Proceedings of the International Conference on Industrial Engineering and Operations Management

Publisher: IEOM Society International, USA DOI: 10.46254/AF07.20260224
Published: May 13, 2026

Determining Factors that Can Significantly Affect the Achievement of Student Outcomes in the University of Santo Tomas Engineering Student Internship Program

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Abstract

On-The-Job Training (OJT) programs exposed engineering students to real-world industries related to their specific disciplines, providing opportunities to develop skills crucial to their future work as engineers. Thus, the researchers employed a purposive sampling technique, selecting 195 fourth-year undergraduate students from various departments of the Faculty of Engineering at the University of Santo Tomas. The researchers aimed to assess the overall effectiveness of the on-the-job training by analyzing student feedback, identifying successes and challenges, and determining areas for improvement to enhance its quality and impact. A structured questionnaire was distributed via Google Forms, which asked students to rate their satisfaction with the program and share insights on expected student outcomes, including improvements in technical competence, communication skills, ethical and professional responsibilities, teamwork skills, and lifelong learning skills. The researchers then analyzed the factors based on the results, determined whether the student outcomes were achieved, and, along with the students' recommendations and suggestions, provided recommendations and suggestions. The findings of this study helped identify possible ways to improve the On-The-Job Training.

Keywords
On-the-Job Training (OJT), Student Outcomes

1. Introduction
Higher educational institutions, such as the University of Santo Tomas, integrate Industry On-the-Job Training (OJT) into their curricula to promote holistic education. This program serves as a vital component of academic development by enhancing employability, providing real-world exposure, and facilitating hands-on learning in collaboration with industry partners (Karunaratne and Perera 2020) and (Jogan 2021). OJT also develops essential soft skills such as communication, teamwork, adaptability, and problem-solving, which are critical in today's competitive job market. By bridging theoretical knowledge and practical application, it equips students with industry-relevant competencies and facilitates a smoother transition to professional practice (Hebron 2020).

Moreover, OJT fosters lifelong learning, ethical awareness, and a deeper understanding of engineering challenges. This study aimed to assess the effectiveness of OJT programs by collecting feedback from participating students, focusing on both strengths and areas for improvement. Key competencies evaluated included technical skills, defined

as the ability to perform tasks accurately and efficiently (Calabit and Paglinawan 2024), as well as problem-solving using engineering, science, and mathematical principles.

Communication skills were also examined, as they are essential for conveying ideas effectively to diverse audiences (Kamaruzaman 2020). In addition, the study assessed leadership and teamwork, recognizing OJT performance as a predictor of leadership and people management capabilities (Maor et al. 2024; Pascua et al. 2022). The research further evaluated students' engagement in continuous learning and their understanding of advanced engineering concepts, alongside factors such as career preparedness, adaptability, supervisor effectiveness, and overall OJT quality.

This study intended to examine the perceived effectiveness of the OJT Program of the University of Santo Tomas through the experiences of engineering student interns. Furthermore, it aimed to evaluate the program based on students' technical competencies, professional readiness, adaptability to industry, and contributions to the continuous improvement of engineering education and internship experiences. The outcomes of this study provided the UST Faculty of Engineering with insights into the program's strengths and weaknesses, prompting curriculum enhancements to ensure that training remains relevant to industry demands. Additionally, recommendations were proposed to strengthen engagement with companies and improve internship placements and mentorship.

While students and engineering faculty recognized the significance of this study, its benefits extended beyond educational institutions to include industry stakeholders and policymakers. Engineering students gained a better understanding of how theoretical knowledge is applied in practice, enhancing their readiness for professional challenges. Feedback was also provided to industry partners regarding potential improvements to their internship programs, contributing to student development and strengthening academe–industry collaboration. Policymakers and education advocates may also use the findings to inform policies that enhance experiential learning in engineering programs. Finally, the results serve as a reference for future studies on the effectiveness of internship programs in developing competencies and strengthening the link between industry and academia, thereby closing the gap between academic training and industry needs.

