Enhancing Industrial Work Culture through Vocational Training for Future Manufacturing Workers

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***Abstract* - Industrial work culture is a fundamental behavioral competency that directly influences safety, productivity, and continuous improvement in manufacturing. However, most vocational training programs still prioritize technical skills, often overlooking the systematic development of workplace behavior. This study examines the effectiveness of the Habituation of Industrial Culture Highly Intensive (HAICHI) training model in fostering work behavior of 5S (Sort, Set in Order, Shine, Standardize, Sustain), Occupational Safety and Health (OSH), and improving Kaizen behavior. This study used a quasi-experimental post-test-only control group design involving 36 students enrolled in a vocational bachelor's program in mechanical engineering, who were divided into experimental and control groups. Behavioral data were collected through structured observations during workshop practice and analyzed using descriptive statistics and multivariate analysis of variance (MANOVA). The results showed that students trained with HAICHI achieved significantly higher scores in all domains compared to students who attended regular project-based training. These findings highlight the value of behavior-focused training in improving vocational learning outcomes.**

The HAICHI model shows strong potential for integration into vocational curricula and new employee orientation to align education with industry demands. The HAICHI model offers strong potential for broader application in manufacturing-related training programs and can be systematically integrated into vocational curricula to promote workplace readiness and cultural alignment.

***Keywords* - Vocational training, industrial work culture, 5S, occupational safety and health, continuous improvement.**

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1. Introduction

Industrial work culture is a critical workforce competency that directly influences organizational performance in the manufacturing sector. Numerous studies have shown that strong organizational culture significantly contributes to innovation development [1], employee engagement [2], [3], and job satisfaction [4]. Therefore, fostering a productive work culture is not only a normative organizational goal but also a strategic imperative in enhancing human resource quality in industry.

While the importance of work culture is widely acknowledged, a key challenge remains in how to effectively cultivate it particularly among prospective industrial workers. Since organizational culture is shaped by shared values, beliefs, and perceptions supported by employees [5], these elements must be internalized early, preferably during pre-employment training. Training, as a structured effort to develop knowledge, skills, and behavior [6], plays a vital role in preparing individuals to adapt and contribute meaningfully in complex industrial settings.

In practice, however, most vocational education programs in Indonesia that implement work-integrated learning continue to focus predominantly on technical competence. Practical training often emphasizes production processes rather than the systematic development of workplace behavioral norms.

As a result, graduates frequently lack the industrial work culture required by employers, including values such as 5S, occupational safety and health (OSH), and Kaizen-based continuous improvement [7].

To address this gap, an intensive training model named HAICHI has been developed to strengthen vocational students' readiness to adapt to industrial work environments [8]. Unlike conventional training approaches, HAICHI emphasizes the structured habituation of essential workplace behaviors, providing hands-on exposure and reinforcement through guided practice.

Despite its conceptual promise, empirical evidence regarding the effectiveness of the HAICHI model remains limited. Therefore, this study aims to evaluate the impact of HAICHI training on improving behavioral outcomes related to 5S, occupational safety, and Kaizen among vocational mechanical engineering students. Employing a quasi-experimental design and multivariate analysis, this research seeks to contribute to the enhancement of vocational training practices that integrate both technical skill development and industrial work culture.

As a key novelty, the study introduces a structured habituation-based training framework designed to embed industrial values into early-stage workforce preparation. The results are expected to provide a practical foundation for integrating cultural competencies into vocational curricula and for shaping adaptive, industry-ready human resources.

2. Literature Review

A strong foundation of theoretical and empirical understanding is essential for designing an effective training model that integrates technical and cultural competencies. This section reviews key literature relevant to the development and implementation of a vocational training approach aimed at fostering industrial work culture. The discussion is structured into four main subtopics: the concept of HAICHI training as the core intervention model, the 5S culture widely practiced in manufacturing settings, OSH as a critical dimension of industrial behavior, and the philosophy of Kaizen as a driver of continuous improvement. Each of these elements serves as a behavioral pillar in the proposed training model and is elaborated below.

2.1. HAICHI Training

Training is widely recognized as a strategic approach to developing workforce competencies, encompassing both technical skills and behavioral attributes. It is typically defined as a planned and structured effort aimed at enhancing job-related knowledge, skills, and behaviors [6], [9].

In the Indonesian context, this role is legally mandated under Article 9 of Law Number 13 of 2003 concerning Manpower of the Republic of Indonesia, which emphasizes that training should equip workers with the competencies necessary to improve productivity, performance, and overall well-being [10]. Nevertheless, despite the conceptual clarity of this definition, most vocational training models continue to concentrate predominantly on cognitive and psychomotor domains, often overlooking the intentional cultivation of workplace culture.

A widely implemented model within Indonesian undergraduate-level vocational training programs is project-based learning (PjBL), which emphasizes product-oriented practical training facilitated through structured job sheets. In this study, this approach is referred to as the regular training model, as illustrated in Figure 1.

