

# Key Perspectives of Student Alumni's Career Satisfaction: A Tracer Study of National Vocational Institute of Battambang and Battambang Institute of Technology, Cambodia

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## Abstract

The Cambodia TVET policy aims to develop a competent, skilled labor force. Despite government commitment, the country still faces gaps in technical skills. This study aimed to explore the contribution of continuous professional teacher competence to quality training provision in technical and vocational education and training schools in Battambang Province, Cambodia. This study examines the effectiveness of technical and vocational education and training (TVET) in Cambodia using a tracer study approach. The research aims to assess how well TVET programs prepare graduates for the job market and contribute to their professional development. By surveying student alumni, employers, and educational institutions, the study analyzes the alignment between TVET curricula and industry needs, as well as the employment outcomes of graduates. We selected respondents using multistage sampling techniques. A total of 234 students graduated from NVIB and BIT in the academic years 2020-2024. Findings from SEM indicate that while TVET programs have improved in recent years, there remain gaps in curriculum relevance and practical skills training. The study provides recommendations for enhancing the quality of TVET in Cambodia, emphasizing the importance of stakeholder collaboration, continuous curriculum evaluation, and increased investment in training infrastructure. These findings contribute to the discourse on workforce development in Cambodia and highlight potential pathways for policy improvement in the TVET sector.

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## Keywords

Technical and Vocational Education and Training (TVET), Student Alumni, Tracer Study, Teacher Competence, Teaching Methodology, Pedagogical Competence, Curriculum Quality, Career Satisfaction, Social Cognitive Career Theory, Cambodia

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## 1. Introduction

The 1990s in Cambodia saw a significant shift in the country's vocational education system, with the establishment of a constitutional monarchy and political stability. The Ministry of Education, Youth and Sports (MoEYS) launched a policy in 1996 to develop a comprehensive vocational training system, leading to the re-opening of TVET institutions and the introduction of new programs. The early 2000s saw further expansion and diversification of TVET programs, with the government and international organizations reforming the system to improve curriculum quality, instructor training, and infrastructure. In the 2010s, the government emphasized the need for high-quality vocational training that aligned with industry needs, guided by the National Technical Vocational Education and Training Policy (2016). As of the late 2010s and 2020s, Cambodia continues to develop its TVET system, partnering with international organizations to improve instructional quality and address skills gaps in labor market. Thus, TVET in Cambodia has transformed from a war-torn system to a restructured, expanding system. Reforms aim to improve vocational education's relevance, quality, and accessibility, positioning it as a crucial part of the country's socio-economic development. Government, stakeholders, and international partners collaborate.

Education is crucial for global economic and social development, with skilled workers being the foundation for sustainable socio-economic transformation. Technical and Vocational Education and Training (TVET) is a triad for acquiring skills, knowledge, and competence for the market labor needs (Mutebi & Ferej, 2023). TVET is an education and training process that aims to equip individuals with knowledge and skills for employment or self-employment. It plays a crucial role in preparing the young generation for the world of work and providing them with the necessary skills for suitable employment (Shefiu & Ayika, 2019). Technical and Vocational Education Training (TVET) policies are seen as significant investments in human capital, aiding economic progress and supporting sustainable development (Mbato & Eguzozie, 2024). TVET aids in developing various abilities that individuals, communities, and society appreciate and value, contributing to the TVET sector (Mboya, 2023). The Ministry of Labor and Vocational Training (MLVT), established in 1993, is a Cambodian government ministry responsible for labor, workforce, and vocational education, currently led by Minister Heng Sour (MLVT, 2024). According to SDGs and the Pentagon Strategy Phase I of the Cambodian government, Cambodia is to become higher-middle-

income country by 2030, as stated by ex-prime Minister Hun Sen (World Bank, 2024). and MLVT will develop comprehensive training programs for youth to enroll in the TVET program in the academic year 2023-2025 with a 1.5 million-student cross-nation in order to fulfil job skills for market needs, as stated by Prime Minister Hun Manet.

The curriculum for vocational training programs is developed by curriculum designers, program managers, researchers, and instructors with scholarly knowledge. Educational policy-makers and accreditation agencies define regulatory framework conditions to ensure academic rigor (Taylor & Bovill, 2018). This scholarship-based curriculum development is common in higher education (Alexander & Hjortso, 2019). Teaching and learning curriculum programs are crucial in enhancing educational skills in field studies through teaching and learning-related activities (Beckett et al., 2020). However, the quality of a higher education curriculum may benefit from additional stakeholders who can provide new perspectives and insights (Tiberius & Weyland, 2024). Another study recommends that future research should conduct comprehensive needs assessments within TVET institutions to tailor Continuous Professional Development (CPD) offerings, identifying skill gaps, industry demands, and emerging vocational trends (Niyonasenze et al., 2024). Indeed, the study on graduates found that communication skills are the most crucial skill for their employment, while collaborative skills are the most useful (Camuyong et al., 2023). Based on the above research gaps and arguments, this study evaluates the effectiveness of Technical and Vocational Education and Training (TVET) in Cambodia through a tracer study, focusing on the experiences and outcomes of graduates as they transition from education to the labor market as economies evolve and industries demand skilled workforces. This study aims to address the knowledge gap in Cambodia's educational landscape by examining the experiences of TVET graduates, their employment status, and employers' perceptions of their competencies, despite significant reforms aimed at improving TVET's quality and relevance. The tracer study methodology uses alumni data and employer insights to analyze TVET programs' impact on career trajectories and job market readiness. It identifies challenges and opportunities within the system, aiming to inform policy-makers, educational institutions, and stakeholders about enhanced vocational training. This study aims to optimize TVET in Cambodia to meet labor market demands, promote economic development, and enhance youth employability. Thus, the research objectives, which aim to enhance student alumni's career satisfaction with Technical and Vocational Education and Training (TVET) programs in Cambodia, focus on the relationship between pedagogical competence, teacher competence, teaching methodology, and curriculum quality. By achieving these objectives, the research can contribute to a deeper understanding of how to effectively enhance the educational experience within TVET programs, ultimately leading to greater career satisfaction among alumnae. Then, this study's contribution expects to provide data-driven policy recommendations for stakeholders in the Cambodian education

system, enhancing TVET program alignment with labor market needs and improving overall educational outcomes.

## 2. Literature Review

### 2.1. Teacher Competence

Teacher competence is a teacher's ability to effectively teach, characterized by their strength, expertise, and consistent quality across different teaching situations, as well as their knowledge, abilities, and beliefs (Anderson & Ball, 1978). TVET meets standards for quality instruction (Komaro et al., 2022). Continuous professional teacher competency significantly enhances teachers' mastery of subject content, teaching methods, and professional values and attitudes, significantly impacting the quality of education in any country (Cabahug et al., 2024). Teacher competence in Technical and Vocational Education and Training (TVET) programs in Cambodia involves a combination of knowledge, skills, and personal attributes. It includes subject-specific expertise, practical experience, pedagogical skills, and understanding local industry requirements and labor market trends. Effective TVET teachers should foster an inclusive learning environment, motivate students, and develop technical and soft skills for career success. Teacher competence is crucial for improving TVET programs, resulting in better educational outcomes and greater career satisfaction for graduates.

### 2.2. Pedagogical Competence

Pedagogical competence involves the combination of theoretical knowledge and practical skills used by teachers to enhance student learning, including understanding theories, mastering teaching strategies, and using appropriate assessment methods (Liakopoulou, 2011; Shulman, 1987). Pedagogical competence encompasses teachers' ability to effectively manage the teaching and learning process, from planning to evaluation stages (Komaro et al., 2022). Over the past few decades, curricular reform has led to significant pedagogical changes (Boudouaia et al., 2024). This research defines pedagogical competence as the skill set of educators that effectively facilitates learning, thereby enhancing student outcomes and creating a supportive educational environment. Indeed, pedagogical competence in Cambodian TVET programs involves educators' ability to use appropriate teaching strategies, methodologies, and assessment practices to facilitate learning effectively. This competence is crucial for creating an engaging learning environment, enhancing TVET education quality, and preparing students for successful careers in various industries.

