptive training in education**	**3.75**	**1.056**	**Very Familiar**
2.	**Basic concepts of Artificial Intelligence (AI)**	**3.72**	**0.946**	**Very Familiar**
3.	**How AI impacts job roles, skill requirements, and workforce demand in the field**	**3.67**	**0.900**	**Very Familiar**
4.	How AI improves efficiency and productivity in TVET sector	3.64	0.956	Very Familiar
5.	How AI can enhance technical training through simulations, robotics, and predictive analytics	3.60	0.905	Very Familiar
6.	AI-powered tools used in education, such as chatbots, virtual assistants, and adaptive learning systems	3.49	0.901	Very Familiar
7.	How to integrate AI concepts into teaching methodologies and curriculum	3.47	1.083	Very Familiar
8.	AI-based assessment tools that help evaluate student performance	3.43	1.015	Very Familiar
9.	How AI is being applied in different industries relevant to TVET fields	3.35	0.867	Familiar
10.	Differences between AI, automation, and machine learning	3.20	1.027	Familiar
	Average Mean	**3.53**		**Very Familiar**

Legend: 1.00-1.80 – Not Familiar; 1.81-2.60 – Quite Familiar; 2.61-3.40 – Familiar; 3.41-4.20 – Very Familiar; 4.-21-5.00 – Very Much Familiar

Table 4 reveals the respondents' frequency of usage of AI applications. Overall, they have somewhat much usage of AI applications as they gave it an average rating of 3.06. This indicates that there is somehow low utilization of AI applications among them. This means that while some trainers may interact with AI a lot, others may not interact with it much based on their institution's setup or job role.

As shown by the data, they ranked first that they actively seek information about AI advancements, which obtained a mean of 3.32, somewhat much. This suggests that TVET educators are showing independent interest in keeping up with AI developments, despite varying institutional support. According to Gitomer and Bell (2016), educators who display personal motivation to understand new technologies are often more successful in adapting their teaching to meet modern learning standards.

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Next, they answered that there is somewhat much significant increase of use of AI in the industry or institution in the past few years, with a mean of 3.26. Also, there is somewhat much use of AI technologies in automating tasks in the profession, with a mean of 3.24. This finding is part of a larger trend of digital change that is changing many areas, such as training and education. Li (2024) said that changes in industrial technologies have caused noticeable changes in how work is done, which has forced training schools to improve how they use technology.

However, the data also shows that the use of AI-driven applications such as machine learning, robotics, or predictive analytics at least once a week was ranked least with a mean of 2.85. This again corroborates with the finding in the previous tables that they were least familiar with these AI applications.

The low standard deviation values reveal moderate variation in their responses. It means that they have more or less similar frequency of AI usage in their respective fields. The responses point to a transitional phase in adoption, where there is awareness and occasional interaction, but not yet full integration into teaching practices.

Table 4

Frequency of AI Usage in Their Respective Fields

Indicators	Mean	Standard Deviation	Verbal Interpretation
1. Active seeking of information about AI advancements	**3.32**	**0.900**	**Somewhat Much**
2. Significant increase of use of AI in the industry or institution in the past few years	**3.26**	**1.123**	**Somewhat Much**
3. Use of AI technologies in automating tasks in the profession	**3.24**	**1.042**	**Somewhat Much**
4. Use of AI-powered tools or software regularly in my field of work	3.09	0.907	Somewhat Much
5. Reliance on AI-driven application (e.g. automation tools, analytics, chatbots) for daily task	3.05	0.882	Somewhat Much
6. Integration of AI technologies in the operations of the workplace	2.99	0.959	Somewhat Much
7. Access to AI-based tools for improving productivity in the workplace	2.98	0.990	Somewhat Much
8. Integration of AI-driven technologies into the assessment and evaluation processes in the field	2.96	1.166	Somewhat Much
9. Use of AI-assisted programs (e.g., virtual simulations, intelligent tutoring systems) for teaching or learning	2.90	1.103	Somewhat Much
10. Use of AI-driven applications such as machine learning, robotics, or predictive analytics at least once a week	2.85	1.089	Somewhat Much
Average Mean	**3.06**		**Somewhat Much**

Legend: 1.00-1.80 – Not Much; 1.81-2.60 – Little Much; 2.61-3.40 – Somewhat Much; 3.41-4.20 – Quite Much; 4.-21-5.00 – Very Much

Table 5 shows the perceived impacts of AI in terms of curriculum development. In general, AI has a strong impact on TVET institutions in the province in terms of curriculum development with an average mean of 3.61. The results reveal a growing awareness among educators that the change toward AI integration is not optional but necessary.

As revealed by the data, the integration of AI-related subjects in the curriculum is essential for keeping TVET programs relevant in the future workforce, which obtained the highest mean of 3.78, strong impact.

Also, AI-driven tools and simulations have enhanced the effectiveness of curriculum delivery (M=3.67, strong impact) and the inclusion of AI in the curriculum has increased student engagement and interest in technical training (M=3.65, strong impact). This shows that adding classes about AI has also made students more interested in learning and ready for work and that is what Malaysia's Ministry of Education found (Wee, 2019).

