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Development and Preliminary Validation of a Psychological Competency Model for TVET Students' Industry Readiness

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ABSTRACT - This study aims to develop and conduct a preliminary validation of a psychological competency model for students in Technical and Vocational Education and Training (TVET) within the context of industry readiness. The study is motivated by the limited integration of psychological factors into a comprehensive framework in vocational education, despite the recognized importance of non-cognitive aspects in shaping work readiness. A quantitative approach was employed using an instrument development design. The proposed model consists of five key dimensions: self-efficacy, resilience, practical confidence, practical anxiety, and teamwork readiness. Data were collected from TVET students in Indonesia using a stratified random sampling technique, involving approximately 200–300 respondents. The instrument was developed using a five-point Likert scale and analyzed using the Rasch Model with the assistance of Winsteps software. The findings indicate that the proposed model offers a structured framework for understanding students' psychological readiness in vocational contexts. Preliminary Rasch analysis suggests that the instrument demonstrates acceptable measurement quality in terms of both validity and reliability. This study contributes by integrating multiple psychological dimensions into a unified model tailored to the TVET context, while also providing a measurement tool that enables a more systematic assessment of students' psychological readiness. Practically, the model may support educational institutions in designing more holistic learning strategies aligned with industry demands. The model also offers implications for future research on psychological competency assessment in vocational education.

INTRODUCTION

Technical and Vocational Education and Training (TVET) has gained increasing attention as a key strategy for human resource development, particularly in developing countries such as Indonesia. In recent years, efforts to strengthen vocational education have been consistently promoted to ensure that graduates' competencies are better aligned with industry needs. (Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi [Kemendikbudristek], 2022). In this context, the success of vocational education is no longer determined solely by academic achievement, but also by the extent to which graduates can adapt and function effectively in dynamic work environments

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The nature of learning in TVET, which emphasizes hands-on activities, the use of technical equipment, and simulations of real working conditions, requires students not only to develop technical competencies but also to demonstrate adequate psychological readiness. In practice, students are often exposed to situations involving pressure, uncertainty, and the risk of making mistakes, which may influence their performance. These conditions may trigger psychological responses such as doubt, anxiety, or even fear, which can ultimately affect their performance in completing practical tasks. Therefore, psychological aspects should be viewed as an integral component of successful vocational learning.

Previous studies have highlighted the importance of psychological factors such as self-efficacy, resilience, and teamwork in supporting individual performance. However, these factors are often examined separately and have not yet been integrated into a comprehensive framework, particularly in the context of vocational education. For example, self-efficacy has been shown to enhance individuals' confidence in their abilities and sustain their efforts when facing challenges (Bandura, 1997), while resilience enables individuals to cope with and adapt to stressful situations (Luthans et al., 2021). In addition, work readiness is influenced not only by technical skills but also by non-cognitive factors such as self-confidence, the ability to manage pressure, and teamwork skills (Jackson, 2023; Succi & Canovi, 2020). These findings suggest that psychological dimensions play a significant role in shaping students' readiness for the workforce.

Despite this, previous studies have tended to examine these factors in isolation and have not yet integrated them into a comprehensive conceptual framework, particularly within the context of vocational education. Furthermore, research that specifically explores the role of psychological factors in practice-based learning environments in TVET, especially in Indonesia, remains limited. Another important limitation is the lack of instruments specifically designed to assess the psychological competencies of vocational students in relation to their readiness for the industrial world.

Given these gaps, there is a need to develop a model that can more comprehensively explain the structure of psychological competencies among TVET students. In this study, the model is developed by integrating five key constructs that are closely related to practice-based learning contexts.

Self-efficacy refers to an individual's belief in their ability to organize and execute the actions required to achieve specific performance outcomes (Bandura, 1997). In the TVET context, this construct plays an important role in encouraging students to actively engage in practical activities and persist when facing difficulties. In addition to this, resilience reflects an individual's capacity to withstand, adapt to, and recover from pressure or failure (Luthans et al., 2021), which is particularly relevant in vocational learning environments characterized by frequent challenges.

Closely related to these internal capacities, practical confidence refers to students' level of confidence in performing practical tasks, including the use of tools and the application of technical procedures (Jackson, 2023). This construct indicates an individual's readiness to act effectively in hands-on situations. However, not all psychological responses are facilitative. In contrast, practical anxiety is associated with emotional reactions such as tension or nervousness when students encounter practical situations, which may hinder performance and reduce learning effectiveness (Zeidner, 1998).