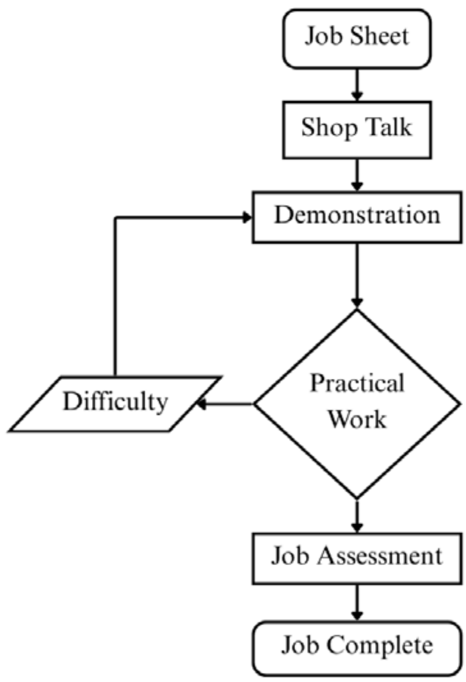

Figure 1. Regular training model based on project-based job sheets

The PjBL framework effectively supports the development of technical proficiency and transversal competencies such as collaboration, critical thinking, and problem solving [11], [12], [13]. However, from a behavioral perspective, this model presents notable limitations. Empirical evidence remains limited regarding the effectiveness of PjBL in cultivating critical industrial work habits such as 5S, OSH, and Kaizen-based continuous improvement.

This disparity between technical skills and cultural readiness highlights a significant shortcoming in current vocational education practices.

While graduates may exhibit high levels of technical competence, they often lack the behavioral discipline and workplace culture alignment expected in modern industrial environments. Addressing this gap requires the integration of a more deliberate and structured cultural training component into existing vocational models.

In response to this need, the HAICHI model was developed to supplement rather than replace PjBL. This model introduces a habituation-based training framework designed to embed industrial values through repeated, guided exposure to real workplace scenarios. The term "HAICHI" is derived from the Japanese word haichi, meaning "placement," which reflects the model's emphasis on aligning behavioral training with specific job functions and contexts [14].

HAICHI is applicable to both vocational students undertaking practical coursework and newly recruited industrial workers. Its structure includes theoretical reinforcement, workplace condition analysis, behavior-focused practice, and behavioral observation and assessment.

Through consistent application of industrial norms and routines, HAICHI facilitates the internalization of work culture values. In doing so, it represents a novel contribution to the field of work-integrated learning by advancing not only technical readiness but also behavioral adaptation. Considering its theoretical potential, empirical validation of HAICHI's effectiveness is crucial for determining its value and bridging the persistent gap between vocational education outcomes and industry expectations. The structure of the HAICHI training model is shown in Figure 2.

