

# Perceptions and Insights on Industrial Training: A Study of IIUM Mechatronics Engineering Students

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## ABSTRACT

*Industrial training plays a pivotal role in providing students with experiential learning opportunities that enhance their technical competence and professional readiness. This study presents an analysis of Mechatronics Engineering students' perceptions of the industrial training programme at the International Islamic University Malaysia (IIUM). A total of 56 students participated in a survey evaluating the quality of training in the host company, ability to apply knowledge, career awareness, and faculty coordination. Quantitative data was complemented by qualitative insights derived from open-ended student reflections. Survey results reveal high satisfaction with supervision quality, mentorship, and work environment. Findings indicate that most students acknowledged that the internship is instrumental in bridging theoretical knowledge with real-world applications and in clarifying their career aspirations. Suggestions for improvement include extending the internship period and enhancing placement support through stronger university–industry partnerships. Overall, the findings revealed the effectiveness of the industrial training programme in fostering professional competencies while highlighting areas for improvement for enhanced experiential learning.*

**Keywords:** Industrial training, student survey, Mechatronics Engineering, experiential learning

## 1. INTRODUCTION

The issue of graduate underemployment in Malaysia is not really about an oversupply of graduates but a mismatch between skills and job requirement. According to the Ministry of Higher Education (MOHE), the Graduate Employability Rate (GER) for 2024 was relatively high at 92.5%, indicating that most graduates were able to secure employment [1]. However, data from the Department of Statistics Malaysia (DOSM) reveal that skill-related underemployment which refers to individuals with tertiary education working in semi-skilled or low-skilled occupations; stood at 35.7% during the first quarter of 2025 [2]. This suggests that a proportion of graduates are employed in roles that do not match their qualifications, which calls for a revamped curriculum structure and strengthened collaboration between academia and industry to address skill gaps and enhance graduate readiness for the workforce.

Industrial training represents a crucial experiential learning component within engineering education, serving as a bridge between theoretical classroom learning and real-world industrial practice [3, 4]. According to Kolb's Experiential Learning Theory, knowledge is created through the transformation of experience, which involves both grasping and processing that experience [5]. Previous studies have consistently shown that internships not only strengthen students' technical proficiency but also play a significant role in shaping their professional identity and employability skills [6, 7]. Nogueira et al. (2021) validated that positive internship experiences are closely associated with higher levels of job satisfaction, improved communication, and

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enhanced teamwork skills [8]. Similarly, Gutiérrez-Pulido and Orozco-Rodríguez (2025), found that internships significantly enhance both technical and soft skills, including teamwork, adaptability, and project management. Their research emphasized that well-structured internship programmes not only foster student motivation and employability but require continuous collaboration between universities and industries to optimize learning outcomes [9]. Prabhu *et al.* (2016) further asserted that the primary objective of internship programmes is to produce “ready-to-use professionals” who can be seamlessly absorbed into industry upon graduation [10]. The author highlighted persistent gaps between academic preparation and industrial expectations, which often require employers to retrain new graduates and bear the additional costs. Complementing this, Raghunath *et al.* (2023) surveyed professionals and identified critical competencies expected from Mechatronics Engineering graduates, such as control systems, embedded programming, and system integration. They concluded that though restructuring programmes to reflect industrial requirement is not easy, dialogues between industry and university needs to be initiated to ensure effective degree offering and graduate readiness [11].

In many Malaysian higher education institutions, including the International Islamic University Malaysia (IIUM), engineering students typically undertake "sandwich-style" industrial training by conducting it in between their third and fourth year of study [12, 13]. As outlined in the EAC Manual 2024, the primary objective of industrial training is to develop practical competence in executing complex engineering tasks while exposing students to real-world engineering environments. In addition, students are expected to gain familiarity with standard engineering processes and hands-on exposure appropriate to their level of study [14]. Currently, the industrial training for Mechatronics Engineering takes place during the short semester, bridging Semester 6 and Semester 7 in which the training duration typically spans 10 to 12 weeks; equivalent to a 5-credit hour course. This is the same with the other 7 undergraduate degree programmes offered by Kulliyah of Engineering (KOE) in IIUM *i.e.* Electrical and Electronics Engineering, Aerospace Engineering, Mechanical Engineering, Manufacturing Engineering, Materials Engineering, Civil Engineering and Chemical Engineering. The industrial training is coordinated by the Engineering Industrial Training Unit (EITU) in KOE, who is responsible for managing the overall process. For instance, before beginning their industrial training journey, students are provided with a briefing on the procedures for company placement, complemented by a series of talks covering essential skills and awareness topics, such as resume and report writing skills, workplace ethics and others. Students are also expected to apply to companies offering tasks that are relevant to their academic background to ensure meaningful industrial exposure. A database containing a list of companies that have previously accepted IIUM students for internships is provided to assist students during the application process.