1.1 Objectives

General Objectives

1. To determine the effectiveness of the On-The-Job Training (OJT) by identifying whether students achieved the intended skills during their On-The-Job Training (OJT)
2. To determine and analyze the influence of program design, advisory support, and learning environment factors affecting the student outcomes among interns.

Specific Objectives

1. To evaluate the effectiveness of students' technical competence, including their ability to identify, formulate, and solve complex engineering problems by applying engineering, science, and mathematics principles after the On-The-Job Training (OJT).
2. To evaluate the effectiveness of students' communication skills, including their ability to effectively communicate with various audiences after the On-The-Job Training (OJT).
3. To evaluate the effectiveness of students' ethical and professional responsibilities, including their ability to make informed judgments considering global, economic, environmental, and societal impacts after the On-The-Job Training (OJT).
4. To evaluate the effectiveness of students' teamwork skills, including their ability to work effectively in teams, provide leadership, establish goals, and contribute to a collaborative and inclusive work environment after the On-The-Job Training (OJT).
5. To evaluate the effectiveness of students' lifelong learning skills, including their ability to acquire and apply new knowledge using appropriate learning strategies after the On-The-Job Training (OJT).
6. To determine whether program design factors (i.e., training manual, internship evaluation system, and structured task assignment) impact student outcomes (i.e., technical competence, communication, ethical and professional responsibilities, teamwork, and lifelong learning)
7. To determine whether advisory support factor (adviser monitoring and consultation) impacts student outcomes (i.e., technical competence, communication, ethical and professional responsibilities, teamwork, and lifelong learning)

8. To determine whether learning environment factors (i.e., collaborative environment and values-based learning) impact student outcomes (i.e., technical competence, communication, ethical and professional responsibilities, teamwork, and lifelong learning).

2. Literature Review

Internship or On-the-Job Training (OJT) programs are a critical bridge between academic learning and professional practice. A review of relevant literature across various industries, both international and local, reveals a shared emphasis on the value of internships in equipping students with technical and interpersonal competencies. Despite differences in context, the studies underscore several recurring themes: the essential role of soft skills, the disconnect between academic theory and industry practice, the significance of program structure and assessment, and the importance of robust collaboration between universities and industry partners.

One of the most consistent findings across disciplines and regions is the increasing importance of soft skills. Research from Brazil (de Campos et al. 2020), the United States (Zer and Korte 2020), and Portugal (Nogueira et al. 2021), among others, highlights the necessity of competencies such as communication, teamwork, leadership, emotional intelligence, and problem-solving. These are viewed not only as complementary to technical expertise but often as decisive factors in employability and workplace success. However, many students report that these skills are not sufficiently developed within traditional academic curricula, underscoring a gap that internship programs are uniquely positioned to fill.

Another prominent concern is the misalignment between theoretical instruction and practical application. Engineering students, in particular, often encounter challenges when applying classroom knowledge to real-world scenarios. Studies from Ethiopia (Gashaw 2018), Hong Kong (Luk and Chan 2021), and the U.S. (Zer and Korte 2020) emphasize the need for curricula that are more responsive to industry demands. In some cases, initiatives such as faculty immersion in industry environments, such as the "Engineering with Engineers" program at Seattle University (Han et al. 2020), demonstrate promising strategies for reducing this theory-practice gap.

Moreover, the structure and implementation of internship programs significantly influence their effectiveness. Factors such as duration, supervision quality, financial support, and student engagement vary widely across programs and directly impact learning outcomes. For instance, students in Bhutan (Wangchuk 2023) and Ethiopia expressed the need for longer internship periods and better stipends, while those in Malaysia and Sri Lanka (Karunaratne and Perera 2019) and (Kowang et al. 2022) emphasized the importance of feedback, creativity-oriented tasks, and post-internship reflection sessions.

