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Self-Efficacy and Learning Environment Toward Technical Drawing Skills of Grade XI DPIB Students

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ABSTRACT

In vocational education, particularly within the Building Modeling and Information Design (DPIB) specialization, students' manual technical drawing abilities show different levels of performance and are influenced not only by cognitive aspects but also by various internal and environmental factors. Among these factors, self-efficacy and classroom learning conditions are considered important contributors to psychomotor competence. Learners who possess stronger self-confidence in their abilities are generally more persistent, careful, and motivated when carrying out technical drawing activities. Likewise, a conducive educational environment may improve concentration and encourage active participation during the instructional process. This research was conducted to investigate the association between self-efficacy, learning environment, and students' manual technical drawing competence, including the combined contribution of both variables among eleventh-grade DPIB students at Vocational School 3 Semarang. A quantitative research design was applied involving 107 students selected through a total sampling technique. Research information was obtained using Likert-scale survey instruments and assessment sheets for technical drawing performance. The obtained data were processed using Pearson correlation analysis and multiple linear regression with the assistance of SPSS Statistics version 25. The findings reveal that self-efficacy demonstrates a very strong and statistically meaningful association with manual technical drawing competence ($r = 0.978$), whereas the learning environment also indicates a strong and significant correlation ($r = 0.755$). In addition, the regression analysis confirms that both independent variables jointly contribute significantly to students' manual technical drawing abilities, with an effective contribution of 95.6%. These results emphasize the importance of enhancing students' confidence in their own abilities and establishing supportive learning conditions to improve technical skill mastery.

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1. INTRODUCTION

In vocational high schools, especially within the Building Modeling and Information Design (DPIB) program, technical drawing is considered one of the fundamental competencies students must acquire. Manual drawing skills are important because they form the basis for understanding digital drawing applications such as AutoCAD and Building Information Modeling (BIM). Through manual practice, students learn essential concepts including scale, projection, line accuracy, and drawing precision, which are necessary for producing proper technical drawings. In addition, manual technical drawing enables students to communicate design ideas and technical information visually in a systematic and accurate manner. This process requires accuracy, precision, and proficiency in using traditional drawing tools, such as pencils, rulers, and compasses (Abryandoko, 2020). Technical drawing skills also involve psychomotor aspects that require continuous training and proper assessment to achieve optimal results (Subagio & Qudus, 2019).

In the context of Kurikulum Merdeka, Grade XI DPIB students begin learning software-based drawing, making manual technical drawing an essential prerequisite. Proficiency in manual drawing enables students to develop accuracy and confidence before progressing to complex digital tools, ensuring foundational competencies are well-established. In addition, research design and learning approaches in education emphasize the importance of systematic and measurable learning processes (Creswell & Creswell, 2017). In addition, effective curriculum implementation and a conducive learning environment in vocational education play an important role in supporting students' engagement and readiness in developing technical competencies, particularly in practice-based learning such as technical drawing in the DPIB program (Meita et al., 2024). Learning outcomes are also influenced by various internal and external factors that shape students' readiness to learn (Djarwo, 2020).

However, students' ability to produce manual technical drawings still shows considerable variation. Based on interview results and initial assistance sessions, approximately 40% of students experience difficulties in maintaining accuracy and neatness in their drawings. Furthermore, from a cognitive perspective, around 20% of the 107 students have not achieved the Minimum Mastery Criterion (KKM) in the Mid-Semester Summative Assessment (ASTS), scoring below 80. This condition indicates that skill achievement is not solely influenced by cognitive aspects but is also related to other factors, both internal and external. One of the internal factors assumed to influence students' performance is self-efficacy, which refers to an individual's confidence in their capability to accomplish certain tasks. According to Social Cognitive Theory, self-belief affects how individuals think, behave, and respond when facing challenges (Bandura, 1977). Students who possess strong self-efficacy are generally more persistent, motivated, and confident during the learning process, which may support better achievement in technical drawing activities (Aprillianti, 2022). Self-efficacy is widely regarded as an important factor in supporting students' academic achievement (Wei et al., 2022).

