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The Implementation of Sort-Set in Order-Shine-Standardize-Sustain (5S) for Vocational High School Learners

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Abstract

Industry demands Vocational High Schools (SMK) graduates to adopt an industrial work culture in Japan, specifically the 5S Principle. Most schools implemented the 5S principle, but its success remains unknown. This research attempted to reveal the planning of the 5S principle in school, learner knowledge, learner attitude, learner behavior, the association of knowledge and attitude to the behavior of 5S learners, and the implementation of the 5S principle. The research method involved conducting case studies at SMK Negeri 2 Salatiga and SMK Negeri Jateng Semarang and analyzing the data using quantitative and qualitative methods. Data collection techniques include initial observations, tests, questionnaires, interviews, and observations for learners during internships in furniture workshops. The results found (1) the 5S principle plan in the form of a special task team, socialization, management planning for the workshop facility and infrastructure, and the supporting program plan; (2) students' knowledge performance shows high results; (3) students' attitudes have obtained good results; (4) students' behavior has obtained high results; (5) there is a relatively perfect relationship between students' 5S knowledge and 5S attitudes towards students' 5S behavior; (6) the implementation of the 5S principle has been successfully implemented in Vocational High Schools (SMK). The research results indicate that the implementation of 5S yielded positive outcomes and can serve as a valuable tool for future enhancements.

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INTRODUCTION

The government, specifically the Vocational High Schools (SMK) directorate, facilitates the development of an industrial work culture to strengthen the school's work culture based on the Regional Regulation or Peraturan Dirjen vokasi No. 10 Year 2020, to ensure Vocational High Schools (SMK) learners understand and have an effective work culture in the workplace. Current conditions require Vocational High Schools (SMK) learners to possess certain skills, including a culture of work in the industry and the adopting the 5S principle. Irwanto (2020) argues that fostering a positive working culture in schools, reflective of the industrial world, would result in effective theoretical and practical learning, and qualified and prepared graduates for industry work.

The researchers selected the Vocational High Schools (SMK) for this study based on the completeness of their facilities and the presence of a dedicated 5S team within the school. The selection criteria of the SMK Negeri Jateng Semarang, are a boarding school with the characteristics of the attending learners, a learner of choice with accommodation facilities, and free school fees. Subsequently, the researchers selected SMK Negeri 2 Salatiga because the school never achieved pilot status as an international class school (RSBI). The information-acquisition process at the school found that the construction and housing engineering expertise program in the two schools implemented the 5S principle even though no follow-up studies entailed the implementation of the principle success. Other obstacles in implementing the 5S principle in Vocational High Schools (SMK) include learners' lack of self-directedness in applying the principle while practicing in the workshop, resulting in learners' positive habit reliance under the direction and supervision of the subject teacher. Additionally, learners in construction and housing engineering had a poor understanding of the 5S principle and its application in the laboratory or during challenges. The results of an interview with the chief division of the program also revealed that the learners continued to adjust and exchange information related to the 5S principle implementation with other programs of expertise.

The researchers conducted another interview with one of Vocational High School's (SMK) associate teachers, who stated that the construction and housing engineering expertise program in the Vocational High Schools (SMK) district of Semarang City and its surroundings could not reach the full potential in implementing the 5S principle due to various encountered obstacles of the schools. Similarly, Parmasari & Nugroho (2020)explained that learners' low awareness and independence in implementing the 5S concept hinder its implementation. On the other hand, Purwanto & Subaris (2018) depicted that the company's employees' lack of understanding leads to a less-than-optimal application of the 5S culture. Aini & Sriasih (2021) elaborated that if an individual gains sufficient and adequate understanding, then the 5S implementation will run effectively. Daniati (2023)found that the industry required Vocational High Schools (SMK) graduates to possess competence, including mastery of the 5S principle. However, many Vocational High Schools (SMK) graduates and the workforce struggle to adhere to this principle.