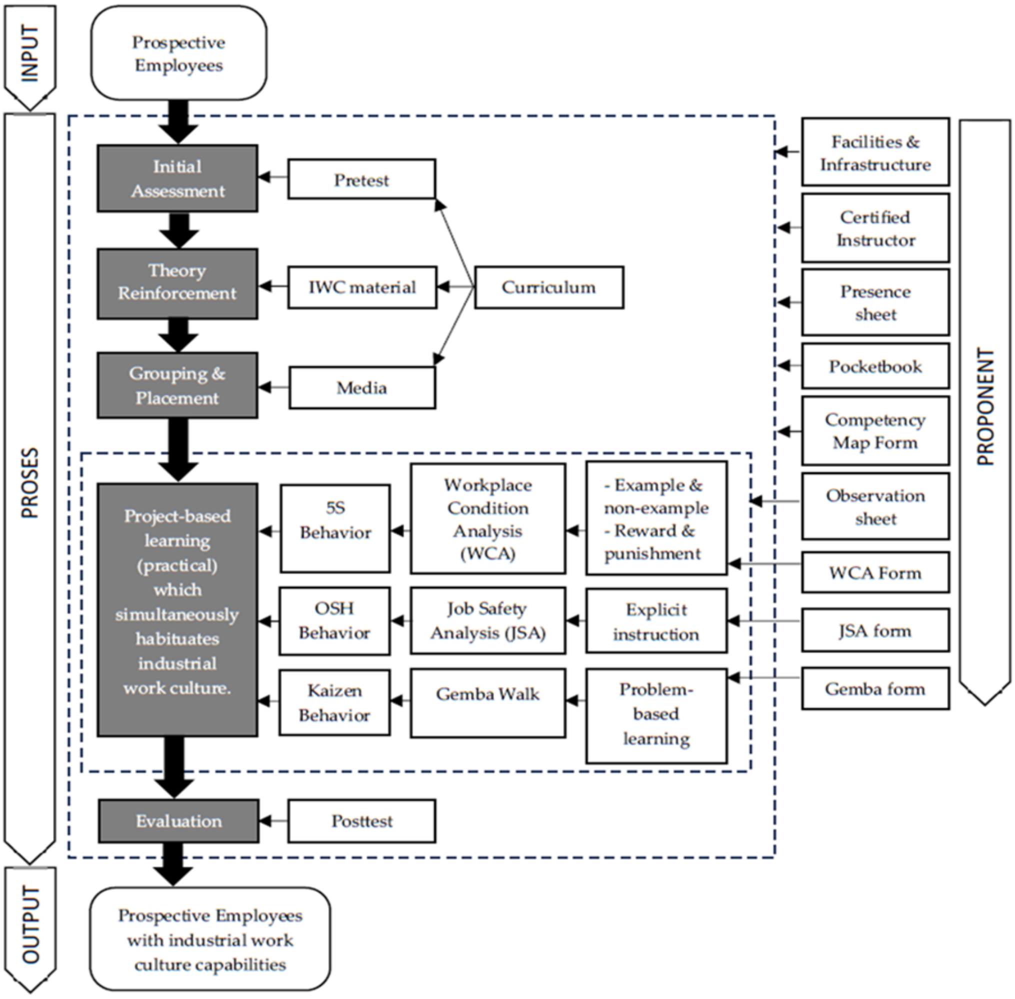

Figure 2. HAICHI training model with structured behavioral habituation stages

2.2. 5S Culture in Manufacturing Industry

The 5S system originating from Japan and comprising Sort (Seiri), Set in Order (Seiton), Shine (Seiso), Standardize (Seiketsu), and Sustain (Shitsuke) has long been regarded as a foundational element of workplace organization and industrial discipline.

As both a practical tool and a cultural framework, 5S is extensively applied in the manufacturing sector and is widely considered the backbone of broader productivity methodologies such as Kaizen and Lean Manufacturing [15].

By fostering cleanliness, orderliness, and consistency in work environments, the 5S approach aims to improve four critical performance domains operational efficiency, productivity, product quality, and workplace safety [16], [17].

Despite its extensive adoption across industries, the implementation of 5S remains fraught with challenges. Empirical studies have reported that efforts to institutionalize 5S often fall short due to limited awareness, inadequate training, and weak engagement between management and employees [18], [19]. This indicates a persistent gap between the conceptual ideals of 5S and its actual application on the shop floor. Many workers tend to perceive 5S merely as a routine cleaning activity, rather than a structured behavioral system that supports production outcomes. Such misinterpretations frequently arise from ineffective onboarding strategies and the absence of ongoing behavioral reinforcement mechanisms.

Further research underscores that successful 5S implementation extends beyond procedural compliance and requires deep behavioral habituation. Employees must acquire the capacity to critically assess their working environment, eliminate non-value-adding elements, and sustain adherence to workplace standards over time [20]. While tools such as workplace condition analysis (WCA), 5S audit checklists, and diagnostic scoring instruments [21], [22], [23] are commonly employed, these tools alone are insufficient without a supportive culture that emphasizes continuous practice, self-discipline, and accountability.

Importantly, the literature highlights training and education as among the most significant enablers for embedding 5S in industrial contexts [24]. When training is absent or poorly structured, workers often lack a clear understanding of the strategic value of 5S, resulting in superficial or unsustainable implementation [25]. However, current vocational training frameworks tend to focus narrowly on technical proficiency and fail to integrate behavioral development in a systematic manner especially in the early stages of industrial exposure.

This study responds to that limitation by positioning 5S as a central behavioral outcome within the HAICHI training model, an intensive habituation-based framework for cultivating industrial work culture. Unlike traditional training approaches that isolate 5S as a standalone module, HAICHI embeds 5S principles directly into daily workshop activities through structured observation, consistent reinforcement, and reflective practice. In doing so, it reframes 5S not merely as a procedure to be followed, but as a set of behaviors to be learned, internalized, and sustained.

Based on this conceptual foundation, the present research hypothesizes that there is a statistically significant difference in 5S behavioral outcomes between trainees exposed to the HAICHI model and those who undergo conventional PjBL. By validating this hypothesis, the study aims to address the ongoing gap between theory and practice and to advance a pedagogical model that integrates cultural readiness into the fabric of vocational training.

2.3. *Occupational Safety & Health (OSH) Culture in Manufacturing Industry*

OSH is not merely a regulatory requirement, but a core component of industrial work culture that significantly impacts employee well-being, organizational productivity, and operational sustainability. In the manufacturing sector where employees routinely face physical hazards, complex machinery, and intense production demands cultivating OSH-oriented behavior is not only necessary, but essential. A workplace that prioritizes safety and health fosters not only accident prevention but also contributes to long-term resilience and employee satisfaction [26], [27].

Despite the presence of formal safety management systems in many industrial settings, workplace accidents remain prevalent. Research has identified that such incidents often result from human error, insufficient hazard awareness, and a lack of consistent safety behavior [28]. These deficiencies are frequently linked to inadequate training, reactive safety practices, and the absence of a deeply rooted safety culture. In response, the concept of behavior-based safety has emerged as a proactive, process-oriented approach. Rather than focusing solely on regulatory compliance or checklists, Behaviour Based Safety (BBS) promotes the internalization of safe practices through behavioral observation, feedback, and reinforcement mechanisms [29], [30], [31].