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Furthermore, it has a significant role in enhancing students' motivation and perseverance in accomplishing learning tasks (Schunk & DiBenedetto, 2020). In addition, research in vocational education shows that students' motivation and engagement in completing learning tasks are closely related to their self-efficacy (Wulansari et al., 2025). Previous studies have shown that self-efficacy is an essential predictor of students' academic achievement and skill development. Learners with stronger self-confidence tend to demonstrate greater persistence, apply more effective learning strategies, and achieve better academic results (Honicke & Broadbent, 2016; Talsma et al., 2018). In the context of Indonesian education, self-efficacy has also been found to significantly influence students' motivation and learning achievement (Sunarti, 2018). Furthermore, self-efficacy significantly influences students' involvement and consistency in accomplishing academic tasks (Schunk & DiBenedetto, 2020).

Besides internal factors, external aspects such as the learning environment also contribute to students' learning performance. The learning environment includes classroom conditions, learning facilities, teacher support, peer interaction, and the overall atmosphere during instruction. Students' perceptions of the classroom situation, including participation, teacher guidance, collaboration, task orientation, and rule clarity, reflect the quality of the learning environment (Fitrianti & Hidayati, 2025). Furthermore, (Li & Li, 2022) emphasizes that learners' views regarding classroom environmental factors are closely related to both academic performance and learning attitudes. A conducive environment can create a sense of comfort, improve concentration, and encourage active participation in the learning process. Research shows that family, school, and community environments contribute to shaping students' motivation and learning achievement (Hermawan et al., 2020). Learning media are also important in facilitating students' understanding, especially in practice-based subjects (Alamsyah & Yusuf, 2025). Furthermore, the implementation of structured and practice-oriented learning programs in vocational education has been shown to support students' readiness and learning effectiveness (Iqbal et al., 2025). In this context, a conducive learning setting enables students to work more attentively, concentrate better, and demonstrate creativity in completing technical drawing tasks. A supportive learning environment is closely associated with students' engagement, motivation, and academic achievement. Classroom climate, teacher support, and the availability of learning facilities contribute significantly to students' learning outcomes (Wang & Degol, 2016). In addition, studies in Indonesia show that the learning environment has a direct and indirect influence on students' achievement through motivational factors (Dewi & Yuniarsih, 2020). A conducive environment also supports students' focus and participation in practice-based learning activities.

Numerous earlier studies have investigated the association among self-efficacy, learning environment, and students' academic outcomes; however, most of them tend to focus on cognitive aspects in general subjects, such as the study by (Sari, 2023) in social studies and the research by (Ole & Dipan, 2023) on school learning environments. Empirical studies that specifically address psychomotor skills, particularly in the context of technical drawing in vocational education, remain limited. In addition, studies that integrate both internal factors (such as self-efficacy) and external factors (such as the learning environment) simultaneously in vocational technical contexts are still relatively scarce (Talsma et al., 2018; OECD, 2019). Considering these aspects, the present study provides novelty from both conceptual and contextual perspectives. From a conceptual standpoint, this research investigates how self-efficacy and the learning environment are associated with technical drawing skills, either individually or collectively, particularly in relation to psychomotor competence. Contextually, the study is conducted among vocational high school students in the DPIB program, which emphasizes the development of technical competencies in the construction field. In addition, various factors influencing student achievement have been widely discussed in educational research (Simamora et al., 2020), and quantitative approaches are commonly used to analyze relationships between variables (Pandiangan & Albina, 2025). Therefore, this study aims to analyze the relationship between self-efficacy and manual technical drawing ability, the relationship between the learning environment and this ability, as well as the simultaneous influence of both variables. The results of this study are anticipated to offer broader insights into the contribution of internal and external factors to the improvement of technical skills, which are considered essential competencies for students preparing to enter the professional workforce.

2. METHOD

This research applied a quantitative method using a correlational design to investigate the relationships among self-efficacy, learning environment, and manual technical drawing skills (Creswell & Creswell, 2017). The research was conducted at Vocational School 3 Semarang, involving 107 eleventh-grade students from the Building Modeling and Information Design (DPIB) program. Because the number of participants was relatively limited, with fewer than 200 individuals, the entire population was selected as the research sample using a total sampling approach (Gordiienko-Mytrofanova et al., 2018).