### 2.3. Teaching Methodology

The UN's Agenda 2030 urges education to develop methods that help students gain sustainable development skills. Scholars are interested in circular economy and sustainability teaching methods (Marcon & Sehnem, 2024). Teaching methods help students learn practice processes (García-Ros & Alhama, 2023). In this

context, different teaching methodologies have emerged that have adapted the useful principles of classical methods to the current reality and needs, where skills learning is a priority, teachers must find tools to improve knowledge transmission, and students must accept responsibility and personal autonomy to grow (Aquereta Beola & Arbea Moreno, 2024). Therefore, this study asserts that teaching methodologies refer to the strategy's educators use to teach. It includes methods, procedures, and styles for engaging students, communicating content, and assessing learning. Teachers use different methods depending on the subject, student age, educational goals, and context. The teaching methodology shapes education and creates effective learning environments. Indeed, teaching methodology in Technical and Vocational Education and Training (TVET) programs in Cambodia involves various strategies to facilitate effective learning and skill acquisition. These methodologies must be tailored to meet the specific needs of adult learners and various industries, aiming to enhance student outcomes, equip graduates with necessary skills, and improve career satisfaction in line with the Cambodian economy.

#### **2.4. Curriculum Quality**

The curriculum should adapt to changing values and educational demands, encompassing more than just syllabi or plans. It should include content, teaching methods, assessment, and evaluation, ensuring comprehensive content beyond just learning materials (Wiranto & Slameto, 2021). Curriculum quality refers to the effective delivery of a curriculum to students, fostering learning and promoting knowledge, behaviors, and attitudes (Ornstein & Hunkins, 1998). Curriculum quality evaluates the curriculum's effectiveness in meeting educational goals, meeting learners' needs, and facilitating student engagement, learning outcomes, and personal growth (Martirosyan, 2015). Curriculum quality measures students', educators', and stakeholders' approval of the educational curriculum's structure, content, and delivery, considering factors like relevance, quality, teaching methods, and learning environment (Garnjost & Lawter, 2019). Indeed, the quality of Technical and Vocational Education and Training (TVET) programs in Cambodia is crucial for preparing students for the workforce. It ensures graduates possess the necessary knowledge and skills, aligning with industry demands and labor market needs. This quality enhances educational outcomes, employability, career satisfaction, and economic development in Cambodia, thereby preparing students for the modern labor market.

#### **2.5. Career Satisfaction**

Career satisfaction is the satisfaction an individual feels about their work and career path, encompassing aspects like job satisfaction, alignment with personal values, work-life balance, growth opportunities, and overall well-being (Hackman & Oldham, 1976). It is a subjective evaluation of career progression, how well it meets expectations and aligns with personal and professional aspirations (Kopelman et

al., 2006). Most importantly, student alumni's career satisfaction in Technical and Vocational Education and Training (TVET) programs in Cambodia is crucial for assessing the effectiveness of these programs and meeting the needs of students and the labor market. Enhancing student alumni's career satisfaction is essential for the long-term success of TVET programs in Cambodia, as satisfied graduates are more likely to contribute positively to the economy, engage in lifelong learning, and recommend TVET pathways.

## 2.6. Hypothesis Development and Conceptual Framework

### 2.6.1. Pedagogical Competence and Curriculum Quality

The relationship between pedagogical competence and curriculum quality is a crucial aspect of educational research. Pedagogical competence refers to the skills, knowledge, and attitudes educators possess to effectively deliver instruction and facilitate learning (Fauth et al., 2019). Curriculum quality, on the other hand, refers to how content teachers and students are with the curriculum's structure, content, delivery, and relevance to learning objectives (Marsen et al., 2021). Teachers who align their teaching practices with curriculum objectives report higher levels of quality, as they can see the direct impact on student learning (Nurhayati et al., 2022). Based on these research arguments, the following hypothesis is proposed:

*Hypothesis 1: Pedagogical competence has a positive influence on curriculum quality.*

### 2.6.2. Teacher Competence and Curriculum Quality

Teacher competence offers principles for creating high-quality learning environments, which have been applied to social science and science education (Pianta & Hamre, 2009). Understanding this relationship can improve teaching practices and overall educational experiences. Teachers with strong competencies are more adept at implementing the curriculum effectively, using appropriate teaching strategies to meet curricular goals. They are more likely to appreciate the relevance and effectiveness of the curriculum (Tohan et al., 2022). Teacher competence also includes the ability to gather and respond to student feedback, fostering a sense of ownership among students and enhancing their satisfaction with the high quality of curriculum (Lauermann & ten Hagen, 2021). When teachers are competent and confident in their ability to deliver the curriculum effectively, both they and their students are more likely to experience satisfaction with the high quality of curriculum (Anub, 2020). Thus, this study suggests that teachers with high teaching competence can enhance students' knowledge, abilities, and skills, ultimately enhancing their satisfaction with the high quality of curriculum. Then, the following research hypothesis is proposed:

*Hypothesis 2: Teacher competence has a positive influence on curriculum quality.*

### 2.6.3. Teaching Methodology and Curriculum Quality

Teaching involves the transmission of knowledge, but it also involves the processes

through which students acquire it. Constructivist teaching and learning theory offers a participatory approach, where students actively participate in the learning process. According to Von Glasersfeld (1989) constructivism theory emphasizes that knowledge is not passively received but actively built up by the cognizing subject. The core of this approach is that the student is an active participant in the learning process, and the teacher must consider this in their efforts to facilitate learning. Constructivist theories of teaching and learning raise the question of whether teaching involves the transmission of knowledge or the facilitation of learning. A teacher, a person with expert knowledge on the subject, plays a crucial role in facilitating learning. The learning experience is greatly enhanced when the student is an active participant in the learning process, making the teacher's role essential. In conclusion, teaching involves both the transmission of knowledge and the facilitation of learning through teaching method. Teaching method is a teacher's mechanism for organizing and implementing educational activities to achieve specific goals, while teaching techniques reflect the success of the learning process and the teacher's competencies (Bound et al., 2013). The relationship between teaching methodology and curriculum quality is crucial for understanding how instructional strategies affect educators' and learners' perceptions (Tessema et al., 2012). Continuous professional development in innovative teaching methodologies can enhance pedagogical skills and curriculum implementation (Peng & Lin, 2019). Effective teaching methodologies involve obtaining student feedback, allowing teachers to adjust instruction based on student input, making the curriculum more responsive and quality (Khan et al., 2024). Another study assumes that teaching methodology leads to high-quality instruction related to material curriculum (Hill & Charalambous, 2012). Based on these arguments, this study proposed the following hypothesis:

*Hypothesis 3: Teaching methodology has a positive influence on curriculum quality.*

#### **2.6.4. Curriculum Quality and Career Satisfaction**

Student satisfaction with their study curriculum is a dynamic process that involves interaction between students, faculty, and the teaching and learning environment (Chen & Lo, 2012). Curriculum quality is crucial in baccalaureate TVET education, influencing student retention, success, and meeting their needs, contributing to intellectual, social, and emotional growth in students (Rossini et al., 2021). According to social cognitive career theory (SCCT), rooted in vocational psychology, offers a comprehensive framework for understanding an individual's career choices, emphasizing personal agency and human capacity. It comprises five interconnected models: interest development, choice-making, performance and persistence, satisfaction and well-being, and career self-management (Lent & Brown, 2019). SCCT integrates various theories related to educational and career interest, choice, and behavior, analyzing the content of career development (Adebusuyi et al., 2022). This study asserts that curriculum quality can enhance teaching

effectiveness, and effective techniques for boosting teachers' self-efficacy and career satisfaction include learning about curriculum implementation, managing school circumstances, and cooperating with administrators and peers (He & Fu, 2022). The study revealed that job satisfaction in Pakistan's public primary schools is positively influenced by curriculum satisfaction with high level of quality (Khan, 2023). Social Cognitive Theory (SCT), developed by Albert Bandura, posits that individuals learn from their environment, experiences, and actions. It provides a framework for understanding career satisfaction, highlighting the importance of setting clear, achievable goals. Setting clear goals leads to a sense of purpose, achievement, and motivation. Incorporating SCT principles into career development empowers individuals to take proactive steps towards achieving career satisfaction (Boudouaia et al., 2024). Thus, this study assumes that student alumni' career satisfaction is a crucial indicator of the quality of higher education, particularly in relation to the quality of curriculum design and overall quality. Then, the following research hypothesis is proposed:

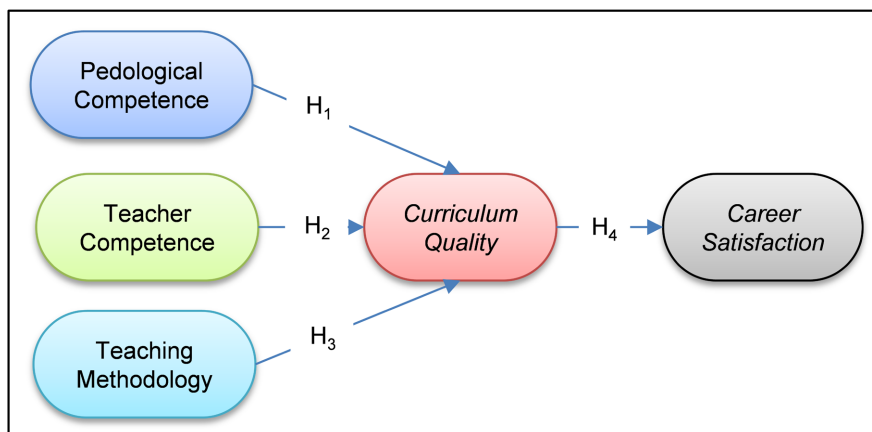
*Hypothesis 4: Curriculum quality has a positive impact on student alumni's career satisfaction.*

## 2.7. Theoretical and Conceptual Framework

This study aims to investigate the relationship between curriculum quality, pedagogical competence, teacher competence, support services, and socio-economic issues in TVET alumni career satisfaction in Cambodia. The research focuses on curriculum relevance, teaching methodology, and career satisfaction. The study emphasizes the importance of vocational education in Cambodia, as it improves educational practices and helps graduates succeed in a competitive work market. The study suggests that a curriculum that meets industrial needs improves graduates' employability. It also examines how curriculum modifications to meet labor market demands affect alumni satisfaction. Practical skills are key in vocational training, and alumni satisfaction can be assessed by how well the curriculum teaches career-relevant skills. Effective teaching strategies that engage students improve learning and career fulfillment. Career counseling and job placement programs in TVET can significantly impact alumni career paths and employment satisfaction.

The social cognitive career theory (SCCT) (Brown & Lent, 2017) is used to understand how TVET skills and abilities affect alumni's professional satisfaction. It states that career success requires competencies—knowledge, skills, and attitudes. The SCCT helps explain how TVET skills and knowledge affect alumni career satisfaction (Jo et al., 2024). TVETipedia Glossary defines TVET as a comprehensive educational process that includes general education, technology and science study, practical skills, attitudes, and knowledge for various economic and social sectors (UNESCO-UNEVOC, 2023). Human Capital Theory posits that individuals acquire skills and knowledge that enhance their productivity and economic value in the labor market Becker (1964). Investments in vocational education can

lead to improved employability and job performance (Marginson, 2019). However, the human capital theory fails realism due to its single theoretical lens, closed system modeling, inappropriate mathematical tools, and multi-variate analysis of interdependent variables. By improving technical and soft skills and encouraging continual learning and professionalism, TVET programs can improve graduates' career prospects and job satisfaction. Thus, this research manuscript applied these key theories to improve TVET curriculum, teaching, and career support in Cambodia to explain the conceptual framework as proposed in **Figure 1**.



**Figure 1.** Conceptual framework of tracer study.

### 3. Methodology

#### 3.1. Research Design

This study uses a quantitative survey of student alumni who graduated in the academic year 2020-2024. A correlational study looks at the link between the research variables of pedagogical competence, teacher competence, and teaching methodology in order to find out what makes student graduates of TVET programs in Cambodia satisfied with their jobs.

#### 3.2. Study Sites and Sampling Techniques

Battambang Province is the third-largest city with more than 1 million people, and most young people migrate to work in another country (i.e., Thailand). Cambodia is implementing the Pentagon Strategy Phase I to increase Cambodian people's incomes to medium-high levels by 2030. In order to reduce migration, TVET in this province works very hard to conduct special vocational training programs to create more jobs for local people. Thus, this study employs a non-probability sampling technique with snowball sampling, a qualitative research method where participants refer others based on study criteria, creating a "snowball" effect (Cooper & Schindler, 2014). We sent a Google Form survey via a Telegram link to 1200 students who graduated in the academic year 2020-2024, asking them to complete the survey for a tracer study. Thus, a total of 256 target respondents were returned, and 22 questionnaire surveys were rejected due to major missing

information. Then, a total of 234 sample sizes were considered a formal sample size for this study.

### 3.3. Sample Size Determination

We collected data from student alumni from the academic year 2020-2024, using a known population. We then applied Yamane (1973)'s formula to calculate the sample sizes, as outlined below.

$$n = \frac{N}{1 + Ne^2}$$

where:

$n$  = Determination of the sample sizes

$N$  = Total known population sizes

$e$  = Tolerance error was suggesting the rank from 5% - 10% (thus, this study uses 7% or 0.07)

We assigned a total of 4352 students (i.e., based on the formal reports of NVIB has 2852 students and BIT has 1500 students in the academic year 2020-2024) as the total known population size for this study. The calculation yielded the following total formal sample sizes:

$$n = \frac{4352}{1 + 4352 * (0.07)^2} = 194$$

According to the calculation, the sample size for this study should be at least 194 students to participate in the primary survey. However, a total of 234 sample sizes were collected for a formal data analysis for this study.

### 3.4. Questionnaire Design and Measurement Scales

This study operationalizes questionnaire items created by earlier researchers. We have operationalized the A-5 elements of career satisfaction from Evers et al. (2000). A-3 item of pedagogical competence was operationalized from Ikromova (2020). A-5 item of curriculum quality was operationalized from Khan (2023). A-3 item of teaching methodology was operationalized by Moreno-Murcia et al. (2015) and a-6 item of teacher competence was operationalized by Dellinger et al. (2008). In order to reduce a common variance bias among the respondents (Brislin, 1980), the questionnaire items were double-back translated from English to Khmer, and the English and Khmer versions were used to double-confirm the meaning of the questionnaire translation before designing an online survey via a Google form. The English version of the questionnaire design is available in the Appendix of this study.

### 3.5. Data Analysis Techniques

This study applies the concepts of the following statistical analysis tools to produce the results of descriptive statistics and frequency distribution to explore the characteristics of the respondents (Table 1) (Bluman, 2023), factor analysis and reliability test (Table 2) and correlation matrix (Table 3) to validate and measure

the reliability of questionnaire items (Allen et al., 2023), Confirmatory Factor Analysis (CFA) (Table 4) and Structural Equation Modeling (SEM) (Table 5) to double-confirmed the results of factor analysis and reliability test before proceeding the hypothesis testing with SEM stage (Hair et al., 2021; Hair Jr. et al., 2021; Jöreskog et al., 2016; Kline, 2023).

## 4. Results

### 4.1. Descriptive Statistics and Frequency Distributions

Descriptive statistics and frequency distributions are crucial tools for summarizing large data sets, conveying complex information in an understandable format, facilitating further analysis, and guiding decision-making processes. Descriptive statistics include measures like central tendency, variability, and position, while frequency distributions show the frequency of each value or range in a data set. Both tools are essential for analyzing large data sets, identifying patterns, trends, and outliers, and aiding in further analysis and decision-making. As a result, Table 1 showed the frequency distribution of the respondents' demographics.