At the heart of BBS is the principle that safety must evolve into a shared organizational value practiced consistently by all personnel, rather than imposed solely by supervisors. This transition from procedural compliance to cultural commitment requires a transformative educational approach, emphasizing continuous improvement, individual awareness, and collective responsibility. Job Safety Assessments (JSA) are widely recognized as an effective tool to operationalize this approach, encouraging workers to identify potential hazards before performing tasks and to implement appropriate control measures [32]. In line with study [33], such practices support the development of observable and measurable safety behaviors, embedding safety as a normalized aspect of daily work.

However, a critical gap remains in the delivery of safety training particularly within vocational education and early workforce development. While technical skills are commonly emphasized in training curricula, the behavioral dimension of safety is often overlooked or delivered in a fragmented and episodic manner. In many cases, OSH is addressed as a one-time compliance module rather than cultivated as a sustained behavioral discipline. Consequently, newly graduated workers frequently enter industrial environments without having internalized safety as a habitual and embedded practice.

To address this pedagogical shortcoming, the HAICHI training model introduces a habituation-based framework that integrates OSH as a core behavioral competency within vocational preparation. In contrast to conventional approaches that rely on passive instruction, HAICHI emphasizes immersive, repetitive practice, guided by explicit instruction and sustained feedback. Trainees are not only exposed to the theoretical underpinnings of OSH, but also engage in contextual application of safety procedures, including regular use of JSA, real-time hazard recognition, and performance monitoring in simulated or real workshop conditions.

In this study, OSH is conceptualized not as a static skillset, but as a dynamic behavior that must be developed, reinforced, and internalized over time. It is hypothesized that participants trained using the HAICHI model will demonstrate significantly higher levels of OSH behavior compared to those receiving conventional project-based training. By embedding safety culture into the structure of vocational habituation, the HAICHI model seeks to address both pedagogical and operational gaps in current safety education and contribute to the formation of a safety culture that is both visible and sustainable.

2.4. Kaizen Culture in Manufacturing Industry

Kaizen derived from the Japanese terms kai (change) and zen (good), represents a philosophy of continuous improvement that is central to achieving operational excellence in modern manufacturing. This approach promotes key values such as “do it right the first time,” “zero defects,” and “zero discrepancies,” all of which aim to enhance long-term quality, efficiency, and adaptability. Unlike short-term interventions, Kaizen emphasizes incremental and sustained improvements that are driven collectively by all members of the organization [34], [35], [36]. As such, it has become one of the foundational strategies for achieving competitiveness and excellence in industrial settings [35], [36], [37].

The implementation of Kaizen in practice involves iterative cycles of evaluation, refinement, and reinforcement, typically applied across domains such as quality assurance, cost efficiency, error prevention, and customer satisfaction. Among the tools associated with Kaizen, Gemba Walks where supervisors and employees observe work processes directly on the production floor are widely recognized for their ability to surface operational inefficiencies and stimulate bottom-up feedback [38], [39], [40]. However, despite the availability of such instruments, the success of Kaizen initiatives depends not solely on systems or tools, but critically on the human factors that sustain them.

A growing body of research has identified learning and training as key enablers for embedding Kaizen as a cultural norm [41], [42], [43], [44]. Conversely, the failure of many continuous improvement programs is frequently attributed to human resource challenges, such as insufficient staff development, lack of leadership support, and resistance to change [45]. Behavioral constraints such as employees’ reluctance to take initiative, skepticism toward innovation, and the perception that improvement efforts are burdensome often undermine the long-term institutionalization of Kaizen principles.

This highlights a critical gap between the theoretical ideals of Kaizen and its practical realization in industrial contexts, particularly among novice or newly trained workers. While the literature strongly affirms the strategic importance of Kaizen, there remains limited empirical investigation into how Kaizen-oriented behaviors can be systematically developed during the early stages of workforce preparation. Most vocational training programs continue to focus primarily on technical skills, with limited emphasis on fostering the mindset, discipline, and behavioral habits essential to support continuous improvement.

To address this gap, the HAICHI training model introduces a behaviorally focused, habituation-based framework that embeds Kaizen principles into everyday training routines. Rather than treating Kaizen as a standalone or theoretical topic, HAICHI integrates continuous improvement behaviors directly into workshop activities through structured reflection, peer evaluation, and guided facilitation. Trainees are routinely encouraged to identify inefficiencies, explore alternative solutions, and implement process enhancements as part of their learning experience. This pedagogical approach aligns closely with real-world Kaizen applications while also promoting intrinsic motivation and collaborative problem-solving capabilities.

Based on this conceptual rationale, the present study hypothesizes that participants trained under the HAICHI model will exhibit significantly stronger Kaizen-related behavioral outcomes compared to those engaged in conventional PjBL. By treating Kaizen not only as a philosophy but as a habit to be formed and reinforced, the HAICHI model aims to fill a critical pedagogical void in vocational education and to provide the behavioral foundation necessary for sustainable improvement in industrial practice.

3. Methodology

To evaluate the effectiveness of the HAICHI training model in fostering industrial work culture, this study adopted a structured methodological framework encompassing research design, data collection, instrument validation, and data analysis. The approach was designed to ensure methodological rigor and to accurately capture observable behavioral changes associated with 5S, OSH, and Kaizen practices. Each component of the methodology is described in detail in the following subsections.