## 2. METHODOLOGY

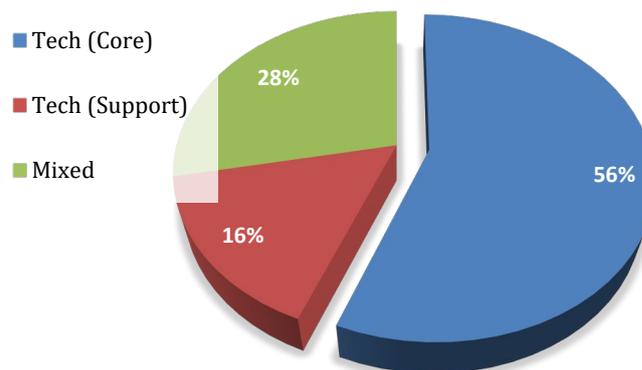
Other than host company feedback and visiting lecturer assessments, the success of the industrial training is evaluated through student surveys; as students are the primary stakeholders with first-hand experience of the programme. Students' perception is regarded as a critical outcome from an internship programme as it reveals how well the training meets its objective of bridging academic knowledge with practical application while also highlighting which aspects of the industrial training that are most beneficial and what areas need to be improved [15, 16]. In this study, data were collected through a survey distributed to 56 Mechatronics Engineering students at the end of their 10–12-week industrial training period. The questionnaire comprised items categorized under four categories; the quality of training in the host company (HC), the ability to apply academic knowledge (K), career awareness (CA) and faculty coordination (FC). Some responses were measured using a 5-point Likert scale [17], where 1 = poor, 2 = fair, 3 = satisfactory, 4 = good, and 5 = excellent. For analysis, responses rated 4 and 5 were grouped as

high, 1 and 2 as low, and 3 as neutral. To better highlight key trends, only the high and low categories were considered in the main discussion. In addition to the quantitative analysis, qualitative data from open-ended responses were examined using content analysis method; a research tool used to determine certain themes within qualitative data and transforming it into meaningful insights for deeper understanding [18].

### 3. RESULTS AND DISCUSSION

#### 3.1 Student Perception Towards Host Company (HC)

For this analysis, the host companies obtained by the students are classified into several sectors according to the Malaysia Standard Industrial Classification (MSIC 2008) issued by the Department of Statistics Malaysia as shown in Table 1 [19]. In addition to industry classification, the job scopes assigned to students during their industrial training are broadly categorized into three main groups; “Technical (core)”, “Technical (support)”, and “Mixed” (Figure 1). Technical (core) refers to roles that are related to engineering practices, technical (support) involves supporting engineering-related activities such as maintenance work, production line monitoring, or data collection. “Mixed” includes roles where students engaged in a combination of technical and non-technical duties, such as preparing reports and handling project logistics. This classification helps in understanding how the nature of the job scope influences the overall internship experience.

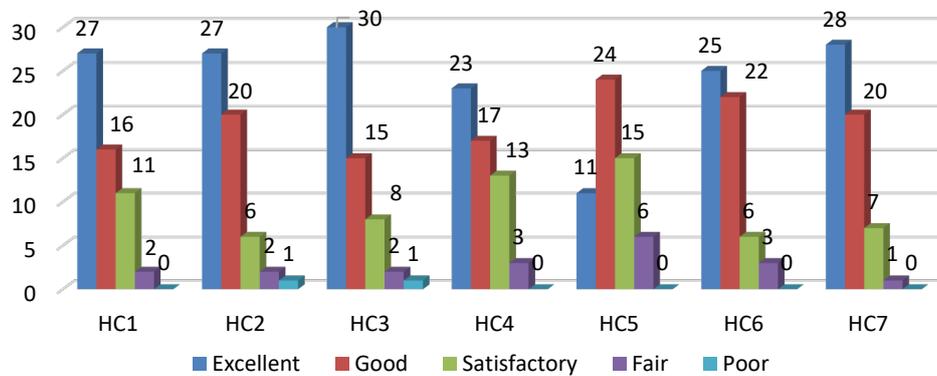


**Figure 1.** Category of job scope assigned to students (blue - Technical (core), red - Technical (support), and grey – Mixed).

