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Foreword

Welcome to the October 2025 edition of our *Compilation of Research Papers on Social Sciences & Humanities (SSH)*. This volume highlights diverse studies that reflect Malaysia's evolving educational, economic, and social landscape, uniting theory and practice to address real-world challenges.

The chapters explore a wide range of themes from emotional intelligence among teachers and student engagement in polytechnic education, to continuous assessment in technical courses and financial well-being among youth. Other contributions examine workers' views on robotics and social sustainability, early exposure to sustainability through the JuniorLestari Programme, and women's empowerment through financial literacy.

Collectively, these studies underscore the relevance of social sciences and humanities in fostering inclusive growth, innovation, and sustainability. We hope this volume inspires readers to pursue further research and contribute to building a more informed and resilient society.

Chapter 1
Emotional Intelligence among Primary School Teachers in Relation to Gender, Teaching Experience and Type of School

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ABSTRACT
Teachers in Malaysia face increasing emotional demands, making emotional intelligence (EI) essential for sustaining well-being and teaching effectiveness. This study examines EI levels among primary school teachers in Putrajaya, focusing on gender, teaching experience, and type of school (national vs. international). A quantitative survey design was employed, using the Wong and Law Emotional Intelligence Scale (WLEIS) to measure four EI dimensions: self-emotion appraisal, others' emotion appraisal, use of emotion, and regulation of emotion. Data were collected through an online survey of 67 teachers, and analyzed using descriptive statistics and independent samples t-tests in SPSS. Findings indicate that both male and female teachers reported high EI, with males scoring slightly higher in self-emotion appraisal and regulation, while females excelled in the use of emotion. Teachers with more than five years of experience recorded significantly higher EI than their less experienced peers, particularly in self-emotion appraisal and use of emotion. Furthermore, national school teachers demonstrated higher EI compared to international school teachers, especially in the use and regulation of emotion. These results highlight the importance of teaching experience and school context in shaping EI. From an Islamic perspective, EI aligns with values such as patience (*sabr*), compassion (*rahmah*), and God-consciousness (*taqwa*), emphasizing its role in holistic teacher development. The study suggests integrating EI into teacher education and professional development programs to strengthen resilience, enhance instructional quality, and improve student outcomes.

Keywords: Emotional intelligence, gender, teaching experience, type of school, Malaysia

1. INTRODUCTION

Teaching is widely recognized as one of the most emotionally demanding professions, as educators are required to manage their own emotions while simultaneously responding to the emotional needs of their students. Teachers' emotional intelligence (EI) includes self-awareness, self-regulation, empathy, and social skills, plays a central role in shaping classroom climate, fostering student engagement, and supporting academic success (Rahman et al., 2024). Teachers with high EI are better able to create supportive learning environments, strengthen teacher–student relationships, and manage classroom behaviour effectively. These skills not only contribute to positive communication and motivation but have also been linked to measurable improvements in student academic performance (Sun et al., 2024; Qazi et al., 2024).

Research demonstrates that teachers' EI directly influences student outcomes. For instance, positive emotional expression by teachers increases students' enthusiasm for learning, while empathy and strong interpersonal skills encourage active participation and engagement (Jaberi et al., 2024). Training programs designed to enhance EI have been shown to improve teacher–student relationships and classroom climate, leading to better academic results (Pattiasina et al., 2024). Studies estimate that classrooms led by emotionally intelligent teachers can achieve up to a 10% improvement in student performance compared to those with lower-EI teachers (Qazi et al., 2024). These findings underscore the importance of equipping teachers with emotional competencies alongside pedagogical and content knowledge.

Despite growing global recognition of the value of EI in education, teachers in Malaysia face substantial challenges that can hinder its development and application. High workloads, administrative burdens, and societal expectations regarding student achievement place considerable stress on teachers, often affecting both their well-being and classroom effectiveness (Yahya & Azman, 2022). While international research has extensively examined EI in education, studies within the Malaysian context, particularly at the primary school level, remain limited. Moreover, the potential influence of demographic factors such as gender, teaching experience, and type of school (national versus international) on EI has not been systematically explored in Malaysia. This lack of empirical evidence presents a gap in understanding how these factors may shape teachers' emotional competencies and, in turn, their teaching effectiveness.

To address this gap, the present study investigates the levels of EI among primary school teachers in Putrajaya, Malaysia. Specifically, it examines differences in EI across gender, teaching experience, and type of school. By doing so, the study seeks to provide insights that can inform teacher education and professional development initiatives. Furthermore, it emphasizes the importance of integrating EI training into educational policies to ensure that teachers are well-prepared to address both the academic and emotional needs of their students.

2. LITERATURE REVIEW

2.1 Definition of Emotional Intelligence

Emotional intelligence (EI) refers to the ability to recognize, understand, and manage one's own emotions as well as those of others, making it vital for personal and professional success. It influences social interactions, relationships, and overall well-being, and is considered a skill that can be developed through practice. Core components of EI include self-awareness, or recognizing the impact of emotions on behavior (Shafik, 2024); self-regulation, the ability to control impulses (Nasution et al., 2023); empathy, or understanding others' feelings (Farmer et al., 2020); and social skills, which foster effective communication and positive relationships (Dhillon et al., 2021).

2.2 Emotional Intelligence among Teachers

Teachers' emotional intelligence (EI) in Malaysia is influenced by demographic factors such as gender, teaching experience, and school type. While teachers generally demonstrate high levels of EI, variations emerge when these characteristics are considered. Studies on gender reveal mixed findings. Some report no significant differences in overall EI between male and female teachers (Chaudhary & Varma, 2021; Yahya & Azman, 2022). Others highlight gender-specific patterns: female teachers often score higher in self-regulation and interpersonal sensitivity, reflecting greater empathy and expressiveness, while male teachers may show strengths in problem-solving, intuition, or resilience (Ahmad, 2013; Usmani et al., 2023). These findings indicate that gender may shape the way EI is expressed and applied in teaching, even if overall levels remain similar.