The workshop of the Light Vehicle Engineering program at Vocational High School (SMK) Muhammadiyah 2 Wates inadequately implemented the 5S concept (Saputra & Solikin, 2016). In contrast, Purjayanto et al. (2015) reported successful 5S principle implementation in the machining workshop at SMK PGRI 3 Malang. Implementing the 5S program can foster a conducive workshop or laboratory environment, minimizing workplace accidents and enhancing learner productivity during workshop or laboratory practice (Mubarok & Martubi, 2018).

This research aimed to determine the 5S principle plan at Vocational High Schools (SMK), students' knowledge levels, attitudes, and behaviors, the correlation between knowledge and attitude on 5S behavior, and the overall implementation of the 5S principle among students. The researchers anticipated that the findings would provide positive references and

contribute to improvements, particularly in 5S principle implementation.

METHOD

1. The Research Design

This case study focused on the 5S principle implementation at SMK Negeri Jateng Semarang and SMK Negeri 2 Salatiga.

2. Research samples

The samples consisted of the learners from construction and property engineering, twelfth grade, practicing the wood workshop. The informants were the school 5S teams, the chiefs of the majors, teachers, and workshop technicians.

3. Data collection technique

The researchers collected data through observation, tests, questionnaires, interviews, and observations of learners during practice.

4. Data collecting instruments

The instruments to collect the knowledge data were tests, questionnaires, observation sheets, and interview guidelines.

5. Data validity technique

The data validity consisted of two techniques, namely quantitative and qualitative. In quantitative, the test sheet was examined for validity, reliability, comparative, and difficulty item tests. The instrument of personal perception received the validity and reliability tests. The observation instruments were CVI (content validity index) and CVR (content validity ratio). In addition, qualitative techniques such as interview data and triangulation were employed, which involved data, technique, and theoretical triangulation.

6. Data analysis

The researchers interpreted the results in the field as a percentage using quantitative data analysis, a test with a score of 1 for true and 0 for wrong. The researchers then calculated the scores on a scale of 1–4 and interpreted them to obtain the perception questionnaire. The statement included an observation sheet where each assessment criteria listed receives a score of 1. The normality test was the prerequisite, and the linearity test came before the correlation test. The researchers conducted the correlation analysis to determine the correlation between knowledge (X1), attitude (X2), and the 5S behaviors of learners (Y), then interpreted the results based on the statistical count. The researchers analyzed qualitative data, such as data reduction, presentation, and conclusion.

RESULT AND DISCUSSION

Results

a. The 5S Principle Plan

The schools planned the principle by establishing the 5S team. Socializing, planning the facility and infrastructure, planning the 5S supporting activity

b. Student knowledge

The knowledge level of students is high. Table 1 shows the students' knowledge level

Table 1. The Results of Student's 5S Knowledge

Parameters	Results (%) of SMK Negeri 2 Salatiga	Results (%) of SMK Negeri Jateng Semarang
- Sort	81% (extremely high)	68% (high)
-Set-in-order	81% (extremely high)	75% (high)
- Shine	58% (average)	57% (average)
- Standardize	72% (high)	77% (high)
- Sustain	63% (high)	67% (high)
Mean	70.69% (high)	68.91% (high)

c. Student attitudes

The student's attitude was good and they also had positive perceptions toward the 5S principle. Table 2 shows the attitude results.

Table 2. The Results of Students' 5S Attitudes

Parameters	Results (%) of SMK Negeri 2 Salatiga	Results (%) of SMK Negeri Jateng Semarang
-Sort	80,5% (good)	74% (good)
-Set-in-order	75% (good)	76.5% (good)
- Shine	72.5% (good)	74.5% (good)
-Standardize	77.5% (good)	75.9% (good)
-Sustain	77.5% (good)	74.5% (good)
Mean	76.6% (good)	75.08% (good)

d. The students' behavior

Students' behavior already reflects the 5S principle and is already in a good category. Table 3 shows the results.

Table 3. The Results of Learners' 5S Behavior

Parameters	The mean of each principle (%)	
	SMK Negeri 2 Salatiga	SMK Negeri Jateng Semarang
-Sort	82,07% (excellent)	80.60% (good)
-Set-in-order	77,22% (good)	77.80% (good)
- Shine	86,66% (excellent)	80.65% (good)
-Standardize	70% (good)	71,52 (good)
-Sustain	77,50% (good)	72.23% (good)
The mean total	78,68% (good)	76.56% (good)

e. The correlation between knowledge and attitude toward behavior

Table 4 shows the correlation between knowledge and attitude toward the behavior.