Figure 2 and table 2 shows the survey results for students’ perception on quality of host company. The industrial training survey responses from 56 Mechatronics Engineering students reveal a generally positive perception of their industrial training experience. With respect to the host companies, the quality of training received by the students; measured in terms of supervision quality, level of interest in assigned projects, mentorship and guidance, conduciveness of the working environment, and availability of technical facilities recorded mean scores of >4.0, and more than 80% rated high across all categories. The response for level of difficulty of assigned tasks (mean = 3.71, 62.5% high) was comparatively lower than other indicators, which may reflect that companies have assigned tasks that were appropriate for initial real-life engineering exposure or aligned with the students’ current skill level. However, from another perspective, it is also possible that some companies were unable to assign more relevant or technically challenging tasks due to limitations in project scope, or the nature of their operations. Standard deviation ranging from 0.7-0.9 across all indicators suggests moderate variation across data which means there are some differing opinions, however consistency is still reflected.

**Table 1** Categories of the host company by sector

Sector	No. of students	(%)
Manufacturing	15	26.3%
Professional, scientific, and technical activities	15	26.3%
Other Service Activities	6	10.5%
Electricity, gas, steam, and air conditioning supply	5	8.8%
Information and Communication	5	8.8%
Education	4	7.0%
Agriculture, forestry, and fisheries	2	3.5%
Construction	2	3.5%
Wholesale and retail trade; repair of motor vehicles	2	3.5%
Water supply, sewerage, waste management, and remediation activities	1	1.8%

**Figure 2.** Student perception towards host company (HC).

When asked whether they would recommend their host company for future student industrial training, 80.4% of the students responded "Yes", which suggests that they saw value in the experience offered by their respective host companies. However, 19.6% of students responded "No" which may reflect factors such as limited technical exposure and hands-on opportunities, or company-specific challenges that may have affected their ability to fully benefit from the training.

**Table 2** Student perception towards host company (percentage)

Code	Description	% High	% Low	Mean	Std. Dev
HC1	Level of supervision	76.7%	3.5%	4.21	.889
HC2	Level of interest in given project	83.9%	5.4%	4.25	.919
HC3	Conduciveness of working Environment	80.3%	5.4%	4.27	.963
HC4	Technical facilities available	71.4%	5.4%	4.07	.931
HC5	Level of difficulty of given work	62.5%	10.7%	3.71	.909
HC6	Mentorship and guidance	83.9%	5.4%	4.23	.853
HC7	Collaboration and communication within team	85.7%	1.8%	4.34	.769

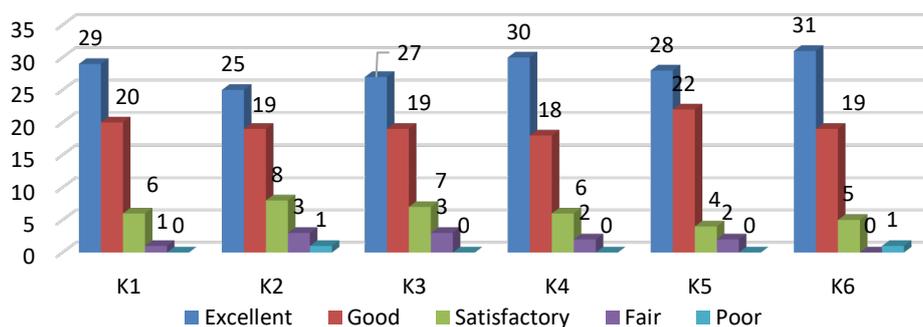
### 3.2 Students' Perceptions on Knowledge Application (K)

This section presents the survey findings on students' perception on their ability to apply academic knowledge and demonstrating skills during their internship. Understanding how well students can bridge academic learning with practical engineering application is one of the key indicators to measure the effectiveness of an industrial training programme, as well as providing insights in areas where the current curriculum can be further enhanced for students' industry readiness.