A common shortcoming identified across studies is the inadequacy of current assessment mechanisms. Standardized rubrics and single-measure evaluation tools often fail to capture the multifaceted learning that occurs during internships. To address this, Kowang et al. (2022) proposed a multiple-measures methodology to evaluate internship effectiveness across personal, interpersonal, and professional domains. This approach not only broadens the scope of assessment but also encourages continuous program improvement and may serve as a model for future social science and management research.

Another vital theme is the necessity of collaboration between academic institutions and industry stakeholders. Effective internship programs are those that are signed and regularly reviewed with input from both educators and employers. Karunaratne and Perera (2019) and Patacsil et al. (2017), among other studies from international and local settings, argue for deeper engagement between universities and industry to align educational objectives with workforce expectations.

Local studies within the Philippines mirror many of these global findings. Research from institutions such as the University of St. Louis (Abana 2020), Lyceum of the Philippines University (Laguador et al. 2020), and Pangasinan State University (Patacsil et al. 2017) confirms that internship programs generally contribute positively to students' personal and professional development. Nonetheless, areas requiring enhancement, such as technical skill acquisition, experiential learning quality, and mentorship consistency, remain evident.

In conclusion, the literature presents a compelling case for the ongoing refinement of internship and OJT programs. While students benefit significantly from these experiences, there is a clear need for more responsive, inclusive, and evaluative approaches to program design. Strengthening collaboration between academia and industry, diversifying

assessment methods, and prioritizing both hard and soft skill development will ensure that internship programs fulfill their transformative potential in preparing students for the complexities of the modern workforce.

3. Methods

The study employed a survey research design, primarily evaluating the effectiveness of the On-the-Job Training (OJT) Program on the skills of Thomasian engineering students. As the students completed their required time in the program, the study's researchers distributed questionnaires via Google Forms to the targeted respondents. Questions are formulated using a Likert scale to assess student outcomes, including technical competency, communication skills, ethical and professional responsibilities, collaborative and leadership skills, and lifelong learning capability.

A purposive sampling technique was initially utilized to select participants based on their direct involvement in the OJT program (Bullard 2024). However, due to unforeseen circumstances, the researchers were unable to meet the stratified distribution aimed at a balanced representation across all departments, and several limitations were encountered:

1. Non-Stratified Distribution: The sampling process was not stratified, meaning the number of respondents per department was not proportional to the target sample size for that department. This was due to external factors beyond the researchers' control, including varying response rates and varying accessibility across different engineering departments. Despite these constraints, the researchers exhausted all available remedies to maximize participation, including multiple follow-ups and coordination with department coordinators to ensure the broadest possible reach.
2. Scope of Generalization: The respondents represent the shared overall engineering student experiences of the 195 respondents rather than a perfectly proportional reflection of each engineering department.

A priori sample size from Daniel Soper's A-priori Sample Size Calculator has been used to determine the appropriate sample size for regression analysis. It has been used with 11 latent variables. With 5 questions per latent variable, this totals 55 observed variables. Thus, the required overall sample size for this study is approximately 195 respondents. This was determined by the distribution of student interns across departments, based on enrollees in the On-The-Job Training for the 2024–2025 academic year.

The researchers used Partial Least Squares-structural equation modeling (PLS-SEM) as the primary statistical method for data analysis. Partial least squares-structural equation modeling (PLS-SEM) has become the standard for analyzing the complexity of inter-relations between observed and latent variables. It is a multivariate approach that has combined multiple regression and factor analysis to correlate the independent and dependent variables of the study. This statistical tool enabled the researchers to investigate the causal relationships among the variables and how these variables contribute to defining students' responses. It was incorporated into this study with its capability to evaluate and analyze findings; it offers a good approximation of common factor models in situations where factor-based SEM cannot deliver results due to its methodological limitations, such as model complexity, sample size requirements, or inclusion of composite variables in the model (Hair et al. 2021).

Through this analysis technique, the researchers assessed whether Thomasian engineering student interns have developed the specific skills required in their fields of specialization. In addition, the researchers used WarpPLS to analyze the data gathered. The software is widely used and known for its PLS-SEM capabilities. This provided user-friendly software that can model both linear and nonlinear models and a wide range of model fits. It produced detailed statistical analysis outputs and excellent reliability in determining the factors that affect student outcomes in on-the-job training.