3.1. Research Design

This research employed a summative evaluation strategy within a quasi-experimental framework, using a post-test-only control group design to assess the impact of the HAICHI model after its developmental refinement. The design is illustrated in Figure 3.

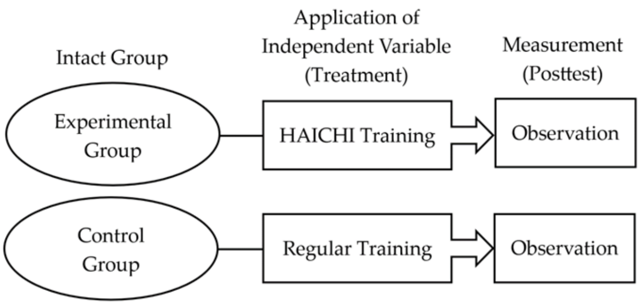

Figure 3. Non-equivalent control group post-test-only design

The study was conducted during the "Advanced Machining Practice" course in the Machining Workshop of the Department of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University. The experimental period spanned five months, from September 26, 2022, to February 4, 2023.

Participants consisted of third-semester students enrolled in the Diploma IV Mechanical Engineering program. Two intact classes were designated as the experimental group and the control group, with each class comprising 18 students.

Due to administrative constraints and the structure of vocational class assignments, random allocation at the individual level was not feasible. Nonetheless, the equivalency of the two groups was examined based on baseline characteristics such as age, gender, and prior academic performance to reduce potential bias. The use of intact classes for comparison is a standard practice in educational research where randomization is constrained by institutional scheduling and policy.

3.2. Data Collection

The independent variable in this study was the type of training model administered either the HAICHI model or a conventional PjBL approach. The dependent variables comprised student behavior scores across three key domains 5S, OSH, and Kaizen. To ensure uniform exposure, both groups received equal instructional time, used identical equipment, and followed job sheets of comparable complexity.

Behavioral data was obtained through direct observation during workshop sessions. A structured observation of rubric and domain-specific checklists were developed to record relevant indicators. For example, 5S behavior was measured through aspects such as workspace arrangement and tool organization. OSH behavior was evaluated based on compliance with safety protocols and proper use of personal protective equipment, while Kaizen behavior was assessed through indicators such as continuous process improvement and active participation in idea-sharing activities.

3.3. Instrument Validity and Ethical Consideration

Prior to data collection, all observation instruments were subjected to both content and construct validation. Content validity was established through expert review by three vocational education specialists and two industry practitioners to ensure relevance and clarity. Construct validity was supported by aligning the instruments with theoretical frameworks for industrial behavior. Additionally, a pilot test involving 10 students from a different cohort was conducted to assess inter-rater reliability. The resulting Cohen's Kappa coefficients ranged from 0.78 to 0.85 across the three behavioral domains, indicating substantial agreement and strong reliability.

The researcher did not use ethical consideration from the Research Ethics Committee of Yogyakarta State University, because in Indonesia it is not yet mandatory to use ethical consideration. However, all participants were transparently informed by the researcher about the purpose of the study, the procedures, and their rights, and provided written informed consent.

Participation was voluntary, data confidentiality was guaranteed through anonymization, and no incentives or penalties were applied based on performance or participation.

3.4. Data Analysis

Data analysis employed a combination of descriptive and inferential statistical methods. Descriptive statistics including mean, median, mode, standard deviation, and range were used to summarize participant performance across the three behavioral domains. To ensure the appropriateness of inferential tests, the assumptions of normality and homogeneity of variance were first examined using the Kolmogorov–Smirnov test and Levene's test, respectively.

To determine the overall effect of the training model on the behavioral outcomes, a multivariate analysis of variance (MANOVA) was conducted. MANOVA was selected as it allowed simultaneous comparison of multiple dependent variables while accounting for potential intercorrelations among them. All statistical analyses were conducted using SPSS version 26 or equivalent software.

4. Results

The research was conducted in the Advanced Machining Practice course at the Department of Mechanical Engineering Education, Faculty of Engineering, UNY. The experimental class and the control class worked on seven job sheets consisting of making (1) Cubes, (2) Parallel strips, (3) Hexagon nuts, (4) Spoor gears, (5) Bevel gears, (6) Straight rack, and (7) Helix gear. Practical activities for the experimental class involved applying HAICHI model so that 5S, OSH, and Kaizen behavior were observed. The control class for practicum implementation focused on implementing regular learning strategies (Regular Model) that contain introductions and briefings, work on job sheets, and assessment of practical results. The observation process is guided by a rubric and recorded on the observation sheet.

Practicum facilities are (1) Eight lathes, (2) Two vertical milling machines, (3) Three horizontal milling machines, (4) Four sets of measuring instruments, (5) Three dividing heads, and (5) Five milling vises.