**Table 3** Student perception on knowledge application (percentage)

Code	Description	% high	% low	Mean	Std. Dev.
K1	Ability to generate a report	87.5%	1.8%	4.37	.752
K2	Apply knowledge	78.5%	7.1%	4.14	.980
K3	Problem solving	82.1%	5.4%	4.25	.879
K4	Demonstrate communication skills	85.7%	3.5%	4.35	.818
K5	Individual and teamwork	89.2%	3.5%	4.35	.772
K6	Ability to demonstrate professionalism and ethics	89.2%	1.8%	4.41	.804

Figure 3 and table 3 shows the survey results for students' perception on their ability to apply knowledge during training. Students demonstrated high levels of satisfaction in their ability to generate reports based on experience (87.5% high), ability to demonstrate communication skill (86% high), ability to work in teams and individually (85.7% high), and demonstrate professional and ethical responsibility (89.2% high). These findings highlight the effectiveness of industrial training in reinforcing both technical and soft skills that are essential for engineering practice. The aspect that received relatively lower ratings is the ability to apply knowledge (78.5% high, 7.1% low). This result may suggest that while students were generally capable of applying academic knowledge in real-world engineering scenarios during their internships, some placements may not have offered full opportunities to do so. This could be due to the varied nature of host companies and project scopes, which sometimes fall outside the Mechatronics Engineering domain.



**Figure 3.** Student perception on knowledge application (K).

#### 3.2.1 Content analysis on students' open response (knowledge application)

Further analysis is made on the open response of students' reflections on how the internship helped them understand the real-world applications of their academic knowledge which revealed four main themes i.e. application of theory learned, enhanced interdisciplinary understanding, partial or limited application of knowledge and recognition of workplace realities. Students mentioned that they were able to apply classroom concepts to real engineering tasks during their

internship. Some of them specifically mentioned gaining experiences with certain skills like PLC programming, automation, machine vision, control systems, IoT integration and others. Students also highlighted interdisciplinary understanding where the internship broadened their perspective on how engineering integrates with other domains. Students also mentioned awareness of workplace realities, including differences between academic theory and industrial practice. Finally, some students reported partial or limited application of academic knowledge in which these responses came from students with companies where the job scope was less technical or outside the Mechatronics Engineering discipline, though they still appreciated gaining transferable skills in communication, project management, and problem-solving.

Overall, the findings indicate that the internship was effective in reinforcing the practical relevance of academic knowledge while also revealing areas where curriculum alignment with industrial practice could be further strengthened. Students who engaged in technically relevant projects reported deeper learning and motivation, confirming the internship's role as a critical experiential link between academic and real engineering practice.

### 3.2.2 Content analysis on students' open response (skills developed)

Analysis of student reflections on the skills most developed during the internship revealed five themes i.e. technical and programming skills, communication and teamwork, problem-solving and critical thinking, project management and documentation, and adaptability. For technical and programming skills, students reported that their internship provided them with deepened technical proficiency through hands-on exposure which are offered in a limited manner in classroom settings. Some of them specifically mentioned PLC programming, machine vision, Raspberry Pi, C#, Python, SOLIDWORKS, AutoCAD, Arduino, and 3D printing as the skills obtained. Some responses emphasized enhanced interpersonal and professional communication through collaboration with cross-disciplinary colleagues, recognized the importance of articulating ideas clearly and engaging effectively in teams.

**Table 4** Sample of students' open response on "how the internship helped them understand the real-world applications of their academic knowledge"

Theme	Sample of student feedback
Practical integration of theory	<p><i>"The internship helped me see how the things I learned in my Mechatronics course are used in real life. I got to apply ideas like automation and control systems to real tasks, such as improving machines and making production more efficient. It showed me how the mix of mechanical, electrical, and software skills from my course is important for solving problems in the real world."</i></p> <p><i>"Internships are often a game-changer because they let me see how all those theories and formulas work in the wild. It's a bit like stepping out of the textbook and into the actual story."</i></p>
Enhanced interdisciplinary understanding	<i>"Throughout the experience, I was able to witness firsthand how concepts from telecommunications, project management, and engineering principles are practically applied in industry."</i>
Recognition of workplace realities	<p><i>"In real-world, most actuators are proprietary and knowledge on one manufacturer cannot be 100% carried to different manufacturers."</i></p> <p><i>"Make me realise routine is good"</i></p>
Partial or limited application of knowledge	<i>"Not much in terms of engineering, but more so on the management side of things. Same as my previous comment on importance of planning, management and communication"</i>