Meanwhile, they ranked least that AI has influenced the revision and updating of TVET curricula to meet industry demands, with a mean of 3.51. This number is still comparatively high, which shows how important it is to have a curriculum that can quickly change to new trends.

As to the dispersion of their responses, the standard deviation values ranging from 0.8 to 1.0 suggests moderate variation in their perceptions as to the impact of AI on curriculum development.

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Table 5
Perceived Impacts of AI in Terms of Curriculum Development

Indicators	Mean	Standard Deviation	Verbal Interpretation
1. The integration of AI-related subjects in the curriculum is essential for keeping TVET programs relevant in the future workforce.	**3.78**	**1.017**	**Strong Impact**
2. AI-driven tools and simulations have enhanced the effectiveness of curriculum delivery.	**3.67**	**0.801**	**Strong Impact**
3. The inclusion of AI in the curriculum has increased student engagement and interest in technical training.	**3.65**	**0.967**	**Strong Impact**
4. The use of AI in curriculum development has improved the alignment between education and labor market needs.	3.61	0.902	Strong Impact
5. The integration of AI-related courses in TVET programs has improved students' job readiness.	3.59	0.817	Strong Impact
6. AI has led to the inclusion of new skill sets and competencies in the curriculum.	3.59	0.852	Strong Impact
7. AI has made curriculum development more efficient by providing automated insights on skill gaps.	3.57	1.047	Strong Impact
8. Industry demands for AI-related skills have pressured TVET institutions to modify their curricula.	3.56	0.898	Strong Impact
9. AI-driven innovations have enhanced the development of adaptive and industry-responsive TVET curricula.	3.54	0.853	Strong Impact
10. AI has influenced the revision and updating of TVET curricula to meet industry demands.	3.51	0.856	Strong Impact
Average Mean	**3.61**		**Strong Impact**

Legend: 1.00-1.80 – No Impact; 1.81-2.60 – Low Impact; 2.61-3.40 – Moderate Impact; 3.41-4.20 – Strong Impact; 4.-21-5.00 – Very Strong Impact

Table 6 reveals the perceived impacts of AI in terms of teaching and learning methodologies. Overall, the respondents perceived that AI has a strong impact on it based on the average mean of 3.74, showing a widespread belief that these tools are making a difference.

As can be seen, AI has helped personalize learning by adapting lessons based on students' progress and performance (M=3.80) and AI technologies have improved access to learning materials and resources in TVET programs (M=3.79). Also, AI-assisted simulations and virtual reality tools have enhanced practical skills training in TVET (M=3.77). These findings indicate the strong impact of AI application to the teaching and learning process among TVET institutions as they have utilized AI tools in their lesson preparation, giving access to learning materials and practical skills training.

On the other hand, they rated least that AI-driven teaching methods have significantly improved students' understanding of complex technical concepts, which obtained the lowest mean of 3.65.

When looking at their level of agreement on the impact of AI on the teaching and learning methodologies, the standard deviation values again reveal that their responses have moderate variation.

Table 6
Perceived Impacts of AI in Terms of Teaching and Learning Methodologies

Indicators	Mean	Standard Deviation	Verbal Interpretation
1. AI has helped personalize learning by adapting lessons based on students' progress and performance.	**3.80**	**0.791**	**Strong Impact**
2. AI technologies have improved access to learning materials and resources in TVET programs.	**3.79**	**0.731**	**Strong Impact**
3. AI-assisted simulations and virtual reality tools have enhanced practical skills training in TVET.	**3.77**	**0.825**	**Strong Impact**
4. The use of AI-driven educational platforms has enhanced student engagement and motivation in learning.	3.76	0.833	Strong Impact
5. AI-powered chatbots and automated feedback systems have made it easier to provide instant support to students.	3.74	0.890	Strong Impact

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6. AI-powered teaching tools (e.g., virtual labs, intelligent tutoring systems) have improved the delivery of technical subjects.	3.72	0.869	Strong Impact
7. AI-driven assessment tools have improved the accuracy and efficiency of evaluating student performance.	3.72	0.789	Strong Impact
8. The use of AI in teaching has reduced the administrative workload of instructors, allowing more time for instruction.	3.72	0.989	Strong Impact
9. The integration of AI in teaching methodologies has allowed instructors to focus more on hands-on training.	3.68	0.880	Strong Impact
10. AI-driven teaching methods have significantly improved students' understanding of complex technical concepts.	3.65	1.013	Strong Impact
Average Mean	**3.74**		**Strong Impact**

Legend: 1.00-1.80 – No Impact; 1.81-2.60 – Low Impact; 2.61-3.40 – Moderate Impact; 3.41-4.20 – Strong Impact; 4.-21-5.00 – Very Strong Impact

Table 7 discloses the perceived impacts of AI in terms of industry alignment of skills training. Overall, the respondents perceived that AI has a strong impact on it as shown by the average mean of 3.70. Each of the ten indicators was rated to have "Strong Impact," which shows that trainers see AI as an important part of closing the skills gap between school and work.