Finally, teamwork readiness reflects an individual's preparedness to work effectively within a team, encompassing communication, collaboration, and contribution toward shared goals (Salas et al., 2015). This competence is particularly important in vocational education, as industrial environments strongly emphasize collaborative work.

Based on these considerations, this study aims to develop and conduct a preliminary validation of a psychological competency model for TVET students who are ready to enter the industrial workforce (industry-ready). In addition, this study seeks to develop a measurement instrument that is aligned with the characteristics of vocational learning. The validation process is conducted using the Rasch analysis approach to ensure the instrument's validity and reliability.

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The findings of this study are expected to contribute to the advancement of research in vocational education psychology, while also providing a foundation for designing more comprehensive and work-oriented learning strategies.

METHODS AND MATERIALS

The research instrument was developed based on five key constructs identified in this study, namely: self-efficacy, resilience, practical confidence, practical anxiety, and teamwork readiness. As shown in Table 1, The items were constructed using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Item development was carried out through adaptation from existing literature and adjusted to fit the context of vocational education and practical learning environments.

Table 1. Operationalization of Constructs

Construct	Operational Definition	Indicators	Number of Items (example)
Self-efficacy	Students' belief in their ability to successfully perform practical tasks	confidence, perceived ability, persistence	5
Resilience	Ability to cope with challenges and recover from difficulties in practical learning	learning adaptability, endurance,	5
Practical confidence	Level of confidence in performing hands-on tasks	willingness to try, confidence during practice	4
Practical anxiety	Level of anxiety experienced during practical activities	nervousness, fear of making mistakes, pressure	4
Teamwork readiness	Readiness to work effectively in a team	communication, collaboration, responsibility	5

To ensure the appropriateness of the instrument content, a content validity process was conducted involving several experts in psychology and vocational education. This evaluation aimed to ensure that each item was clear, relevant, and representative of the intended constructs.

Research Design

This study employed a quantitative approach using an instrument development design (instrument development study). This design was selected in accordance with the objective of the study, which is to develop and conduct a preliminary validation of a psychological competency model among TVET students who are prepared to enter the industrial workforce.

Overall, the study was conducted in three main phases: (i) the development of a conceptual model based on an extensive literature review, (ii) the construction of instrument items based on the identified constructs, and (iii) the validation of the instrument using the Rasch Model approach.

Sampling

The participants of this study consisted of students enrolled in Technical and Vocational Education and Training (TVET) programs in Indonesia, representing various vocational fields of study. The inclusion of students from diverse programs aimed to provide a more comprehensive understanding

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of psychological competencies within practical learning contexts.

The sample was selected using a stratified random sampling technique to ensure balanced representation across different fields of study (Creswell, 2014). This approach was considered appropriate given the heterogeneous nature of the study population in terms of academic programs and learning backgrounds. The targeted sample size ranged between 200 and 300 respondents. This range is considered adequate for Rasch Model analysis to produce stable and reliable item parameter estimates (Linacre, 1994; Boone, Staver, & Yale, 2014).

Data Collection

Data were collected through an online questionnaire. Prior to participation, respondents were provided with information regarding the purpose of the study and were assured that all responses would remain confidential and used solely for research purposes. Participation in this study was voluntary, and only fully completed responses were included in the data analysis to ensure the quality and reliability of the findings.

Data Analysis

The collected data were analysed using the Rasch Model with the assistance of Winsteps software. This approach was chosen due to its ability to simultaneously evaluate the validity and reliability of the instrument, as well as to provide detailed information on the functioning of each item in measuring the intended constructs (Bond & Fox, 2015).

Several key indicators in the Rasch analysis applied in this study included: Item and person reliability, Item fit statistics, Unidimensionality analysis, and Person–item distribution map (person-item map). Items that did not meet the required fit criteria were considered for revision or removal to ensure that the instrument maintained a high standard of measurement quality (Linacre, 2012).

Validity and Reliability

The validity of the instrument was assessed through two main approaches: content validity and construct validity. Content validity was established through expert judgment, while construct validity was evaluated using Rasch Model analysis, which allows for examination of item fit and measurement structure (Bond & Fox, 2015). Reliability was determined based on reliability indices obtained from the Rasch analysis, including both item reliability and person reliability. High reliability values indicate that the instrument consistently measures the intended constructs.

RESULTS AND DISCUSSION

This study aims to develop and conduct a preliminary validation of a psychological competency model for TVET students who are prepared to enter the industrial workforce. Based on the literature analysis and the developed conceptual framework, the findings are presented in the form of a conceptual model and the preliminary study of instrument validation.