Teaching experience is another factor linked to EI differences. Many studies suggest that experienced teachers display stronger emotional competencies due to accumulated classroom exposure and life experiences (Yahya & Azman, 2022; Don et al., 2014; Amponsah et al., 2024). Their enhanced classroom management and pedagogical practices are often associated with higher EI (Awwad, 2022). Yet, findings are not always consistent. Some research shows novice teachers demonstrating higher emotional clarity and repair skills, while experienced teachers may suffer from emotional exhaustion (Porras-Cruz & Buitrago-Bonilla, 2024). Others found no significant differences across experience levels (Chaudhary & Varma, 2021). These inconsistencies suggest that external factors, including coping mechanisms, institutional support, and training, may play a crucial role in shaping EI.

School type has also been explored, though evidence remains inconclusive. Some studies report no significant EI differences between national and international school teachers (Chaudhary & Varma, 2021; Don et al., 2014). However, contextual variations matter. International school teachers often engage with culturally diverse classrooms, requiring adaptability, empathy, and cross-cultural competence, but also encountering unique emotional demands (Fernández-Berrocal et al., 2017; Tolentino, 2023). National school teachers, in contrast, often manage larger classes and standardized curricula, which demand strong emotion regulation and stress management skills. Thus, while school type may not directly determine EI, it shapes the contexts where emotional competencies are enacted.

2.3 Emotional Intelligence from the Islamic Perspective

From an Islamic perspective, emotional intelligence (EI) is integral to the teaching profession as it supports moral formation, character development, and holistic education. EI is not only about managing emotions but also about cultivating values, fostering positive relationships, and guiding students' academic and spiritual growth. The Qur'an and Sunnah emphasize the integration of emotional and spiritual development, positioning EI as an essential element of effective teaching and learning.

In Islamic education, EI aligns with the goal of nurturing individuals who are intellectually capable, emotionally balanced, and spiritually conscious (Sofiani et al., 2024). Its classroom application contributes to character building, helping students internalize religious values while promoting prosocial behavior and psychological well-being (Susanti & Nukman, 2024). Teaching methodologies such as role modeling, habituation, and offering advice reflect a holistic approach to cultivating EI, ensuring learners develop both knowledge and virtue (Sofiani et al., 2024).

Furthermore, EI in Islam is intertwined with spiritual intelligence, guiding individuals toward divine consciousness (*taqwa*) rather than personal desires (Sa'idah, 2023). Foundational EI aspects like self-control, empathy, and social skills are embedded in Islamic teachings, which stress patience (*sabr*), compassion (*rahmah*), and forgiveness (Masruroh, 2015). Thus, effective teaching requires integrating emotional, moral, and spiritual dimensions.

3. METHODOLOGY

This study employed a quantitative research design to examine emotional intelligence (EI) among primary school teachers in Putrajaya, Malaysia. A quantitative approach was chosen because it allows for statistical analysis of group differences and provides measurable insights into EI across demographic variables, including gender, teaching experience, and type of school. Data were collected using an online survey distributed via Google Forms, ensuring accessibility, convenience, and efficiency. Responses were exported into IBM SPSS Statistics (Version 26) for analysis, including descriptive statistics and independent samples *t* tests.

The study population comprised 67 primary school teachers from national and international schools in Putrajaya. Table 1 shows the demographic profile of the respondents. Convenience sampling was applied for national school teachers to facilitate direct access, while snowball sampling was used for international schools, with initial participants referring colleagues to participate. This combination enhanced diversity and addressed recruitment challenges.

Table 1 Demographic Profile

Category	Frequency (N=67)	Percentage (100%)
Gender		
Male	50	75
Female	17	25
Teaching Experience		
Less than 5 years	19	28
More than 5 years	48	72
Type of School		
National	47	70
International	20	30

Teachers' EI was measured using the Wong and Law Emotional Intelligence Scale (WLEIS), a validated instrument with 16 items covering four dimensions: self-emotion appraisal, others' emotion appraisal, use of emotion, and regulation of emotion. Items were rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The WLEIS has shown robust psychometric properties across cultures, with Cronbach's alpha values typically exceeding .85 (Law, Wong, & Song, 2004). In this study, a pilot test confirmed its reliability, yielding an overall Cronbach's alpha of .96, indicating excellent internal consistency.

The study adhered to ethical research standards. Informed consent was obtained from all participants, who were informed about the purpose, procedures, and their right to withdraw at any time without penalty. Participation was voluntary, and anonymity was maintained by coding responses. Data were securely stored and used solely for academic purposes. Ethical approval was obtained from the institutional review board to ensure compliance with research ethics.

4. RESULTS AND DISCUSSION

This study examined the levels of emotional intelligence (EI) among primary school teachers in Putrajaya, focusing on gender, teaching experience, and type of school. The following sections present and interpret the results.

4.1 Gender Differences in Emotional Intelligence

An independent-samples *t* test was conducted to compare emotional intelligence (EI) scores between male and female teachers. The results indicated no significant difference in EI scores, $t(98) = 1.18$, $p = .24$, 95% CI [−0.07, 0.27], $d = 0.24$. Male teachers (M = 4.10, SD = 0.68) scored slightly higher on self-emotion appraisal and regulation, whereas female teachers (M = 4.12, SD = 0.74) scored marginally higher on the use of emotion.