As revealed by the findings, the increasing use of AI in industries has made it necessary for TVET programs to continuously update their training approaches. It was given the highest mean of 3.83. Also, strong impact is perceived as AI has influenced the development of industry-relevant skills training programs in TVET institutions and AI-driven labor market data has helped align TVET programs with industry demands. Both obtained a mean of 3.73.

Meanwhile, they least perceived the impact of AI on TVET institutions' integration of AI-related industry certifications to improve graduates' employability (M=3.58). This entails the need to strengthen the utilization of AI on this aspect. Trainers seem to acknowledge that such certifications enhance employability, though implementation may still be at early stages in some institutions.

Their responses as to the impact of AI on industry alignment of skills training shows moderate variation as shown by the low standard deviation values ranging from 0.7 to 1.0.

Table 7

Perceived Impacts of AI in Terms of Industry Alignment of Skills Training

Indicators	Mean	Standard Deviation	Verbal Interpretation
1. The increasing use of AI in industries has made it necessary for TVET programs to continuously update their training approaches.	**3.83**	**1.057**	**Strong Impact**
2. AI has influenced the development of industry-relevant skills training programs in TVET institutions.	**3.73**	**0.867**	**Strong Impact**
3. AI-driven labor market data has helped align TVET programs with industry demands.	**3.73**	**0.817**	**Strong Impact**
4. The adoption of AI-driven technologies has created new job roles that require adjustments in TVET training.	3.72	0.835	Strong Impact
5. AI has improved the collaboration between TVET institutions and industries in curriculum planning.	3.70	0.794	Strong Impact
6. AI-powered training simulations and tools have enhanced hands-on industry-based learning for students.	3.70	0.850	Strong Impact
7. AI-driven workforce analytics have enabled TVET institutions to anticipate future industry skill needs.	3.67	0.981	Strong Impact
8. AI has helped identify gaps between the skills taught in TVET programs and the actual demands of industries.	3.66	0.965	Strong Impact
9. Employers now expect TVET graduates to have AI-related competencies in their respective fields.	3.64	0.880	Strong Impact
10. TVET institutions have integrated AI-related industry certifications to improve graduates' employability.	3.58	0.860	Strong Impact
Average Mean	**3.70**	**1.057**	**Strong Impact**

Legend: 1.00-1.80 – No Impact; 1.81-2.60 – Low Impact; 2.61-3.40 – Moderate Impact; 3.41-4.20 – Strong Impact; 4.-21-5.00 – Very Strong Impact

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Part IV. Transcribed Responses

The responses from Table 8 show that TVET institutions in Quezon Province are using a variety of strategies to respond to AI-related changes, though their approaches are not uniform. Some schools have gone further by embedding AI concepts beyond just technical courses. Participant #1 explained that they *"incorporated AI literacy across all subjects… including business and the arts"*, showing a broad approach that attempts to make AI understandable in different fields. This approach complements the earlier findings from Table 5, where trainers rated the influence of AI on curriculum development strongly across all indicators.

In contrast, other institutions are still in early phases of digital adaptation. Participant #3 mentioned that they *"focused on strengthening foundational technical skills rather than directly integrating AI"*, which points to a cautious, step-by-step method of preparing students for future changes. It shows how some institutions prioritize core digital skills before fully committing to AI topics.

While a few schools have taken steps to revise course content, others are limited by external factors. Participant #5 admitted, *"full AI integration remains limited due to resource constraints,"* drawing attention to the reality that finances, equipment, and infrastructure continue to affect what institutions can realistically implement. This gap between intent and execution also appeared in the trainer survey under Table 6, where AI was recognized as transformative for teaching but still dependent on institutional capacity.

Another key theme was industry collaboration, which remains limited but shows signs of growing interest. Participant #4 noted that they have *"industry partners that offer OJT programs and work immersion"*, suggesting some institutions are using practical experience to prepare students for real-world expectations. However, many of these partnerships still focus on traditional trades, as Participant #5 mentioned that most of their collaborations *"focus on traditional trades,"* implying that AI-related industry alignment is not yet widespread. Table 7 findings confirm this, where the integration of industry-based AI certifications and real-time workforce analytics received slightly lower scores than other items.

Faculty training was another frequently mentioned concern. Some institutions are trying to provide relevant professional development, while others are still limited in scope. Participant #1 described conducting *"seminars where AI experts and thought leaders share their knowledge,"* which suggests proactive efforts to expose instructors to evolving technologies. In contrast, Participant #6 revealed that *"no AI-related training yet"* is available in their school, a reflection of gaps in institutional planning.

The findings from Table 6 already show that AI is making a strong impact on teaching methodologies, yet without teacher readiness, that impact may not be fully realized. As Aljemely (2024) explained, teacher training must include both technical and soft skills to equip educators to handle AI in ways that promote critical thinking, not just automation.