Table 4. The Correlation between Knowledge, Attitude, and Behavior

Schools	Variables	R (correlation coefficient)	Sig.
SMK Negeri 2 Salatiga	Knowledge *Behavior	.796	.000
	Attitude* Behavior	.801	.000
	Knowledge & Attitude* Behavior	.856	.000
SMK Jateng Semarang	Knowledge *Behavior	.718	.000
	Attitude* Behavior	.805	.000
	Knowledge & Attitude* Behavior	.832	.000

f. The implementations ran properly based on the school plans. The realized implementation successfully adhered to the 5S principle.

Discussion

The 5S principle implementation based on the interviews was also relevant to the observation results. Here are the explanations:

1. The special task team establishment

The principals led SMK Negeri 2 Salatiga and SMK Negeri Jateng Semarang to establish a special team. This team included a program leader responsible for planning and monitoring the 5S principle implementation. Furthermore, the teacher supervised the learners during the practice, and the technician inspected the workshop's entire facilities and accompanied the learners during the learning process. SMK Negeri 2 Salatiga also carried out the formation of responsibilities related to risk aspects within the scope of the school, under the management role. The school also already had a special 5S team to

take care of the entire task program within the scope of one school.

2. Socialization

SMK Negeri 2 Salatiga and SMK Negeri Jateng Semarang implemented the 5S socialization planning principle during meetings, ceremonies, briefings, and learning activities in the workshop. Principals, program leaders, and 5S-trained teachers engaged in socialization activities. Industry representatives also participated in school visits and other events. Socialization became the provision of 5S, Safety Guidelines, and SOP materials for all school citizens to recognize.

3. Planning the infrastructure-facility management

The schools planned the management of the storage facilities at SMK Negeri 2 Salatiga and SMK Negeri Jateng Semarang based on their type and the intensity of their use. The 5S method of storage should consider factors including intensity of use, type of tool or material, weight of items, and suitability based on training materials (Osada, 2018). The storage of tools based on the intensity of use was placed around the working area, i.e., on the side of the work area, such as a closet and a shelf. The efforts of storing material were specifically for non-humid materials. The schools already separated the equipment based on the types. The schools provided shelves and cabinets on each side of the workshop workspace. Suwandi *et al*. (2023) found the presence of the 5S manual could improve the learner's habit of applying the 5S working culture to manage the tools and materials during practice activities in the workshop.

Using tools and practical materials required good administration to maintain order among learners. Administrative activities included the inventory or statement of goods, uses, tools, and practical materials. This process could also cultivate and enhance the learner's sense of responsibility to maintain and care for the borrowed practice tools and materials. The researchers found some available documents, such as SOP and tool borrowing books. The workshops maintained the wood processing tools and machines, although the results were not optimal due to the lack of a regular schedule.

4. Planning the supporting activities

The workshop's creation of a green line was an effort to support the implementation of 5S at the schools. The green color implementation indicated the main and safe path to pass, while the other line marking used other colors based on the functions (Osada, 2018).

The waste management process at SMK Negeri 2 Salatiga and SMK Negeri Jateng Semarang managed the waste by converting the wastes into useful and valuable goods (Andini & Fazria, 2022). The woodworking workshop wastes included fine powder and small pieces of wood from the cutting.

The program chiefs, teachers, and technicians monitored the training process in the workshop. The SMK Negeri 2 Salatiga employed a manager to apply the 5S. The school assigned managers to monitor one of the 5S principles, the shine aspect. SMK Negeri 2 Salatiga had a weekly routine agenda. Every Wednesday before beginning the class, learners and teachers jointly performed hygienic cleaning of the floor, tools, machinery, and items from dust.

