

Sternberg Thinking Skills Levels for Vocational College Students and Analysing Demographic Disparities

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Abstract

This study was conducted to identify the level of Sternberg's thinking skills based on the perceptions of vocational college students along with students' demographic factors. The research design employed in this study is quantitative, utilizing a survey method. A total of 193 vocational college students from Likas and Miri Vocational Colleges were randomly selected as the study sample. A questionnaire in the form of a 'google form' was used for data collection and served as the research instrument. The data was analysed using SPSS software. Based on the analytical dimensions of creativity and practicality, the findings of the study indicate that the majority of students perceive themselves to have a high level of Sternberg's Thinking Skills. Overall, students demonstrate mastery of Sternberg's thinking skills by actively controlling cognitive regulation and possessing cognitive knowledge in problem-solving methods to achieve better learning goals. The summary of the findings from this study indicates that the level of Sternberg's thinking skills based on the perceptions of vocational college students is high across all elements, namely analytical, practical, and creative. Meanwhile, concerning demographic differences, significant variations were found in terms of gender, field of study, and academic achievement of individual students. This suggests that technical students are highly suitable for applying these Sternberg's Thinking Skills in the teaching and learning process. The information obtained from the findings of this study is crucial for educators to gain a deeper understanding of students and to choose suitable teaching approaches in conducting effective teaching and learning processes. It is undeniable that educators are one of the critical factors in determining the success of students, especially in mastering Sternberg's thinking skills and problem-solving abilities.

1. Introduction

In pursuit of achieving the status of a developed nation, particularly in the education sector, numerous adjustments have been made. The primary objective is to ensure the nation's readiness for the future beyond the

approaching years. TN50 emphasizes five key elements in its execution, with a particular focus on the economy. The development of skilled workers can help transform the economy from a middle-income country to a high-income country, and this is one of the agendas of the 11th Malaysia Plan (2016-2020). This is because it is expected that quality graduates will succeed in the increasingly challenging job market in this era of globalization (Mohamed Makhbul & Abd Latif, 2019). Technical and Vocational Education (TVE) is important in nurturing highly skilled talent and at the same time meeting the needs of the country, and this talent is considered a significant investment as a driver of economic progress dominated by the industrial sector (Mansor, 2017). Furthermore, TVE is also one way to train students with skills and prepare graduates for the workforce (Thangaiah, Jenal, & Yahaya, 2020)."

According to Othman & Kassim (2021), thinking skills involve the ability to analyse and understand something. Among the activities that can be carried out to develop thinking skills are active thinking, viewing the environment based on different perspectives, and organizing ideas systematically. Every individual needs a thinking style to avoid failure and solve problems more effectively (Maya, Sari, & Zanthly, 2018). Creative and critical thinking styles can help students to test the truth of a problem so as not to make decisions based on incorrect conclusions (Syarif, Fatchurahman, & Karyanti, 2019). The use of thinking skills in the teaching and learning process can encourage students to acquire new information, store, organize, and relate it to existing knowledge (Thavarajah, et al., 2021). Thinking skills are also significant in producing more solid conclusions according to current needs and developments and are the most fundamental skills that can be developed.

2. Problem Statement

The study by Hanapi et al., (2018) found that graduates face difficulties in obtaining job opportunities. Generally, employers require workers who have skills in problem-solving from various aspects (Haji Zainal Abidin, 2021). This facilitates employers in obtaining good task outcomes. This is supported by Halim and Sahid (2020) who stated that graduates lack detailed information about thinking skills for problem-solving. Furthermore, according to Hanapi, Yong, Safiee, and Tee (2018), skilled workers also experience problems caused by their weakness in problem-solving. This is because, since school or their institutions did not instill thinking skills from the beginning. Therefore, once in the workforce, the outcomes of their work tend to lack quality.

Subsequently, the creative and critical thinking styles can help students test the truth of a problem so that they do not make decisions with incorrect conclusions (Syarif, Fatchurahman, & Karyanti, 2019). This underscores that individuals with robust thinking skills can adeptly tackle challenges and hold an advantage in becoming proficient professionals in their respective fields of work. Furthermore, individuals with strong thinking skills will consistently be in high demand in today's industries, as every employer seeks workers capable of generating meaningful ideas. Students also struggle to solve problems or make decisions correctly (Fitria, Hidayani, Hendriana, & Amelia, 2018). This assertion clearly underscores employers' preference for workers with adept problem-solving capabilities. While employers recognize that graduates may lack experience, they are hesitant to take the risk of hiring less capable individuals, thus prioritizing proficiency in problem-solving. As noted by This problem occurs because the lack of emphasis on teaching thinking skills during the teaching and learning process is one of the causes of students not practicing thinking skills (Bael, Nachiappan, & Pungut, 2021).