Data collection was conducted using questionnaires and performance assessment sheets. The questionnaires were designed to measure students' self-efficacy and perceptions of the learning environment using a four-point Likert scale. Indicators of self-efficacy included confidence in one's abilities, persistence in facing difficulties, willingness to try new techniques, motivation to complete tasks, and emotional control (Motaharinezhad et al., 2016). Meanwhile, learning environment indicators covered the availability of facilities, classroom comfort, support from teachers and peers, a conducive learning atmosphere, and the availability of learning media and resources (Hermawan et al., 2020).

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Students' manual technical drawing skills were assessed using a structured assessment document based on standardized performance evaluation criteria (Endrayanto, 2019). The assessment focused on three aspects: accuracy (precision of dimensions and proportions), neatness (clarity and cleanliness of lines), and completeness (conformity with technical drawing standards). Prior to data collection, all instruments were tested for validity and reliability to ensure accuracy and consistency in measuring the research variables (Ghozali, 2018). Instrument validity and reliability analyses were carried out to determine whether the research instruments were suitable and dependable for measuring the studied variables. Item validity was analyzed through the Pearson Product Moment correlation method, whereas instrument consistency was evaluated using the Cronbach's Alpha coefficient.

Information for this study was obtained by administering questionnaires to all participants and evaluating students' technical drawing products directly. Furthermore, the obtained data were processed through descriptive statistical analysis to illustrate the characteristics of each variable, including average scores, percentages, and distribution patterns (Subhaktiyasa et al., 2023). In addition, Imam Ghozali (2018) stated that descriptive statistics serve to explain the general features of research data, enabling researchers to gain a clearer understanding of the studied variables prior to performing advanced statistical analysis. Subsequently, inferential statistical procedures were employed for hypothesis testing. The association among the variables was identified through Pearson product-moment correlation analysis, whereas multiple linear regression was utilized to examine the combined influence of self-efficacy and the learning environment on students' manual technical drawing abilities. The interpretation of the strength of the relationships between variables in this study refers to the guidelines proposed by (Sugiyono, 2018), which classify correlation coefficient values into categories of very low, low, moderate, strong, and very strong based on specific value ranges. All statistical analyses were performed using SPSS Statistics version 25.

3. RESULT AND DISCUSSION

3.1 Validity and Reliability Testing

The validity and reliability assessments were carried out to determine whether the research instruments were appropriate and consistent in measuring the variables under study. Instrument validity was analyzed using the Pearson Product Moment correlation method, where an item was considered valid when the obtained r-value exceeded the r-table value. In addition, reliability analysis employed Cronbach's Alpha coefficient, with an instrument regarded as reliable if the Alpha coefficient was higher than 0.70. Research instruments that fulfilled both validity and reliability requirements were considered suitable for data collection. The findings of the validity analysis for self-efficacy, learning environment, and manual technical drawing skills are presented in **Table 1**.

Table 1. Validity Test Results

Item	r-count	r-table	Result
X1.1	0.555	0.361	Valid
X1.2	0.365	0.361	Valid
X1.3	0.512	0.361	Valid
X1.4	0.404	0.361	Valid
X1.5	0.417	0.361	Valid
X1.6	0.455	0.361	Valid
X1.7	0.688	0.361	Valid
X1.8	0.704	0.361	Valid
X1.9	0.594	0.361	Valid
X1.10	0.486	0.361	Valid
X1.11	0.500	0.361	Valid
X1.12	0.708	0.361	Valid
X1.13	0.610	0.361	Valid
X1.14	0.394	0.361	Valid
X1.15	0.409	0.361	Valid
X1.16	0.636	0.361	Valid
X1.17	0.105	0.361	Invalid
X1.18	0.417	0.361	Valid
X1.19	0.307	0.361	Invalid
X1.20	0.516	0.361	Valid
X2.1	0.487	0.361	Valid
X2.2	0.489	0.361	Valid
X2.3	0.705	0.361	Valid
X2.4	0.603	0.361	Valid
X2.5	0.549	0.361	Valid
X2.6	0.257	0.361	Invalid
X2.7	0.507	0.361	Valid
X2.8	0.600	0.361	Valid
X2.9	0.085	0.361	Invalid
X2.10	0.476	0.361	Valid
X2.11	0.349	0.361	Valid
X2.12	0.633	0.361	Valid
X2.13	0.564	0.361	Valid
X2.14	0.523	0.361	Valid
X2.15	0.641	0.361	Valid
X2.16	0.554	0.361	Valid
X2.17	0.013	0.361	Invalid
X2.18	0.223	0.361	Invalid
X2.19	0.721	0.361	Valid
X2.20	0.460	0.361	Valid
Y1	0.726	0.361	Valid
Y2	0.782	0.361	Valid
Y3	0.699	0.361	Valid