**Table 1.** Descriptive statistics for demographic of respondents.

| Demography                    | Frequency | Percent |
|-------------------------------|-----------|---------|
| <b>Institutions</b>           |           |         |
| NVIB                          | 108       | 46.2%   |
| BIT                           | 126       | 53.8%   |
| <b>Gender</b>                 |           |         |
| Female                        | 72        | 30.8%   |
| Male                          | 162       | 69.2%   |
| <b>Marital Status</b>         |           |         |
| Single                        | 209       | 89.3%   |
| Married                       | 23        | 9.8%    |
| Other                         | 2         | 0.9%    |
| <b>TVET Programs</b>          |           |         |
| C1                            | 87        | 37.2%   |
| C2                            | 7         | 3.0%    |
| C3                            | 33        | 14.1%   |
| BST                           | 41        | 17.5%   |
| Bachelor                      | 66        | 28.2%   |
| <b>TVET Program Awareness</b> |           |         |
| No                            | 91        | 38.9%   |
| Yes                           | 143       | 61.1%   |

## 4.2. Factor Analysis and Reliability Test

**Table 2.** Factor analysis and reliability test.

| Research Constructs                 | Reliability Test |              |              |               | Reliability Test |              |
|-------------------------------------|------------------|--------------|--------------|---------------|------------------|--------------|
|                                     | FL               | KMO          | Eig.         | %             | ITC              | $\alpha$     |
| <b>Pedological Competence (PEC)</b> |                  |              |              |               |                  |              |
| Q19_2                               | 0.859            | <b>0.711</b> | <b>2.150</b> | <b>71.653</b> | 0.668            | <b>0.802</b> |
| Q19_3                               | 0.841            |              |              |               | 0.640            |              |
| Q19_1                               | 0.839            |              |              |               | 0.637            |              |
| <b>Teaching Methodology (TEM)</b>   |                  |              |              |               |                  |              |
| Q18_2                               | 0.902            | <b>0.712</b> | <b>2.290</b> | <b>76.339</b> | 0.763            | <b>0.844</b> |
| Q18_3                               | 0.875            |              |              |               | 0.713            |              |
| Q18_1                               | 0.843            |              |              |               | 0.661            |              |
| <b>Teacher Competence (TEC)</b>     |                  |              |              |               |                  |              |
| Q21_5                               | 0.871            | <b>0.897</b> | <b>3.964</b> | <b>66.070</b> | 0.795            | <b>0.893</b> |
| Q21_3                               | 0.838            |              |              |               | 0.753            |              |
| Q21_1                               | 0.832            |              |              |               | 0.738            |              |
| Q21_6                               | 0.788            |              |              |               | 0.696            |              |
| Q21_2                               | 0.779            |              |              |               | 0.670            |              |
| Q21_4                               | 0.763            |              |              |               | 0.665            |              |
| <b>Curriculum Quality (CUQ)</b>     |                  |              |              |               |                  |              |
| Q28_6                               | 0.874            | <b>0.781</b> | <b>2.678</b> | <b>66.943</b> | 0.740            | <b>0.833</b> |
| Q28_5                               | 0.864            |              |              |               | 0.731            |              |
| Q28_2                               | 0.798            |              |              |               | 0.635            |              |
| Q28_7                               | 0.728            |              |              |               | 0.554            |              |
| <b>Career Satisfaction (CAS)</b>    |                  |              |              |               |                  |              |
| Q20_3                               | 0.903            | <b>0.872</b> | <b>3.645</b> | <b>72.901</b> | 0.833            | <b>0.906</b> |
| Q20_2                               | 0.874            |              |              |               | 0.790            |              |
| Q20_4                               | 0.861            |              |              |               | 0.773            |              |
| Q20_1                               | 0.843            |              |              |               | 0.752            |              |
| Q20_5                               | 0.783            |              |              |               | 0.674            |              |

Note: % = Cumulative %, Eig. = Eigenvalue, FL = Factor Loading score, KMO = Kaiser-Meyer-Olkin, ITC = Item-total Correlation,  $\alpha$  = Cronbach Alpha.

The purpose of conducting a test of factor analysis is to define the underlying structure among the research variables (Hair Jr. et al., 2019). To ensure a high level of validation for the results, we employ the following guidelines to assess the factor analysis process: 1) KMO > 0.50 and Bartlett's test is significant at p-value < 0.05; 2) Communalities of each variable should be higher than > 0.5; 3) Factor Loading  $\geq$  0.60 or 0.70; 4) Eigenvalue  $\geq$  1; 5) Cumulative percentage > 60%. This report also used the "Varimax rotation" and "Principal Component Extraction" methods to validate the meaning of research variables. Therefore, we may delete some research items if they have a factor loading score below 0.60 or communality values below 0.50. We adopted the factor analysis procedure to conduct the reliability test, leaving the items intact. We commonly apply the estimate of the coefficient Alpha, an indicator of convergent validity measurement, to evaluate the reliability of questionnaire items (Hair et al., 2010). According to Churchill Jr. (1979: p. 68), coefficient Alpha "absolutely should be the first measure one calculates to assess the quality of the instrument". To assess its representation of structure, one should apply common factor analysis and reliability tests (Hair et al., 2021). We use two criteria for the reliability test to check the construct validity: 1) The item-to-total correlation must be at least 0.5; 2) The coefficient alpha ( $\alpha$ ) must be at least 0.6 (for an exploratory study) or 0.70 (for a confirmatory study) (Table 2). Therefore, the results of the factor analysis and reliability test for this study have high reliability and validity.

### 4.3. Correlation Matrix

**Table 3.** Correlation matrix.

| Variables | Mean  | Std. Deviation | PEC            | TEM     | TEC     | CUQ            | CAS  |
|-----------|-------|----------------|----------------|---------|---------|----------------|------|
| PEC       | 3.764 | 0.622          | 1.00           |         |         |                |      |
| TEM       | 3.712 | 0.753          | 0.309**        | 1.00    |         |                |      |
| TEC       | 3.768 | 0.628          | 0.497**        | 0.263** | 1.00    |                |      |
| CUQ       | 3.792 | 0.567          | <b>0.721**</b> | 0.364** | 0.573** | 1.00           |      |
| CAS       | 3.821 | 0.646          | 0.689**        | 0.353** | 0.598** | <b>0.702**</b> | 1.00 |

\*\*Correlation is significant at the 0.01 level (2-tailed). Note: PEC = Pedological Competence, TEM = Teaching Methodology, TEC = Teacher Competence, CUQ = Curriculum Quality, CAS = Career Satisfaction.

Correlation is the measure of the size and direction of the linear relationship between the two variables, while squared correlation is the measure of the strength of the association between them (Tabachnick et al., 2018). The correlation matrix (Table 3) illustrates the interrelationship among key research variables as proposed

in the conceptual framework. All of the variables in this study have a strong positive relationship with each other. The Pearson correlation coefficient test with a two-tailed test gave this relationship with  $**p\text{-value} < 0.01$ . We evaluated the correlation between the variables using the correlation matrix (Steiger, 1980). The study's findings demonstrate that among these relationships, "Pedological Competence" exhibits a highly and strongly significant correlation with student alumni's Curriculum Satisfaction, with a correlation coefficient of approximately  $r = 0.721$  or 72.10%. Indeed, "student alumni's Curriculum Satisfaction" also has a strongly significant correlation with "Student alumni's Career Satisfaction", with  $r = 0.702$  or 70.02%, respectively. Thus, in TVET contexts, "Pedological Competence" and "Curriculum Satisfaction" play the most important roles in increasing student alumni's Career Satisfaction after their graduated from institutions.

#### 4.4. Confirmatory Factor Analysis (CFA)

The purpose of conducting CFA is to double-confirm the reliability and validity of research items with exploratory factor analysis and reliability tests, as shown in Table 2. The CFA procedures consisted of three steps: 1) Creating a first-ordered factor model; 2) Creating a second-ordered factor model; 3) Creating an overall factor model (i.e., refer to Chanveasna et al., 2024). We also adopted Average Variance Extracted (AVE) and Composite Reliability (CR), as shown in Table 4 & Figure 2, to ensure the validity and reliability of the research constructs in this study. The CFA results indicated that all research constructs have high reliability and validity, with the best model fit assessment (i.e.,  $\chi^2/D.F = 1.166$ , GFI = 0.936, AGFI = 0.902, NFI = 0.946, CFI = 0.992, and RMSEA = 0.027), as meet the thresholds recommended by Hair Jr. et al. (2021), Kline (2023), and Jöreskog et al. (2016) (i.e.,  $\chi^2/D.F < 2.5$ , GFI > 0.90, AGFI > 0.90, NFI > 0.90, CFI > 0.90, and RMSEA < 0.05). We then used all the research items from the CFA stages to test the research hypotheses through SEM, as shown in Table 5 & Figure 3.