Therefore, graduates are encouraged to proactively enhance their knowledge and proficiency in problem-solving processes to align with the criteria sought by current employers and industries. TVE was established to educate students to become employable graduates with employability skills so that they are always balanced with the country's economic development (Darol Baha, Mansur, & Ismail, 2020). Therefore, the objectives of this study are:

- i. Identify the level of Sternberg's thinking skills among vocational college students.
- ii. Determine the differences in the mastery levels of Sternberg's thinking skills based on student's gender.
- iii. Determine the differences in the mastery levels of Sternberg's thinking skills based on student's field of study.
- iv. Determine the differences in the mastery levels of Sternberg's thinking skills based on student's academic achievement.

3. Methodology

The researcher conducted the study using a survey design, employing a quantitative approach to assess the level of Sternberg thinking skills as perceived by vocational college students at Likas Vocational College and Miri Vocational College. The survey method requires researchers to collect data to test the hypotheses of the study, examine the existing relationships between variables, and provide answers to the research questions (Maliki, Mustafa, & Ali, 2019). The choice of the survey method was deemed suitable for identifying the level of Sternberg's thinking skills based on the perception of vocational college students. The research sample comprised Diploma students specializing in Electronic Technology, Tourism, Construction Technology, Automotive

Technology, Electrical Technology, Accounting, Business Management, Air Conditioning & Refrigeration Technology, and Welding Technology, enrolled in Likas Vocational College and Miri Vocational College. All of these final-year diploma students, set to embark on industrial training, were selected as the study sample. Following the Krejcie and Morgan table, a total of 191 students were randomly chosen to participate in the research.

This study utilized a single questionnaire comprising two main sections, namely demographic details and the level of mastery of Sternberg's thinking skills among vocational college students. The demographic section included gender, field of study, year of study, Vocational College, and academic achievement. The second section consisted of 30 items requiring respondents to indicate their agreement level on a four-point Likert scale: Strongly Disagree, Disagree, Agree, and Strongly Agree. The study received insights, agreement, and validation from three experts in the language and thinking skills fields. To analyse the gather data, the researcher manually examined and reviewed the data using SPSS. The data underwent analysis through both descriptive and inferential quantitative methods. Descriptive statistics were employed to summarize the dataset, whereas inferential statistics were utilized to draw conclusions about a population based on the sample data collected from that population (Idris, 2013).

4. Result and Discussion

4.1 The Level of Sternberg's Thinking Skills Among Vocational College Students

The overall average minimum score for Sternberg's thinking skills level based on the perception of vocational college students is 4.59 (SD = 0.48), indicating a high level. This means that the competency level of Sternberg's thinking skills based on the perception of vocational college students is high. The item "I prioritize Understanding in the learning process." has the highest score in Sternberg's thinking skills level based on the perception of vocational college students, with a minimum score of 4.71 (SD = 0.58), indicating the highest level. This is because most students tend to achieve good academic results. Additionally, they tend to understand what they are learning. This process is influenced by an individual's depth of mastery in that field (Wan Abdullah, Mohd Zhaffar, & Tamuri, 2019). On the other hand, the lowest minimum score is for the item "I am able to influence my environment." with a score of 4.51 (SD = 0.65). Although this minimum score is the lowest, the item still falls within the high level. Detailed items are attached in the appendix, and a summary of the minimum score values is provided in Table 1.

The research findings indicate that the overall average minimum score for Sternberg's thinking skills level based on the perception of vocational college students is 4.59 (SD = 0.48), which is at a high level. This means that the competency level of Sternberg's thinking skills based on the perception of vocational college students is high. The item "I prioritize understanding in the learning process." has the highest score in Sternberg's thinking skills level based on the perception of vocational college students, with a minimum score of 4.71 (SD = 0.58), reaching the highest level. This is because students tend to achieve excellent academic results, which, in turn, make it easier for them to secure employment with outstanding careers. Meanwhile, the lowest minimum score is for the item "I am capable of influencing my environment." with a score of 4.51 (SD = 0.65). Although this minimum score is the lowest, the item still falls within the high level. This is because most students may not easily understand what they observe in their environment if it is explained by the lecturer. Ayuni et al. (2018) emphasizes the significance of incorporating creative thinking styles within students, particularly during the teaching and learning process. Detailed items are attached in the appendix, and a summary of the minimum score values is as follows. Files must be in MS Word only and should be formatted for direct printing, using the CRC MS Word provided. Figures and tables should be embedded and not supplied separately.