Table 8
Strategies Implemented to Adapt the Curriculum to AI-Driven Changes

Question	Responses	Codes / Categories
What strategies have your institution implemented to adapt the curriculum to AI-driven changes?	***Participant #1:*** *We incorporated AI literacy across all subjects, not just technology or computer science. For instance, we incorporated AI concepts into fields such as business and even the arts will provide students with a holistic understanding of how AI impacts different industries. It includes teaching fundamental concepts like machine learning, ethics, and the societal implications of AI.*	Cross-disciplinary AI literacy Ethics integration Societal AI understanding
	Participant #2: *Curriculum integration and classroom engagement…*	Curriculum integration Learner engagement
	Participant #3: *We primarily focused on strengthening foundational technical skills rather than directly integrating AI. We have revised our curriculum to emphasize digital literacy, problem-solving, and adaptability to technological changes.*	Foundational digital skills Adaptive learning
	Participant #4: *As of the moment, our institution is still updating its course content…adding AI applications to our competencies.*	Curriculum development AI integration roadmap
	Participant #5: *Our institution has integrated digital literacy and basic computing into all courses to prepare students for AI-driven industries. However, full AI integration remains limited due to resource constraints.*	Digital readiness Resource limitations

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	Participant #6: *We follow the TESDA's Training Regulations (TRs), which currently do not have full AI integration. However, we incorporate digital literacy into our existing courses.*	Policy compliance Digital inclusion
What partnerships have you established with the industry to ensure AI-related skills training aligned with market needs?	***Participant #1:*** *We established partnership of AI training programs which is tailored for specific industries by partnering with sector-specific companies, such as in business and finance industries.*	Industry-specific AI training Sectoral collaboration
	Participant #2: *Industry and linkages…*	Industry linkage
	Participant #3: *We have established partnerships with local industries to align our training programs with current job market demands.*	Labor market alignment Local industry collaboration
	Participant #4: *We have industry partners that offers OJT programs to students and work immersion to our trainers.*	Work immersion OJT programs
	Participant #5: *We have partnered with local businesses to provide on-the-job training, but most collaborations still focus on traditional trades.*	Traditional industry ties Limited AI focus
	Participant #6: *We have existing MOA with different industries as part of our program registration.*	Formal partnerships Program-linked agreements
What initiatives have been introduced to support continuous learning and professional development in AI for your faculty?	***Participant #1:*** *We provide faculty development workshops and seminars. We often organize workshops, webinars, and seminars where AI experts and thought leaders share their knowledge. These can cover topics such as machine learning, ethical considerations in AI, or integrating AI tools in the classroom.*	Faculty upskilling Expert-led seminars
	Participant #2: *Through financial support and services…*	Institutional support
	Participant #3: *We offer faculty development programs in ICT and emerging technologies. However, AI-specific training is still minimal.*	Emerging tech training AI training gap
	Participant #4: *We encourage our trainers to undergo specialized ICT workshop and seminars to ensure they can effectively deliver LMS-based lessons.*	ICT-based pedagogy LMS competency
	Participant #5: *We offer government-sponsored training on ICT skills, but there is no dedicated AI training yet. Some instructors have attended TESDA's Industry 4.0 workshops, but implementation remains in early stages.*	Government-led training Early-stage AI readiness
	Participant #6: *Our trainers participate in upskilling training like ICT trainings, but no AI-related training yet.*	ICT-focused upskilling AI absence

Table 9 highlights some of the key issues TVET institutions face while going for AI-driven changes. Limited resources were one of the main problems mentioned repeatedly in the answers. A big problem that kept institutions from engaging in AI tools, training, and infrastructure was often pointed out as a lack of money. Participant #1 stated that *"lack of funding and infrastructure are big problems that make it hard to use AI in education."* This response supports the observation made by Kuntadi et al. (2022) who stated that the financial investment needed for implementing AI is a major challenge in TVET institutions across different nations.

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A lack of knowledge among faculty members was also brought up as a problem by several participants. Participant #4 said that *"resistance to change among some faculty members*" is a problem. This is related to the fact that teachers need to learn new skills and get used to new ways of teaching. In line with what Chou et al. (2024) found, teachers said it was hard to use AI because they did not have enough professional development opportunities and the right training. Staff members who are used to using old-fashioned methods are fighting against the change to training methods that are based on AI.

The study did find certain problems with AI, but it also found some encouraging opportunities for TVET institutions. AI have the incredible ability to build real learning environments. One of the participants said, *"AI-driven simulations can provide students hands-on experience without the need for actual equipment."*

More and more people are getting interested in AI because it has the potential to allow the creation of virtual environments where students can interact with real scenarios without having to invest in expensive physical equipment. Therefore, this technology makes learning and training opportunities available at a lower cost while providing more inclusive alternatives.

The use of AI also opens the door to the upgrade of provision of skills training in TVET programs. Participant #3 said that "*AI presents opportunities for new skill-based certifications and improved employability."* This is an implication that AI can help make the entry of college graduates into new careers and means of climbing the professional ladder easier. Industry 4.0 skilled workers are on the rise, and as such, TVET schools have a responsibility to keep up with technological advancements. Participant #4 stated, *"TVET institutions may benefit from technological advances, creating new jobs and training courses that align with Industry 4.0."* There are many emerging new jobs, particularly in intelligent manufacturing, logistics, and digital services. This offers TVET schools a great chance to upgrade training programs and prepare students with future skills in the labor market.