Although the statistical difference was not significant, the patterns align with previous findings suggesting that gender may shape how EI competencies are expressed. Male teachers often emphasize self-regulation and problem-solving, while female teachers demonstrate stronger emotional expressiveness and empathy (Chaudhary & Varma, 2021; Usmani et al., 2023). These complementary strengths highlight the potential value of gender-sensitive approaches in EI development programs to support effective classroom practice. From an Islamic perspective, both male and female teachers are encouraged to embody *rahmah* (compassion) and *sabr* (patience), reinforcing EI as a universal trait essential for nurturing relationships and guiding students' holistic development (Anwar et al., 2020).

4.2 Teaching Experience and Emotional Intelligence

An independent-samples *t* test was conducted to compare EI scores between teachers with 1–5 years of experience and those with more than 5 years. The results showed a significant difference, $t(98) = 2.99$, $p = .004$, 95% CI [0.10, 0.50], $d = 0.60$, indicating a medium effect size. Teachers with more than 5 years of experience (M = 4.18, SD = 0.71) scored higher in self-emotion appraisal and use of emotion compared to those with 1–5 years of experience (M = 4.02, SD = 0.68).

These findings suggest that EI tends to develop with professional experience, supporting studies that link prolonged exposure to classroom dynamics with enhanced emotional management and resilience (Don et al., 2014; Yahya & Azman, 2022). Experienced teachers may be better equipped to regulate emotions, manage stress, and foster stronger teacher–student relationships, which are critical for effective classroom management (Amponsah et al., 2024; Awwad, 2022). However, literature also notes that early-career teachers may sometimes display higher emotional clarity and repair skills, while experienced teachers may face emotional fatigue due to accumulated stress (Porras-Cruz & Buitrago-Bonilla, 2024). From an Islamic perspective, the stronger performance of experienced teachers can be associated with *hikmah* (wisdom), which grows with age and experience, enabling educators to act with balance, patience, and emotional maturity.

4.3 Type of School and Emotional Intelligence

An independent-samples *t* test was conducted to compare EI scores between national and international school teachers. The results indicated a significant difference, $t(98) = 2.99$, $p = .004$, 95% CI [0.10, 0.50], $d = 0.61$, suggesting a medium effect size. National school teachers (M = 4.22, SD = 0.66) reported higher EI scores, particularly in the use and regulation of emotions, compared to international school teachers (M = 3.96, SD = 0.79).

The higher EI scores among national school teachers may reflect differences in institutional context. Teachers in national schools often manage larger class sizes and standardized curricula, which may foster stronger emotion regulation and stress management skills (Yahya & Azman, 2022; Don et al., 2014). By contrast, international school teachers face unique challenges associated with cultural diversity and varied student backgrounds, which may require heightened adaptability and empathy but also present different emotional demands (Fernández-Berrocal et al., 2017; Tolentino, 2023). These contextual differences highlight that while school type may not directly determine EI levels, it shapes the ways teachers apply emotional competencies in practice. From an Islamic perspective, such differences resonate with the Qur'anic principle of *ta'aruf* (mutual understanding) in diverse settings (Qur'an 49:13), reminding educators of the universal obligation to demonstrate fairness, empathy, and compassion across all teaching environments.

5. CONCLUSION

The findings of this study emphasize the importance of emotional intelligence (EI) as a core competency for primary school teachers. High levels of EI, particularly in self-awareness, regulation, and empathy, are vital for effective classroom management, fostering student engagement, and strengthening teacher–student relationships (Yahya & Azman, 2022; Don et al., 2014). The results suggest that teacher education programs in Malaysia should incorporate EI development into both pre-service and in-service training. Professional development workshops focusing on stress management, empathy-building, and emotional regulation could further enhance teachers' capacity to address classroom challenges (Chaudhary & Varma, 2021).

This study has several limitations. First, the relatively small sample size (N = 67) limits the generalizability of the findings, as it may not capture the full diversity of Malaysian primary school teachers. Larger and more varied samples are needed to improve external validity (Chaudhary & Varma, 2021). Second, the study relied on self-reported data through the Wong and Law Emotional Intelligence Scale (WLEIS). Although the instrument is reliable, self-reporting carries the risk of social desirability bias, where participants may overestimate their emotional abilities (Law, Wong, & Song, 2004). Third, the cross-sectional design prevents establishing causal relationships between demographic factors and EI. Longitudinal studies would better capture how EI develops across teachers' careers (Amponsah et al., 2024).

Future research should expand to include teachers from diverse educational contexts, such as rural, urban, private, and religious schools, for a more comprehensive understanding of demographic and contextual influences on EI (Tolentino, 2023). Mixed-methods designs incorporating classroom observations, peer evaluations, and interviews could reduce reliance on self-reports and provide richer insights (Fernández-Berrocal et al., 2017). Studies should also evaluate the effectiveness of EI training programs in enhancing teacher performance and student outcomes, contributing to evidence-based educational practice (Don et al., 2014).

This study contributes to literature on EI by examining gender, teaching experience, and school type among Malaysian primary teachers. Findings show that while both male and female teachers demonstrate high EI, more experienced teachers generally score higher in self-awareness and regulation. Differences between national and international school teachers further highlight the role of contextual factors. These results underscore the need to integrate EI training into teacher preparation and professional development, recognizing EI as a professional skill that strengthens teacher effectiveness, resilience, and student achievement (Yahya & Azman, 2022; Don et al., 2014).

