Jurnal Dinamika Vokasional Teknik Mesin
Vol. 10, No. 1, April 2025, pp. 91-97
https://journal.uny.ac.id/index.php/dynamika/issue/view/89415
ISSN: 2548-7590, DOI: 10.21831/dinamika.v10i1.89415

An Analysis of Differences in Learning Outcomes of Manufacturing Technical Drawing in Vocational High Schools in Sleman Regency

Hesty Monica Suri [1], Ayuni Lestari[1], Insan Kamil[2]

[1]Department of Refrigeration and Air Conditioning Engineering, Politeknik Sekayu, Musi Banyuasin, Indonesia

[2]Department of Mechanical Engineering, Politeknik Negeri Batam, Indonesia

Article Info

***Article history*:**

Received Mar 26, 2025
Revised Apr 20, 2025
Accepted Apr 30, 2025
Published Apr 30, 2025

***Keywords*:**

ManufacturingTechnical Drawing
Learning Outcomes
Vocational High School

ABSTRACT

This study aims to analyze the differences in learning outcomes of Manufacturing Technical Drawing among vocational high schools (SMK) in Sleman Regency, as well as to compare the specific achievements of vocational schools (SMK). The study employed a quantitative descriptive method, involving 142 12th grade students from the Mechanical Engineering program across 5 vocational schools: SMKN 1 Seyegan, SMKN 2 Depok, SMK Muhammadiyah Prambanan, SMK Nasional Berbah, and SMK Piri Sleman. Data were collected through a learning outcome test that assessed conceptual understanding, drawing skills, and proficiency in using design software. The results revealed significant differences in students' learning outcomes among the schools. SMKN 2 Depok achieved the highest average score (74.35), while SMK Piri Sleman recorded the lowest (65.29). A focused analysis of public vocational schools indicated that both SMKN 1 Seyegan (72.85) and SMKN 2 Depok (74.35) demonstrated high achievement levels, with a relatively small gap between their scores. Several factors contributed to these differences, including teacher competence, availability of facilities, teaching strategies, and student motivation. These findings are expected to provide valuable insights for schools to enhance the quality of teaching and learning.

Corresponding Author:

Hesty Monica Suri
Department of Refrigeration and Air Conditioning Engineering, Politeknik Sekayu, Musi Banyuasin, Indonesia
Email: hestymonicas@gmail.com

INTRODUCTION

Vocational education plays a strategic role in preparing skilled human resources who are ready to compete in the industrial world. According to Catts et al. (2011), “We contend that effective vocational learning comprises two equally important dimensions: (a) learning as the acquisition of vocational knowledge and (b) learning as the contextualized (socio-political and cultural) application of that knowledge.” Wenrich and Galloway (1988) stated that vocational education is equivalent to technical education and occupational education. The terms vocational education, technical education,

and occupational education can be used interchangeably. Vocational high schools are required to provide learning that focuses on developing skills to adapt to the industrial world, enabling students to respond to the advancement of science and technology (Alam, 2023; Achmad, 2021). The availability of high-quality human resources in the fields of science and technology is a crucial factor in determining a nation's ability to compete globally with strong competitiveness (Aryani et al., 2024). Vocational education plays a strategic role in preparing a workforce that not only possesses technical expertise but also the ability to adapt to dynamic industrial transformations. In the era of rapid globalization and technological disruption, industries demand graduates who are innovative, flexible, and capable of applying knowledge to real-world challenges. Therefore, strengthening the relevance of vocational high school curricula with industrial needs is essential to ensure that graduates are not only employable but also able to contribute to sustainable national development and international competitiveness. Although these terms carry different connotations, all three refer to education aimed at preparing individuals for work, focusing on the learning of technical skills relevant to industry needs. One of the important subjects in the Mechanical Engineering expertise program is Manufacturing Technical Drawing, which requires mastery of manual technical drawing skills as well as proficiency in using design software according to industry standards. In this context, manufacturing engineering drawing serves as a medium of communication between the planning and implementation stages in the process of tool and machine production. Therefore, students are trained to master machine design skills in accordance with industrial standards through the use of design software such as Autodesk Inventor (Fitra et al., 2024).

