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Confirmatory Factor Analysis of Creative Self-Efficacy for Vocational High School Students

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ABSTRACT

Creative self-efficacy is essential in strengthening the creative thinking skills of Vocational High School students. Many studies have examined the importance of creative self-efficacy, but not much has been done about how to measure creative self-efficacy in Vocational High School students. Therefore, this study aims to develop a creative self-efficacy questionnaire for Vocational High School students. This study involved 342 Vocational High School students, and a self-administered questionnaire was used to collect data for this study. Data analysis used Confirmatory Factor Analysis (CFA) to measure the validity and reliability of the questionnaire. The study results reveal that students' creative self-efficacy can be measured using a six-item creative self-efficacy questionnaire consisting of efficiently solving problems, confidence in creative abilities, imagination, ingenuity, overcoming difficult situations, overcoming difficulties, and original solutions to problems. The findings of this study provide important implications for educational practitioners to internalize students' creative self-efficacy.

Keywords: creative thinking, creative self-efficacy, CFA, innovation, vocational school

INTRODUCTION

Innovation plays a central role in the economic development of a country, serves as an important factor in industrial competitiveness, and is essential for individual career advancement (European Union, 2016). Therefore, it appears that industrialized countries emphasize developing their people's creativity (European Union, 2016). According to Amabile (1996), creative performance depends on creative thinking, subject expertise, self-efficacy, and motivation. Previous studies have stated that cognitive load can be influenced by student characteristics, such as prior knowledge (Sweller et al., 2011). One characteristic influencing students' approach to complex tasks is self-efficacy, individual beliefs about their ability to succeed in specific jobs (Bandura, 1982). In addition, various empirical studies have provided evidence of multiple correlations between creative performance and factors such as creative thinking and creative self-efficacy (CSE) in various domains of industrial and applied commercial design (Hartley et al., 2016; Liu et al., 2017).

Creative self-efficacy is crucial in developing creative thinking skills (Haase et al., 2018; Huang et al., 2020; Stolz et al., 2022; Tang & Sun, 2021). The potential effect of self-efficacy on the processes involved in complex tasks can be related to its impact on cognitive load (Paas et al., 2010). This occurs when individuals' beliefs in their ability to work effectively divert their resources from the needs of the task. An alternative scenario is that individuals with higher perceptions of their abilities in certain areas, such as creativity, may

experience reduced cognitive load when faced with tasks requiring creative talent. This can be attributed to their creative self-efficacy, a source of self-confidence, thus facilitating task completion. Investigations into the potential influence of creative self-efficacy, which refers to individuals' perceptions of their capacity to do innovative work effectively, regardless of their actual skills, on cognitive load, has significant theoretical importance (Redifer et al., 2021).

Theoretically, belief in an individual's creative abilities creates a mental environment conducive to experimentation and exploring new ideas (Redifer et al., 2021). When people believe they can think creatively, they are likelier to try innovative approaches to solving problems and creating new ideas. This helps develop creative thinking skills, as repeated practice and experimentation is the primary key to improvement. Various studies have documented the beneficial effects of self-efficacy on creative thinking tasks (Farmer & Tierney, 2017; Mattern et al., 2013). Furthermore, creative self-efficacy motivates individuals to seek new knowledge and learn continuously. When people feel confident in their creative abilities, they are more open to learning and seek inspiration from various sources. This can help them develop broader insights, explore new ideas, and integrate multiple ideas into their creative thinking. Creative thinking skills often depend on deep knowledge and understanding of various subjects, and creative self-efficacy can be an essential impetus for acquiring this knowledge.

A recent meta-analysis conducted by Haase et al. (2018) shows a simple but beneficial correlation between creative self-efficacy and creative thinking. However, it should also be noted that this relationship depends on the specific method used to measure creative tasks, especially how creative self-efficacy is measured. Therefore, further investigation is needed to explain the influence of creative self-efficacy on creative cognition. This study aims to test the innovative self-efficacy measurement model for vocational school students.

METHOD

This study involved 342 vocational high school students to provide their perceptions about creative self-efficacy. Based on gender, there were 21.9% male students and 78.1% female students (see Table 1). The students gave their assessments about their sense of confidence to think creatively.

Table 1. Respondent Demographics

Attribute	Categories	N	%
Gender	Male	75	21.9
	Female	267	78.1
School	State Vocational High School 4 Balikpapan	24	7
	State Vocational High School 4 Samarinda	31	9.1
	State Vocational High School 3	100	29.2

Attribute	Categories	N	%
	Samarinda		
	State Vocational High School 2 Penajam Paser Utara	30	8.8
	State Vocational High School 4 Penajam Paser Utara	13	3.8
	State Vocational High School 1 Berau	20	5.8
	State Vocational High School 4 Tanah Grogot	40	11.7
	State Vocational High School 1 Tanjung Selor	84	24.6

This study uses a questionnaire reference from previous studies to measure creative self-efficacy in vocational school students (Karwowski et al., 2018). The total number of creative self-efficacy questionnaire items is six items. The measurement scale for this study uses five Likert scales consisting of strongly agree = 5, agree = 4, somewhat agree = 3, disagree = 2, strongly disagree = 1. The aim of this research is to assess the reliability and validity of the creative self-efficacy questionnaire through application confirmatory factor analysis (CFA). Confirmatory factor analysis was carried out using SPSS Amos 21 for Windows. This study used acceptance criteria for standard loading factor values, also known as lambda parameter values (λ), which were set at a minimum threshold of 0.5 (Ghozali, 2017).