Item	r-count	r-table	Result
Y4	0.705	0.361	Valid

Based on **Table 1,** the validity test results show that out of 20 items measuring self-efficacy, 18 items are valid and 2 items are invalid. The invalid items were excluded from further analysis because the number of valid items was sufficient to represent the construct being measured. Similarly, for the learning environment variable, 16 out of 20 items are valid, while 4 items are invalid and therefore excluded from the analysis. Meanwhile, all indicators used to assess students' technical drawing skills are valid, indicating that the instrument is appropriate for measuring students' performance accurately. Thus, a total of 18 self-efficacy items, 16 learning environment items, and 4 technical drawing skill indicators were used in this study. Furthermore, the reliability test results for each variable are presented in **Table 2** below.

Table 2. Reliability Test Results

Variable	Number of Items	Cronbach's Alpha
Self-efficacy	18	0.861
Learning Environment	16	0.859
Technical Drawing Skills	4	0.773

Based on **Table 2**, the Cronbach's Alpha coefficients obtained were 0.861 for self-efficacy, 0.859 for the learning environment, and 0.773 for technical drawing skills. Since all values are above the minimum criterion of 0.70, the instruments demonstrate satisfactory internal consistency. This indicates that the instruments produce consistent and stable measurements across items. Thus, all items are valid and reliable; therefore, the instruments are deemed suitable for use in this study to accurately measure self-efficacy, learning environment, and manual technical drawing skills.

3.2 Classical Assumption Tests

Classical assumption testing was performed to determine whether the data satisfied the requirements for multiple linear regression analysis. The procedures included tests of normality, multicollinearity, and heteroscedasticity (Field, 2024).

3.2.1 Normality Test

A normality assessment was performed as a prerequisite for applying parametric statistical techniques. The purpose of this analysis was to identify the distribution pattern of the collected data. Referring to Imam Ghozali (2018), data are classified as normal when the Kolmogorov–Smirnov probability score is above 0.05. The outcomes obtained from this analysis can be seen in **Table 3**.

Table 3. Normality Test Results

Variable	Number of Items	Kolmogorov-Smirnov (sig.)
Self-efficacy	107	0.186
Learning Environment	107	0.178
Technical Drawing Skills	107	0.001

Referring to **Table 3**, the significance values obtained for the self-efficacy variable (p = 0.186) and learning environment variable (p = 0.178) were above the 0.05 threshold, indicating a normal data distribution for both variables. Meanwhile, the technical drawing skills variable produced a significance value of 0.001, suggesting a non-normal distribution according to the Kolmogorov–Smirnov analysis. Nevertheless, Andy Field (2024) explained that normality testing in large samples is often highly sensitive, meaning that minor deviations may result in non-normal outcomes. For this reason, the data distribution was also examined through descriptive statistical measures. The summary of the descriptive statistical analysis for technical drawing skills is displayed in **Table 4**.

Table 4. Statistics of Manual Technical Drawing Skills

Statistics Y	
N	107
Range	35
Interquartile Range	15
Skewness	-.225
Kurtosis	-.814

Based on **Table 4**, the skewness (–0.225) and kurtosis (–0.814) values fall within the acceptable range of –2 to +2, indicating an approximately normal distribution Hair et al., 2019). Acording to the central Limit Theorem, sampling distribution tend to approach a normal distribution as the sample size increases, particularly when n ≥ 30 (Hair et al., 2019). With a sample size of 107 respondents, the data can be considered approximately normal. Therefore, despite the Kolmogorov–Smirnov result, the data meet the assumptions for parametric statistical analysis.