Vocational education is designed to equip students with both technical (hard) skills and interpersonal (soft) skills to prepare them for the workforce. In the context of the Industrial Revolution 4.0, students are expected to be adept at utilizing advanced technologies to enhance their professional expertise in industrial settings. Therefore, vocational education must undergo consolidation and transformation by addressing various critical factors to develop intelligent and competent individuals. Quality education empowers society to actively contribute to national progress and development (Roslidah N, Ferary D, 2017:34). Despite this, student achievement in this subject shows considerable variation across different schools. Such disparities may stem from differences in teacher qualifications, availability of facilities, instructional methods, and student motivation. Hence, this study seeks to investigate the variations in learning outcomes among vocational high schools (SMK) in Sleman Regency, with particular emphasis on public vocational schools (SMK Negeri), aiming to provide insights into current learning conditions and propose strategies for improvement. According to Hesty M. (2023), the importance of evaluating learning lies in determining the effectiveness and efficiency of the instructional system, which includes objectives, materials, methods, media, learning resources, environment, and the assessment system itself. The demands of the Merdeka Curriculum emphasize an educational process that provides opportunities for students to develop their full potential. Therefore,

ensuring the effectiveness of the learning process becomes crucial, as it supports the achievement of the desired outcomes in the field of education. Manufacturing Technical Drawing is a key subject in the Mechanical Engineering specialization, designed to develop students' skills in interpreting, understanding, and producing technical drawings in compliance with industry standards, both manually and through computer-aided design (CAD) software. Mastery of these skills is fundamental for careers in manufacturing, machining, and production engineering.

Nonetheless, student performance in Manufacturing Technical Drawing varies among schools. These differences can be attributed to disparities in teacher expertise, learning resources, pedagogical approaches, and the level of student engagement. While some schools have access to fully equipped computer labs with up-to-date software and certified instructors, others face limitations in resources. Given these conditions, it is crucial to analyze the variations in learning outcomes across schools to identify factors influencing student performance. This research not only compares the outcomes of all SMKs in Sleman Regency but also focuses specifically on public vocational schools, which generally benefit from better funding and resources compared to private institutions. This analysis aims to provide a comprehensive understanding of the quality of Manufacturing Technical Drawing education in vocational schools and offer recommendations for enhancement.

METHOD

The population of this research is all twelfth-grade students of the Mechanical Engineering expertise program in several vocational high schools (SMK) in Sleman Regency, with a total population of 240 students. The sampling technique used is proportionate stratified random sampling, and the data were collected using questionnaires and test items. This type of research is descriptive quantitative; through this research, the researcher will describe what actually happens regarding the current condition being studied. Sugiyono (2017:2). The data analysis techniques used are descriptive data analysis to describe the data in each variable in every syntax of the learning model, simple regression a

RESULTS AND DISCUSSION

This research was conducted in Sleman Regency, involving the following schools: SMKN 2 Depok, SMKN 1 Seyegan, SMK Muhammadiyah Prambanan, SMK Nasional Berbah, and SMK Piri Sleman. The study population consisted of tenth-grade students taking the Manufacturing Technical Drawing subject.

The average learning outcomes across all participating vocational schools in Sleman Regency are presented in Table 1 below:

Descriptive Statistics

The following table presents the number of respondents, the average scores, and the standard deviations of learning outcomes for each school.

Table 1. Average Learning Outcomes of All Vocational High Schools (SMK)

School	N	Mean	Std. Dev
SMK MUHAMMADIYAH PRAMBANAN	33	72.85	7.72
SMK NASIONAL BERBAH	21	65.29	8.08
SMK PIRI SLEMAN	7	68.71	4.64
SMKN 1 SEYEGAN	41	70.46	7.04
SMKN 2 DEPOK	40	74.35	9.67

Analysis of Learning Outcome Differences Across Vocational High Schools in Sleman Regency

The results of the One-Way ANOVA analysis show an F-value of 4.910 with a p-value = 0.00099 ($p < 0.05$). This indicates that there are statistically significant differences in the average learning outcomes among the five vocational high schools.

In other words, students' achievement in the Manufacturing Technical Drawing subject varies significantly between schools.

Table 2. One-Way ANOVA Test Results

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1286.11	4	321.53	4.910	0.00099
Within Groups	8971.25	137	65.48		
Total	10257.36	141			

Independent Samples t-Test Between Public and Private Vocational Schools

The comparison of average learning outcomes between public (SMK Negeri) and private (SMK Swasta) vocational high schools was conducted using an independent samples t-test. The results of the analysis are presented in the table below.