RESULT AND DISCUSSION

Descriptive Statistical Analysis

A six-item creative self-efficacy questionnaire measured students' beliefs about creative thinking abilities: students were asked to provide their perceptions regarding the self-efficacy of their creative thinking skills. Descriptive statistical analysis was used by categorizing the data by paying attention to the hypothetical mean value (μ), hypothetical standard deviation (σ), and empirical value (X) of the self-efficacy variable for creative thinking ability. This study uses three categories which include high, medium, and low. The formulation of data categorization on social support variables is shown in Table 2.

Table 2. Categorization of Creative Self-Efficacy

Intervals	Value	Category
$X > (\mu + 1.\sigma)$	$X > 27$	High
$(\mu - 1.\sigma) \leq X \leq (\mu + 1.\sigma)$	$18 \leq X \leq 26$	Medium
$X < (\mu - 1.\sigma)$	$X < 17$	Low

The results of descriptive statistical analysis using categorization show that most students have a moderate perception of creative thinking ability self-efficacy (80%). In

addition, only a small proportion of respondents rated their creative self-efficacy as low (7%) and high (13%) (see Figure 1).

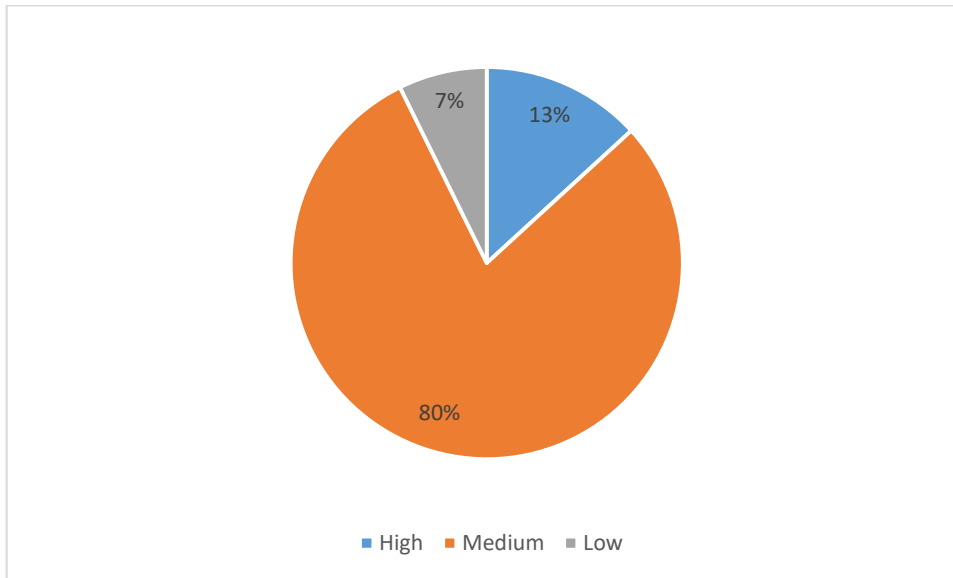


Figure 1. Description of Creative Self-Efficacy

Confirmatory Factor Analysis

Creative self-efficacy of Vocational High School students was measured using a six-item questionnaire. The results of the CFA test on the students' creative self-efficacy questionnaire are shown in Figure 2. The model fit analysis shown in Figure 2 revealed that the model did not fit with the results of the appropriate criteria as follows: $\chi^2 / df = 4.997$, RMSEA = 0.108, CFI = 0.955, GFI = 0.959, TLI = 0.926, IFI = 0.956, AGFI = 0.904, and RMR = 0.031. Therefore, the model needs to be modified to get good fit model results.

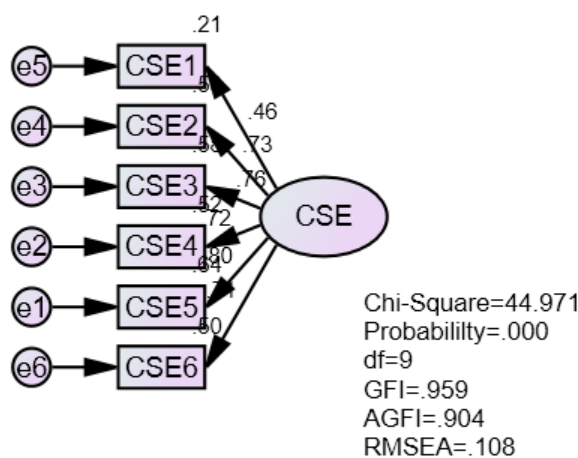


Figure 2. Creative Self-Efficacy Measurement Model

Next, we tested the modified model. Testing the modified model shown in Figure 3 shows the criteria for an excellent fit model with the requirements $\chi^2/df = 1.200$, RMSEA = 0.024, CFI = 0.998, GFI = 0.991, TLI = 0.996, IFI = 0.998, AGFI = 0.975, and RMR = 0.011 (see Table 3). Furthermore, this model is used for hypothesis testing.