4. Data Collection

In this study, the participants are the fourth-year undergraduate students from the Faculty of Engineering at the University of Santo Tomas (UST-FOE). The target respondents came from various departments, including Civil Engineering (CE), Chemical Engineering (ChE), Electrical Engineering (EE), Electronics Engineering (ECE), Industrial Engineering (IE), and Mechanical Engineering (ME). These students were selected because they represent the population that underwent On-the-Job Training (OJT) and are in their fourth year, which can provide insight into the overall engineering student experience. So focusing on this year's level aligns well with the study's objectives.

The study used a set of survey questionnaires to determine the effectiveness of the OJT program for Thomasian engineering students. The data were collected using a Google Form that explained the study's purpose, included a

consent section, collected basic demographic information, and provided details about the research. The form was distributed online via a clickable link.

To assess how well certain skills were developed during the OJT program, the researchers used a Likert scale. This allowed participants to rate their level of agreement in specific student outcomes, and helped the researchers gain a clearer understanding of the OJT program's effectiveness. In addition, the researchers used a nominal scale for some questions. This allowed the responses to be grouped and compared more easily during data analysis.

5. Results and Discussion

5.1 Numerical Results

The findings indicate that the training manual or plan has a significant positive effect on technical competence ($\beta = 0.166$, $p = 0.006$), teamwork ($\beta = 0.167$, $p = 0.006$), and lifelong learning ($\beta = 0.128$, $p = 0.027$). However, it does not significantly influence communication skills ($\beta = 0.086$, $p = 0.099$) or ethical and professional responsibilities ($\beta = 0.094$, $p = 0.078$), suggesting that structured guidelines alone are insufficient for developing interpersonal and values-based competencies (Table 1).

Table 1. Effects of training manual/plan on student outcomes

Paths	Estimate (β)	p-value	Criteria	Significance
Training Manual / Plan				
Technical Competence (SO1)	0.166	0.006		Significant
Communication (SO3)	0.086	0.099	p-value should	Not significant
Ethical & Professional Responsibilities (SO4)	0.094	0.078	be less than	Not significant
Teamwork (SO5)	0.167	0.006	0.05	Significant
Lifelong Learning (SO7)	0.128	0.027		Significant

The internship evaluation system demonstrates mixed effects. It does not significantly affect technical competence ($\beta = 0.039$, $p = 0.279$), teamwork ($\beta = 0.020$, $p = 0.383$), or lifelong learning ($\beta = 0.029$, $p = 0.333$). However, it significantly improves communication skills ($\beta = 0.182$, $p = 0.003$) and negatively affects ethical and professional responsibilities ($\beta = –0.134$, $p = 0.022$), suggesting that rigid evaluation structures may encourage compliance rather than ethical development (Table 2).

Table 2. Effects of internship evaluation system on student outcomes

Paths	Estimate (β)	p-value	Criteria	Significance
Internship Evaluation System				
Technical Competence (SO1)	0.039	0.279		Not significant
Communication (SO3)	0.182	0.003	p-value should	Significant
Ethical & Professional Responsibilities (SO4)	-0.134	0.022	be less than	Significant
Teamwork (SO5)	0.020	0.393	0.05	Not significant
Lifelong Learning (SO7)	0.029	0.333		Not significant

The adviser monitoring and consultation variable shows limited influence on most outcomes, with no significant effects on technical competence ($\beta = 0.078$, $p = 0.122$), ethical responsibilities ($\beta = 0.016$, $p = 0.408$), teamwork ($\beta = 0.000$, $p = 0.499$), and lifelong learning ($\beta = 0.072$, $p = 0.140$). A significant positive effect is observed only for communication skills ($\beta = 0.166$, $p = 0.006$) (Table 3).