Psychological Competency Model of TVET Students

Based on the identified constructs, the proposed psychological competency model in this study consists of five main dimensions: Self-efficacy, Resilience, Practical confidence, Practical anxiety, Teamwork readiness. These five dimensions collectively form a higher-order construct, namely the psychological competency of TVET students, which contributes to their readiness to face the industrial environment. Figure 1 illustrates the conceptual model developed in this study. The model comprises five key dimensions: self-efficacy, resilience, practical confidence, practical anxiety, and teamwork readiness, which collectively shape the psychological competency of TVET students. In this model, practical anxiety is positioned as a negatively contributing factor, while the other variables contribute positively to psychological competency.

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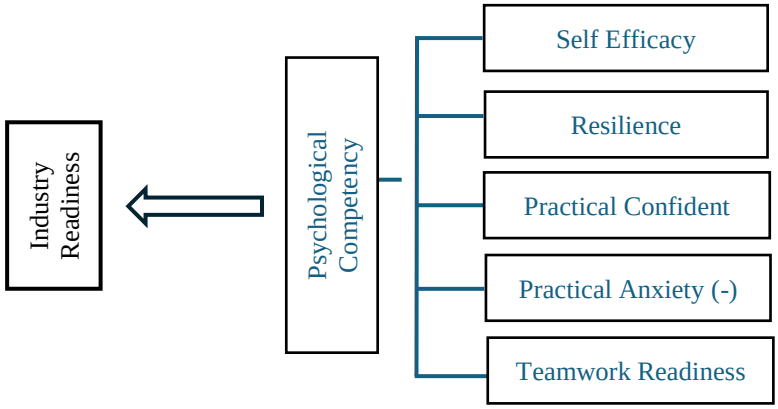

Figure 1. Psychological Competency Model for TVET Student

The resulting psychological competency is assumed to play a role in enhancing students' readiness to enter the industrial workforce (industry readiness). This model provides an initial representation of the psychological factors relevant to practice-based vocational learning contexts.

Within this framework, self-efficacy and practical confidence are expected to function as factors that enhance students' confidence in performing practical tasks. Resilience serves as an internal mechanism that enables students to cope with pressure and failure during the learning process. In contrast, practical anxiety is expected to have a negative relationship with psychological competency, as higher levels of anxiety may hinder performance and reduce confidence. Meanwhile, teamwork readiness represents a crucial element in vocational education, particularly in contexts that emphasize collaborative work in real-world settings.

Expected Outcomes of Instrument Validation

Based on the Rasch analysis approach, several anticipated findings of this study are as follows:

1. Instrument Reliability
   The developed instrument is expected to demonstrate good reliability, with both item reliability and person reliability indices reaching acceptable levels.
2. Item Fit
   Most items are expected to meet the fit criteria of the Rasch model, indicating that they adequately measure the intended constructs. However, some items may require revision or removal based on item fit analysis.
3. Unidimensionality
   The instrument is expected to exhibit satisfactory unidimensionality, indicating that each set of items within a construct measures a single underlying psychological dimension consistently.
4. Person Item Distribution
   Through the person–item map analysis, a balanced distribution between respondent ability and item difficulty is expected, suggesting that the instrument is well-targeted to the study population. Preliminary Implications of the Model

The model developed in this study is expected to provide an initial understanding of the structure of psychological competencies among TVET students in relation to industry readiness. With this model, educational institutions may be better equipped to identify key psychological aspects that require attention in the learning process, particularly in enhancing students' confidence, resilience, and ability to cope with practical challenges.

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Furthermore, the developed instrument has the potential to be used as a diagnostic tool to assess students' psychological readiness, thereby supporting the design of more targeted and effective educational interventions.

DISCUSSION AND IMPLICATIONS

The findings of this study provide an initial understanding of the structure of psychological competencies relevant to vocational education, particularly in preparing students to face the demands of the industrial world. The proposed model suggests that psychological competency does not exist as a single construct but rather emerges from the integration of several key dimensions, namely self-efficacy, resilience, practical confidence, practical anxiety, and teamwork readiness. This indicates that students' readiness is shaped not by a single psychological factor, but by the interaction of multiple dimensions that collectively support their preparedness for the workplace.

From a theoretical perspective, these findings align with Bandura's (1997) view on the central role of self-efficacy in influencing individual behavior and performance. In the context of vocational learning, students who possess strong beliefs in their capabilities tend to take initiative, engage in new experiences, and perform practical tasks more effectively. These findings are also consistent with previous studies highlighting the importance of psychological factors in enhancing work readiness, particularly in practice-based learning environments (Jackson, 2023; Succi & Canovi, 2020). In addition, resilience appears to play a significant role in helping students cope with pressure and setbacks that frequently arise during the learning process (Luthans et al., 2021).