	<p><i>"I know (understand) that not all the academic knowledge will be applied in the real-world applications. But the basic knowledge of all the academic that we learn in the university might (can) still be apply. Our studies in university help us to boost our soft skills especially in critical thinking."</i></p> <p><i>"Irrelevant to academic knowledge course"</i></p>
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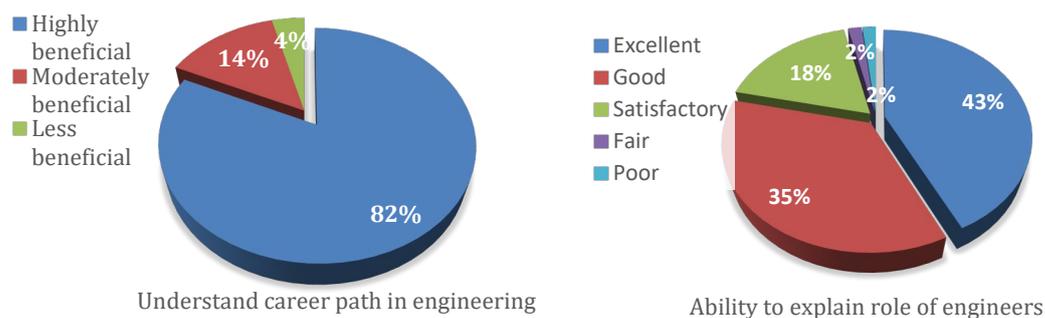
Other than that, many students mentioned problem-solving and critical thinking as skills developed, where they are tasked with troubleshooting, debugging, and optimizing systems. A smaller group highlighted project management and documentation as skills acquired, including managing project timelines, preparing technical reports, and ensuring the output met some quality standards. Some students also mentioned adaptability, where they needed to adjust to diverse professional environments and conditions. Overall, the findings demonstrate that the internship enhanced students' professional growth through integration of both technical competence and essential soft skills.

**Table 5** Sample of students' open response on "skills developed during internship"

Theme	Sample of student feedback
Technical and programming skills	<p><i>"PLC Programming, which I have learnt and enjoyed before, I have further developed in the tasks/projects I did for the company. For example, HVAC control of Hospitals using PLC."</i></p> <p><i>"I developed programming skills the most, particularly in C#, basic XAML, Python, AI, and machine vision."</i></p>
Communication and teamwork	<i>"Communication skills. In development process of my tasks, I need to interview many peoples in different background, such as, operators, supervisors, and engineer teams."</i>
Problem-solving and critical thinking	<i>"Creativity. As a designer, there were never any blueprints provided. I had to be very creative to achieve clients goals in a short amount of time whilst also learning the very new techniques myself. I had to use basic trigonometry to figure out the curves and angles. Lots of imagination used."</i>
Project management and documentation	<i>"Report writing: I learn to make a remark that's detailed. Communication: Dealing with operators to carry out prioritized task. Awareness: Keeping track of the status of 18 SMT production lines."</i>
Adaptability	<i>"One of the biggest takeaways from my internship was learning how to work effectively with different people from various backgrounds and professional roles. In this context, adaptability became crucial. I learned to adjust my working style depending on whether I was dealing with supervisors, engineers, project managers, or external stakeholders."</i>

### 3.3 Students' Perception of Career Awareness (CA)

This section explores how the industrial training experience contributed to students' understanding of engineering career paths and professional roles. Gaining career awareness is a crucial outcome of industrial training, as it provides students with the opportunity to align their academic journey with future professional goals. Through real workplace exposure, students may discover new interests or talents such as in management, project coordination, or engineering economics, or even realize that certain aspects of engineering may not align with their preferences. This exposure is valuable in helping students make informed decisions, especially as they prepare to choose elective courses in their final year of study.



