11th LIS International Conference
Liga Ilmu Serantau 2025

ISSN: 2985-4393

Institution-Industry Linkages Through Academic Visits: An Empirical Study on the Development of Mechanical Engineering Students, Politeknik Kuching Sarawak

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Abstract. The academic visit program is a form of experiential learning that provides students with direct exposure to real working environments. This study aims to assess the effectiveness of academic visits to three industries i) Fuya Energy Sdn. Bhd., ii) Acson Malaysia Sales & Service Sdn. Bhd., and iii) Beverages Marketing (S) Sdn. Bhd. on polytechnic students in four main domains: i) academic, ii) self-exploration, iii) personality, and iv) industry relevance. A total of 79 students who participated in the program completed reflection forms using a likert scale. This research employed a descriptive quantitative method using percentage statistics and mean scores as the basis for analysis. The analysis showed that the program was highly effective, with an overall effectiveness score of 97.89%. The academic domain recorded the highest score (98.73%), followed by personality (98.00%), industry relevance (97.68%), and self-exploration (97.15%). These findings indicate that academic visits significantly enhance students' understanding of course content and effectively relate this exposure to their field of study. In addition, it indirectly contributes to students' personal development and their preparedness for the real-world working environment. The program also successfully built students' confidence in interacting with industry professionals and exploring opportunities within their respective fields. This study supports Kolb's (1984) experiential learning theory and aligns with previous research that emphasizes the importance of contextual learning in Technical and Vocational Education and Training (TVET). The implications of this study suggest that industrial visit programs should be made a permanent element of the polytechnic curriculum, with an emphasis on systematic reflection and collaborative industry partnerships. The study also recommends further research to expand the scope to other institutions and different industrial contexts. Overall, academic visits have been proven to have a significant positive impact on the holistic development of polytechnic students.

Keywords: Academic Visit, Industry, Politeknik Kuching Sarawak, Student Development, TVET

1. INTRODUCTION

Experiential learning has long been recognized as an effective approach in higher education, particularly in the field of technical and vocational education and training (TVET). In technical and vocational education and training (TVET), strong institution–industry linkages are essential to ensure that students acquire the practical knowledge, skills, and attitudes needed to meet industry demands. The true effects of academic visits on students' academic development, technical competence, and career development, however, have not yet been thoroughly investigated despite attempts to incorporate them into educational experiences in mechanical engineering programs. Such programs are still in place at many schools, such as Politeknik Kuching Sarawak, despite the lack of conclusive proof that they improve students' overall development and industrial preparedness. This lack of empirical evaluation creates uncertainty about how well these initiatives align with the objectives of producing competent, industry-relevant graduates. Therefore, the purpose of this study is to examine how well academic visits, as a type of institution-industry collaboration, advance the academic growth, self-discovery, personality development, and comprehension of real-world workplace practices of mechanical engineering students at Politeknik Kuching, Sarawak. Academic visit programs are one of the key approaches that provide students with the opportunity to immerse themselves in real work environments and connect theoretical knowledge acquired in the classroom with practical applications in the industry. This study aims to assess the direct impact of academic visits on polytechnic students who participated in visits to different companies. Evaluation was based on four main domains: academic improvement, self-exploration,

personality development, and relevance to the working world. This study also provides empirical justification for the role of out-of-classroom learning in shaping holistic students who are prepared to meet the challenges of the workforce. based on reflection forms completed by students after the visits, data was analysed to determine the effectiveness of the program and provide suggestions for improving polytechnic education policy. The study is important as it contributes to a deeper understanding of the need for such programs and how off-campus activities add value to students' learning processes in preparing them to become future-ready and industry-relevant graduates.

2. LITERATURE REVIEW

Experiential learning, introduced by Kolb (1984), emphasizes that learning occurs when individuals actively engage in experiences, reflect, generalize, and apply the acquired knowledge in new contexts. academic visits are a prime example of this approach in polytechnic education. According to Azizi et al. (2021), industry visits enhance students' understanding of course content, build connections with industry professionals, and boost their self-confidence. Nordin and Rahman (2022) found that such programs motivate students to learn actively and plan their careers more clearly. Ibrahim et al. (2023) emphasized the importance of industry engagement in TVET teaching and learning to align curricula with labour market needs.