According to the study's findings, TVET institutions must give greater emphasis to developing new learning opportunities on new AI technologies, improving infrastructure, and teacher preparation. Additionally, training programs' Industry 4.0 compatibility and government policy planning on AI learning will further enhance TVET programs to be of greater utility and effectiveness.

Finally, incorporation of AI by TVET is not without problems that must be addressed, yet it also brings a lot to the table about the development and advancement, provided the institutions take a step to realize it. The results show that TVET institutions can better prepare students for the future workforce by making targeted investments, getting policy support, and making sure that students are ready.

Table 9
Challenges and Opportunities Among TVET Institutions in Adapting to AI-Driven Changes

Question	Responses	Codes / Categories
What challenges have your institution faced in adapting to AI-driven changes in education and training?	***Participant #1:*** *We experience challenges related to resources. Funding and Budget Constraints in implementing AI-driven education often involves significant financial investment, including purchasing software, hardware, and other tools, as well as providing faculty with professional development opportunities.*	Funding limitations Infrastructure gaps Professional development needs
	Participant #2: *Financial and TESDA support through scholarships…*	Financial dependency External support reliance
	Participant #3: *The biggest challenge we face is the lack of infrastructure and faculty expertise in AI-related subjects.*	Infrastructure deficiency Expertise shortage
	Participant #4: *Resistance to change, some faculty members prefer traditional teaching methods and lack AI expertise and need upskilling.*	Cultural resistance Upskilling needs
	Participant #5: *Most of the instructors are trained in traditional fields, not AI.*	Traditional skill set AI expertise gap
	Participant #6: *Maybe the lack of AI-specific TESDA training modules.*	Curriculum limitations Regulatory gaps
What opportunities do	***Participant #1:*** *On our end, AI can enhance simulation-based training by providing virtual environments that replicate real-world*	Immersive learning Virtual simulation

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you see for TVET institutions in embracing AI-driven changes?	*scenarios. AI-driven simulations can offer students hands-on experience without the need for physical equipment. It allows for real-time feedback and adjustments based on student performance, enhancing learning outcomes.*	Real-time analytics
	Participant #2: *TVET is more likely embracing information technology-based practices.*	Digital transformation
	Participant #3: *AI presents opportunities for new skill-based certifications and enhanced employability. However, we need more government support to leverage these opportunities.*	Skills innovation Policy support required
	Participant #4: *TVET institution may benefit with the technological advances, creating new jobs and training courses that aligns to Industry 4.0.*	Future-ready programs Technological alignment
	Participant #5: *AI can create new jobs in smart manufacturing, logistics, and digital services, but training programs must evolve.*	Emerging careers Digital economy
	Participant #6: *In the future, TESDA updates on their Training Regulation may include AI-driven skills in different trades.*	Regulatory evolution Anticipated curriculum change

Institutions' preparedness to use AI technologies varied greatly, as shown in Table 10. Participant #1 said that they are *"on 95% level of preparedness with regard to adopting AI-related changes"*, claiming that their institution is extremely high. This demonstrates that some institutions are already on their way to implementing AI technologies. Still others were more cautiously optimistic. Participant #2 said that they *"have to exert effort more,"* referring to the need to put in more work to reach an acceptable level of readiness at the table. Therefore, AI is recognized, but more work needs to be done to fully integrate it into the system.

Likewise, the institution is only now starting to consider the possibilities AI provisions. According to Participant #3, they *"are in the initial phase of understanding AI adoption."* The problems seem too big for some, as Participant #4 said, *"I believe we are not yet ready,"* which emphasized the high infrastructure and faculty expertise gaps that are keeping them from being ready. A study by Viberg et al. (2020) found that teachers' lack of knowledge was a problem when it came to integrating new digital technologies.

Infrastructure became a major issue. Basic technology needs are still a problem for some institutions. For example, Participant #3 said that their *"institution is not yet well-equipped for AI technologies because they do not have enough money for software, hardware, and connectivity."* There seems to be a theme of not having enough money running through all the answers. Participant #4 stated, *"we are integrating AI technologies into our institutions which requires a robust infrastructure,"* emphasizing the need for both specialized software and high-speed internet. This result backs up what Lasi et al. (2014) said about how advanced technologies like AI need infrastructures that are strong and up to date. But not all institutions are in such bad shape. One participant said, *"We make sure that students and faculty can use these AI technologies by giving them institutional licenses or open-source versions."* This shows that some institutions are adapting by giving students and teachers different ways to access the technologies. Still, Participant #5 said, *"our computer labs support basic training; internet access is available but not strong enough for AI-driven applications."* This indicates that many TVET institutions are still struggling to get the right infrastructure.