3.2.2 Multicollinearity Test

The multicollinearity test was performed to examine whether strong correlations existed among the independent variables. A regression model is considered free from multicollinearity when the tolerance value exceeds 0.10 and the Variance Inflation Factor (VIF) is below 10. These criteria indicate that each independent variable contributes separately to the regression model. The results of the multicollinearity test are presented in **Table 5**.

Table 5. Multicollinearity Test Results

Model	Unstandardized Coefficients		t	Sig.	Collinearity Statistics	
	B	Std. Error			Tolerance	VIF
X1	.901	.030	30.408	.000	.435	2.298
X2	.052	.035	1.487	.140	.435	2.298

Based on **Table 5,** both independent variables have tolerance values of 0.435 (> 0.10) and VIF values of 2.298 (< 10). This indicates that there is no multicollinearity among the independent variables. Therefore, the regression model is acceptable and meets the multicollinearity assumption.

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3.2.3 Heteroscedasticity Test

The heteroscedasticity test was conducted using the Glejser test to examine whether there is inequality of variance in the residuals. A regression model is considered free from heteroscedasticity if the significance value is greater than 0.05. **Table 6** below shows the results of the heteroscedasticity test.

Table 6. Heteroscedasticity Test Results

Model	Unstandardized Coefficients		t	Sig.	Collinearity Statistics	
	B	Std. Error			Tolerance	VIF
X1	-.010	.020	-.497	.620	.435	2.298
X2	.023	.023	.981	.329	.435	2.298

Based on **Table 6**, the significance values for both self-efficacy (0.620) and learning environment (0.329) are greater than 0.05. This indicates that there is no heteroscedasticity in the regression model. Therefore, the model meets the assumption of homoscedasticity and is suitable for further regression analysis. Overall, the results of the classical assumption tests indicate that the data meet the required assumptions for multiple linear regression analysis, including normality, absence of multicollinearity, and homoscedasticity. Therefore, the regression model is appropriate and can be used for further hypothesis testing.

3.3 Descriptive Statistical Analysis

The results of descriptive statistical analysis provide an overview of the distribution and characteristics of each research variable, including self-efficacy, learning environment, and students' manual technical drawing skills. Furthermore, this analysis serves as an initial step to understand the overall pattern of the data before conducting more advanced inferential statistical tests. It also helps identify the tendency and variability of each variable, which are essential for interpreting the research findings comprehensively. The descriptive statistics of the self-efficacy variable are presented in **Table 7.**

Table 7. Descriptive Statistics of Self-Efficacy

Statistics X1	
N	107
Mean	52.70
Median	54.00
Std. Deviation	10.710
Minimum	31
Maximum	72

Based on **Table 7,** The self-efficacy variable shows a mean score of 52.70, with a median of 54.00 and a standard deviation of 10.710. The scores range from 31 to 72, indicating a relatively varied distribution of data, with values generally centered around the mean. The frequency distribution shows that most students' self-efficacy scores fall within the moderate to high range, with higher frequencies around scores such as 48, 54, and 59. This indicates that students generally have a positive level of self-efficacy, while only a small proportion fall into the low category. The distribution can be seen in **Figure 1.**

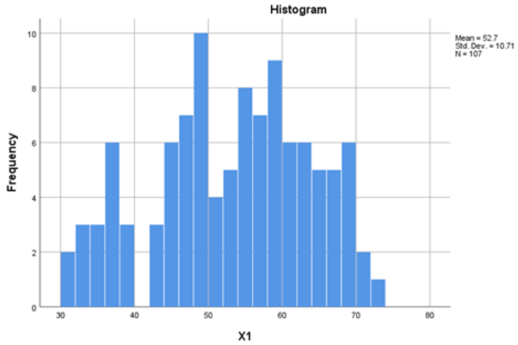

Figure 1. Self-Efficacy Frequency Diagram

Based on Figure 1, the data distribution tends to cluster around the central values, supporting the descriptive results that students generally possess a moderate to high level of self-efficacy with relatively balanced variation among respondents. This pattern indicates that most students have sufficient confidence in their ability to complete technical drawing tasks, solve learning-related problems, and adapt to instructional demands during the learning process. The absence of extreme score dispersion also suggests that students' confidence levels are relatively consistent across the class, reflecting a stable psychological condition in vocational learning activities. The findings of this study are consistent with earlier research showing that learners who have higher confidence in their abilities generally display stronger participation, increased perseverance, and better academic achievement in vocational education (Kumalasari et al., 2024; Muliasa & Wrahatnolo, 2023). To provide additional analysis of another variable, **Table 8** displays the summary statistics of the learning environment variable.