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Chapter 2
Synergizing Collaborative Learning and Academic Advising: Pathways to Student Engagement in Polytechnic Education

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ABSTRACT
Engagement of students has emerged as a key issue in higher education, especially like polytechnics. Two important approaches, collaborative learning and academic advising, are gaining acknowledgment for their significance in fostering meaningful educational experiences and enhancing academic results. Collaborative learning promotes students collaborating, exchanging knowledge, and cultivating teamwork abilities vital for job readiness, while academic advising offers organized assistance, direction, and mentoring during students' educational experiences. This paper integrates existing viewpoints on the application of collaborative learning and academic advising in higher education, focusing particularly on the polytechnic environment. It emphasizes that the integration of these practices can improve student motivation, performance, and retention. The conversation also addresses shared difficulties like advisor burden, student inactivity, and institutional limitations, while highlighting the promise of digital resources and artificial intelligence (AI) to enhance student involvement. The article ends with suggestions for educators and policymakers to align advising and cooperative learning methods with changing educational demands.

Keywords: Collaborative Learning; Academic Advising; Student Engagement; Polytechnic.

1. INTRODUCTION

A crucial factor of academic success that been acknowledged widely is student engagement and it is an overall learning quality in higher education. In the landscape of polytechnic, nurturing student engagement is very substantial where the program underline on the skill of practicality and knowledge application. Students who are actively involved in their studies are more likely to persist in their studies, perform effectively in project-based duties, and successfully transition into the workforce.

Academic advising and collaborative learning are two of the most notable engagement boosting tactics. Based on social constructivist theory, collaborative learning highlights information sharing, peer support, and group interaction as crucial components of learning. It enables polytechnic students to put theoretical ideas into practice, simulating teamwork in the workplace (Moses & Yamjal, 2022). Academic advising, on the other hand, offers tailored assistance that helps students overcome obstacles in their studies, establish professional objectives, and stay motivated. Despite their differences, both strategies work well together to influence students' academic and personal growth (Chaerunisyah, 2024; Lopes, 2024).

Academic advice and collaborative learning are frequently used alone in the polytechnic setting, but their combination has a greater chance of having an impact. Through the integration of the group-based learning benefits and academic advising's individualized help, educational institutions can establish a more comprehensive framework for student achievement. Nonetheless, a number of issues still exist, such as a lack of resources, uneven advising procedures, and varying student preparedness for group projects (Picton et al., 2023; Ruijuan et al., 2023).

This study looks at how academic advising and collaborative learning might be used together to improve student engagement in polytechnic education. In particular, it looks at current methods, emphasizes how the two approaches work together, and finds areas for innovation, such as the use of digital technologies and artificial intelligence (AI). By concentrating on the polytechnic setting, the conversation offers valuable perspectives for educators and policymakers who aim to increase participation in technical and vocational programs.

2. COLLABORATIVE LEARNING AND ACADEMIC ADVISING IN POLYTECHNIC EDUCATION

The foundation of collaborative learning is social constructivism, which holds that knowledge is jointly constructed by students by communication and interaction. Group projects, lab work, peer conversations, and problem-based assignments are some ways that collaborative learning occurs in the polytechnic setting. Through these exercises, students can develop communication and cooperation skills, discuss a variety of viewpoints, and exercise critical thinking (Ansari & Naseer, 2024; Salimovna, 2023). Such cooperative activities help technical and vocational students better understand difficult ideas and replicate the cooperative atmosphere of industrial settings (Zhao & Ko, 2022).

In polytechnic education, the advantages of collaborative learning are widely known. Students that actively engage in group learning settings exhibit increased motivation, better academic achievement, and enhanced subject-matter retention. Additionally, they cultivate soft skills that are critical to employment, such decision-making, leadership, and dispute resolution. But there are still difficulties. Group dynamics can be unbalanced, with some students taking charge while others retreat, and evaluation equity in group projects frequently becomes an issue. Furthermore, the depth of cooperative activities may be constrained by time constraints under strict academic schedules (Khan, 2024; Matongo & Goronga, 2024).

Contrarily, academic advising offers students organized assistance as they traverse their academic and personal growth. Advisors at the polytechnic serve a variety of purposes, including helping students choose courses, counselling them on careers, keeping track of their academic progress, and offering encouragement. Good advising increases overall student satisfaction, lowers dropout rates, and creates a sense of community. Additionally, it provides chances for early assistance when kids experience personal or academic difficulties (Abu Shunnar, 2022).

Academic advising is difficult in many polytechnic institutions, despite its significance. Advisors frequently oversee sizable class sizes, which restricts the depth of one-on-one conversations. Due to societal reluctance to approach lecturers outside of the classroom or a lack of knowledge about the advantages of asking for help, students may be reluctant to do so. Furthermore, its efficacy may be weakened by inconsistent advising procedures and a lack of institutional support (Hensby & Naylor, 2024).

When combined, academic advising and collaborative learning aim to promote greater student involvement. One promotes group learning and peer-to-peer interactions, while the other places more emphasis on one-on-one coaching and mentoring. Although both strategies support academic achievement, their integration holds the most promise, as discussed in the section that follows.

3. INTEGRATING COLLABORATIVE LEARNING AND ACADEMIC ADVISING FOR STUDENT ENGAGEMENT

In polytechnic education, academic advising and collaborative learning are frequently used as distinct approaches. However, because both strategies address distinct but complementary facets of the learning process, their combination offers a greater chance to improve student engagement. Academic advising guarantees that students receive individualized assistance and motivation, while collaborative learning fosters peer engagement, teamwork, and knowledge exchange (Khan, 2024; Matongo & Goronga, 2024). These strategies can support one another when they are in harmony, creating a more comprehensive learning environment.

Advisor-led group activities, which mix academic advising sessions with cooperative assignments, are one method integration takes place. Advisors can, for instance, encourage students to collaborate in groups to create project proposals, exchange approaches to problem-solving, or evaluate academic performance as a group (Siegeris & Pfennig, 2023). In addition to improving group dynamics, these exercises give advisors the chance to monitor student progress and offer focused interventions. Students who feel encouraged by their peers and mentored by mentors are more engaged as a result of this dual approach (Hammond & Masters, 2024).