The institutions' capacity to implement changes related to AI is strongly influenced by external factors, such as funding and policies. Collaboration with research-focused institutions was a key enabler for Participant #1. They said, *"we work with research-focused institutions, which can give access to AI research, experts, and funding."* This plan for an outside partnership looks like a good way to close the resource gap. Not all institutions are as lucky, though. Participant #5 said, *"public TVET depends on national budget allocations for tech upgrades."* This shows that technology improvements need government funding. Participant #4 also talked about the problems that come up because of *"funding and TESDA regulations."* They emphasized that government backing and rules can either make AI more popular or less popular. According to Participant #6, *"funding limitations affect how fast AI can be adopted."* This is still a big problem for quick implementation.

The results point TVET administrators to several different ways for them to think about. One important area is making the facilities better. Better internet access, new tools, and specialized software should also be top priorities for institutions when they spend money. Because of this, developing the faculty must be a

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top concern. Administrators should also seek external partnerships to address funding shortfalls. Collaborating with research institutions and other organizations can provide both financial and technical support. Finally, the implementation of AI should be approached in a way that ensures all students have equal access to the opportunities AI provisions. As Shams and Zowghi (2021) emphasized, AI can help promote inclusivity by providing personalized learning experiences, particularly for marginalized students.

Furthermore, TVET administrators must overcome infrastructure and resource challenges to fully integrate AI into their programs. By doing so, they can better prepare their institutions to meet the demands of the future workforce to make sure that students are equipped with the necessary skills for the rapidly evolving job market.

Table 10

Preparedness of TVET Institutions in Quezon Province to Integrate AI-Related Skills into Their Programs

Question	Responses	Codes / Categories
What is your level of preparedness with regard to adopting AI-related changes?	***Participant #1:*** *We're on 95% level of preparedness with regard to adopting AI related changes.*	High readiness Strategic integration
	Participant #2: *I would say we have to exert effort more*	Moderate readiness Improvement required
	Participant #3: *We are in the initial phase of understanding AI adoption.*	Initial stage Conceptual exploration
	Participant #4: *I believe we are not yet ready.*	Low preparedness Readiness gap
	Participant #5: *We are aware but not fully equipped for AI adoption.*	Awareness without capacity Infrastructure limitation
	Participant #6: *Most TESDA training centers lack AI infrastructure but are slowly adopting digital tools in assessments and e-learning.*	Limited infrastructure Gradual digital transition
In terms of infrastructure, how well-equipped is your institution to support AI technologies (e.g., equipment, software, connectivity)?	***Participant #1:*** *We ensure that students and faculty have access to these AI technologies either through institutional licenses or open-source versions. We have a very strong internet connection.*	Access facilitation Infrastructure strength
	Participant #2: *More likely far from what it needs*	Infrastructure inadequacy
	Participant #3: *Our institution is not yet well-equipped for AI technologies due to limited funding for software, hardware, and connectivity.*	Financial limitation Equipment deficit
	Participant #4: *Integrating AI technologies into our institutions requires a robust infrastructure encompassing advanced equipment, specialized software, and high-speed connectivity. Initiatives at both institutional and national levels to address these gaps is much needed.*	National support needed High-tech gap
	Participant #5: *Our computer labs support basic training. Internet access is available but not strong enough for AI-driven applications.*	Basic infrastructure Connectivity issues
	Participant #6: *Basic equipment as required in the Training Regulations are available, but AI tools are not yet integrated.*	Minimum standard No AI integration
What external factors (e.g., funding, government policies) have influenced your	***Participant #1:*** *We collaborate with research-focused institutions which can provide institutions with access to AI research, experts, and funding. These collaborations also lead to joint programs, knowledge exchange, and shared resources.*	Research collaboration External funding
	Participant #2: *Funding and support from TESDA…*	TESDA dependency

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institution's ability to adapt to AI?	***Participant #3:*** *Government funding and policy directives play a crucial role in our ability to modernize our programs.*	Policy influence Budget dependency
	Participant #4: *Funding and TESDA regulations may limit our ability to adapt AI.*	Regulatory limitations Funding barrier
	Participant #5: *Public TVET depend on national budget allocations for tech upgrades. Also, we rely on TESDA policies in adapting to new training.*	Government dependency Budget allocation limits
	Participant #6: *Funding limitations affect how fast AI can be adopted.*	Financial bottleneck

Table 11 shows the thematic analysis of the adoption of AI in different industries in Quezon Province that has created varied effects on the demand for TVET graduates.

Some participants observed a growing demand for digital and technical skills. Participant #1 said, "absolutely yes," which shows a clear positive change, that demand is going up. Participant #2 said that companies are now looking for "graduates who are capable and computer literate," which shows that digital literacy is becoming more important. Some people, though, said that AI still does not have much of an impact. Also, Participant #3 said that "AI hasn't had a big effect on local demand for TVET graduates yet because most industries in Quezon Province still need traditional skills." This means that several businesses in the area are still focusing on traditional skills. But Participant #4 said that AI might have a bigger effect on demand "in the next decade or so," which means that it will have an effect in the future. In the Philippines, where traditional skills are still in high demand, the slower rate of AI uptake in some places is consistent with larger trends (Acemoglu & Restrepo, 2018).