Table 3. Results of the Independent Samples t-Test

Levene Test F	Sig. (Levene)	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
0.0128	0.910	1.833	140	0.069	2.612	1.425

t-Test for Public vs. Private Vocational Schools

The results of the independent samples t-test comparing public (SMK Negeri) and private (SMK Swasta) vocational schools showed a t-value of 1.833 with a p-value of 0.069 ($p > 0.05$).

This indicates that there is no statistically significant difference in the average learning outcomes between public and private vocational schools at the 5% significance level.

Although the mean score of public SMKs was slightly higher, the difference was not strong enough to be considered statistically significant**.**

DISCUSSION

Analysis of Differences in Manufacturing Technical Drawing Learning Outcomes Among Vocational Schools in Sleman Regency Descriptive analysis revealed that students' average learning outcomes in the Manufacturing Technical Drawing subject varied across schools. Public vocational schools (SMK Negeri) generally showed higher performance compared to private ones (SMK Swasta), although the independent samples t-test indicated that this difference was not statistically significant ($p = 0.069$). In contrast, the results of the one-way ANOVA among the five schools yielded a p-value of 0.00099 ($p < 0.05$), indicating a statistically significant difference in learning outcomes across the schools. These findings suggest that differences in student achievement are likely influenced by school-specific factors, rather than simply the status of the school as public or private. Such factors may include the quality of teaching, availability of resources, instructional strategies, and student engagement.

Learning Outcomes

The learning outcomes in this study refer specifically to students' performance in technical drawing using Inventor software, with a focus on drawing a toolpost. The total number of respondents was 142 students from five vocational high schools (SMKs) in Sleman Regency. The data showed that SMKN 2 Depok had the highest average learning outcome, with a mean score of 74.35. This school implemented a Project-Based Learning (PjBL) model in its teaching process. One contributing factor to this result is the high competency of the instructor, who holds a CAD certification, which is included in the appendix of this study.

Several factors are believed to contribute to the differences in student achievement, including**:**

Factors Influencing Learning Outcomes

- **Teacher Competence** Teachers with professional certifications and extensive teaching experience tend to deliver more effective instruction, which positively impacts student performance.
- **Availability of Facilities and Infrastructure** Schools equipped with adequate computer laboratories, up-to-date CAD software, and complete manual drawing tools are able to offer a more supportive and engaging learning environment.

- **Instructional Strategies** Schools that implement active learning methods such as Project-Based Learning (PjBL) are generally more successful in increasing student engagement compared to those that rely heavily on lecture-based instruction.

- **Student Motivation Differences in students'** interests and motivation levels also play a role. Students with clear career goals in the field of manufacturing engineering tend to be more enthusiastic and committed during learning activities.

These findings align with the study by Satoto & Nuryadi (2013), which found that the success of technical learning is influenced by a combination of teacher competence, facility availability, and active student participation. Therefore, improving the quality of learning requires an integrated approach. The results of this study suggest that differences in learning outcomes are more likely influenced by unique contextual factors within each school, rather than simply the public or private status of the institution. Factors such as teacher qualifications, learning facilities, and instructional approaches appear to play a more significant role in shaping student achievement.

CONCLUSION

Based on the findings and discussion, the following conclusions can be drawn:

There are significant differences in learning outcomes across schools. The results of the one-way ANOVA showed a p-value of 0.00099 ($p < 0.05$), indicating that there are statistically significant differences in student achievement in Manufacturing Technical Drawing among the five vocational schools involved in the study.

Differences between public and private schools are not statistically significant. The independent samples t-test comparing the average learning outcomes of public and private vocational schools yielded a p-value of 0.069 ($p > 0.05$). This suggests that, although public schools had slightly higher average scores, the difference is not statistically significant. Learning outcome variations are more likely influenced by school-specific factors rather than school status alone.

Factors such as teacher competence, the availability of laboratory facilities, instructional strategies, and student motivation are believed to have a greater impact on learning outcomes than whether a school is public or private.