Collaborative advising methods strengthen academic and social ties, as demonstrated by case studies from polytechnic schools. For example, during group advising sessions, advisers provide organized feedback while students can benefit from each other's experiences. This fosters a caring environment that encourages group development and lessens the sense of isolation that is frequently experienced in higher education. Additionally, project-based learning (PBL), in which students complete real-world assignments under the supervision of an advisor, can be connected to collaborative advising to better connect academic instruction with real-world application.(Barney et al., 2022; Matongo & Goronga, 2024).

The incorporation of digital resources broadens these possibilities. Learning management systems (LMS), collaborative tools (like Google Workspace or Microsoft Teams), and online discussion platforms allow advisors to track group advancement, encourage peer engagement, and deliver prompt feedback. Recently AI tools, such as ChatGPT, have emerged as helpful resources for brainstorming, drafting, and developing ideas (Kurki et al., 2024). When utilized appropriately, AI can help students tackle writer’s block, enhance their project concepts, and gain various viewpoints. Meanwhile, advisors can support students in using these tools ethically and critically, making sure that technology aids rather than substitutes for human effort (Ramadhan et al., 2024).

While this integration holds great potential, there are obstacles to consider. If not handled with care, excessive dependence on AI may diminish students' critical thinking abilities, and group advising necessitates extra planning and time from faculty members who are already stretched thin. Therefore, institutional backing is essential to provide the necessary training, resources, and frameworks for successful integration. Nevertheless, when executed thoughtfully, the combination of collaborative learning and academic advising, bolstered by digital innovation, can greatly enhance student engagement, academic success, and preparedness for professional careers (Crain et al., 2025; Ruijuan et al., 2023).

4. CHALLENGES AND OPPORTUNITIES IN POLYTECHNIC CONTEXT

Although combining collaborative learning with academic advising presents distinct advantages, various obstacles impede its complete adoption within polytechnic education. A major complication is the lack of resources. Academic advisors frequently oversee sizable groups of students, which complicates their ability to offer personalized support while also coordinating group learning activities. Such a workload may diminish the quality of both the advising and collaborative initiatives (Rawatlal & Dhunpath, 2023; Ruijuan et al., 2023).

A further challenge relates to student perceptions and preparedness. Certain students may hesitate to engage in teamwork, opting instead for solitary assignments, while others might feel insecure about requesting help from academic advisors. Cultural influences, like hesitance to interact with instructors beyond scheduled class times, can also impact the success of advising. Furthermore, evaluation methods can occasionally overlook the richness of involvement encouraged through collaboration and advising, emphasizing results rather than the methods used (Hensby & Naylor, 2024; Zaher, 2024).

Technological and digital gaps create additional obstacles. Although numerous polytechnics are implementing learning management systems and online collaboration tools, not every student has the same access to dependable internet or digital literacy abilities. Excessive dependence on AI tools may result in academic integrity problems if students utilize them without critical analysis (Song, 2024).

In spite of these obstacles, considerable opportunities are present. The growing focus on student-centered education in Malaysian higher education policy encourages the enhancement of collaborative and advisory approaches. Digital instruments such as e-portfolios, online forums, and AI-driven feedback systems can assist advisors in managing bigger groups more efficiently while preserving student engagement. Additionally, integrating collaborative learning within project-based programs creates an organic connection between advising and practical applications, equipping students for workplace requirements (Neo et al., 2023; Rose et al., 2024).

By recognizing these obstacles and utilizing new opportunities, polytechnics can create a more nurturing and interactive educational environment. This necessitates institutional dedication, training for counsellors, and policies that promote innovation in educational practices.

5. CONCLUSION

This paper has emphasized the importance of cooperative learning and academic counselling in improving student involvement in polytechnic education. Collaborative learning allows students to engage in knowledge sharing, teamwork, and problem-solving actively, whereas academic advising offers tailored guidance that fosters both academic success and personal development. When these two methods are carefully integrated, they establish a more well-rounded and comprehensive learning atmosphere that encourages both peer assistance and individualized guidance.

Even with their advantages, obstacles persist, such as the workload of advisors, inconsistent group dynamics, student preparedness, and issues with technology. Nonetheless, there are chances available by combining digital platforms with artificial intelligence resources that can enhance advising processes and improve collaborative efforts. Support from institutions, training for mentors, and policies that promote innovation are crucial to fully leverage the potential of these strategies.

In summary, enhancing student involvement in polytechnics necessitates a collaboration between cooperative learning and academic guidance. By incorporating these practices more consistently into curricula and institutional frameworks, polytechnics can equip students for both academic achievement and future personal and professional growth.

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Chapter 3
Evaluating Diploma Student Performance through Continuous Assessment in the Course of Petrochemical Process Technology

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ABSTRACT
Continuous assessment has emerged as a crucial approach in technical and vocational education, facilitating ongoing evaluation of both theoretical knowledge and practical skills. This study investigates the continuous assessment outcomes of 25 diploma students enrolled in the Petrochemical Process Technology course at Politeknik Tun Syed Nasir Syed Ismail (PTSN) during the second semester of the 2024/2025 academic year. Data retrieved from the Sistem Pengurusan Maklumat Politeknik (SPMP) included scores from quizzes, tests, end-of-chapter assignments, and presentations. Descriptive statistical analysis indicated an overall average score of 84.8, with the majority of students scoring between 80 and 95, reflecting consistent engagement and understanding of the course content. A few students scored below 75, pointing to a need for enhanced academic support and personalized feedback. Gender-specific analysis revealed that female students had a higher average score (85.8) than male students (83.5), though their performance showed more variation, with some achieving the highest score (97) and others among the lowest (69–72). These findings support the role of continuous assessment in maintaining student engagement, ensuring fair evaluation, and identifying instructional areas for improvement. It remains a vital method in polytechnic education, not only assessing academic achievement but also nurturing essential communication, collaboration, and employability skills needed in the petrochemical sector.

