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ADAPTIVE MODELS IN THE DISCOURSE OF TOMORROW'S TVET

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Abstract: Technical and Vocational Education and Training (TVET) institutions provide young people with the valuable skills and competencies needed for their seamless transition into the workforce. However, most TVET institutions adopt traditional curriculums and assessment approaches that are irrelevant to testing skills and competencies demanded in the current job markets. This challenge leads to job-skill mismatch and underemployment. This work proposes an adaptive and flexible TVET model that can address the identified challenges by nurturing holistic skill sets, replacing the traditional assessment methods with practical assessment approaches, and incorporating curriculums that reflect current industry practices. The study uses a quantitative approach to collect and present data from various stakeholders (students, employers, and teachers). The results indicate that most students recognize that the current TVET models and systems are ineffective in providing the skills and competencies needed in the current job markets. The participants strongly supported the interventions incorporated into the new model as effective measures for addressing the mismatch between the skills obtained in TVET institutions and skills needed in the workplaces. Moving forward, the TVET institutions should adopt the adaptive model to enhance students' employability and on-job competence. The findings indicate that TVET institutions can benefit from adopting the model, as it will enable them to implement drastic shifts in their landscapes, adapt to the rapid technological changes, and embrace innovation for competency development.

Keywords: TVET, curriculum, adaptive model, graduate employability, assessment, and job market
Field: Education

1. INTRODUCTION

Technical and Vocational Education and Training (TVETs) are recognized as the centers for providing students with practical, in-demand skills to meet the evolving skill needs in the labor market. The 21st-century job market has become more competitive and exigent, demanding graduates with technical and soft skills and adequate exposure to real-life work settings to enhance their knowledge, creativity, adaptivity and problem-solving skills. The increased technology adoption in workplaces and the introduction of artificial intelligence (AI) to automate manual and routine operations implies that graduates must be equipped with more than basic skills to survive the changing job market dynamics. For example, studies illustrate that AI could replace up to 47% of low-skill jobs in the US within the next 20 years and free workers to do more competitive tasks (Shen & Zhang, 2024). This implies that the TVETs should equip students with competitive technical skills to ensure seamless human-machine partnerships in an increasingly inclusive AI-driven world. Equipping students with technical and soft skills to perform high-skill jobs will ensure that the graduates' jobs are complemented rather than replaced by the disruptive adoption of new technologies and automation in modern workplaces. However, most TVET institutions rely on traditional curricula and models that are inflexible and insufficient in meeting the evolving needs of the current labor markets, leading to lack of competence in required skills and labor mismatch (ILO, 2023). It therefore becomes imperative for TVET institutions to adopt new models that equip students with transferable skills based on interdisciplinary curriculum with a strong focus on real-world application and adaptability. Traditional assessment techniques that test students' mastery of theoretical knowledge should be replaced by practical and hands-on assessment activities like simulation and product-making tasks. This paper contributes to the discourse of adaptive models of tomorrow's TVET institutions by proposing an adaptive model with an action-oriented assessment, real-world focus, grouping, and interdisciplinary curriculum for secondary TVET institutions to ensure graduates' smooth transition into the evolving job market.

1.1 Purpose, Problem Statement, and Objectives

The main problem explored in this study is the skill gap and labor mismatch between graduates from the current TVET institutions and the labor market. In the context of rapid technology adoption, increased reliance on data, and demographic transformations, the labor market is rapidly changing thus requiring evolving combinations of technical and soft skills to meet its demand. However, the current TVET institutions are ill-equipped to address this challenge because of their reliance on traditional curriculum,

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non-practical assessments, and lack of adaptive models to identify and nurture creative students with exceptional potential for innovation. This problem is compounded by the increasing adoption of AI technologies in workplaces to automate manual and repetitive tasks, creating a greater need for changing the traditional TVET curricula with adaptive models that can equip learners with ability to perform high-skill tasks. The immediate effect of the current TVET models and curricula is that although the institutions are identified as a sustainable solution to graduate employability problems, their graduates still struggle with low-quality jobs, underemployment, and working poverty associated with the informal jobs (Shi & Bangpan, 2022). This means that in the absence of significant changes in TVET models and curricula, the current TVET programs only enhance the graduate's employability for low-skill minimum-wage jobs, driving them down to the poverty trap and higher risks of joblessness as AI continues to replace their jobs (Shi & Bangpan, 2022). In light of these problems, the overarching purpose of this study is to propose an adaptive model that can trigger the required systemic change in secondary TVET institutions using data collected from a sample of secondary TVET students. The study's first objective is to determine the extent to which current TVET approaches influence skill mismatch and skill gap in the labor market. The second objective is to develop and present the proposed model, highlighting its key characteristics and ability to solve the identified problems.