The Average Variance Extracted (AVE) and Composite Reliability coefficients (CR) are applied to relate the quality of a measure. To avoid misconceptions, it is needed to appropriately understand the equations of the AVE and CR, as well as their association to the definition of validity and reliability. In this manuscript, we explain, using simulated one-factor models, how the number of items and the homogeneity of factor loadings might influence the AVE and CR results.

$$AVE = \frac{\sum_{i=1}^n \lambda_i^2}{n} \quad (1)$$

$$CR = \frac{\left(\sum_{i=1}^n \lambda_i\right)^2}{\left(\sum_{i=1}^n \lambda_i\right)^2 + \left(\sum_{i=1}^n \delta_i\right)} \quad (2)$$

where:  $\lambda$  (Lamda) represents the standardized factor loading, and  $i$  is the number of items (1) and  $\delta$  (Delta) represents error variance terms (2) while  $\delta = 1 - \lambda_i^2$ .

According to Fornell & Larcker (1981) and Peterson & Kim (2013), AVE must exceed 0.50, and CR must exceed 0.70, respectively. Hair et al. (2014) recommend that the t-value must be greater than 1.96 and the p-value < 0.05. Therefore, AVE and CR have met the thresholds for this study.

**Table 4.** The results of CFA.

| Code  |   | Research Constructs           | $\lambda$ | t-value | AVE          | CR           |
|-------|---|-------------------------------|-----------|---------|--------------|--------------|
| Q19_1 | ← | <b>Pedological Competence</b> | 0.720***  | A       | <b>0.573</b> | <b>0.801</b> |
| Q19_2 | ← |                               | 0.781***  | 9.894   |              |              |
| Q19_3 | ← |                               | 0.768***  | 9.846   |              |              |
| Q18_1 | ← | <b>Teaching Methodology</b>   | 0.731***  | A       | <b>0.647</b> | <b>0.845</b> |
| Q18_2 | ← |                               | 0.873***  | 12.617  |              |              |
| Q18_3 | ← |                               | 0.803***  | 11.784  |              |              |
| Q21_6 | ← | <b>Teacher Competence</b>     | 0.724***  | A       | <b>0.602</b> | <b>0.900</b> |
| Q21_5 | ← |                               | 0.850***  | 12.653  |              |              |
| Q21_4 | ← |                               | 0.683***  | 11.162  |              |              |
| Q21_3 | ← |                               | 0.803***  | 11.872  |              |              |
| Q21_2 | ← |                               | 0.749***  | 11.195  |              |              |
| Q21_1 | ← |                               | 0.831***  | 11.549  |              |              |
| Q28_7 | ← | <b>Curriculum Quality</b>     | 0.669***  | A       | <b>0.501</b> | <b>0.800</b> |
| Q28_6 | ← |                               | 0.705***  | 9.506   |              |              |
| Q28_5 | ← |                               | 0.708***  | 9.706   |              |              |
| Q28_2 | ← |                               | 0.746***  | 10.008  |              |              |
| Q20_4 | ← | <b>Career Satisfaction</b>    | 0.830***  | A       | <b>0.663</b> | <b>0.907</b> |
| Q20_3 | ← |                               | 0.887***  | 17.061  |              |              |
| Q20_2 | ← |                               | 0.854***  | 16.044  |              |              |
| Q20_1 | ← |                               | 0.773***  | 13.798  |              |              |
| Q20_5 | ← |                               | 0.715***  | 12.345  |              |              |

Note:  $\lambda$  = Standardized Estimates; AVE = Average variance extracted and CR (Composite Reliability) was calculated by Hair et al. (2010). \*\*\* $p < 0.001$ , which is significant level at t-value > 1.96. A = parameter regression weight was fixed at 1.

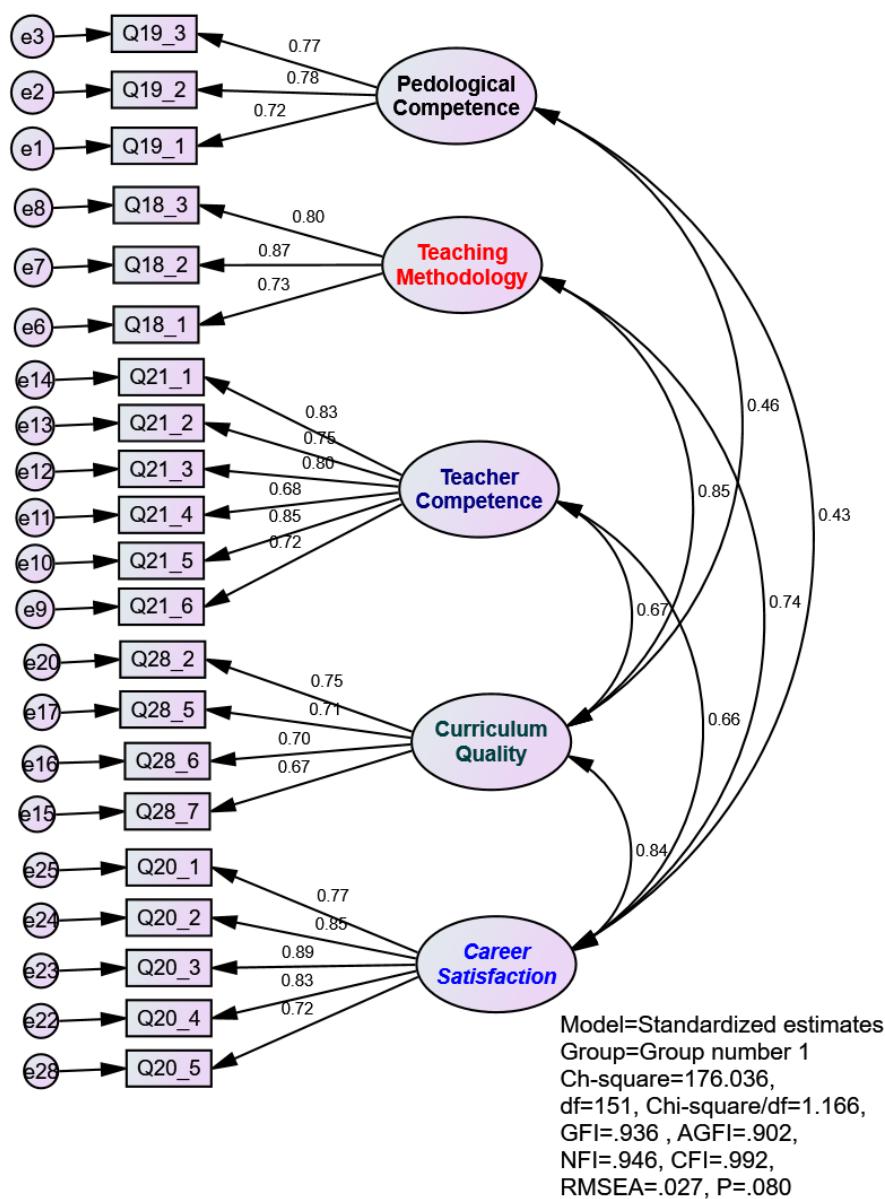


Figure 2. The overall of CFA.

### 4.5. Structural Equation Modeling (SEM)

AMOS 29 and SPSS 29 are used to produce the results of confirmatory factor analysis (CFA) to evaluate the goodness-of-fit model assessment for the measurement model for this study, and Structural Equation Modeling (SEM) to test the proposed research hypotheses. All questionnaire items that remained from the formal results of the overall CFA (Table 4) were adopted to proceed with the SEM. Indeed, the thresholds for SEM are the same as the thresholds for CFA, stated above which were also adopted to evaluate the results of SEM. The results of SEM indicated that  $\chi^2/D.F = 1.486$ , GFI = 0.917, AGFI = 0.876, NFI = 0.929, CFI = 0.975, and RMSEA = 0.046, which met the thresholds and have a good assessment of model fit for this study (Table 5 and Figure 3).