**Figure 4.** Student perception on understanding career path in engineering.

In terms of future career awareness (Figure 4), 82% of students rated the industrial training as highly beneficial in helping them understand potential career paths in engineering, while 14% considered it moderately beneficial, and 4% felt it was less beneficial. Students were also assessed on their ability to explain the roles of an engineer. There are 24 students who rated themselves as excellent and 20 as good (78.6%, high) in understanding the role of an engineer in a professional context. Only 2 students (3.6%) rated themselves as fair or poor and 10 students (17.9%) rated themselves as satisfactory, indicating a basic but developing understanding of engineer's role.

### 3.3.1 Content analysis on student's open response (career awareness)

Further analysis of students' open-ended responses on how the internship helped them understand potential career paths in engineering revealed three main themes i.e. clearer career direction, exposure to real engineering roles and strengthened interest in a specific field. Some students expressed that the internship helped them clarify their potential career paths, which indirectly shows the level of exposure they gained during internship. Exposure to various industrial environments and tasks allowed them to assess their strengths, preferences, and the type of engineering roles they would like to pursue in future. Some students highlighted that the internship provided valuable real-world exposure to engineering practices, including automation, control systems, project management, and production operations. A smaller group indicated that their internship experiences deepened their interest in particular areas such as automation, machine vision, control systems, energy management, or teaching. These experiences often reinforced their desire to specialize or choose related courses in those fields during their final year. A few responses mentioned mixed or neutral feedback, including challenges such as unrelated tasks or limited technical engagement.

Overall, majority of the students reported that the internship was instrumental in enhancing their career clarity and understanding of engineering roles. They also gained valuable insights into the day-to-day responsibilities of engineers across different fields from Mechatronics such as semiconductor, quality assurance, and energy management. Through this exposure, students were able to clarify their interests and identify specific areas they would like to pursue further for course specialization, and for future engineering careers. The findings highlight the crucial role of industrial training in preparing students for an informed career decision as engineers.

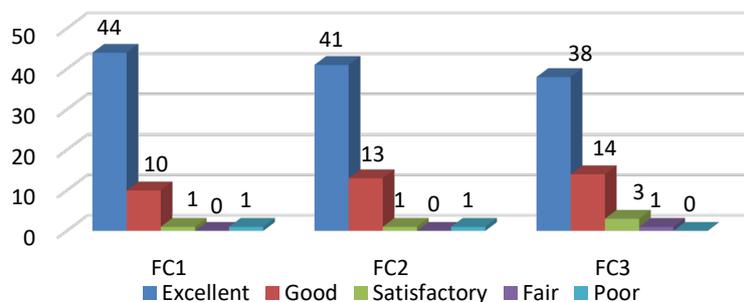
### 3.4 Students' Perception on Faculty Coordination (FC)

This section discusses students' perception on faculty coordination which plays crucial role on the well-preparedness of students for their industrial training and ensuring smooth implementation of the programme. The feedback collected focuses on effectiveness of coordination (FC1), relevance of pre-training briefings (FC2) and method of assessment through

logbooks and executive summary (FC3). Understanding students' perspectives in this area can help improve faculty coordination and enhance the overall industrial training programme.

**Table 6** Sample of students' open response on "how the internship helped them understand potential career paths in engineering"

Theme	Sample of student feedback
Clearer career direction	<p>"Much clearer vision towards engineering path."</p> <p>"I received advice and feedback on what I am good at... increased my interest in engineering specifically Mechatronics."</p> <p>"The experience highlighted various career possibilities, automation, data analytics, and project management."</p> <p>"It gives the exposure to me about how engineer do the engineering job and what specialization I want to take in final year"</p> <p>"I can see clearly my engineering career or path after graduation because I already know the culture of this industry"</p> <p>"Helped me explore potential career paths in software engineering and quality assurance."</p>
Exposure to real engineering roles	<p>"Really beneficial as I can observe how engineers work in real-world."</p> <p>"Very beneficial. Gives me a clear view on what engineer do in their day-to-day basis and expose me to how the semiconductor industry operates."</p> <p>"I learn a lot of things during my internship which includes conducting detailed energy audit and development of energy management system"</p> <p>"My internship as an automation engineer provided valuable hands-on experience mostly on PLC and industrial actuators."</p>
Strengthened interest in a specific field	<p>"Machine Vision is more interesting than I thought."</p> <p>"I have also developed interest in certain parts of engineering like Control Systems."</p>
Others	<p>"Good but so many unrelated things to do."</p> <p>"Not much"</p>