TVET graduates are slowly getting new job opportunities as AI technologies improve, but the change is still in its early stages. Participant #1 noticed that there is a higher need for people with AI skills and said, "there is a high employment demand due to their knowledge in utilizing their technical skills in AI." The rise of new jobs in areas like "information technology and analytics" was also emphasized by Participant #2. Participant #4 also said that there are more and more jobs in "ICT and other related industries," which showed a change toward digital careers. Participant #5 said that "new jobs related to information technology" are popping up, which shows that these areas are growing. There were, however, some responses that said most job opportunities are still in traditional trades. As Participant #3 said, "most job opportunities still focus on traditional trades." This shows that AI has not really changed the way many people do their jobs yet.

To better prepare graduates for the AI-driven economy, TVET administrators in Quezon Province listed several actions that TVET institutions must take. Participant #1 suggested a broad plan that included "to better equip graduates for the AI driven economy the TVET institution must take into considerations the following important factors: curriculum enhancement, industry partnerships, and upskilling and reskilling." Graduates will be prepared for the challenges of the future labor market through this all-encompassing method. In the same way, Participant #4 suggested putting money into "modern equipment and software" to let people use AI tools in real life. This fits with what Chou et al. (2024) found that educational materials need to be kept up to date to teach AI-related subjects successfully. Other people also said that ties with businesses should be strengthened. Participant #5 called for "apprenticeships in digital fields" and government funding to improve TVET infrastructure. In the same way, Participant #6 suggested adding AI-related skills to the TESDA curriculum. This would help prepare graduates for a world driven by AI. These suggestions show that TVET institutions need to change with the times to make sure that their graduates are ready for the changing needs of the job market.

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Table 11

How Adoption of AI Impact the Labor Market in Quezon Province Particularly in Industries with a High Concentration of TVET Graduates

Question	Responses	Codes / Categories
In your view, how has the adoption of AI influenced the demand for TVET graduates in Quezon Province?	***Participant #1:*** *Absolutely yes.*	Positive demand impact
	Participant #2: *In my view, many industries need graduates who are capable and computer literate*	Digital literacy demand
	Participant #3: *AI has not significantly influenced local demand for TVET graduates yet, as most industries in Quezon Province still rely on traditional skills.*	Limited AI influence Traditional industry demand
	Participant #4: *I think it has not yet influenced demand for graduates, maybe in the next decade or so.*	Delayed impact Anticipated change
	Participant #5: *Employers still prioritize manual skills, but automation in industries like manufacturing is increasing.*	Gradual change Automation emergence
	Participant #6: *AI-driven automation is slowly influencing the demand for technical workers, but traditional NC holders are still needed*	Slow transition Mixed skills requirement
What new job opportunities have been created by AI for TVET graduates?	***Participant #1:*** *High employment demand due to their knowledge in utilizing their technical skills in AI.*	Technical-AI roles Skill-based AI demand
	Participant #2: *Information technology and analytics*	IT analytics Digital careers
	Participant #3: *Most job opportunities still focus on traditional trades.*	Job status quo
	Participant #4: *Creation of new jobs related to ICT and other related industry*	ICT-driven jobs
	Participant #5: *New emerging job related to information technology…*	Digital economy roles
	Participant #6: *The skilled workers who can operate AI-assisted systems.*	Operator-level AI roles
Looking ahead, what steps do you think TVET institutions in Quezon Province need to take to better equip graduates for the AI-driven economy?	***Participant #1:*** *For me, to better equip graduates for the AI driven economy the TVET institution must take into considerations the following important factors. Curriculum Enhancement; Industry Partnerships, and Upskilling and Reskilling.*	Holistic reform Strategic alignment
	Participant #2: *Collaboration and support initiatives…*	Institutional collaboration Partnership drive
	Participant #3: *TVET institutions should focus on digital literacy training, industry partnerships, and faculty upskilling to prepare for AI-driven changes.*	Workforce alignment Teacher readiness
	Participant #4: *Invest in modern equipment and software to provide hands-on experience with AI applications. Offer professional development to help the Trainers effectively*	Resource investment Curriculum-to-industry alignment

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teach AI-related subjects. Partner with industries to align training with current AI industry demands, facilitating internships and apprenticeships.	
Participant #5: *Strengthening industry ties to introduce apprenticeships in digital fields and advocating for government funding to upgrade TVET infrastructure for future AI integration*	Policy advocacy Apprenticeship expansion
Participant #6: *I think updates on TESDA curriculum to include AI-related competencies in NC certifications will equip graduates for this kind of economy.*	Curriculum revision TESDA modernization

CONCLUSIONS

Based on the findings, the following conclusions are derived:
Majority of the respondents were males within the age group of 25 to 34 years old. A significant portion of the participants has completed a college degree, with a smaller group holding post-graduate qualifications. Most were working as TVET trainer, emphasizing a group with substantial professional and educational backgrounds.