Keywords: Continuous assessment; Polytechnic education; Student performance; Gender-based analysis; Teaching and learning.

1. INTRODUCTION

Assessment plays a vital role in higher education, functioning as a tool to evaluate student performance, assess learning outcomes, and deliver constructive feedback. In recent years, there has been a growing emphasis on continuous assessment, as it reflects student achievement throughout the semester rather than depending solely on final exams. This method enables lecturers to monitor progress, identify learning gaps, and offer timely support (Hatt, 2018; Hernández, 2012).

In technical and vocational education, especially in course like Petrochemical Process Technology, continuous assessment is essential, as it requires students to combine theoretical knowledge with practical application (Wang et al., 2023). A single examination may not effectively capture the range of student competencies, while continuous assessment through quizzes, tests, exercises, and presentations offers a more thorough evaluation of their abilities. This approach promotes regular engagement with the content, minimizes reliance on rote memorization, and cultivates essential skills such as problem-solving, communication, and teamwork (Bansal, 2014; Djamalovna, 2024).
The implementation of continuous assessment is also in line with Malaysia's higher education agenda, notably the Malaysian Education Blueprint (Higher Education) and the Twelfth Malaysia Plan (RMK-12), which highlight the importance of competency-based learning and graduate employability. By assessing students through various methods, polytechnics ensure that graduates are equipped not only with academic knowledge but also with transferable skills that are highly valued by industry (Mohd et al., 2025; Yusof et al., 2017).
This study analyses the continuous assessment outcomes of students enrolled in the Petrochemical Process Technology course at Politeknik Tun Syed Nasir Syed Ismail (PTSN). It specifically investigates the cohort's overall performance, examines gender-based differences in achievement, and discusses the implications of these findings for teaching and learning strategies. The results aim to offer valuable insights into how continuous assessment contributes to student success in technical education.

2. LITERATURE REVIEW

Continuous assessment is widely acknowledged as an effective approach for enhancing learning outcomes in higher education. Unlike summative evaluation, which assesses learning at the end of a course, continuous assessment enables instructors to track student progress throughout the semester and offer feedback that supports improvement. Research has demonstrated that regular, smaller assessments foster stronger study habits, boost motivation, and improve long-term knowledge retention (Combrinck & Hatch, 2012; Salama Muhammad et al., 2024).

In technical and vocational education, continuous assessment holds particular importance. Courses in engineering and applied sciences demand that students exhibit both theoretical understanding and practical proficiency. Utilizing various assessment methods such as assignments, quizzes, and presentations allows for a comprehensive evaluation of these diverse skill sets (Djamalovna, 2024; Moldovan et al., 2017). For instance, quizzes and assignments evaluate immediate understanding, while presentations and projects assess teamwork and communication skills, key competencies essential for employability (Ramandeep Kaur, 2025).

Gender differences have also been noted in assessment outcomes. Research indicates that female students often attain higher average scores in coursework-based evaluations but tend to show greater performance variability compared to male peers. This underscores the need to analyse gender-based performance to ensure that continuous assessment supports all learners fairly and effectively (Teshome, 2025; Woodfield et al., 2005).

In the Malaysian context, continuous assessment supports national goals for student-centered, competency-based education. Polytechnic institutions, in particular, are responsible for developing graduates who are not only academically proficient but also possess the soft skills demanded by industry (Idrus, 2014). Despite this emphasis, limited research has analysed continuous assessment outcomes in specialized courses such as Petrochemical Process Technology.

3. METHODOLOGY

3.1. Research Scope

This study was carried out within the context of a diploma-level course titled Petrochemical Process Technology, offered in diploma of petrochemical engineering. The course covers the fundamental principles and practical applications of petrochemical processes, including separation, conversion, and product handling. Continuous assessment plays a central role in evaluating students, ensuring that both theoretical knowledge and practical skills are effectively measured.

3.2. Participants

The study sample of a class included 25 students enrolled in Semester 2 of the 2024/2025 academic session, consisting of 11 male and 14 female participants. All students were registered in the Petrochemical Process Technology course under the Diploma in Process Engineering (Petrochemical) program. The sample represents a typical class size and demographic profile for technical education at the polytechnic level.

3.3. Data Source

Data for this study was sourced from the official Sistem Pengurusan Maklumat Politeknik (SPMP) of Politeknik Tun Syed Nasir Syed Ismail (PTSN). Continuous assessment scores were directly retrieved from SPMP, ensuring data reliability and accuracy. To uphold confidentiality and adhere to ethical research standards, all student identities were anonymized.

3.4. Assessment Components

The continuous assessment system for this course comprised four main components:

- Quizzes: Short evaluations measuring immediate comprehension of course material.
- Tests: Assessments focused on problem-solving and the application of theoretical concepts of certain topic.
- End-of-Chapter Exercises: Assessment designed to reinforce learning and verify topic mastery of certain topic via non-face to face learning
- Presentations: Group-based evaluations measuring communication skills, teamwork, and applied understanding of petrochemical processes.

Each student’s total continuous assessment score was determined by aggregating marks from these components, based on the weightage set by the course lecturer and institutional guidelines.

3.5. Data Analysis

A quantitative, descriptive statistical approach was applied to analyse the data. The following steps were undertaken:

- Descriptive Statistics: Mean, median, standard deviation, and score range were computed to describe the overall performance.
- Gender-Based Analysis: Student performance was analysed separately for male and female learners to identify differences in average achievement and variability.