Table 3. Effects of adviser monitoring & consultation on student outcomes

Paths	Estimate (β)	p-value	Criteria	Significance
Adviser Monitoring & Consultation				
Technical Competence (SO1)	0.780	0.122		Not significant
Communication (SO3)	0.166	0.006	p-value should	Significant
Ethical & Professional Responsibilities (SO4)	0.016	0.408	be less than	Not significant
Teamwork (SO5)	0.000	0.499	0.05	Not significant
Lifelong Learning (SO7)	0.072	0.140		Not significant

In contrast, a collaborative environment exhibits strong and significant positive relationships across all student outcomes, including technical competence ($\beta = 0.315$, $p < 0.001$), communication skills ($\beta = 0.334$, $p < 0.001$), ethical and professional responsibilities ($\beta = 0.139$, $p = 0.017$), teamwork ($\beta = 0.378$, $p < 0.001$), and lifelong learning ($\beta = 0.181$, $p = 0.003$) (Table 4).

Table 4. Effects of collaborative environment on student outcomes

Paths	Estimate (β)	p-value	Criteria	Significance
Collaborative Environment				
Technical Competence (SO1)	0.315	<0.001		Significant
Communication (SO3)	0.334	<0.001	p-value should	Significant
Ethical & Professional Responsibilities (SO4)	0.139	0.017	be less than	Significant
Teamwork (SO5)	0.378	<0.001	0.05	Significant
Lifelong Learning (SO7)	0.181	0.003		Significant

Similarly, values-based learning demonstrates consistently strong positive effects on all measured outcomes: technical competence ($\beta = 0.253$, $p < 0.001$), communication skills ($\beta = 0.208$, $p < 0.001$), ethical and professional responsibilities ($\beta = 0.400$, $p < 0.001$), teamwork ($\beta = 0.201$, $p = 0.001$), and lifelong learning ($\beta = 0.308$, $p < 0.001$) (Table 5).

Table 5. Effects of values-based learning on student outcomes

Paths	Estimate (β)	p-value	Criteria	Significance
Values-Based Learning				
Technical Competence (SO1)	0.253	<0.001		Significant
Communication (SO3)	0.208	<0.001	p-value should	Significant
Ethical & Professional Responsibilities (SO4)	0.400	<0.001	be less than	Significant
Teamwork (SO5)	0.201	0.001	0.05	Significant
Lifelong Learning (SO7)	0.308	<0.001		Significant

Lastly, structured task assignment shows limited significance, with a positive effect only on communication skills ($\beta = 0.201$, $p = 0.001$). Its effects on technical competence ($\beta = 0.090$, $p = 0.089$), ethical responsibilities ($\beta = –0.026$, $p = 0.351$), teamwork ($\beta = –0.031$, $p = 0.324$), and lifelong learning ($\beta = 0.099$, $p = 0.068$) are not statistically significant(Table 6).

Table 6. Effects of structured task assignment on student outcomes

Paths	Estimate (β)	p-value	Criteria	Significance
Structured Task Assignment				
Technical Competence (SO1)	0.090	0.089		Not significant
Communication (SO3)	0.201	0.001	p-value should	Significant
Ethical & Professional Responsibilities (SO4)	-0.026	0.351	be less than	Not significant
Teamwork (SO5)	-0.031	0.324	0.05	Not significant
Lifelong Learning (SO7)	0.099	0.068		Not significant

5.2 Graphical Results

The training manual/plan significantly affects technical competence ($p = 0.006$), teamwork skills ($p = 0.006$), and lifelong learning skills ($p = 0.027$). The internship evaluation system also showed significant effects on communication skills ($p = 0.003$) and ethical and professional responsibilities ($p = 0.022$). Likewise, adviser monitoring and consultation significantly affect communication skills ($p = 0.006$).