The plan monitoring refers to activities set to support the 5S principle at SMK Negeri 2 Salatiga. Since the Vocational High Schools (SMK) did not have any monitoring, neither the program chief nor the teacher expressed a strong desire for the special support of industry-related parties, such as consultants and housing developers. It was crucial for the implementation of the 5S. Monitoring learning can help learners overcome difficulties, provide necessary guidance and support, and motivate them to improve, ultimately contributing to the quality of Indonesian human resources (Suwarmaet al., 2023).

The special 5S team at SMK Negeri 2 Salatiga also received the award for the support activities they carried out every three months. The recognition was a framed charter or token. The recognitions were divided into two categories: the best 5S and the worst 5S realizations. Other research also suggests that the corporate recognition system influences employees' performance (Herawati *et al.*, 2022).

The 5S training at Vocational High Schools (SMK) could enhance school citizens'

comprehension of 5S. The objective of the training was to improve teachers' understanding of the 5S and train the hard skills of teachers about the 5S principles in an industrial setting. There were industry visits and collaborations to improve the 5S habit of working at the workshop. Industries also visited schools to provide training related to the industrial work culture, followed by teachers. Previous research also found that employees with good 5S method implementation required adequate training. This was because mastering the method and gaining basic knowledge of how to run 5S through integrated training phases was crucial, as it significantly influenced the quality of actual implementation in the field (Nusannas, 2016).

b. The Learners' Knowledge about the 5S Principle

Overall, by examining the outcomes of each 5S principle, the researchers achieved equally high results even though the implementation was not optimum. The high score on knowledge of the principles of sort, sort-in-order, and shine at the SMK Negeri 2 Salatiga, and high scores on knowledge about the principles of sort-in-order and standardize were observable at the SMK Negeri Jateng Semarang.

The overall level of knowledge related to the understanding, the purpose of the 5S, and the application of each principle influenced each other. The researchers found a decrease in knowledge level from translating the meaning, purpose, or benefit to interpreting examples of the 5S implementations.

Most learners did not apply 5S perfectly because they had limited 5S implementation. Most learners were still in the learning phase and had not yet advanced to the application stage, indicating that their knowledge was not entirely complete. Lu *et al*. (2023) also found that without a thorough knowledge of the basic ideas, learners often had difficulty identifying the sources and causes of various kinds of uncertainty, thus creating confusion about the need for and methods of calculation in the processing of mathematical data.

c. The Learners' 5S Attitudes

Table 2 shows that the learner's attitude already achieves a satisfactory result but not maximum. Here are the results: 1) the attitude about short principle, 19.5% of learners at SMK Negeri 2 Salatiga and 2% of learners at SMK Negeri Jateng Semarang indicated hesitation to take tools. Furthermore, the students tended to take more than they needed. 2) the attitude of sort-in-order, 25% of learners at SMK Negeri 2 Salatiga and 23.75% of learners at SMK Negeri Jateng Semarang, not succeed in folding shelves, clothing, and tools, or created disorganization with materials. Additionally, they did not arrange work material residues systematically. 3) the attitude of shine, 27.5% of learners at SMK Negeri 2 Salatiga and 24.1% at SMK Negeri Jateng Semarang neglected to clean tables and chairs, often delaying cleaning until areas became heavily soiled. 4) Regarding the attitude of standardization, 22.5% of learners at SMK Negeri 2 Salatiga and 25.5% of learners at SMK Negeri Jateng Semarang, left the work equipment recklessly and did not store the tools orderly. 5) the attitude of sustain, 22.5% of learners at SMK Negeri 2 Salatiga and 25.5% at SMK Negeri Jateng Semarang struggled to adhere to the workflow and lacked initiative in peer correction for mutual improvement.