This methodological framework provided a structured analysis of continuous assessment outcomes, supported by reliable institutional data and guided by ethical standards in handling student information.

4. RESULT AND DISCUSSION

4.1. Overall Performance of the Cohort

Descriptive statistics revealed that the 25 students enrolled in the Petrochemical Process Technology course achieved an overall mean continuous assessment score of 84.8, with a median of 85 and a standard deviation of 8.2. The scores ranged from 68 to 97, indicating generally strong performance across the cohort, with some variability among individual results.

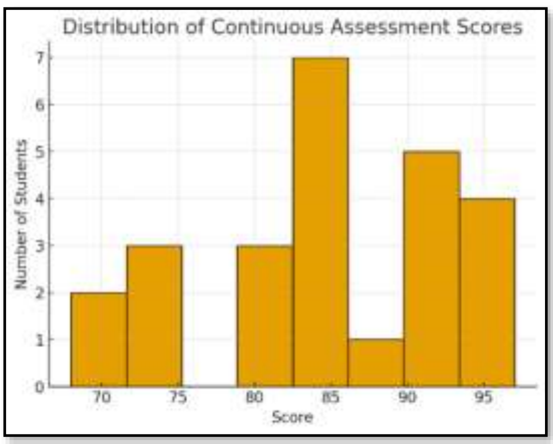

Figure 1: Distribution of Continuous Assessment Scores

Figure 1 illustrates that the majority of students scored between 80 and 95 marks, reflecting strong engagement and a solid grasp of the course content. Only a few students scored below 75, indicating that although continuous assessment promotes consistent performance, a small subset of learners may face challenges in sustaining regular study habits.

These findings reinforce the effectiveness of continuous assessment in supporting sustained student learning. Prior research has shown that frequent, smaller assessments boost motivation and help learners stay aligned with course content. The concentration of scores in the higher range suggests that components such as quizzes, end-of-chapter exercises, and presentations effectively reinforced learning throughout the semester (Smith et al., 2023). This supports the notion that students in technical courses show greater engagement when assessed progressively, rather than relying solely on final examinations (Jordan & Bolton, 2024).

4.2. Gender-Based Performance

Gender-based analysis showed that male students (n = 11) achieved an average score of 83.5 (SD = 5.8), while female students (n = 14) attained a slightly higher average of 85.8 (SD = 9.8).

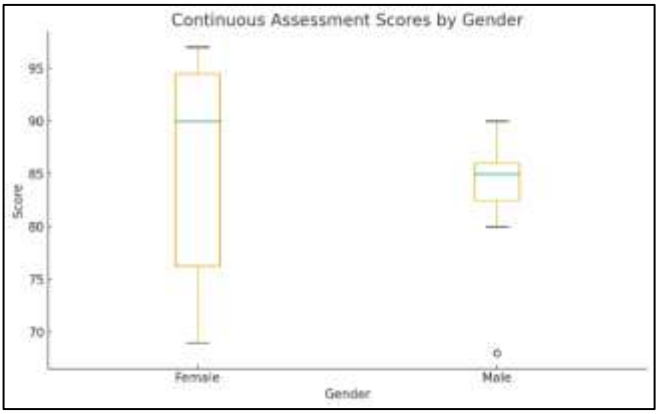

Figure 2: Continuous Assessment Scores by Gender

Figure 2 illustrates that male students' scores were more consistently clustered around the mid-80s, whereas female students displayed greater variability. Female students not only achieved the highest score in the cohort (97) but also accounted for several of the lowest scores (69–72). This suggests wider performance variation among female students, encompassing both top achievers and those who faced academic challenges.

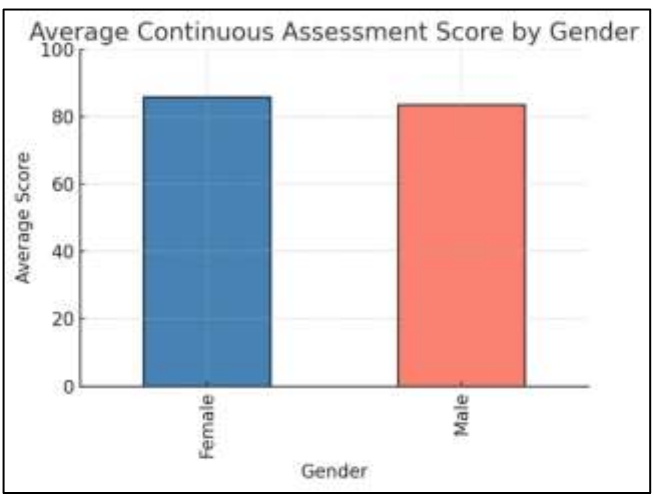

Figure 3: Average Continuous Assessment Score by Gender

Figure 3 indicates that female students outperformed their male counterparts on average, with a modest margin of approximately 2.3 points. While the higher mean score among females reflects stronger performance at the upper end, the greater variability suggests that a subset of female students had difficulty keeping pace with the overall cohort.

Although female students achieved higher average scores than males, the variability within the female subgroup is significant. While female learners often excel in coursework, their performance tends to span a wider range of outcomes compared to their male peers. (O'Dea et al., 2018; Orr et al., 2011). In the Malaysian polytechnic context, it is also observed that female students often dominate the top performance group while simultaneously appearing among the lower-performing cohort (Zainal et al., 2014).

This finding highlights the need for gender-sensitive teaching interventions. While male students showed consistent performance, female students would benefit from differentiated instructional strategies such as targeted remedial support for those struggling and enrichment opportunities for high achievers (Cohen et al., 2025; Pilotti, 2021). This reinforces the idea that continuous assessment should serve not only as a tool for measuring learning but also as a means to inform instructional improvements tailored to diverse student needs. (Dela Peña et al., 2025).