Table 1 *The level of mastery of Sternberg's thinking skills among vocational college students*

Item	Min	Standard Deviation (SD)	Interpretation Min
Element1	4.71	0.58	High
Element2	4.65	0.58	High
Element3	4.68	0.55	High
Element4	4.57	0.71	High
Element5	4.61	0.62	High
Element6	4.53	0.69	High
Element7	4.52	0.66	High
Element8	4.56	0.68	High

Element9	4.54	0.67	High
Element10	4.54	0.68	High
Elementb11	4.65	0.62	High
Elementb12	4.64	0.56	High
Elementb13	4.60	0.62	High
Elementb14	4.61	0.61	High
Elementb15	4.59	0.62	High
Elementb16	4.58	0.71	High
Elementb17	4.60	0.63	High
Elementb18	4.57	0.62	High
Elementb19	4.55	0.64	High
Elementb20	4.64	0.61	High
Elementc21	4.62	0.68	High
Elementc22	4.51	0.65	High
Elementc23	4.62	0.65	High
Elementc24	4.58	0.62	High
Elementc5	4.61	0.59	High
Elementc26	4.55	0.69	High
Elementc27	4.54	0.69	High
Elementc28	4.59	0.64	High
Elementc29	4.55	0.67	High
Elementc30	4.57	0.68	High

4.2 Differences in the Level of Mastery of Sternberg's Thinking Skills Based on Student's Gender

In the study analysis, a minor distinction of 0.17 was observed in the minimum scores between males and females regarding the mastery level of Sternberg's thinking skills. However, a more comprehensive investigation was carried out to evaluate the proficiency in Sternberg's thinking skills based on the perception of vocational college students, specifically categorized by gender. This assessment utilized an independent-sample t-test.

The independent-sample t-test analysis indicates that the p-value from Levene's test (Sig. = 0.085) is greater than the chosen significance level ($\alpha = 0.05$), suggesting that variances between the two groups are considered equal. Therefore, the analysis proceeds under the assumption of equal variances. Subsequently, the t-test yields a significant p-value of 0.015 (2-tailed), surpassing the chosen significance level ($\alpha = 0.05$). The minimum difference observed between males and females is 0.17. This is because male students tend to have higher practical thinking skills compared to female students. This is supported by Mohamad Lutpi and Ramli (2021), stating that matters involving reading and research are more inclined towards female students, while male students prefer activities involving movement and physical actions.

As a result, the null hypothesis is rejected, signifying a significant difference in the mastery level of Sternberg's thinking skills based on the perception of vocational college students categorized by gender. A summary of the independent t-test findings is presented in Table 2.

Table 2 The level of mastery of Sternberg's thinking skills based on student's gender

Levene's test for equality of variances		t-test for equality of mean			
F	Sig	t	df	Sig (2 tailed)	Mean Different
3.00	0.08	2.45	191	0.01	0.17

Results from the Independent t-test indicate a significant difference in the mastery level of Sternberg's thinking skills based on the perception of vocational college students, categorized by gender. The mastery level of Sternberg's thinking skills is higher among male students compared to female students. This is evidenced by Anwar, Khizar, and Azhar (2020), who indicate that female students have thoughtful impacts on their thinking skills. Gender differences may also depend on the students' field of study. This can be observed through the findings of this study that male students have a higher level of practical thinking skills than female students in technical fields.

4.3 Differences in the Level of Mastery of Sternberg's Thinking Skills Based on Student's Field of Study

The analysis found that the F value (test statistic) is 2.71 and the Sig. value (P-value) is 0.07. This Sig. value is greater than 0.05. Therefore, the conclusion is that the data contain at least one significant difference in the minimum level of mastery of Sternberg's thinking skills based on the perceptions of vocational college students according to the field of study among the ten fields of study compared. A summary of the one-way ANOVA analysis results is as shown in Table 4.13.