REFERENCES

Adli, A., Ambiyar, A., Refdinal, R., & Purwantono, P. (2025). Pengaruh Model Pembelajaran Berbasis Proyek terhadap Hasil Belajar Menggambar Teknik Mesin. Jurnal Pendidikan Teknik Mesin , 1 (1), 26–31. https://doi.org/10.24036/meej.v1i1.9

Alam, A. M. F. (2023). Strategi Kepala Sekolah Dalam Peningkatan Mutu Pendidikan Di Sekolah Menengah Kejuruan (Studi Kasus Smkn 1 Mojokerto). AsSuluk : Jurnal Manajemen Pendidikan Islam, 1(1), 67–86.

Arikunto, S. (2013). *Prosedur Penelitian: Suatu Pendekatan Praktik* . Jakarta: Rineka Cipta.

Aryani, R., & Fanisyah, E. *Benchmarking as a Vocational Quality Improvement Strategy Towards SMK PK* (Center of Excellence of Vocational High School**).**

Aryanto, Dhani. "Penerapan Model Pembelajaran Project Based Learning (Pjbl) Mapel Gambar Teknik Manufaktur." *Nozel Jurnal Pendidikan Teknik Mesin* 3.2: 69-83.

Basri, M. H., Handoyono, N. A., & Inderanata, R. N. (2023). Gambar Teknik Manufaktur.

Chen, X., Lin, S., Yang, S., & Liu, Y. (2009, December). The simulation of engineering drawing practice teaching platform based on assembly modeling. In *2009 First International Conference on Information Science and Engineering* (pp. 3532-3535). IEEE

Creswell, JW (2014). *Desain Penelitian: Pendekatan Kualitatif, Kuantitatif, dan Metode Campuran* (edisi ke-4). Thousand Oaks, CA: SAGE Publications.

FAJRI, Redha Nuzul; SYAHRIL, Syahril; PURWANTONO, Purwantono. *Meningkatkan Hasil Belajar Siswa Di Mata Studi Gambar Teknik Manufaktur Kelas Xi Tp 1 Smk N 1 Sumatera Barat Bersamaan Penerapan Model Pembelajaran Berbasis Proyek*. *Jurnal Vokasi Mekanika*, 2022, 4.4: 90-97.

Fitra, R., Prasetya, F., & Adri, J. (2024). *Exploration of the implementation of project-based learning in tehnical drawing courses toward. Journal of Engineering Researcher and Lecturer*, 4(1), 46-55.

Gitelman, L. (2014). *Paper knowledge: Toward a media history of documents*. Duke University Press

Hara, A. (2012). Studi Komparasi Hasil Belajar Matematika Siswa Lulusan SMP Swasta dan SMP Negeri di SMK Negeri 1 Banyudono Kelas X Semester Genap Tahun Ajaran 2011/2012 (Doctoral dissertation, Universitas Muhammadiyah Surakarta).

Islami, M. F., & Mujiati, M. (2024). Perbandingan Kualitas Pendidikan Antara Sekolah Negeri Dan Sekolah Swasta: Eksplorasi Pada Aspek Pembelajaran. Kelola: Jurnal Manajemen Pendidikan, 11(2), 183-196.

Nuryanto, A., Ngadiyono, Y., & Widodo, S. F. A. (2025, April). *Implementation of Project-Based Learning in CAD Education to Support Machine Design Drawing Skills. In The 8th International Conference on Education Innovation* (ICEI 2024) (pp. 1434-1448). Atlantis Press.

Riyanto, Y. (2010). *Paradigma Baru Pembelajaran* . Jakarta: Grup Media Kencana Prenada.

Satoto, T., & Nuryadi. (2013). Penerapan *Project Based Learning* pada pembelajaran teknik. *Jurnal Pendidikan Teknologi dan Kejuruan* , 22(1), 45–53.

Sugiyono. (2019). *Metode Penelitian Pendidikan* . Bandung: Alfabeta.

Suri, H. M., & Nuryanto, A. (2023). Implementation of the SMK Manufacturing Engineering Drawing Learning Model in Sleman. European Journal of Education and Pedagogy, 4(6), 93-96.

Vanthournout, G., Gijbels, D., Coertjens, L., Donche, V., & Van Petegem, P. (2012). *Students' persistence and academic success in a first-year professional bachelor program: The influence of students' learning strategies and academic motivation*. Education Research International, 2012.

Wahyuni, D., Endramawan, P., & Hardiyanto, D. (2021). Perbandingan Media Konvensional dengan Software terhadap Minat Belajar dan Psikomotorik Gambar Teknik. *Edu Elektrika Journal*, *10*(2), 47-55.