The research tests whether there are differences in 5S behavior, OSH behavior, and Kaizen behavior scores for students trained with the HAICHI Model, and for students trained with the Regular Model. Vocational education is a type of education that prepares graduates to enter the world of business and industry in the field of expertise they are studying. This college is the last place of formal education before someone enters the world of business and industry. The industrial work culture studied includes 5S, OSH, and Kaizen behaviors. These three industrial work cultures are believed to be very important so that someone can work effectively, efficiently, productively, safely, and sustainably. Therefore, these three industrial work cultures have a central role in supporting the productivity of an industry. Based on the experimental results of applying the HAICHI model to vocational students, the average score data for 5S, OSH, and Kaizen behavior were obtained for both the experimental and control classes. The mean scores of 5S, OSH, and Kaizen behavior for the experimental class were 3.50, 3.48, and 3.49. 5S behavior gets the highest score, followed by Kaizen and, finally, OSH. While the mean scores of 5S, OSH, and Kaizen behavior in the control class were 2.52, 2.49, and 2.56. OSH gets the highest score, followed by Kaizen and 5S. The high or low score reflects the level or weight of the research subjects' 5S, OSH, and Kaizen behavior. With a maximum score of 4, the greater the score, the better vocational students' 5S, OSH, and Kaizen behavior in practical courses. In general, it is known that the 5S, OSH, and Kaizen behavior in the experimental class are better than the control class. It falls under the hypothesis proposed in this study. However, to be sure of the research data, it is necessary to carry out descriptive statistical tests. Quantitative Descriptive statistics from the 5S, OSH, and Kaizen behavior scores for the experimental and control classes were obtained through calculations with the help of IBM SPSS Statistics 25 software. Data description can be seen in Table 1.

Table 1. Quantitative descriptive statistics of the 5S, OSH, and Kaizen behavior

Measure		5S of Exp. Class	OSH of Exp. Class	Kaizen of Exp. Class	5S of Cont. Class	OSH of Cont. Class	Kaizen of Cont. Class
N	Valid	18	18	18	18	18	18
	Missing	0	0	0	0	0	0
Mean		3.5000	3.4750	3.4900	2.5200	2.5933	2.5622
Median		3.4800	3.4400	3.4700	2.5200	2.5650	2.5900
Mode		3.40[a]	3.38	3.41	2.60[a]	2.38[a]	2.53[a]
Std. Deviation		.11581	.18395	.12518	.18098	.28092	.21988
Minimum		3.32	3.13	3.29	2.28	2.25	2.18
Maximum		3.72	3.75	3.71	2.76	3.13	2.94

a. Multiple modes exist. The smallest value is shown.

Multivariate normality assumptions need to be checked before applying MANOVA. There are several methods available to check multivariate normality, one of which is visual inspection of the mahalanobis distance value for each observation of the expected chi square quantile. The multivariate normality test in this study was carried out by plotting the mahalanobis distance obtained on the chi squared distribution quantiles with two degrees of freedom.

The data multivariate normality test was carried out with the help of the SPSS application. The plot in Figure 4 suggests the data is close to multivariate normal, since the squared mahalanobis distance closely follows the chi squared distribution of the same degree of freedom, with 3 attributes.

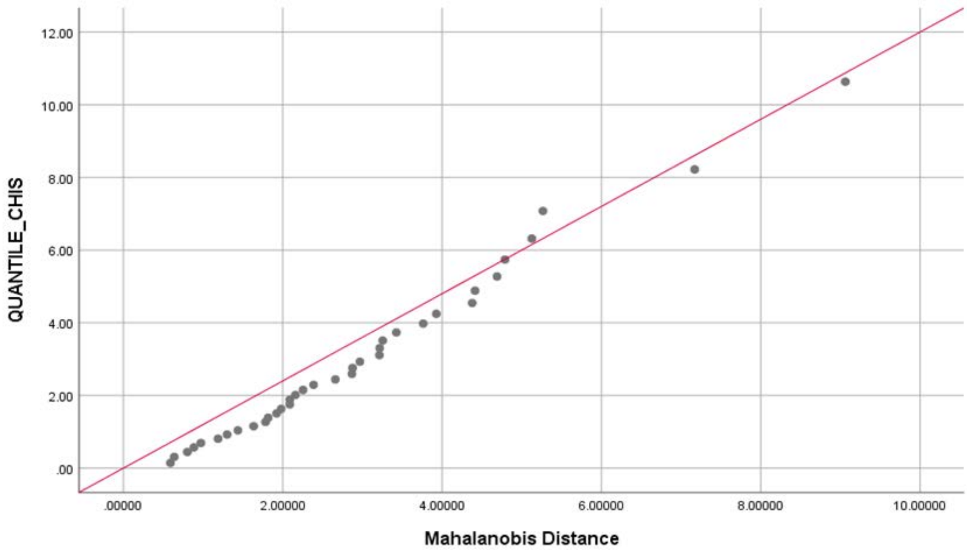

Figure 4. Plot of mahalanobis distance vs chi square quantile

MANOVA requires that the covariance matrix of the dependent variables to be the same. The homogeneity test of the covariance matrix can be seen from the results of the Box's M test with the help of SPSS as seen in Table 2.