The respondents were mostly familiar with AI technologies like AI-powered chatbots, speech recognition, and AI-based data analytics tools, indicating that TVET trainers are becoming more aware of AI innovations, especially those that can be applied within educational environments and other professional fields. As to their understanding of AI applications, they were very familiar with AI applications, particularly on those they use for personalized learning and adaptive training in education. They were also well-acquainted with the basic concepts of AI showing their readiness to integrate such technologies into their teaching practices. As to the frequency of AI usage, they somehow have much use of AI in their respective field, which means that some trainers interact much with AI but the others do not have much.
AI has a strong impact on the curriculum development of TVET in Quezon Province, confirming that AI is not an additive but rather a strategic imperative in today's curriculum development. This shift, underpinned by regional and global education policy contexts, emphasizes the imperative for AI-facilitated, future-oriented training programs aligned with the tempo of technological and workforce developments. As to teaching and learning methodologies, AI also has a strong impact indicating a widespread belief that AI tools are making a difference. As to industry alignment of skills training, AI has a strong impact as trainers see AI as an important part of closing the skills gap between school and work.

TVET institutions in Quezon Province are using a variety of strategies to respond to AI-related changes. As to their curricula, some schools have gone further by embedding AI concepts beyond just technical courses, others are still in early phases of digital adaptation. While a few schools have taken steps to revise course content, others are limited by external factors. As to teaching methodologies, faculty training was frequently mentioned concern. Some institutions are trying to provide relevant professional development, while others are still limited in scope. As to student support services, industry collaboration remains limited but shows signs of growing interest. However, many of these partnerships still focus on traditional trades, implying that AI-related industry alignment is not yet widespread. Various challenges confront TVET institutions as they attempt to integrate changes brought by AI. Most common was resource shortage, including financial resources, hardware, software, and other AI technologies, which are challenging to obtain. Shortage of faculty knowledge on the topic also discourages AI integration into the curriculum. Some instructors are hesitant to teach differently because it is easier for them, even if modifications are required. The challenge of preparing instructors to handle content developed by AI is further worsened by this reluctance.

TVET institutions in Quezon Province are at varying levels of being ready to deploy AI. Some are really well-equipped while others are just starting out or do not have the appropriate tools. Simple tools are available, but a strong internet connection and more sophisticated tools are required to fully advance. External factors like funding and government policies have a huge effect on how rapidly AI is implemented because many institutions have financial limits that hinder progress.

AI adoption is beginning to affect the labor market in Quezon Province, though its impact remains limited in many traditional industries. Some sectors have increased their demand for digitally literate TVET graduates, while others still prioritize manual skills. New job roles in ICT and analytics are emerging, but traditional trades still dominate. TVET institutions are responding by updating curricula, promoting digital skills, and aligning with industry needs. However, industry feedback remains mixed, and the need for broader curriculum reform and stronger partnerships is clear to ensure graduates are prepared for future AI-driven work.

RECOMMENDATIONS

Based on the conclusions, the following recommendations are offered:
The government needs to formulate policies for different agencies like DOLE, TESDA, and DepEd that promote the integration of

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artificial intelligence into technical and vocational education. The policies should ensure greater cooperation among industries and TVET institutions, ease the modernization of education systems, and provide more funding for AI facilities. The government also needs to set training programs to teach people how to utilize AI.

TVET schools should incorporate courses and modules specifically dedicated to digital skills and AI. To put AI-based courses into practice, they should purchase new machinery and program and improve their internet speed. To provide a platform where students can successfully and effectively work with technology, the instructors should receive proper training so that they may incorporate AI in their courses.

TVET system teachers must always have access to continuous professional development particularly on the use of AI. With these, the teachers can advance their competencies and incorporate AI in their pedagogy. This will not only enhance their own competence but enhance students' readiness for AI capability occupations, enhancing teaching in general.

TVET institutions should integrate AI-related skills in numerous various subjects to promote digital literacy. This should also involve areas where AI can be extremely useful as well as hasten technical tasks. This will ensure that students will be able to adjust to the demands of a future job that will involve extensive use of AI.

Students should be adequately trained on AI technology through industry-TVET collaboration. Emphasis needs to be laid on internships, work placement, and project learning just as AI technology is being practiced in industry today. The students will be adequately qualified for work through involvement with the AI program and will come to understand how AI will influence their future work in the real business world.

To enable TVET schools utilize AI more effectively, legislators should allocate funds to render the schools learning friendly. The investments would enable institutions to have the hardware and tools to implement AI-based pedagogical approaches, such as new investment technologies. TVET institutions ought to be given improved hardware and internet connectivity along with funding AI approaches.

TVET institutions ought to verify if they are prepared to implement AI on a daily basis. They should also explore the level of competence of teachers, available equipment, and the technological infrastructure. To ensure that their training courses are up to date and sensitive to the needs of future workers, schools can utilize these analyses to figure out what areas require improvement, set priorities on changes required, and stay on top of industry demands.

Future researchers should determine the long-term impact of the utilization of AI in TVET, how it changed pedagogy, and how the labor market is transformed. Researchers should also develop strategies for making the student more employable by incorporating AI capabilities into training programs.

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