**Figure 5.** Student perception on faculty coordination (FC).

**Table 5** Student perception on faculty coordination (percentage)

Faculty coordination		% high	Mean	Std. Dev.
FC1	Coordination	96%	4.71	.679
FC2	Briefings	96%	4.66	.694
FC3	Progress report (log book/report/ executive summary)	92%	4.58	.681

The feedback on faculty coordination and support (Figure 5 and Table 5) throughout the industrial training programme was seemingly positive. More than 90% of the students rated excellent and good for overall coordination and pre-internship briefings. Several described the programme as “well-organized,” and some even expressed that it was “perfect” and required no changes. This reflects positively on the efforts made by the Engineering Industrial Training Unit (EITU) in preparing and supporting students before and during their industrial training. In addition, 92% of students gave similarly high ratings for the management of progress reporting, including the use of logbooks and reports/executive summaries. This indicates appropriate mechanisms for documenting students’ reflection and learning outcomes from the industrial training.

### 3.5 Other Challenges and Suggestions

Analysis of the students’ open response on what are the challenges faced during internship reveals several recurring themes i.e. limited technical exposure/unclear jobscope, heavy workload, technical/learning curve and workplace-specific challenges. Students encountered various technical learning curves such as learning new software, troubleshooting machines, and others; which while demanding, these experiences were viewed as valuable learning opportunities. Several interns reported a lack of structured guidance, unclear project goals, or minimal technical involvement. On the other hand, several students highlighted heavy workloads where they were assigned multiple projects at once or given tight deadlines. In addition, a few students also reported workplace-specific challenges e.g. ethical concerns and absence of internship allowance.

Student feedback on further suggestions for improvement highlighted several key areas. The most frequent suggestion was to extend the internship duration from 10–12 weeks to at least three to six months, as many companies prefer longer placements and students require more time to gain meaningful experience. In terms of application processes, students found the existing company database is helpful but called for more proactive engagement by the university to build partnerships with companies, especially those willing to accept short-term interns. Many students struggled to secure a placement aligned with their field of study, leading them to accept mismatched companies thus limited their technical exposure and hands-on experience.

**Table 7** Sample of students’ open response on “specific experiences or challenges you faced during the internship”

Theme	Sample of student feedback
Limited technical exposure/unclear jobscope	<i>“Lack of sites work due to the risky working environment that needs specific work permit, training and certification”</i>
Heavy workload	<i>“I need to develop a software in just 3 week duration”</i>  <i>“Since this is a small company there is a lot of projects for a small number of employees, so I have to juggle between different project based on urgency and importance.”</i>

	<i>"New projects keeps coming up until I cannot focus on the current project and finally left unattended"</i>
Technical/learning curve	<i>"I lacked knowledge on industrial design, so I had to take on a bit of a learning curve when designing the casing."  "The task assigned to me was quite big which is building hardware of a control panel as well as software troubleshooting, it was high responsibility to make sure everything goes right"</i>
Workplace-specific challenges	<i>"Handling internal communication is more complex than handling client"  "The company does not separate the restrooms according to genders, so I just use the public restrooms outside of the company. Just for heads-up for future interns. And then, there is no allowance. Other than that, all is good, all team members are respectful to each other."</i>

## 6. CONCLUSIONS

The study demonstrates that industrial training is a crucial experiential learning component in preparing engineering students for professional practice. Quantitative and qualitative analysis from student survey revealed satisfaction with their host companies, supervision quality, and faculty coordination. The internship effectively enhanced students' technical, interpersonal, and ethical competencies while deepening their understanding of real-world engineering applications and career pathways. However, challenges such as the relatively short 10–12 week training duration restricted deeper learning engagement. Students emphasized the need for extended internship periods and stronger university–industry collaboration to ensure more meaningful and technically relevant placements. However, this initiative must be balanced against curriculum structure and the university's academic calendar. Addressing these issues will further enhance the programme's impact and ensure that engineering education remains closely aligned with industry needs, thereby helping to reduce graduate underemployment in Malaysia.

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