2. MATERIALS AND METHODS

2.1 Study Design

This study used a quantitative design and surveys to collect data from the target participants. The rationale for using surveys was to facilitate quick collection of accurate data from participants while maintaining their anonymity to encourage honest responses. Step 1 of the study involved communicating the purpose of the study to potential participants and obtaining their informed consent before they were recruited into the study. Precisely, social media and printed posts were distributed in different TVET institutions to inform potential participants about the study's purpose and goals. The posts included information and directions on how interested candidates can contact research assistants. Step 2 of the study focused on providing participants with soft copies of informed consent forms for them to sign. After collecting the signed informed consent forms, the interested participants were provided with participant screening questionnaire developed based on the study's inclusion criteria. The third step encompassed distributing survey questionnaires to the final group of participants and collecting the completed questionnaires. The questionnaires constituted ten questions formulated with respect to a five-point Linkert scale response scheme: strongly agree (SA), agree (A), neutral (N), disagree (D), and strongly disagree (SD). The questions were developed based on the key sub-variables of the study, including graduate employability, skill mismatches, need for adaptive TVET model, and need for policy adaptation.

2.2 Population and Sample Size

The primary target populations for this study were final year students in secondary technical VET institutions, teachers, and stakeholders in the job market. The students were targeted to collect their views on the effectiveness of the current TVET approaches and models to equip them with the needed work-based training. On the other hand, the stakeholders in the job market (human resource experts) were included to provide data on the consistency of the current TVET approaches with the requirements in the job market. This was important because the TVET's primary role is to link graduates with jobs through their formal structured programs. The study therefore collected data from a sample of 50 participants (41 final year students, six teachers, and three human resource experts). The students were recruited through stratified random sampling method while the teachers and human resource experts were purposefully sampled. In terms of demographic characteristics, 31 participants were male, 17 were females, while two of the participants identified as neither males nor females. All participants were aged between 25 and 50 years (M = 35.7, SD = 7.2), with 51% identified as Whites, 29% as African Americans, 7% as Asian Americans, 6% as Hispanic and the remaining percentage as Other Ethnic group. More than 70% of the student participants were employed in casual jobs while the remaining 30% were concluding their internship programs.

2.3 Research Instruments and Techniques for Data Analysis

Questionnaires were used to collect data from all the participants. The responses were then recorded in Microsoft Excel software for validation and analysis. The research team ensured compliance with ethical guidelines by using pseudonyms instead of participants' real names and implemented strict data access controls to ensure participants' confidentiality. The specific materials and instruments used in

this research included laptops, data analysis software, data recording tools, and access control software. The quantitative data from the survey questionnaires were analyzed using inferential statistics to test the need and effectiveness of the new TVET model. The section below presents the results obtained from the study.

3. RESULTS

The reports and responses from the survey questions were recorded based on their frequencies and scores on the Linkert scale. Table 1 below shows the distribution of responses according to the current TVET infrastructure, approaches, and need for an adaptive model to equip students with workplace-based training that uses real jobs and simulations as the basis for instructions. The statements were derived from the questions.

Table 1: Distribution of Responses According to Characteristics of the Proposed TVET Model and Efficiency of the Existing TVET Approaches (source: field statistics).

Statement	Frequency (f) and %f	SA	A	N	DA	SDA
The current TVET approaches and curriculum are practical.	(f)	11	2	3	2	32
	% f	22	4	6	4	64
Need for a shift in the TVET landscape	(f)	34	3	1	4	8
	% f	68	6	2	8	16
Need for dedicated learning pathways to challenge and nurture gifted students	(f)	26	3	9	5	7
	% f	52	6	18	10	14
Need for interdisciplinary curriculum to facilitate integration of soft and technical skills	(f)	25	2	3	11	9
	% f	50	4	6	22	18
Need for real-world focus and adaptability based on on-the-job training model as basis for instructions	(f)	28	11	6	5	0
	% f	56	22	12	10	0
Need for action-oriented assessment based on simulations and a shift from the traditional assessment methods.	(f)	22	13	6	7	2
	% f	44	26	12	14	4
There is a mismatch between the skills obtained using theory-based instructional methods and those demanded in the job market.	(f)	35	8	3	4	0
	% f	70	16	6	8	0

Source: author's research (Feb-April 2024)