**Table 5.** The results of SEM.

| Code   |   | Research Constructs           | Standardized Estimates | t-value      | p-value |
|--|---|-------------------------------|------------------------|--------------|---------|
| Q19_1  | ← | <b>Pedological Competence</b> | 0.73                   | A            | ***     |
| Q19_2  | ← |                               | 0.786                  | 9.935        | ***     |
| Q19_3  | ← |                               | 0.758                  | 9.768        | ***     |
| Q18_1  | ← | <b>Teaching Methodology</b>   | 0.741                  | A            | ***     |
| Q18_2  | ← |                               | 0.870                  | 12.76        | ***     |
| Q18_3  | ← |                               | 0.804                  | 11.957       | ***     |
| Q21_6  | ← | <b>Teacher Competence</b>     | 0.721                  | A            | ***     |
| Q21_5  | ← |                               | 0.854                  | 12.529       | ***     |
| Q21_4  | ← |                               | 0.681                  | 11.158       | ***     |
| Q21_3  | ← |                               | 0.793                  | 11.684       | ***     |
| Q21_2  | ← |                               | 0.745                  | 11.021       | ***     |
| Q21_1  | ← |                               | 0.835                  | 11.545       | ***     |
| Q28_7  | ← | <b>Curriculum Quality</b>     | 0.670                  | A            | ***     |
| Q28_6  | ← |                               | 0.705                  | 9.459        | ***     |
| Q28_5  | ← |                               | 0.716                  | 9.768        | ***     |
| Q28_2  | ← |                               | 0.734                  | 9.748        | ***     |
| Q20_4  | ← | <b>Career Satisfaction</b>    | 0.841                  | A            | ***     |
| Q20_3  | ← |                               | 0.881                  | 17.216       | ***     |
| Q20_2  | ← |                               | 0.848                  | 16.181       | ***     |
| Q20_1  | ← |                               | 0.775                  | 14.061       | ***     |
| Q20_5  | ← |                               | 0.716                  | 12.507       | ***     |
| <b>Path Relationships—Hypothesis testing</b> |   |                               |                        |              |         |
| Hypothesis 1: PEC → CUQ                      |   |                               | 0.122**                | 2.015        | 0.044   |
| Hypothesis 2: TEC → CUQ                      |   |                               | 0.261***               | 3.759        | 0.000   |
| Hypothesis 3: TEM → CUQ                      |   |                               | <b>0.68***</b>         | <b>7.638</b> | 0.000   |
| Hypothesis 4: CUQ → CAS                      |   |                               | <b>0.752***</b>        | <b>6.739</b> | 0.000   |

Note: \*\*\* $p < 0.001$ , \*\* $p < 0.05$  which is significant level at t-value  $> 1.96$ . A = parameter regression weight was fixed at 1.

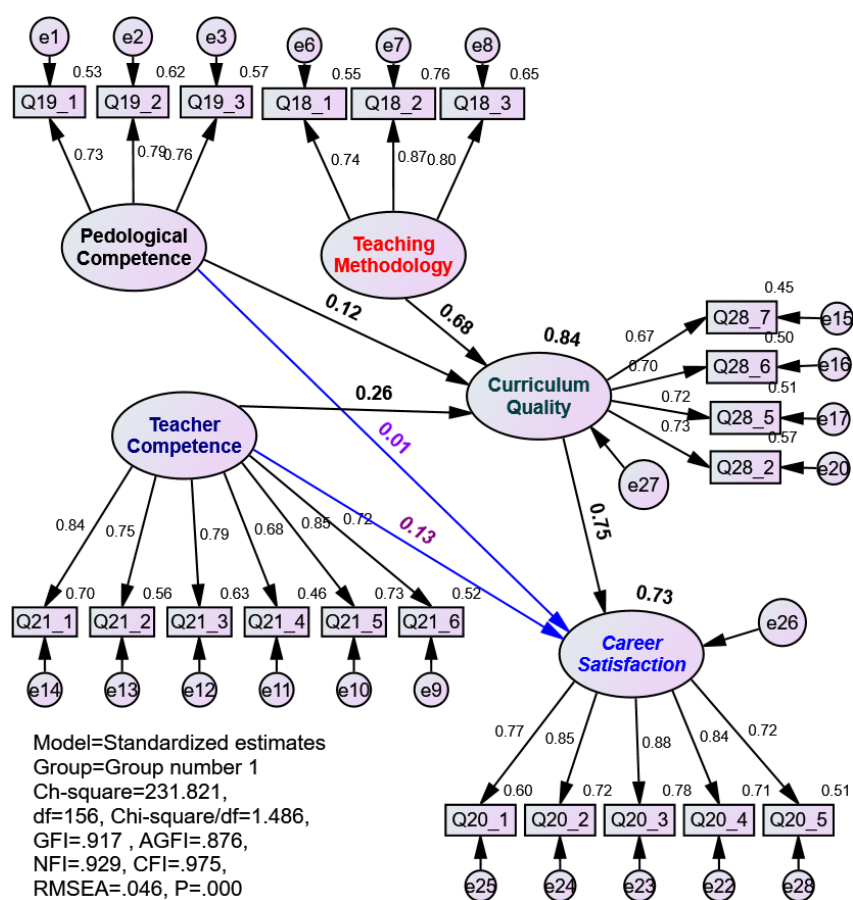


Figure 3. The results of SEM.

Also, this research finding found that the original proposed research hypotheses are well-confirmed and significant by this study. **Hypothesis 1**—The relationship between “Pedagogical Competence—PEC” and “Curriculum Quality—CUQ” has a positive effect with  $\beta = 0.122^{**}$ ,  $t\text{-value} = 2.015 > 1.96$ , and  $p\text{-value} = 0.044 < 0.05$ . **Hypothesis 2**—The relationship between “Teacher Competence—TEC” and “Curriculum Quality—CUQ” has a positive effect with  $\beta = 0.261^{***}$ ,  $t\text{-value} = 3.759 > 1.96$ , and  $p\text{-value} = 0.000 < 0.001$ . **Hypothesis 3**—The relationship between “Teaching Methodology—TEM” and “Curriculum Quality—CUQ” has a positive effect with  $\beta = 0.68^{***}$ ,  $t\text{-value} = 7.638 > 1.96$ , and  $p\text{-value} = 0.000 < 0.001$ . **Hypothesis 4**—The relationship between “Curriculum Quality—CUQ” and “Career Satisfaction—CAS” has a positive effect with  $\beta = 0.752^{***}$ ,  $t\text{-value} = 6.739 > 1.96$ , and  $p\text{-value} = 0.000 < 0.001$ . Therefore, this study assumes that “Teaching Methodology” and “Curriculum Quality” have very important roles and indicators in enhancing student alumni’s career satisfaction with TVET programs in Battambang province, Cambodia.

According to Sobel’s test (Table 6), this research finding also suggests that “Curriculum Quality” plays most important role as a key mediating variable to facilitate the relationship among “Pedagogical Competence”, “Teacher Competence” and “Career Satisfaction” among 234 students alumni in TVET programs.

These core values of providing knowledge, skills, and competencies as a way to develop their work environment in the workplace; therefore, they are satisfied with the quality of these curricula in TVET.