Table 8. Descriptive Statistics of Learning Environment

Statistics X2	
N	107
Mean	43.67
Median	43.00
Std. Deviation	9.103
Minimum	24
Maximum	61

Referring to **Table 8**, the learning environment variable has a mean score of 43.67, with a median of 43.00 and a standard deviation of 9.103. The scores range from a minimum of 24 to a maximum of 61. These results indicate that students' perceptions of the learning environment show a moderate level of variation, with the data relatively centered around the mean. The frequency distribution of the learning environment variable is also presented using a bar chart. The data show that scores are distributed across a range of 24 to 61, with the highest frequencies occurring around the values of 40 and 54, indicating a concentration of data near the average. The relatively even distribution suggests that students' perceptions of the learning environment vary, although most fall within the moderate to high category. This condition reflects that the learning environment experienced by students is generally supportive, although there are still some variations in perception.

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In addition, the absence of extreme values indicates that no students perceive the learning environment as very poor or very excellent. **Figure 2** illustrates the distribution of the learning environment variable.

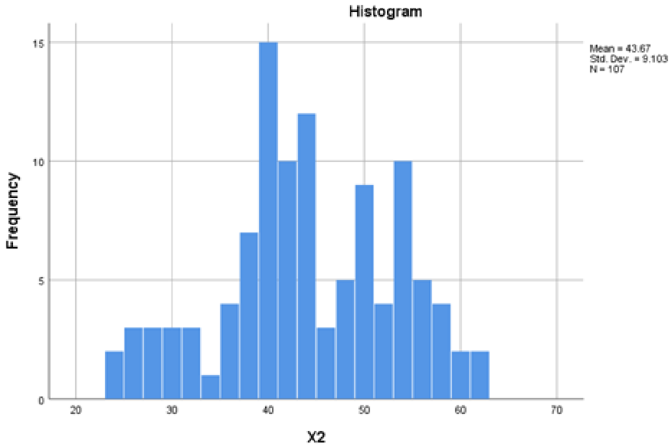

Figure 2. Learning Environment Frequency Diagram

As shown in **Figure 2** the data distribution is not highly skewed, suggesting that the overall learning environment is relatively balanced despite variations in students' perceptions. However, the presence of variation still indicates that not all students experience the learning environment in the same way. Furthermore, these differences may influence students' engagement and learning outcomes, thereby requiring further attention in the instructional process. To examine students' performance outcomes, the descriptive of manual technical drawing skills are presented in **Table 9.**

Table 9. Descriptive Statistics of Manual Technical Drawing Skills

Statistics Y	
N	107
Mean	79.25
Median	80.00
Std. Deviation	10.229
Minimum	60
Maximum	95

Referring to **Table 9**, the manual technical drawing skills variable shows a mean score of 79.25, with a median of 80.00 and a standard deviation of 10.229. The minimum score is 60 and the maximum score is 95. This finding indicates that students' technical drawing skills tend to be in the high category, with a moderate level of variability. The frequency distribution of manual technical drawing skills is presented in a bar chart to illustrate the spread of students' scores. The data indicate that scores range from 60 to 95, with the highest frequency at a score of 80 (19.6%), followed by 75 (15.9%) and 85 (15.0%). This shows that most students are concentrated in the upper-middle to high score intervals, while lower scores occur less frequently.

However, the presence of scores at the lower bound indicates that not all students have achieved an optimal level of skill. In addition, the relatively wide variation in scores suggests the existence of disparities in students' abilities that require greater attention in the learning process. The distribution of students' technical drawing skills is further illustrated in **Figure 3.**