Table 3 *The level of mastery of Sternberg's thinking skills based on student's field of study*

Field of study	SS	MS	F	P	N ²
The level of mastery of Sternberg's thinking skills according to the students' field of study.	4.76	0.59	2.717	0.07	0.10
Between groups within	40.30	0.21			

In this study, the analysis results indicate that there is a significant difference in the level of mastery of Sternberg's thinking skills based on the perceptions of vocational college students according to the students' field of study, specifically between Tourism and Construction Technology, with $p = 0.030 < 0.05$. This suggests that the field of study in Construction Technology dominates more in Sternberg's thinking skills. This could be because the field of Construction Technology relies more on technical skills compared to the field of Tourism. Individuals who are creative have the potential for high intellectual capacity, high self-confidence, willingness to accept, and ability to try new ideas (Mohammad, 2018).

According to Che Kob (2016), lecturers should be aware of suitable learning strategies for students before initiating the teaching process to ensure effectiveness and quality in the implementation of teaching and learning sessions. Consequently, this leads to an improvement in students' academic achievement and has a positive impact on the teaching and learning process in the classroom. Furthermore, the teaching and learning activities conducted by lecturers for a particular field vary, resulting in differences in the mastery level of Sternberg's thinking skills among students. According to Ayuni et al. (2018), creative thinking style is one of the crucial aspects that should be instilled in students, especially in the teaching and learning process. This, in turn, contributes to an improvement in students' academic achievements and has a positive impact on the classroom teaching and learning processes.

4.4 Level of Mastery of Sternberg's Thinking Skills Based on Students' Academic Achievements

The analysis results indicate that the F value (test statistic) is 37.82 and the Sig. value (P-value) is 0.00. This Sig. value is smaller than 0.05. Therefore, the conclusion is that the data contain at least one significant difference in the minimum level of mastery of Sternberg's thinking skills based on the perceptions of vocational college students according to the academic achievement of students compared. Che Hassan, Mohd Daud, and Abdul Karim (2020) stated that TVET involves hands-on learning, which is practical and requires real-life experience to further sharpen students' practical skills. A summary of the one-way ANOVA analysis results is as shown in Table 4. The analysis results indicate a significant difference in the level of mastery of Sternberg's thinking skills based on the perceptions of vocational college students according to students' academic achievement. This analysis suggests that most students in vocational colleges apply Sternberg's thinking skills effectively. This factor is attributed to vocational colleges focusing more on technical learning compared to regular daily schools. Furthermore, students' academic achievement also influences the level of Sternberg's thinking skills in problem-solving. This is because students who achieve excellent results usually utilize Sternberg's thinking skills to solve arising problems. Prioritizing students in public higher education institutions is crucial because it allows students to enhance their academic achievements (Mohd Razali & Abdul Raup, 2018).

Table 4 *The level of mastery of Sternberg's thinking skills based on students' academic achievement*

Academic achievement	SS	MS	F	P
The level of mastery of Sternberg's thinking skills based on the academic achievement.	16.90	5.63	37.82	0.00
Between Groups Within	45.06	0.14		

5. Conclusion

The study reveals that students in the field of Construction Technology exhibit a high level of thinking skills. Furthermore, there exists a noteworthy difference in the mastery level of Sternberg's thinking skills, as perceived by vocational college students, taking into account both the students' gender and their field of study. In summary, students demonstrate adeptness in Sternberg's thinking skills by actively regulating cognitive processes and possessing cognitive knowledge in problem-solving methods, contributing to the achievement of enhanced learning goals. These findings offer valuable insights for educators, enabling them to better comprehend students and select appropriate teaching approaches for effective teaching and learning processes. Undoubtedly, educators play a pivotal role in determining students' success, particularly in mastering Sternberg's thinking skills and problem-solving. Therefore, it is recommended that educators actively promote the application of Sternberg's thinking skills within the teaching and learning process. This approach can be realized by encouraging students to assess their knowledge, engaging in discussions about critical thinking, and fostering effective planning and organization to enhance their cognitive abilities. This becomes particularly crucial in regulating cognitive processes and problem-solving methods when addressing challenges beyond the ordinary. The continual dedication, collaboration, and support from various stakeholders should be emphasized to further enhance Sternberg's thinking skills in the teaching and learning journey for students. This study aims to assist all involved parties in recognizing both strengths and weaknesses, urging them to strive for continuous improvement and the realization of their full potential in acquiring advanced skills and knowledge.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

*The authors confirm contribution to the paper as follows: **study conception and design:** Shafie, M. A. A., Yee, M. H.; **data collection:** Shafie, M. A. A.; **analysis and interpretation of results:** Shafie, M. A. A., Yee, M. H., Mohamad, M. M.; **draft manuscript preparation:** Kok, B. C., Syifaul Fuada. All authors reviewed the results and approved the final version of the manuscript.*

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