Notably, the table illustrates that 64% of the study participants strongly disagreed that the current TVET approaches and curriculum are effective while only 22% agreed that they are effective. Regarding the need for shift in the TVET landscape 68% of the participants strongly agreed that the shift in the current TVET landscape is necessary, whereas only 16% strongly disagreed with the changes. The participants who strongly disagreed with the shift in the TVET landscape justified their responses by pointing out that the entire education system is increasingly becoming irrelevant and lagging regarding practices and skills demanded by the job market. Table 1 also shows that more than half (52%) of the respondents strongly agreed that the current TVET institutions should incorporate dedicated learning pathways to challenge and nurture gifted students. Similarly, 54% (50% SA and 4% A) of the respondents expressed their interests in an interdisciplinary curriculum that integrates soft and technical skills. Regarding the need for real-world focus and adaptability based on on-the-job training, 78% (56% SA, 22% A) of the respondents agreed that the current secondary TVET institutions should use on-the-job training practices that use real jobs as instructional basis. In addition, 70% (44% SA and 26% A) of the respondents affirmed the need for action-oriented assessment based on practical applications, product development, and simulations, whereas only 18% disagreed with the statement. Finally, 86% (70% SA and 16% A) of the participants agreed that there is a mismatch between the skills obtained using theory-based instructional methods and those demanded in the job market. The proposed model therefore aims to leverage the participant responses to develop an adaptive TVET model that will ensure a seamless match between the skills obtained in TVET institutions and the skills demanded in the job market to eliminate the existing gaps between available and demanded skills. The discussion section below fits the study results into the existing fabric of knowledge and provides a diagrammatic representation of the proposed model.

4. DISCUSSIONS

The goal of this study was to develop an adaptive TVET model that responds to the evolving needs of the current job markets based on the insights obtained from data collected from various stakeholders. The key characteristics that the participants recommended to be incorporated into the model include flexibility, grouping, interdisciplinary curriculum, real-world focus and adaptability, and action-oriented assessment. The finding that the model should be based on the shifting landscape of TVET to equip students with transferable skills is consistent with Kanwar et al.'s (2019) suggestion that TVET systems should adopt formal and informal approaches to focus on promoting work-based and community-based learning. Kanwar et al. (2019) claim that for TVET institutions to adequately prepare workers for the skill-demanding jobs in the age of technological transformations, they must shift their systems away from the traditional occupational profiles and focus on new training programs that meet the skills required by the emerging occupations. Enhancing students' abilities to self-learn and innovate is more important in the current labor market than equipping them with vocational know-how learned from theoretical coursework (Kanwar et al., 2019). As such, the secondary TVET institutions should have a flexible curriculum that equips learners with flexible and diverse skill sets to prepare them for emerging occupations and new professions.

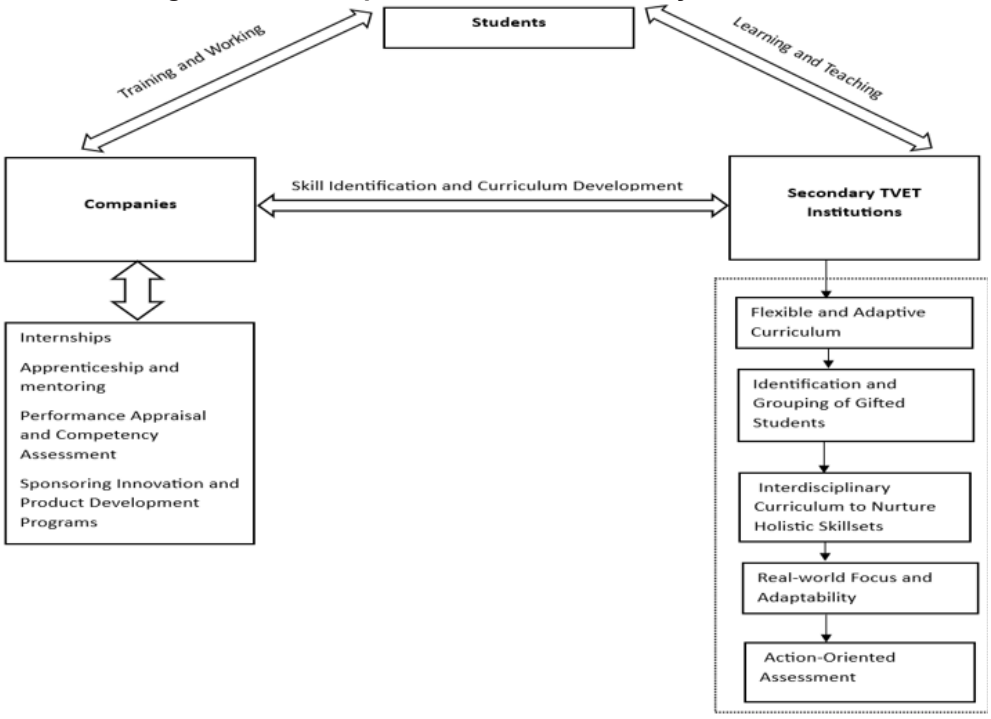
The study also found that based on participants' learning experiences and needs, new TVET models should focus on creating dedicated learning pathways for gifted students. It reaffirms the counterintuitive and overlooked reality that academic underachievement is predictable in secondary TVET institutions. Most gifted students have negative experiences derived from insufficient formal TVET interventions, including low-skill or impractical training content, deficient facilities and poor administrative services. These findings align with Minghat et al.'s (2020) study which established that gifted TVET students have limited opportunities and targeted support. The data also revealed that contemporary TVET systems should nurture holistic skillsets using interdisciplinary curricula to facilitate integration of soft skills with technical expertise. This is corroborated by Ye et al.'s (2024) finding that TVET institutions of the 21st century should adopt a multidisciplinary curriculum that addresses digital literacy, soft skills development, entrepreneurship and innovation, and problem-based learning. The purpose of secondary TVET institutions is to strengthen social cohesion in communities by developing skilled and adaptable workforce, thereby fostering socioeconomic growth (Kamarudin, 2022). To achieve this target, the TVET institutions must adopt an interdisciplinary curriculum with problem-based learning approach, which not only presents students with challenging real-world problems but also encourages them to collaborate when working to find solutions.