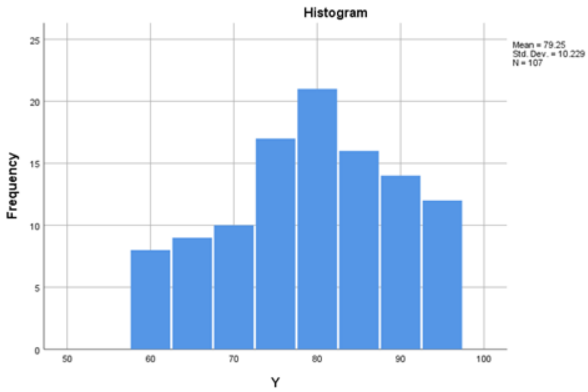

Figure 3. Technical Drawing Skills Frequency Diagram

These findings reinforce the descriptive results that students' technical drawing skills are generally high with a relatively even distribution, as shown **Figure 3.** Overall, the descriptive statistical results indicate that all variables exhibit a reasonably varied distribution while still showing a tendency to cluster around central values. These findings provide an initial understanding of the data characteristics before further inferential statistical analysis is conducted.

3.4 The Effect of Self-efficacy on Manual Technical Drawing Skills

Based on the research findings, self-efficacy has a very strong and statistically significant relationship with students' manual technical drawing skills among Grade XI DPIB students at Vocational School 3 Semarang ($r = 0.978$; $R^2 = 0.956$; $Sig < 0.05$). This suggests that students who possess greater self-confidence in their abilities are likely to perform better in technical drawing tasks. However, the magnitude of this correlation is unusually high and should be interpreted with caution. In educational research, correlation coefficients approaching 1.00 are relatively rare and may reflect not only a strong theoretical relationship but also potential methodological influences. The extremely high correlation ($r = 0.978$) observed in this study may indicate potential methodological issues, such as common method bias or overlapping constructs (Podsakoff et al., 2017). Additionally, high correlations may occur when variables are measured using similar instruments or derived from relatively homogeneous samples (Hair et al., 2019). These conditions may include similarities in data collection methods, overlapping indicators between variables, or shared variance within a single school context. Therefore, this finding should be understood as a strong relationship within this specific context rather than a universally causal relationship.

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From a theoretical perspective, these findings are in line with Bandura's Social Cognitive Theory, which states that a person's confidence in their own abilities can affect their effort, persistence, and emotional responses when carrying out tasks (Bandura, 1977). Students who possess strong self-efficacy are generally more confident and persistent, which helps them create technical drawings that are more accurate and systematically organized. However, earlier research indicates that the influence of self-efficacy on achievement can differ according to several conditions, including task difficulty, learning support, and students' previous experience (Schunk & DiBenedetto, 2020). Furthermore, self-efficacy does not operate independently but interacts with other factors such as learning strategies, prior knowledge, and instructional support (Talsma et al., 2018). This indicates that self-efficacy should be understood as part of a broader system influencing student performance.

Descriptive analysis shows that the indicator of belief in one's abilities has the highest value, indicating that most students possess a relatively high level of confidence. In contrast, emotional control has the lowest value, suggesting that some students still experience difficulty managing emotions when encountering errors during the drawing process. This condition may reduce focus and persistence, thereby affecting performance outcomes. Thus, although self-efficacy plays an important role, its contribution should be understood within the context of this study and in relation to other supporting factors.

3.5 The Effect of Learning Environment on Manual Technical Drawing Skills

The results indicate that the learning environment has a positive and statistically significant relationship with students' manual technical drawing skills ($r = 0.755$; $R^2 = 0.570$; $Sig < 0.05$). This suggests that better learning environment conditions are associated with improved performance in technical drawing within this context. However, in the multiple regression analysis, the learning environment does not show a statistically significant partial effect. This suggests that its influence may overlap with self-efficacy or be mediated by students' internal factors. In other words, a supportive learning environment alone may not directly improve performance without being accompanied by strong self-belief. The non-significant partial effect of the learning environment in the regression model indicates that its influence may be indirect or mediated by internal factors such as self-efficacy. Similar findings have been reported in previous studies, where environmental factors influence learning outcomes through motivational and psychological mechanisms (Wang & Degol, 2016)

This finding is consistent with studies emphasizing the importance of the learning environment (e.g., Lestari et al., 2026), while also differing from research that identifies the environment as a dominant direct factor. Such differences may be influenced by variations in measurement methods, sample characteristics, and learning contexts. Descriptive analysis shows that the availability of learning facilities has the highest value, indicating that physical resources are relatively adequate. However, the availability of learning media and resources has the lowest value, suggesting limitations in supporting materials such as examples, modules, and additional references. This may hinder deeper understanding and optimal skill development. Therefore, although the learning environment serves as an important supporting factor, its influence appears to be indirect and dependent on students' internal conditions.