Academic visits act as a vital medium to build this connection and enhance students' understanding of real work environments. Overall, existing literature supports the idea that academic visits positively impact holistic student development. however, quantitative studies that systematically analyse student reflection data remain limited. this study aims to fill that gap by providing empirical analysis based on scientifically structured student reflection data.

3. RESEARCH METHODOLOGY

This study used a quantitative approach through descriptive survey methods. Data was collected from student reflection forms completed after academic visits to industries. The Feedback forms used was constructed following the guidelines issued for the institutions. The feedback forms contained 12 items which are divided into four main domains: academic, exploration, personality, and industry relevance. Each item was rated using a Likert scale: 1 (Not Effective), 2 (Less Effective), 3 (Effective), and 4 (Very Effective). From the four courses offered under the Mechanical Engineering Department, a total of seventy-nine (79) students were selected to participate in the industrial visit program organized in collaboration with several partnering companies. These students were carefully chosen to represent a diverse mix of academic levels, skills, and interests within the department, ensuring that the visit would provide a holistic learning experience reflective of the different areas of mechanical engineering. The selection aimed to expose students to real industrial settings related to their coursework, such as manufacturing processes, machine design, thermodynamics, and maintenance engineering. All students completed the form, resulting in a 100% response rate where students was given one day to complete the forms after the academic visits. The quantitative data were analyzed using descriptive statistics such as total scores, average per domain, and effectiveness percentages.

Additionally, the total score was calculated and the overall effectiveness percentage was computed using the formula (A/B x 100%). This allowed the researchers to categorize the program's effectiveness (0–25% Not Effective, 26–50% Less Effective, 51–75% Effective, 76–100% Very Effective).

Though the study did not use hypothesis testing or advanced statistical inference like ANOVA or multiple regression, the data were sufficient to provide an initial picture of the program's impact. Student reflection served as a practical research instrument for continuous improvement.

4. RESULTS

Analysis of the students' reflection forms revealed that the academic visit program had an exceptionally strong impact on the participants. The evaluation results demonstrated that all four measured domains — academic learning, self-exploration, personality development, and industry relevance — achieved scores exceeding 95% across all three industrial visits, as presented in Table 1. This consistently gives high performance across multiple domains and visit

locations indicates that the program was highly effective in achieving its intended learning outcomes. The findings find that students not only gained deeper academic understanding but also experienced personal growth, enhanced self-awareness, and greater appreciation of real-world industry practices from the academic visit. The uniformly high scores further reflect the success of the program's design and implementation, highlighting its capacity to integrate theoretical knowledge with practical exposure while fostering holistic student development in both professional and personal dimensions.

Table 1. Student Reflection Scores

	Score Achieved				
Domain	Fuya Energy	Acson Malaysia	Beverages Marketing	Max Score	Percentage (%)
i) Academic	411	227	298	948	98.73
ii) Exploration	403	224	294	948	97.15
iii) Personality	403	227	299	948	98.00
iv) Relevance	406	226	294	948	97.68
Total		**3712**		**3792**	**97.89**

The findings from the study reveal that the academic visit program gives a highly positive impact on the development of Mechanical Engineering students, as evidenced by the overall effectiveness score of 97.89%, placing it in the "very effective" category. Among the four assessed domains, the academic domain recorded the highest average score of 98.73%, indicating that the majority of students strongly agreed that the program significantly enhanced their understanding of course learning outcomes for the courses taught during the years of studies. Students reported that the visits also helped them effectively in relating theoretical content that had been taught in the classroom to real industrial applications, whereby bridging the gap between conceptual learning and practical implementation. Notably, all 67 students scored the maximum score for understanding the relationship between theory and practice, demonstrating the program's strong pedagogical impact. However, a small group of students rated slightly lower in the aspect of course relevance, suggesting that minor refinements may be needed to ensure that all visited industries align more closely with specific course content and learning objectives.