The 5S habituation is necessary for learners during practice to realize good results. Nurkadri *et al.* (2023) argue something that begins with consistent and repeated actions will lead to something positive. (Aprilian*iet al.*, 2021) also explain that 5S practice could encourage learners to develop good disciplinary attitudes. A good learner's knowledge level also influences the outcome of a good attitude. Samoling *et al*. (2023) explain that understanding and knowledge of 5S behavior foster the employee's attitude.

d. The 5S Principle Behaviors

1) The behavior of Sort

Students' sort behavior is already at an excellent result for SMKN 2 Salatiga and SMKN Jateng Semarang city obtained good results. However, these schools had similar problems: 16.67% of learners at SMK Negeri 2 Salatiga and 22% of learners at SMK Negeri Jateng Semarang

kept using a large number of hand-working tools which led to a high stack of tools. Learners at SMK Negeri Jateng Semarang were still hesitant to pick up tools as stated on the job desk. 23% of learners at SMK Negeri 2 Salatiga and 25% at SMK Negeri Jateng Semarang were still leaving a pile of residual material around the work area. The wooden workshops at the two schools had no storage for the remaining materials. The researchers found irrelevant items with practical activities around the work area at the two schools. All learners at the two schools used the machine based on the functions.

2) The behavior of Sort-in-Order

The researchers found this behavior was good at both schools although it did not reach the maximum score. However, these schools had similar problems: 16.67% of learners at SMK Negeri 2 Salatiga and 14% of learners at SMK Negeri Jateng Semarang still took the device without making a prior registration. Learners from both schools still left the remaining material in the corner and around the walls of the work area since no specific space was available to store the materials. 22.22% of learners at SMK Negeri 2 Salatiga and 22% of learners at SMK Negeri Jateng Semarang still left their tools recklessly The researchers found that learners at both schools did not label the shelves or cabinets, along with unnecessary items littering the work area.

3) The behavior of Shine

The researchers found that the learners demonstrated this good behavior although the scores were not optimum. The researchers found the hygienic problem in the machinery facilities of both schools tended to improve. The other issue at both schools dealt with the unclean work area's floor, and the learners did not initially clean before practicing. The workshop's machines were unclean and dusty. 16.67% of learners at SMK Negeri 2 Salatiga and 21.67% of participants at SMK Negeri Jateng Semarang did not sweep the workshop after the program ended. The learners at both schools demonstrated hygienic behavior to keep the workshop clean, such as hygienic equipment and machines.

4) The behavior of Standardize

Learners at SMK Negeri 2 Salatiga and SMK Negeri Jateng Semarang demonstrated good standardized behavior and achieved good results. The schools had similar problems. The workshop lacks a Standard Operating Procedure (SOP) due to the limited walls. The arrangement of the SOP was still ongoing and not yet visible at both schools. The researchers also found dusty workshops with unreadable texts. The other problem at both schools was no clear boundary on the floors around the machine area; the wood material was placed on the floor without any base and mixed up with various sizes and irregularities. The researchers also found no written procedure related to the standard maintenance of the machinery in the workshop. 17.4% of learners at SMK Negeri Jateng Semarang still used improperly working devices. The workshop lacks a written procedure for the standard maintenance of the machinery and a routine maintenance schedule. The SMK Negeri 2 Salatiga lacks a technician to improve the planning and management of storage, maintenance, and inventory areas. The improved surveillance, clear SOPs, and the creation of green lines were necessary for SMK Negeri Jateng Semarang to support the learners' 5S behaviors.

5) The behavior of Sustain

Learners at both schools had equally good results in terms of learner behavior, but neither achieved the maximum score. Learners at both schools continued to engage in activities without wearing complete self-protectors such as masks, ear protectors, and gloves. Furthermore, the issue at SMK Negeri 2 Salatiga dealt with the absence of secure and safe signs, the learners' inability to refine and arrange existing items, and their failure to fully implement the 5S during their internship. The problem with the SMK Negeri Jateng Semarang dealt with the absence of specific 5S signs. The researchers found that 20% of learners at SMK Negeri 2 Salatiga and 26,09% of learners at SMK Negeri Jateng Semarang did not fix or arrange anything that was not in place. The next evaluation of SMK Negeri Jateng Semarang showed good implementation, but the school required a specific evaluation of 5S. Furthermore, the researchers found learners who did not apply the 5S principle properly during their internship at the workshop. Then, for SMK Negeri 2 Salatiga, the researchers found that 20% of

learners had not applied the principle 5S at the internship.

Several factors, including a learner's high level of knowledge and a positive attitude, contribute to successful 5S implementation. Consistent with this, Puspitaningtyas (2017) posits that a positive attitude can significantly influence 5S behaviors and enhance the overall work environment. Similarly, Samoling et al. (2023) assert that a positive attitude fosters 5S practices, while a combination of high knowledge and a positive outlook leads to desirable behaviors.