3.6 The Simultaneous Effect of Self-efficacy and Learning Environment

The results of multiple linear regression analysis indicate that self-efficacy and the learning environment simultaneously have a very strong and statistically significant effect on students' manual technical drawing skills ($R = 0.978$; $R^2 = 0.956$; $Sig < 0.05$). This suggests that a large proportion of the variance in students' performance can be explained by the interaction of these two variables within the sample.

However, the very high coefficient of determination should be interpreted cautiously. While it indicates strong predictive power, it may also reflect shared variance, overlapping measurement constructs, or common method bias, particularly when data are collected from the same respondents using similar instruments. Therefore, these findings should be viewed as strong statistical relationships within this study rather than definitive causal conclusions.

Furthermore, partial analysis shows that self-efficacy has a more dominant role, while the learning environment does not demonstrate a significant independent effect. This indicates that internal psychological factors play a more direct role in shaping students' performance, whereas external factors function as supporting conditions. Overall, these findings suggest that improving technical drawing skills requires not only adequate facilities but also the strengthening of students' confidence and persistence. Therefore, instructional strategies should integrate both psychological and environmental aspects to achieve more optimal learning outcomes. However, these findings are limited to Grade XI DPIB students at Vocational School 3 Semarang and should be interpreted within this specific context. The results of the correlation and regression analysis are presented in **Table 10.**

Table 10. Results of Correlation and Regression Analysis

Variable	Correlation Coefficient (r)	Sig.	Coefficient of Determination (R^2)	t-count	F-count
Self-efficacy → Skills	0.978	0.000	0.956	47.515	-
Learning Environment → Skills	0.755	0.000	0.570	11.788	-
Simultaneous (X1 & X2 → Y)	0.978	0.000	0.956	-	1142.968

The results presented in **Table 10** indicate that self-efficacy has a stronger relationship with technical drawing skills compared to the learning environment variable. The correlation coefficient of self-efficacy ($r = 0.978$) demonstrates a very strong positive relationship, suggesting that students with higher confidence in their abilities tend to achieve better performance in technical drawing competencies. In addition, the coefficient of determination (R^2 = 0.956) shows that self-efficacy contributes substantially to the variation in students' technical drawing skills. These findings emphasize the importance of psychological factors in vocational learning, particularly in subjects that require precision, problem-solving ability, and consistent practice such as technical drawing. Meanwhile, the learning environment variable also showed a significant positive relationship with technical drawing skills, although its contribution was lower than self-efficacy. This indicates that supportive classroom conditions, learning facilities, and instructional situations still play an important role in improving students' learning outcomes. Furthermore, the simultaneous test results demonstrate that self-efficacy and the learning environment collectively have a significant influence on technical drawing skills. Therefore, improving vocational students' competencies should not only focus on providing adequate learning facilities, but also on strengthening students' confidence, motivation, and persistence during the learning process.

4. CONCLUSION

This study demonstrates that self-efficacy is a key determinant of manual technical drawing skills among Grade XI DPIB students at Vocational School 3 Semarang, exhibiting a very strong, positive, and statistically significant effect. Students with higher levels of self-confidence tend to demonstrate greater accuracy, persistence, and overall performance in completing technical drawing tasks. The learning environment shows a positive relationship with technical drawing skills; however, its partial effect is not statistically significant in the multiple regression model. This indicates that the role of the learning environment is more supportive and may overlap with self-efficacy in explaining students' performance in this study. Furthermore, the simultaneous effect of self-efficacy and the learning environment shows a very strong and significant contribution, confirming that technical competencies in this context are shaped through the interaction between internal (psychological) and external (environmental) factors. In this case, self-efficacy emerges as the most dominant factor. Therefore, improving technical drawing skills in this context requires strengthening students' self-efficacy while maintaining a supportive learning environment, particularly through the provision of adequate facilities and learning resources. Educators in similar vocational education contexts are encouraged to design instructional strategies that enhance students' confidence and persistence while also improving the quality of the learning environment.

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