**Table 6.** The result of Sobel's test.

| Sobel's test formula $z\text{-test} = \frac{ab}{\sqrt{b^2 SE_a^2 + a^2 SE_b^2}}$ (Sobel, 1982) |          |          |                       |                       |                |
|--|----------|----------|-----------------------|-----------------------|----------------|
| <b>1) Mediating test of PEC → CUQ → CAS</b>  |          |          |                       |                       |                |
|  | <i>a</i> | <i>b</i> | <i>SE<sub>a</sub></i> | <i>SE<sub>b</sub></i> | <i>p-value</i> |
| PEC → CUQ  | 0.122    |          | 0.044                 |                       | 0.044          |
| CUQ → CAS  |          | 0.752    |                       | 0.148                 | 0.000          |
|  |          |          |                       | <b>z-test = 2.433</b> | <b>0.0149</b>  |
| <b>2) Mediating test of TEC → CUQ → CAS</b>  |          |          |                       |                       |                |
|  | <i>a</i> | <i>b</i> | <i>SE<sub>a</sub></i> | <i>SE<sub>b</sub></i> | <i>p-value</i> |
| TEC → CUQ  | 0.261    |          | 0.051                 |                       | 0.000          |
| CUQ → CAS  |          | 0.752    |                       | 0.148                 | 0.000          |
|  |          |          |                       | <b>z-test = 3.601</b> | <b>0.0003</b>  |

Note: Significant level of Sobel's test is  $z\text{-test} > 1.96$  and  $p\text{-value} < 0.05$  and online calculation of the Sobel's test also can be found at the following webpage and also shown in the Appendix 2: <https://quantpsy.org/sobel/sobel.htm>. *a* is the path coefficient of the relationship between the independent and the mediator variables; *b* is the path coefficient of the relationship between the mediator and the dependent variables; *SE<sub>a</sub>* is the standard error (SE) of the relationship between the independent and the mediator variables; *SE<sub>b</sub>* is the standard error (SE) of the relationship between the mediator and the dependent variables.

## 5. Conclusion

In HEI's context, research scholars found that perceived curriculum service quality has a positive correlation with students' alumni satisfaction (Bui et al., 2023; Lunsford et al., 2018; Rafik & Priyono, 2018). Similarly, this research manuscript discovered a strong positive correlation between curriculum quality and students' career satisfaction (i.e.,  $\beta = 0.75$  or 75% and  $p\text{-value} < 0.001$ , which is significant at the level of  $t\text{-value} < 1.96$ ) in the TVET program in Cambodia.

Teaching methodologies have revolutionized teacher training, fostering reflective thinking and promoting active professional development for future sustainability education students (Martínez Valdivia et al., 2023). Authors have explored the use of effective teaching methodologies to improve the quality of the undergraduate curriculum (Maddalena et al., 2018). In line with this author, this manuscript indicated that teaching methodology has a critical and important role in improving vocational training curriculum quality in the TVET program, respectively ( $\beta = 0.68$  or 68% and  $p\text{-value} < 0.001$ , which is significant at the level of  $t\text{-value} < 1.96$ ).

The new curriculum in Romanian higher education aims to improve pedagogical training through a mixed study (i.e., qualitative research design, including desk research, content analysis, case studies, and structured interviews with key experts) and will be assessed based on international teacher competency assessment (Dumitru, 2017). In line with existing arguments, this research finding indicates that teacher competency plays a crucial role in enhancing curriculum quality (i.e.,  $\beta = 0.26$  or 26% and  $p$ -value  $< 0.001$ ), which in turn increases the high level of career satisfaction among students and meets the industrial needs and expectations for TVET curriculum. Interestingly, this study confirmed the influence of pedagogical competence on curriculum quality ( $\beta = 0.12$  or 12% and  $p$ -value  $< 0.05$ ), which is an existing research finding because there is no empirical evidence to test this relationship yet.

According to social cognitive career theory (SCCT), a 25-year-old framework that combines foundational theoretical approaches to career development (Lent et al., 1994). It adopts Bandura (1986)'s triadic reciprocal causation framework and emphasizes contextual, personal, and behavioral factors that shape career and educational development. SCCT also investigates how certain aspects of individuals, such as gender and culture, and their socio-economic locations, shape career-relevant learning experiences and choice options through differential socialization processes, performance opportunities, modeling, and social encouragement (Lent & Brown, 2019). The study uses social cognitive career theory to examine student alumni's satisfaction with Technical and Vocational Education and Training (TVET) programs in Cambodia. It finds a positive correlation between pedagogical competence, teacher competence, teaching methodology, and curriculum quality, with the strongest relationship between career satisfaction and curriculum quality. The study suggests training manager development programs and career counseling to support career development policies, highlighting the importance of pedagogical practices, teacher competence, and innovative teaching methodologies in enhancing employability. As alumni of TVET programs transition into the workforce, the integration of these elements contributes to their overall job satisfaction and career success. Therefore, continuous professional development for educators, along with regular curriculum evaluations and updates, is essential to strengthen this relationship. By focusing on these key areas, TVET institutions in Cambodia can not only improve student outcomes but also foster a more competent and satisfied workforce that meets the demands of the evolving job market.

### 5.1. Recommendation

We propose several key recommendations regarding pedagogical competence, teacher competence, teaching methodology, and curriculum quality to enhance the career satisfaction of student alumni from Technical and Vocational Education and Training (TVET) programs in Cambodia.

**1) Professional development for educators:** Implement ongoing training programs for educators to enhance pedagogical and subject-specific competencies,

offering workshops, seminars, and mentorship opportunities to stay updated on best practices and innovative teaching strategies.

**2) Curriculum linkage with TVET and Industrials:** The curriculum should be regularly reviewed and updated to ensure it aligns with industry standards and labor market demands, while also involving industry stakeholders for relevance and practicality.

**3) Industry collaboration models:** The research investigates the influence of collaboration models between TVET institutions and industries on student satisfaction and employability, focusing on the structuring of partnerships for meaningful internships and job placements.

**4) Student-centered learning approaches:** The study examines the efficacy of various student-centered teaching methods like project-based or experiential learning in enhancing engagement, career competence, and alumni satisfaction.

**5) Enhanced assessment techniques:** Utilize diverse and formative assessment methods to provide feedback on students' learning progress and competencies, thereby enhancing individual learning paths and skill acquisition.

**6) Internship opportunities with local industries:** The initiative promotes collaborations with local businesses to offer internships, apprenticeships, and job placement programs to students, thereby enhancing their practical skills and enhancing their job readiness post-graduation.

**7) Feedback mechanisms from student alumni:** Implement a systematic method for gathering alumni feedback on career satisfaction and workforce skill applicability to enhance educational programs for continuous improvement.

**8) Focus on soft skills development:** The curriculum should incorporate training that focuses on soft skills like communication, teamwork, and problem-solving, as these are crucial for career success and satisfaction.

**9) Perceptions and attitudes survey:** Studying students', current, and employers' perceptions of TVET programs can aid in designing interventions to enhance vocational education's relevance to the workforce.

**10) Policy analysis:** Research TVET policies in Cambodia to identify gaps and reform opportunities, including funding mechanisms, regulatory frameworks, and faculty development support.

**11) Technology integration:** The study investigates the impact of technology on TVET teaching methodologies, curriculum delivery, student engagement, and skill acquisition, offering valuable insights for program improvement.

The recommendations proposed by TVET institutions in Cambodia can significantly enhance the educational experience, prepare students for successful careers, and boost alumni satisfaction in the workforce.

## 5.2. Limitation and Future Research

This study explores alumni career satisfaction by examining the correlation between pedagogical competence, teacher competence, teaching methodology, and curriculum quality in Cambodian Technical and Vocational Education and

Training programs in cross-sectional study. In future research, longitudinal studies should track TVET graduates' career progression and satisfaction over time to understand how pedagogical competencies, teacher competencies, and curriculum quality affect alumni success in the workforce. Indeed, comparative studies are crucial in comparing TVET institutions to identify best practices for alumni career satisfaction and inform improvements across the sector. Future research aims to enhance career satisfaction among TVET alumni in Cambodia by aligning pedagogical practices and curriculum design with labor market needs. Key factors influencing career satisfaction include job relevance, employment opportunities, skill utilization, career development, work environment, financial compensation, and work-life balance. According to a recent study, organizational commitment and teacher empowerment (Yao & Ma, 2024), self-efficacy, social acceptance, and role clarity (Richter et al., 2022) are necessary to predict career satisfaction. Most importantly, external factors, such as labor market dynamics and socio-economic conditions, can impact career satisfaction. Then, further elaboration is needed on how the identified relationships between variables can be leveraged to improve TVET programs and enhance graduate outcomes.

### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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## Appendix 1. Questionnaire items

All questionnaire items were rated by a 5-point Likert Scale.

| Research Constructs           | Item Code | Questionnaire items   | Authors                     |
|-------------------------------|-----------|---|-----------------------------|
| <b>Career Satisfaction</b>    | Q20_1     | The degree to which you can personally develop or grow in your job.                       | Evers et al. (2000)         |
|                               | Q20_2     | Your working conditions   |                             |
|                               | Q20_3     | The style of supervision  |                             |
|                               | Q20_4     | Changes in your salary in the course of time  |                             |
|                               | Q20_5     | The company's pay policy  |                             |
| <b>Pedological Competence</b> | Q19-1     | My lecturer uses multiple kind of techniques to deliver lecture everyday                  | Ikromova (2020)             |
|                               | Q19-2     | My lecturer encourages class discussion of the students during every stage of instruction |                             |
|                               | Q19-3     | My lecturer does applied coursework on specific skills                                    |                             |
| <b>Curriculum Quality</b>     | Q28_1     | The load of curriculum is appropriate for understanding at primary level                  | Khan (2023)                 |
|                               | Q28_2     | I have been consulted before finalizing the curriculum for students                       |                             |
|                               | Q28_3     | I have access to all the learning materials I need  |                             |
|                               | Q28_4     | I have given the chance to give feedback regarding the school curriculum.                 |                             |
|                               | Q28_5     | I believe that the curriculum should not change in my school.                             |                             |
| <b>Teaching Methodology</b>   | Q18_1     | My lecturer encourages student interest and the motivation to learn.                      | Moreno-Murcia et al. (2015) |
|                               | Q18_2     | My lecturer interacts satisfactorily with the students.                                   |                             |

**Continued**

|                           |       |   |                         |
|---------------------------|-------|---|-------------------------|
|                           | Q18_3 | My lecturer organizes activities for the student to actively participate in course assignments.   |                         |
|                           | Q18_4 | My lecturer uses material resources that facilitate learning.   |                         |
|                           | Q18_5 | My lecturer applies the assessment criteria of the activities as established in the subject's curriculum.   |                         |
|                           | Q21_1 | My lecturer continually finds better ways to teach us effectively.  |                         |
|                           | Q21_2 | My lecturer knows how to teach this subject concept effectively.  |                         |
|                           | Q21_3 | My lecturer is generally responsible for the achievement of students in this teaching subject.  |                         |
| <b>Teacher Competence</b> | Q21_4 | My lecturer typically be able to answer student's questions.  | Dellinger et al. (2008) |
|                           | Q21_5 | When a student has difficulty understanding any teaching course or lesson concept, my lecturer is usually at a loss as to how to help the student understand it better. |                         |
|                           | Q21_6 | When teaching a complicated course/lesson, my lecturer usually welcome student questions.   |                         |

## Appendix 2. The Sobel's Test Calculation

1) The mediating effect of curriculum quality between relationship of *Pedagogical Competence* and *Career Satisfaction*

### CALCULATION FOR THE SOBEL TEST

An interactive calculation tool for mediation tests

Curriculum vitae  
 Selected publications  
 Supplemental material for publications  
 Online utilities  
 Mediation & moderation material  
 PSY-GS-8850: Advanced SEM  
 PSY-GS-8882: Multilevel Modeling  
 Vanderbilt Psychological Sciences  
 Vanderbilt Quantitative Methods  
 Organizations  
 Friends and colleagues  
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mediator is significantly different from zero.

| Input:         |       | Test statistic:          | Std. Error: | p-value:   |
|----------------|-------|--------------------------|-------------|------------|
| a              | 0.122 | Sobel test: 2.43391757   | 0.03769396  | 0.0149364  |
| b              | 0.752 | Aroian test: 2.3983963   | 0.03825233  | 0.01646734 |
| s <sub>a</sub> | 0.044 | Goodman test: 2.47107264 | 0.0371272   | 0.01347085 |
| s <sub>b</sub> | 0.148 | Calculate                |             |            |

Alternatively, you can insert  $t_a$  and  $t_b$  into the cells below, where  $t_a$  and  $t_b$  are the t-test statistics for the difference between the  $a$  and  $b$  coefficients and zero. Results should be identical to the first test, except for error due to rounding.

| Input:    |  | Test statistic: | p-value: |
|-----------|--|-----------------|----------|
| $t_a$     |  | Sobel test:     |          |
| $t_b$     |  | Aroian test:    |          |
|           |  | Goodman test:   |          |
| Reset all |  | Calculate       |          |

The reported  $p$ -values (rounded to 8 decimal places) are drawn from the unit normal distribution under the assumption of a two-tailed z-test of the hypothesis that the mediated effect equals zero in the population.  $\pm 1.96$  are the critical values of the test ratio which contain the central 95% of the unit normal distribution.

We should note that there are three principal versions of the "Sobel test" - one that adds the third denominator term (Aroian, 1944/1947 - this is the version popularized by Baron & Kenny as the Sobel test), one that subtracts it (Goodman, 1960), and one that does not include it at all. We stress that researchers should consult MacKinnon, Lockwood, Hoffman, West, and Sheets (2002), as well as sources cited therein, before attempting to interpret the results of any of these tests. Researchers should consult Krull & MacKinnon (1999) before attempting to apply the Sobel test to parameter estimates obtained from multilevel modeling.

Formulae for the tests provided here were drawn from MacKinnon & Dwyer (1994) and from MacKinnon, Warsi, & Dwyer (1995):

2) The mediating effect of curriculum quality between relationship of *Teacher Competence* and *Career Satisfaction*

### CALCULATION FOR THE SOBEL TEST

An interactive calculation tool for mediation tests

Curriculum vitae  
 Selected publications  
 Supplemental material for publications  
 Online utilities  
 Mediation & moderation material  
 PSY-GS-8850: Advanced SEM  
 PSY-GS-8882: Multilevel Modeling  
 Vanderbilt Psychological Sciences  
 Vanderbilt Quantitative Methods  
 Organizations  
 Friends and colleagues  
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mediator is significantly different from zero.

| Input:         |       | Test statistic:          | Std. Error: | p-value:   |
|----------------|-------|--------------------------|-------------|------------|
| a              | 0.261 | Sobel test: 3.60572539   | 0.05443343  | 0.00031128 |
| b              | 0.752 | Aroian test: 3.57155211  | 0.05495426  | 0.00035487 |
| s <sub>a</sub> | 0.051 | Goodman test: 3.64089875 | 0.05390757  | 0.00027169 |
| s <sub>b</sub> | 0.148 | Calculate                |             |            |

Alternatively, you can insert  $t_a$  and  $t_b$  into the cells below, where  $t_a$  and  $t_b$  are the t-test statistics for the difference between the  $a$  and  $b$  coefficients and zero. Results should be identical to the first test, except for error due to rounding.

| Input:    |  | Test statistic: | p-value: |
|-----------|--|-----------------|----------|
| $t_a$     |  | Sobel test:     |          |
| $t_b$     |  | Aroian test:    |          |
|           |  | Goodman test:   |          |
| Reset all |  | Calculate       |          |

The reported  $p$ -values (rounded to 8 decimal places) are drawn from the unit normal distribution under the assumption of a two-tailed z-test of the hypothesis that the mediated effect equals zero in the population.  $\pm 1.96$  are the critical values of the test ratio which contain the central 95% of the unit normal distribution.

We should note that there are three principal versions of the "Sobel test" - one that adds the third denominator term (Aroian, 1944/1947 - this is the version popularized by Baron & Kenny as the Sobel test), one that subtracts it (Goodman, 1960), and one that does not include it at all. We stress that researchers should consult MacKinnon, Lockwood, Hoffman, West, and Sheets (2002), as well as sources cited therein, before attempting to interpret the results of any of these tests. Researchers should consult Krull & MacKinnon (1999) before attempting to apply the Sobel test to parameter estimates obtained from multilevel modeling.

Formulae for the tests provided here were drawn from MacKinnon & Dwyer (1994) and from MacKinnon, Warsi, & Dwyer (1995):