The fourth item is curriculums with real-world focus and adaptability to accommodate current industry practices and facilitate students' seamless transition into the workforce. Introducing adaptable curricula that combine on-the-job training for highly skilled practices such as applied science and technology ensures that the trainees fit seamlessly in the job market. For example, TVET institutions should adopt formal work-based learning-by-doing activities in combination with theoretical instructions for technical fields like cybersecurity and engineering to adequately prepare students for jobs in these areas. The curriculums that focus on the real-world problems and solutions equip students with foundational knowledge and skills that are crucial in their fields (Smaragdina et al., 2021). TVET students enrolled in adaptive interventions obtain additional knowledge besides the primary skills targeted, including financial management skills, work readiness and business management skills. The non-technical skills go hand-in-hand with the technical expertise to ensure that the students are not only good in technical competencies but also in soft skill areas like effective communication, problem-solving, emotional intelligence and conflict management (Smaragdina et al., 2021). Recognizing the need for these complex and diverse TVET interventions is an important step toward creating an adaptive and flexible model that accommodates diverse students' needs while addressing the existing skill mismatch.

The final item that should be incorporated into the model is action-oriented assessment. Current TVET institutions rely on the traditional assessment approaches that test students' mastery of theoretical instructions. The problem with these approaches is that they do not test the skills and knowledge required in the real-world working environments where recruits are expected to show their experience and skills in performing various work-related tasks (Yusop et al., 2022). The proposed solution to this challenge in the model is to replace the traditional assessment techniques with practical methods that test students' ability to apply acquired knowledge in real-world working environment. The practical assessment techniques that should be incorporated into secondary TVET institutions' assessment models include product-making assessments, simulations, and competency-based assessments (Yusop et al., 2022). These are better alternatives to written tests, oral questioning (formative in-class assessments) and case studies that most

secondary TVET institutions rely on to test their students because they empower students to take action and prioritize their competency development rather than their ability to master theoretical knowledge (Garraway, 2022). Figure 1 below visually represents the proposed model with its key characteristics.

Figure 1: The Adaptive Model for Secondary TVET Institutions



Source: author's

The model shows that students are central to TVET institutions' interventions and collaborations with companies for sponsoring of special product development and innovation programs. It is student-centered to ensure that the interventions implemented by secondary TVET institutions are tailored to individual needs of students. Based on the model, students access teaching and training from the secondary TVET institutions to gain competence and higher-order thinking capabilities. The training and teaching are based on a flexible curriculum that is developed to reflect the emerging skill needs of the labor market. The horizontal arrow shows the collaboration between companies (stakeholders in the job market) and institutions in development of adaptive secondary TVET curriculums (Cai & Kosaka, 2024). The collaboration ensures that the curriculums are interdisciplinary and flexible to equip the learners with the latest needed skills. The role of companies in this model is to provide mentors, expert speakers, internship and apprenticeship opportunities, as well as sponsoring innovation and product development programs (Cai & Kosaka, 2024). The model therefore facilitates exchange of services and value co-creation among students, colleges and enterprises.

5. CONCLUSIONS

This study set out to present an adaptive secondary TVET model that facilitates students' seamless transition into the workforce through flexible curriculums, action-oriented assessments, and real-world focus that uses on-job training as a basis for instructions. The model is developed based on the valuable insights obtained from participants' input to reflect their needs. It marks a shift from the conventional approaches used in secondary TVETs because it incorporates practical assessment methods and interdisciplinary curriculums which enable students to acquire flexible skill sets demanded by the contemporary job industries. The model will be effective in addressing the skill gaps, skills mismatch, and underemployment facing industries and fresh graduates from TVET institutions.

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