Moreover, a collaborative environment emerged as a strong predictor across multiple outcomes, significantly affecting technical competence ($p < 0.001$), communication skills ($p < 0.001$), ethical and professional responsibilities ($p = 0.017$), teamwork skills ($p < 0.001$), and lifelong learning skills ($p = 0.003$). Similarly, values-based learning had a significant impact on technical competence ($p < 0.001$), communication skills ($p < 0.001$), ethical and professional responsibilities ($p < 0.001$), teamwork skills ($p = 0.001$), and lifelong learning skills ($p < 0.001$). Finally, structured task assignment significantly predicted communication skills ($p = 0.001$) (Figure 1).

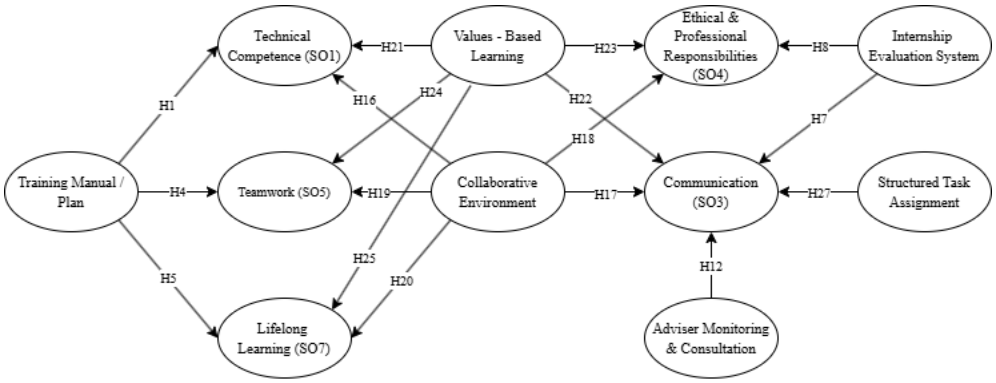

Figure 1. Final SEM model for factors affecting student outcomes

5.3 Proposed Improvements

The recommendations for Performance standard, team-based tasks, and learning journals are based on the PLS-SEM results. It is recommended that the company strengthen and further formalize the structure and content of the internship training manual to maximize its impact. A more comprehensive and detailed manual should clearly outline learning objectives, task expectations, performance standards, and competency-based milestones, as structured internship design has been shown to enhance workplace learning and skill development (Chong et al. 2021). It should integrate team-based tasks, role-rotation guidelines, and collaborative project requirements to develop teamwork skills, consistent with the literature, which emphasizes that systematic, planned collaborative activities strengthen interns' interpersonal and cooperative skills (Ali 2018). Additionally, it is recommended to embed self-regulated learning tools, such as learning journals and periodic self-evaluations, within the manual, as these mechanisms reinforce continuous learning habits and support the development of lifelong learning competencies (Lázaro et al. 2024).

Given that communication-based criteria motivate students to improve their written and verbal communication (Suskie 2019), evaluators are recommended to continue incorporating explicit communication indicators in assessment rubrics. Supervisors should also provide timely, formative feedback through brief discussions or written notes so students can adjust and develop their communication skills throughout the internship, not only at the end. Moreover,

to address the negative relationship with ethical and professional responsibilities, evaluation practices must be reframed to support autonomy and ethical decision-making. Instead of rigid, punitive scoring, supervisors may adopt evaluation approaches that emphasize growth, responsibility, and professional reasoning rather than strict adherence to rules.

To further strengthen students' communication skills during internship, it is recommended that schools and host companies institutionalize regular adviser monitoring and consultation sessions as part of the internship framework. Since adviser involvement has a significant positive effect on communication development (Chan and Lu 2019), structured check-ins such as weekly progress meetings, feedback consultations, and guided reflection discussions should be formally integrated into the OJT program. Advisers should also be provided with clear guidelines and communication-focused mentoring strategies to ensure consistent, meaningful interactions with interns. Encouraging interns to be articulate during these consultations can help reinforce professional communication practices. Strengthening this mentor-student communication channel will not only enhance interns' communication competencies but also improve overall internship learning outcomes.