Table 2. Box's test of equality of covariance matrices[a]

Measure	Output
Box's M	12.446
F	1.875
df1	6
df2	8375.547
Sig.	0.081
Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.	

a. Design: Intercept + TM

The results of the homogeneity test with Box's Test of Equality of Covariance Matrices show that the significance value (Sig.) is 0.081 > 0.05, so it can be concluded that the observed covariance matrix of the dependent variable is the same in all groups.

The multivariate normality test showed that the data was normally distributed, and the homogeneity test showed that the dependent variable covariance matrix was the same. Therefore, hypothesis testing can be carried out using MANOVA which aims to test whether there are differences between several dependent variables and several different groups. This study tested the differences in 5S behavior, OSH behavior, and Kaizen behavior scores for students trained with the HAICHI Model, and for students trained with the Regular Model.

The decision was taken using the analysis of Pillai's Trace, Wilk Lambda, Hotelling Trace, Roy's Largest Root.

The results of the analysis can be seen in Table 3.

Table 3. Multivariate tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.999	9621.502[b]	3.000	32.000	.000	.999
	Wilks' Lambda	.001	9621.502[b]	3.000	32.000	.000	.999
	Hotelling's Trace	902.016	9621.502[b]	3.000	32.000	.000	.999
	Roy's Largest Root	902.016	9621.502[b]	3.000	32.000	.000	.999
Training Model (TM)	Pillai's Trace	.957	235.812[b]	3.000	32.000	.000	.957
	Wilks' Lambda	.043	235.812[b]	3.000	32.000	.000	.957
	Hotelling's Trace	22.107	235.812[b]	3.000	32.000	.000	.957
	Roy's Largest Root	22.107	235.812[b]	3.000	32.000	.000	.957

a. Design: Intercept + TM.
b. Exact statistics.

The analysis results showed that the F value of Pillai's Trace, Wilk Lambda, Hotelling Trace, and Roy's Largest Root had a significance that was smaller than 0.05. This means that the F prices for Pillae Trace, Wilk Lambda, Hotelling Trace, and Roy's Largest Root are all significant. Thus, there are differences in scores for 5S behavior, OSH behavior, and Kaizen behavior for students trained with the HAICHI Model, and for students trained with the Regular Model simultaneously.

Furthermore, the inter-subject effect test, which is listed in Table 4, shows that:

1) The relationship between the application of the HAICHI model (x) and 5S behavior (y1) gives an F value of 374,468 with a significance of 0.000 < 0.05, which means there is a significant difference in 5S behavior, caused by differences in training models.

2) The relationship between the HAICHI Model (x) and the OSH behavior score (y2) gives an F value of 124.092 with a significance of 0.000 < 0.05, which means there are differences in OSH behavior caused by different training models.

3) The relationship between the HAICHI Model (x) and the Kaizen behavior score (y3) gives an F value of 242.023 with a significance of 0.000 < 0.05, which means there are differences in Kaizen behavior caused by differences in training models.

Table 4. Tests of the effects of between subjects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	5S Behavior	8.644[a]	1	8.644	374.468	.000	.917
	OSH Behavior	6.996[b]	1	6.996	124.092	.000	.785
	Kaizen Behavior	7.747[c]	1	7.747	242.023	.000	.877
Intercept	5S Behavior	326.164	1	326.164	14130.431	.000	.998
	OSH Behavior	331.422	1	331.422	5878.576	.000	.994
	Kaizen Behavior	329.665	1	329.665	10299.072	.000	.997
TM	5S Behavior	8.644	1	8.644	374.468	.000	.917
	OSH Behavior	6.996	1	6.996	124.092	.000	.785
	Kaizen Behavior	7.747	1	7.747	242.023	.000	.877
Error	5S Behavior	.785	34	.023			
	OSH Behavior	1.917	34	.056			
	Kaizen Behavior	1.088	34	.032			
Total	5S Behavior	335.592	36				
	OSH Behavior	340.335	36				
	Kaizen Behavior	338.500	36				
Corrected Total	5S Behavior	9.428	35				
	OSH Behavior	8.913	35				
	Kaizen Behavior	8.835	35				

a. R Squared = ,917 (Adjusted R Squared = ,914).
b. R Squared = ,785 (Adjusted R Squared = ,779).
c. R Squared = ,877 (Adjusted R Squared = ,873).

The results of descriptive analysis and hypothesis testing show that in general there is a statistically significant and positive effect of implementing the training model on increasing work culture scores (5S, K3, and Kaizen). Therefore, it can be determined that the HAICHI model has proven to be effective because it produces a better average work culture score (5S, OSH, and Kaizen) than the regular mode.

5. Discussion

This study demonstrated that students who participated in the HAICHI training model exhibited significantly higher levels of 5S, OSH, and Kaizen-related behaviors compared to those in the control group. The experimental group recorded mean scores of 3.50 (5S), 3.48 (OSH), and 3.49 (Kaizen), whereas the control group scored 2.52, 2.49, and 2.56 respectively. These results confirm the statistical effectiveness of the HAICHI model, as validated through MANOVA analysis. The multivariate normality and homogeneity tests met the required assumptions, justifying the use of MANOVA to assess the combined effect of the intervention on multiple behavioral domains. A histogram of the score differences is presented in Figure 5.