Another contributive factor in the formation of 5S behavior in learners was the provision of 5S-related programs and the fulfillment of 5S support facilities. Samoling *et al*. (2023) explained that a worker with adequate work will promote 5S behavior, where work serves as a tool to assist the worker. Teachers must monitored both within and beyond the classroom. They believed that effective supervision could mold positive 5S learner behavior because learners would be afraid to violate the principle. Applying an orderly system based on the 5S principle as a control could also encourage good 5S behavior in learners.

e. The Correlation between Knowledge and Attitudes of Learners' 5S Behaviors

Table 5 presents the results of the correlation analysis between knowledge, attitude, and 5S behavior. The correlation between knowledge and 5S behavior was found to be statistically significant ($p < 0.05$), with a positive linear relationship ($r = 0.796$ and 0.718). Similarly, a significant positive correlation was observed between attitude and 5S behavior ($p < 0.05$, $r = 0.805$). Furthermore, both knowledge and attitude demonstrated significant positive correlations with 5S behavior when analyzed together ($p < 0.05$, $r = 0.536$ and $r = 0.832$, respectively). These findings suggest that higher levels of knowledge and positive attitudes are associated with improved 5S behaviors among learners.

Yuliyanti (2021) found a significant correlation between attitudes and COVID-19 preventive behavior toward elderly families in the Sukoharjo District. Wati *et al*. (2022) contrary found no correlation between knowledge and attitude and COVID-19 prevention behavior at the Pancasila Training House in Bengkulu City. Perceived control systems could foster and change learner behavior.

f. The Implementation of Learners' 5S Principle

The 5S principle reveals the success of a program by comparing the planned and actual outcomes and determining the relevance of the obtained results and the targeted outcomes (Wiwit *et al.*, 2020). The learners at both schools successfully implemented the 5S principle due to the existence of special team planning. This team planned the program and the evaluation process. The school's socialization efforts and collaboration with the industry became successful evidence of learners' knowledge level. The efforts and collaboration improved the implementation of industrial culture in schools based on the industrial culture growth in the business and industry sectors (Bunyamin *et al.*, 2022).

High knowledge and a positive attitude influenced the behavior of learners, leading to good results. A positive attitude facilitates learners to adapt to any living environment to realize successful careers (Ariwibowo *et al.*, 2020). Planning the facilities was also good with the provision of tools and materials, arrangement, SOP, inventory, maintenance, and so on. The implementation of the 5S support program included the construction of the security and safety signs, waste management, surveillance, and 5S training. However, the development of the green line at SMK Negeri Jateng Semarang was ongoing. SMK Negeri 2 Salatiga continued to seek support, particularly from the industry, for the learning process during practice. The researchers also conducted an evaluation, but it would be more beneficial if the school conducted a special 5S evaluation. To enhance the implementation of 5S in schools, SMK Negeri 2 Salatiga conducted an evaluation and received and found the solution by giving 5S recognition or award.

SMK Negeri 2 Salatiga encountered challenges in implementing the 5S principle due to their continued reliance on industry and 5S

funding, and limited numbers of technicians. SMK Negeri Jateng Semarang also encountered the same challenges. SMKN 2 Salatiga and SMK Negeri Jateng Semarang successfully implemented the 5S principle in learners, yielding relevant results with the planned outcomes. However, the results were not maximum.

CONCLUSION

The discussion and research findings lead to the following conclusion: 5S principle planning consists of the creation of dedicated teams; socialization planning; management of facilities, including storage facilities; administration of tools and practical materials; maintenance; and planning of support activities.

Learners demonstrated a high level of knowledge regarding 5S principles, and their attitudes towards 5S were positive. Similarly, 5S behaviors were observed at a satisfactory level. A positive and linear correlation was found between knowledge, attitude, and 5S behavior, indicating that increased knowledge and positive attitudes contribute to enhanced 5S practices. The successful implementation of 5S principles can contribute to effective planning at the school level.

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