Given the recommendation that a collaborative environment has a significant and positive effect on all measured student outcomes (Kahando and Mungai 2018), schools and host companies should work together to design internship activities or facility layouts that encourage teamwork, shared problem-solving, and peer-to-peer interaction. Such activities, such as group-based task assignments, peer mentoring systems, cross-functional project involvement, and regular team meetings, allow interns to engage with colleagues and supervisors.

Since values-based learning demonstrates a strong and significant influence across all student outcomes (Nogueira et al. 2021), it is recommended that internship programs more intentionally integrate organizational values into the design and delivery of internship activities. Host organizations may strategize for consistency by communicating expectations in value-based language. When assigning tasks, supervisors should connect expectations with specific values. This should help interns understand how values guide real workplace behavior.

Lastly, given the result and drawing from Kolb's (1984) experiential learning theory, it is recommended that tasks should not be overly prescriptive; instead, they should allow interns to encounter real decision points that require analysis, adaptation, and interaction with team members. Supervisors may conduct short debrief sessions after task completion, encourage interns to explain their reasoning behind decisions, and involve them in small collaborative problem-solving activities. By embedding these elements into structured tasks, organizations can extend the benefits beyond communication skills.

5.4 Validation

The findings of this study are supported by existing literature on internship and experiential learning. The positive influence of structured training manuals on technical competence and efficiency is consistent with Jalani et al. (2017), who emphasize that clear procedural guidance enhances task accuracy and performance.

The limited effect of training manuals on communication and ethical competencies aligns with Magno et al. (2023), who highlight that communication skills are primarily developed through workplace interaction. Similarly, Mullins (2019) argues that ethical behavior cannot be effectively developed through written policies alone; it requires reinforcement through mentorship and organizational culture.

The mixed results of the internship evaluation system support the observations of Ajjawi et al. (2020), who note inconsistencies in workplace assessment practices due to varying supervisor capabilities. The positive impact on communication skills is consistent with Suskie (2018), who explains that clear assessment criteria can guide performance improvement. However, the negative relationship with ethical development suggests that overly rigid evaluation systems may encourage compliance rather than the internalization of ethical judgment.

The limited influence of adviser monitoring aligns with Gutiérrez-Pulido and Orozco-Rodríguez (2025), who emphasize that supervision's effectiveness depends on its quality and consistency rather than mere presence. The significant improvement in communication skills is supported by Chan and Lu (2019), who highlight the importance of mentor–trainee interaction and feedback.

The strong influence of a collaborative environment is reinforced by Kahando and Mungai (2018), who argue that collaborative settings simultaneously develop multiple competencies, including teamwork, communication, and ethical behavior.

Similarly, the consistent positive effects of values-based learning support the findings of Nogueira et al. (2021), who emphasize that integrating organizational values into training promotes holistic competency development.

Finally, the limited effectiveness of structured task assignment is consistent with Kolb's (1984) experiential learning theory, which suggests that deeper learning occurs through active engagement, reflection, and exploration rather than rigidly structured tasks.

6. Conclusion

Overall, the descriptive analysis demonstrates that all evaluated student outcomes were achieved at a high level, with mean scores ranging from 3.62 to 3.84 out of a maximum of 4. This indicates strong agreement among respondents that the internship experience effectively contributed to the development of their technical skills, communication abilities, ethical and professional behavior, teamwork capabilities, and lifelong learning orientation. The consistently high means and low variability further suggest that these perceptions were shared across the student group. Collectively, the findings confirm that the internship program played a substantial and positive role in supporting students' holistic professional growth.

Furthermore, the study's results offer valuable insights into how the various components of on-the-job training affect student outcomes. The analysis highlights the factors that significantly affect students' technical competencies, teamwork, ethical and professional behavior, communication, and lifelong learning skills. Table 1-5 presents the summary of the hypothesized paths, including their corresponding direct effects, p-values, and significance levels. Initially, thirty (30) hypotheses were proposed and tested in the structural equation model. Following model estimation and refinement, sixteen (16) hypothesized relationships were found to be statistically significant, while the remaining paths were not supported.