The exploration domain, which achieved a score of 97.15%, highlights the program's role in fostering intellectual curiosity and motivating students to explore their chosen field more deeply. This outcome suggests that real-world exposure plays a vital role in cultivating confidence and inspiring students to actively engage with current industrial practices, innovations, and emerging technologies. Such engagement not only enhances students' technical understanding but also broadens their perspectives on career pathways and specialization opportunities within the mechanical engineering profession.

In the personality domain, a high score of 98% indicates that the academic visits contributed significantly to students' personal and professional growth. Participants reported an increased sense of motivation, responsibility, and productivity following the visits. These results imply that experiential learning opportunities not only build technical competence but also shape students' attitudes, work ethics, and self-identity as future engineers. The sense of responsibility observed among the participants suggests that the program encouraged a mindset aligned with professional standards and lifelong learning.

Meanwhile, the industry relevance domain achieved a strong score of 97.68%, signifying that students gained substantial insights into industry expectations, workplace culture, and professional communication. This finding supports the notion that early exposure to real-world industrial environments helps students develop a clearer understanding of the skills and attributes required by employers. Furthermore, the experience strengthened students' appreciation of the importance of collaboration, problem-solving, and adaptability—competencies that are essential in modern engineering practice.

Overall, the consistently high scores across all domains confirm that the academic visit program was highly successful in achieving its objectives. The initiative effectively bridged the institution–industry gap, enhanced students' academic learning, promoted exploration, fostered personal development, and increased industry awareness. Minor improvements could focus on aligning specific course topics with the selected industries to ensure maximum relevance. Nonetheless, the overwhelmingly positive responses demonstrate that academic visits remain a vital experiential learning strategy that supports holistic student development and strengthens institution–industry partnerships.

5. DISCUSSION

The findings reflect a very positive impact across all four domains, consistent with prior research that supports experiential learning's deep influence on students not only academically, but emotionally, socially, and professionally (Kolb, 1984; Azizi et al., 2021). High scores in the personality and relevance domains suggest that direct exposure to real work environments builds essential soft skills needed in the job market. The high effectiveness score also reflects strong program design - industry selection, active student participation, and effective delivery by the industry speakers. This reinforces the idea that industrial visits are not merely supplementary activities but integral learning strategies in polytechnic education.

However, a small number of students (1–2) reported limited impact, especially in course relevance and exploration. This indicates room for improvement in preparatory briefings, reflective activities, and post-visit sessions to help students connect their experiences meaningfully.
The discussion confirms that effective implementation requires close collaboration between lecturers, industry, and students to maximize the impact of experiential learning.

6. CONCLUSION AND RECOMMENDATIONS

This study concludes that academic visits to selected industries were highly effective in enhancing polytechnic students' learning. The overall effectiveness score of 97.89% places the program in the "very effective" category. this demonstrates the program's success not only in meeting learning objectives but also in developing personality and industry awareness.

Key impacts include improved theoretical and practical understanding, boosted student interest and confidence, and increased awareness of labour market needs—aligning with national TVET policy on contextual and industry-linked learning.

Recommendations:

i) Integrate more industrial visits into the curriculum structure.
ii) Conduct pre- and post-visit briefings to encourage deeper reflection.
iii) Implement learning journals or e-portfolios for systematic documentation.
iv) Expand industrial networks to expose students to various employment contexts.

Further research is encouraged with larger samples from multiple polytechnics and the use of inferential statistics to explore variations by course, gender, or academic level. such studies will contribute to better and more impactful higher education policy.

7. IMPACT OF THE STUDY

The main impact of this study lies in two areas: practical application and educational policy. Practically, the findings provide empirical evidence that academic visits significantly contribute to students' holistic development. This encourages educational administrators to prioritize and formalize such activities in the curriculum.

From a policy perspective, the study supports the re-evaluation of learning approaches in polytechnics to be more industry-based. It proves that out-of-classroom learning fosters soft skills that are difficult to in still through theoretical instruction alone. With greater industry involvement, student learning outcomes can be enhanced to meet the demands of the Fourth Industrial Revolution (IR 4.0) and future skills requirements. Overall, this study contributes to existing knowledge in TVET education and supports government initiatives to produce competitive, job-ready, and industry-aligned polytechnic graduates.

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