Interestingly, this study highlights the roles of practical confidence and practical anxiety as two closely related factors with opposing effects. Students with higher levels of confidence in performing practical tasks tend to demonstrate better readiness in real work situations. In contrast, elevated levels of anxiety may act as a barrier that undermines both performance and confidence. This finding reinforces the notion that emotional factors significantly influence individual performance, particularly in evaluative and practical contexts (Zeidner, 1998). Therefore, managing anxiety becomes a critical aspect that should be addressed in vocational education settings.

Furthermore, the dimension of teamwork readiness underscores the importance of social competencies within the TVET context. The industrial environment not only requires technical proficiency but also the ability to collaborate effectively in teams. This is in line with the findings of Salas et al. (2015), which emphasize that team effectiveness is strongly influenced by individuals' readiness to communicate and collaborate. Therefore, teamwork readiness emerges as a key indicator of students' preparedness to enter the workforce.

From a contribution standpoint, this study offers a more comprehensive approach by integrating multiple psychological constructs into a single model that is relevant to vocational education contexts. Unlike previous studies that tend to examine psychological factors in isolation, this study demonstrates that psychological competency is inherently multidimensional and should be understood as an interconnected system. In addition, this study contributes practically through the development of an instrument specifically designed to assess the psychological readiness of TVET students for the industrial environment.

In terms of practical implications, the proposed model can serve as a foundation for designing more holistic student development programs. Vocational education institutions may utilize this model to identify key psychological aspects that need to be strengthened, for instance through self-efficacy enhancement programs, resilience training, or instructional approaches that help reduce anxiety in practical activities. Moreover, the developed instrument has the potential to function as a diagnostic tool for assessing students' psychological readiness in a more systematic manner. With a valid and reliable measurement tool, institutions can monitor student development over time and design more targeted interventions.

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Nevertheless, this study has several limitations. The validation process remains at a preliminary stage and is limited to a specific context, thus further research involving larger and more diverse samples is required. In addition, the relationships among the constructs in the proposed model remain conceptual and require further empirical testing to strengthen the model structure. Future studies are also encouraged to examine the model using alternative approaches, such as structural analysis, to provide stronger evidence of the relationships among the constructs. Overall, this study provides an initial contribution to understanding the role of psychological factors in vocational education, while also opening avenues for further research in this area.

CONCLUSION

This study aims to develop and conduct a preliminary validation of a psychological competency model for TVET students in the context of industry readiness. Based on the proposed conceptual framework, psychological competency is understood as a multidimensional construct consisting of self-efficacy, resilience, practical confidence, practical anxiety, and teamwork readiness. The findings suggest that an integrative approach, which considers multiple psychological factors, provides a more comprehensive understanding of vocational students' readiness, particularly in responding to the demands of practice-based learning and real-world work environments. In addition, the use of Rasch analysis in the validation process offers a solid methodological foundation for ensuring the quality of the developed instrument in terms of both validity and reliability. From a practical perspective, the model and instrument developed in this study have the potential to be utilized as tools for assessing and enhancing the psychological readiness of TVET students in a more systematic manner. This is particularly relevant in supporting educational institutions in preparing graduates who are not only technically competent but also mentally and emotionally ready to face the challenges of the industrial world. However, this study is still at a preliminary stage, and further research is needed to test and expand the proposed model across more diverse contexts. Future studies are also encouraged to employ alternative analytical approaches to further strengthen the validity of the model. Overall, this study is expected to serve as an initial step toward the development of a more integrated and applicable body of research in vocational education psychology, while also contributing to the improvement of vocational education practices.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

AUTHORS CONTRIBUTION

Nuzsep Almigo: Conceptualization, Methodology, Supervision, Writing – Review & Editing. **Fidela Fatimah** Firjatullah: Data curation, Investigation, Writing – Original Draft Preparation.

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AVAILABILITY OF DATA AND MATERIALS

Data available on request from the authors.

DECLARATION OF GENERATIVE AI

During the preparation of this work, the authors used ChatGPT to improve language clarity. The authors reviewed and approved the final manuscript and take full responsibility for its content.

ETHIC STATEMENTS

This study involved human participants. All participants provided informed consent prior to participation. The study was conducted in accordance with relevant ethical guidelines.

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