The training manual/plan was found to have a significant and positive effect on technical competence, teamwork skills, and lifelong learning skills, indicating that well-defined tasks, guidelines, and structured training activities contribute to enhancing students' hands-on skills, ability to work effectively with others, and ongoing desire to improve their knowledge and competencies.

Similarly, the internship evaluation system was found to have a significant impact on communication skills and ethical and professional responsibilities. This suggests that consistent evaluation and feedback help interns develop their professional communication skills and enhance their understanding of proper workplace conduct.

The collaborative environment demonstrated strong and consistent effects across all student outcomes: technical competence, communication skills, ethical and professional responsibilities, teamwork skills, and lifelong learning skills. These findings indicate that opportunities for cooperation, teamwork, and shared problem-solving are significant in shaping well-rounded engineering interns.

Similarly, values-based learning demonstrated significant positive effects across all student outcomes. This suggests that when internship programs emphasize integrity, responsibility, respect, and workplace professionalism, students demonstrate higher levels of technical ability, communication, ethical judgment, teamwork, and continuous self-improvement.

Lastly, structured task assignment significantly affects communication skills, suggesting that clear, well-defined, and organized tasks enhance students' ability to articulate their activities, report progress, and coordinate with supervisors and coworkers.

In conclusion, these significant findings highlight the factors that best support student development during on-the-job training. The results provide a clearer understanding of how structured learning approaches, collaborative and values-driven environments, and effective evaluation systems contribute to shaping the competencies required of engineering students in real organizational settings. These findings validate the study's purpose: to identify actionable factors in internship programs that enhance student performance and professional growth.

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Biographies

Jan Adrian Angeles is an Industrial Engineering student at the University of Santo Tomas, Manila, currently pursuing advanced coursework in Operations Research and Analytics. Throughout his academic journey, he has developed a strong analytical foundation and a keen interest in data-driven decision-making. He has acquired practical skills in Python, which he utilizes to address real-life problems by transforming raw data into meaningful and actionable insights. His training has enabled him to apply quantitative methods, optimization techniques, and statistical analysis to support efficient and effective solutions in various contexts. In addition, he demonstrates the ability to interpret complex datasets, identify patterns, and communicate findings clearly. His academic background, combined with his technical competencies, reflects his commitment to continuous learning and his readiness to contribute to data-oriented and process improvement initiatives in the field of Industrial Engineering.

Ricardo Rogelio de la Rosa IV is a student from University of Santo Tomas, majoring in Bachelor of Science in Industrial Engineering with a specialization in Production Engineering. Particularly academically interested in supply chain management, operations research, risk management, and quality decision making. He focused on production engineering, mainly on supply chain management, macroergonomics, and sustainability engineering and management. He had an OJT experience from EEI Corporation focused on the Enterprise Risk Management department, where he learned and experienced firsthand the risk assessments from a company's perspective to their field and office operations, with a goal of combining these interests and knowledge and applying it to further enhance his abilities as he aims to explore the manufacturing and logistics business organizations.

Engr. Charlie Marquez is currently a faculty member at the University of Santo Tomas, Department of Industrial Engineering, and the UST Graduate School. He is also a Quality Management Consultant to government and private institutions. Before this, he was the Director of the Office of Planning and Development of UST and also the Chairman

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Elton John Taniegra is a Bachelor of Science in Industrial Engineering student at the University of Santo Tomas, Manila. His academic interests focus on operations management, inventory management, and process optimization. He further developed his expertise in Operations Research, beginning with Multicriteria Decision Making (MCDM) and progressing into more advanced analytical techniques. Through this, he strengthened his ability to evaluate complex problems involving multiple and often conflicting criteria. He also acquired proficiency in using Python for data processing, modeling, and decision analysis, allowing him to apply quantitative methods to real-world problems. In addition, his studies in Data Mining and Analytics enhanced his ability to extract meaningful insights from data for informed decision-making. In contrast, his Risk Management studies enhanced his ability to identify, assess, and mitigate uncertainties in operational systems.