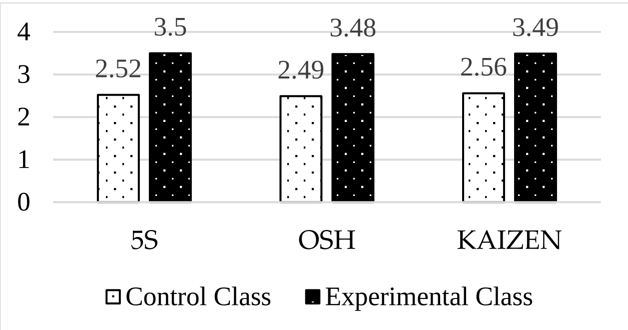

Figure 5. Histogram of differences in mean scores of 5S, OSH, and Kaizen between experimental group and control group

The superior outcomes of the HAICHI group can be attributed to the behavioral habituation embedded in the training structure. In the domain of 5S, improvements were shaped through exposure to “examples and non-examples” of ideal workplace conditions, leading students to perform structured workplace condition analysis (WCA). This formative process helped students internalize key 5S practices sort, set in order, and shine before transitioning to the application and standardization stages. Rewards and sanctions were also used as behavioral reinforcers: top-performing students received public recognition, while those with lower scores received constructive feedback and accountability labels.

This aligns with study with conclusion habit formation framework trigger–routine–reward, which emphasizes consistent reinforcement in behavioral development [46].

In support of OSH behavior, the HAICHI model employed explicit instruction and orienting reflex (OR) techniques to train students in hazard awareness and proactive safety practices. Students engaged in repeated JSA to assess potential risks and implement control measures collaboratively. This hands-on, repetitive exposure contributed to the formation of behavioral safety, consistent with the findings of [47], [48], who asserted that proactive safety behavior develops when training fosters repeated, self-guided identification of hazards within real-world contexts.

Kaizen behavior was cultivated through a problem-based learning (PBL) approach that tasked students with identifying inefficiencies during machining practices and proposing solutions aligned with Gemba Walk principles. Through cycles of investigation, discussion, and documentation, students improved processing times and product quality. These outcomes reinforce findings by [40], [49], [50], who concluded that PBL and Gemba-based Kaizen practices enhance analytical thinking and accountability in manufacturing processes. Furthermore, Kaizen reports detailing problems, root cause analysis, and outcomes demonstrated students’ capacity to translate continuous improvement into actionable behaviors.

Taken together, these processes reflect HAICHI’s alignment with behaviorally grounded models of learning and change. Unlike conventional approaches, HAICHI embeds industrial work culture into the cognitive, affective, and behavioral domains through structured routines and reinforcement. By integrating habit-formation theory into vocational education, the model ensures that 5S, OSH, and Kaizen become internalized as professional norms rather than isolated knowledge.

Despite its promising results, the study is not without limitations. First, the relatively small sample size (n = 36) restricts the generalizability of findings. Future studies with larger, more diverse populations across multiple institutions are recommended. Second, the research focused only on short-term behavioral changes during training. Longitudinal studies are needed to assess whether these habits persist in real industrial settings post-graduation. Third, the study did not explicitly measure related soft skills such as teamwork, communication, or initiative which may also be influenced by the HAICHI model.

Finally, since the study was conducted in a single cultural and institutional context, comparative research in other countries is required to evaluate the model's cross-context applicability.

Nevertheless, the findings affirm the value of behaviorally intensive training models in vocational education. By embedding 5S, OSH, and Kaizen into the practical routines of workshop learning, the HAICHI model contributes a structured, evidence-based approach to habituating industrial work culture in future workforce development.

6. Conclusion

The study concludes that the HAICHI training model is significantly effective in enhancing industrial work culture behaviors specifically 5S, OSH, and Kaizen among vocational mechanical engineering students. Compared to conventional project-based training, HAICHI facilitates a deeper internalization of workplace norms through behaviorally grounded strategies such as repetition, structured reflection, and instructor-guided practice. The improvements observed across all three behavioral domains underscore the model's practical relevance in aligning vocational education with the expectations of modern manufacturing environments.

From an applied perspective, the HAICHI model offers a complementary approach to existing training methodologies by embedding behavioral competencies within technical instruction. It is particularly beneficial for novice vocational learners and newly recruited workers who are expected to adapt quickly to disciplined industrial systems. Therefore, systematic integration of HAICHI into vocational curricula especially within work-integrated learning schemes is recommended. Its institutionalization in workforce development programs could also strengthen industry-readiness and cultural alignment.

However, this study is subject to certain limitations. The relatively small sample size and single-institution setting may limit the generalizability of the results. Additionally, the study focused solely on short-term behavioral outcomes, without assessing the long-term retention or transferability of these behaviors to actual workplace contexts. Future research should involve larger, more diverse samples across multiple institutions, along with longitudinal tracking to evaluate sustained impacts. Further investigation is also warranted to examine the influence of the HAICHI model on other relevant soft skills, such as communication, initiative, and leadership, as well as its adaptability in different industrial and cultural settings.

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