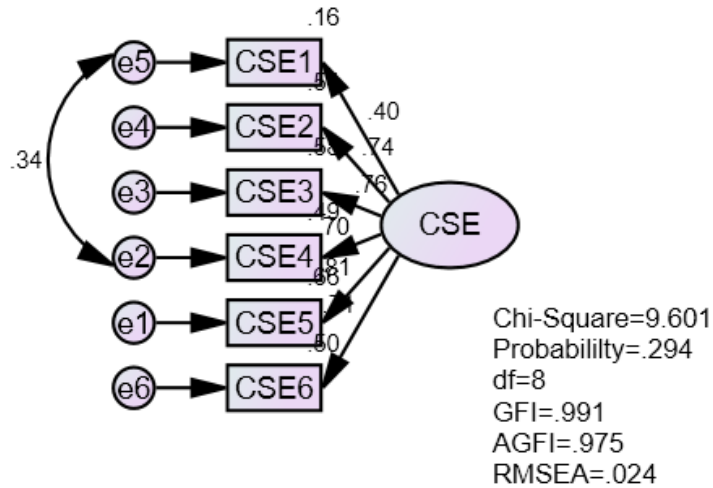


Figure 3. Modified Creative Self-Efficacy Measurement Model

Table 3. Fit Index for the Creative Self-Efficacy Model

Goodness of Fit Measure	Value	Cut off-value	Note
df	8		
Chi-square of estimate model	9.601	< 2 df	Fit model
Probability level	0.294	> 0.05	Fit model
Cmin/df	1.200	≤ 5	Fit model
Goodness of Index (GFI)	0.991	GFI ≥ 0.9 = good fit; 0.8 ≤ GFI < 0.9 = marginal fit	Fit model
Adjusted Goodness of Index (AGFI)	0.975	AGFI ≥ 0.9 = good fit; 0.8 ≤ AGFI < 0.9 = marginal fit	Fit model
RMSEA	0.024	≤ 0.08	Fit model
RMR	0.011	< 0.05	Fit model
Tucker-Lewis Index (TLI)	0.996	TLI ≥ 0.9 = good fit; 0.8 ≤ TLI < 0.9 = marginal fit	Fit model
Comparative Fit Index (CFI)	0.998	CFI ≥ 0.9 = good fit; 0.8 ≤ CFI < 0.9 = marginal fit	Fit model

Goodness of Fit Measure	Value	Cut off-value	Note
Normo Fit Index (NFI)	0.988	NFI ≥ 0.9 = good fit; 0.8 ≤ NFI < 0.9 = marginal fit	Fit model

The results of the model measurement estimation in Figure 3 using the Maximum likelihood estimation in Amos show good factor loading results for each item. All items have a significance value below 0.05 (see Table 4). The validity test results revealed that all six items were declared valid for measuring Vocational High School students' perceptions of creative self-efficacy.

Table 4. Standardized Loading Factor Values in the Creative Self-Efficacy Measurement Model

Variables	Code	Item	Estimate	P-Value
Creative self-efficacy	CSE1	I know I can efficiently solve even complex problems	0.402	***
	CSE2	I trust my creative abilities	0.735	***
	CSE3	My imagination and ingenuity set me apart from my friends	0.763	***
	CSE4	Time and time again, I have proven that I can handle difficult situations	0.698	***
	CSE5	I believe I can solve problems that require creative thinking	0.81	***
	CSE6	I am good at proposing original solutions to problems	0.71	***

The reliability test in this study uses the construct reliability value reference in SEM. This test determines the reliability and consistency of data from a research instrument. The acceptance criterion limit for construct reliability is > 0.7. However, because Amos does not have the output to find out how significant the construct reliability value is, it is calculated using the following formula (Netemeyer et al., 2003):

$$\text{Construct Reliability} = \frac{(\sum \text{Std. loading})^2}{(\sum \text{Std. loading})^2 + \sum \epsilon_j}$$

The results of the construct reliability test on the creative self-efficacy questionnaire obtained a construct reliability value of 0.890. These results show that the entire research questionnaire has a construct reliability value above 0.7. This finding means that the questionnaire is suitable for measuring vocational school students' creative self-efficacy.

CONCLUSION

This study proves that vocational school students' perceptions of creative self-efficacy can be measured using a six-item creative self-efficacy questionnaire. The six items of this questionnaire include efficient problem-solving, confidence in creative abilities, imagination, and ingenuity, overcoming difficult situations, overcoming problems, and original solutions to problems. The findings of this study provide important implications for educational practitioners to internalize students' creative self-efficacy. Apart from that, this questionnaire can also function as a tool for measuring the creative self-efficacy achievements of vocational school students and can be applied to a broader scope.

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