4.2. Implications for Teaching and Learning

The findings of this study offer several important implications for teaching and learning practices within polytechnic education.:

1. *Encouraging Consistent Engagement*
   The clustering of scores within the 80–95 range underscores the effectiveness of continuous assessment in sustaining consistent student performance. This supports the notion that distributed assessment enhances both learning outcomes and student motivation (Asghair, 2025).
2. *Addressing Performance Variability*
   While most students performed well, the observed variability particularly among female students indicates the need for adaptive teaching strategies to promote inclusivity. Approaches such as peer learning, remedial tutorials, and targeted feedback could assist lower-performing students in narrowing the achievement gap (Cohen et al., 2025; Sharma, 2025).
3. *Balancing Assessment Components*
   The integration of quizzes, tests, end-of-chapter tasks, and presentations represents a holistic assessment approach that evaluates both academic proficiency and essential soft skills such as communication and teamwork. This aligns with the Malaysian Education Blueprint (Higher Education), which advocates for student-centered, competency-based learning (Sapan et al., 2020).
4. *Supporting National Policy Goals*
   Continuous assessment practices in this course directly support the objectives of the Twelfth Malaysia Plan (RMK-12), which emphasizes improving TVET outcomes, enhancing graduate employability, and promoting lifelong learning. By evaluating both technical expertise and transferable skills, the assessment system equips students more effectively to meet industry and workplace expectations (Cheong et al., 2016).

The findings are consistent with global best practices in engineering education, where continuous assessment is recognized as a powerful tool for enhancing learning outcomes. However, the presence of performance variability and underachievement among a minority of students highlights the need for continuous refinement of assessment strategies, ensuring that continuous assessment serves effectively as both a measurement and instructional tool (Subheesh, 2023; Subheesh & Sethy, 2018).

5. CONCLUSION

This study investigated the continuous assessment performance of 25 diploma-level students enrolled in the Petrochemical Process Technology course at Politeknik Tun Syed Nasir Syed Ismail (PTSN) during Semester 2 of the 2024/2025 academic session. The analysis revealed an overall mean score of 84.8, with most students scoring between 80 and 95, indicating steady academic performance throughout the semester. A small subset scored below 75, suggesting the need for targeted support and intervention. Gender-based analysis showed that female students outperformed males on average but exhibited greater score variability, achieving both the highest and some of the lowest marks within the cohort.

These results affirm the effectiveness of continuous assessment in technical education, as it fosters consistent engagement, reduces dependence on final examinations, and offers a fairer evaluation of diverse competencies such as communication, teamwork, and applied knowledge. However, the findings also underscore the importance of remedial support for struggling students and the implementation of differentiated instructional strategies to bridge performance gaps. Continuous assessment should remain a fundamental component of evaluation in technical and vocational education, as it not only measures academic outcomes but also cultivates employability skills crucial for success in the chemical and petrochemical industries.

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Chapter 4
Investigating the Predictors of Financial Well-Being among Youth in Kelantan: Insights from Peer, Financial Literacy and Financial Knowledge

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ABSTRACT
Financial well-being is an important component of individual stability and overall quality of life, particularly among youth navigating the transition toward financial independence. Therefore, this study aims to analyse the factors influencing financial well-being among youth in Kelantan. A structured questionnaire covered dimensions such as peer, financial literacy and financial knowledge were distributed. A convenience sampling method was employed, and a total 400 respondents were participated. Data collected were then analysed to determine the significant predictors of financial well-being and assess their relative influence. Results revealed that peer, financial literacy and financial knowledge significantly influencing financial well-being among youth in Kelantan. This study contributes to the existing body of knowledge by offering empirical insights into the factors shaping financial well-being among youth. The findings will provide valuable insights for policymakers, educators, and financial institutions in designing evidence-based interventions and educational programs that enhance financial capability and promote sustainable financial well-being among youth.

Keywords: financial well-being, financial literacy, financial knowledge, youth, convenience sampling

1. INTRODUCTION

Financial well-being is the ability to manage money and resources effectively. In addition, financial well-being among youth has become an increasingly important issue in today's dynamic economic environment, where early financial decisions can sustain youth's future lives. Several factors are associated with financial well-being including peer, financial literacy and financial knowledge. As young people face increasing financial pressures such as student loans, unemployment, and rising cost of living, understanding financial well-being is critical to promote economic stability among youth. Therefore, this study aims to investigate the determinants of financial well-being including peers, financial literacy and financial knowledge among youth in Kelantan.

2. LITERATURE REVIEW

According to Sabri & Falahati (2012), financial well-being can be defined as a healthy, happy, and worry-free financial state, which is based on a subjective assessment of one's financial situation. Hayta (2008) mentioned that peer influence contributes to effective learning about financial values and social motivation. Peer influence has a significant impact on individuals' financial literacy (Putri and Wijaya, 2020; Alshebami & Aldhyani, 2022). In addition, Abdullah and Chong (2014) highlighted that financial literacy is the ability to make effective financial decisions. Hung et al. (2009) stated that financial literacy is the understanding of financial concepts necessary for the proper management of financial resources to reach financial well-being. Previous studies mentioned that financial literacy had significantly influenced financial well-being (Lavonda et al. 2021; Fazli et. al, 2012).

Moreover, financial knowledge is defined as individual's level of knowledge on the concept, fact and basic financial information (Falahati and Paim, 2011). Rafien et al. (2022) found that financial knowledge had significant effect to financial well-being among students. Lee et al. (2020) demonstrated that respondents with higher levels of objective financial knowledge had greater levels of financial well-being. Therefore, a research framework is presented in Figure 1. Dependent variable is financial well-being meanwhile independent variables are peer, financial literacy and financial knowledge.

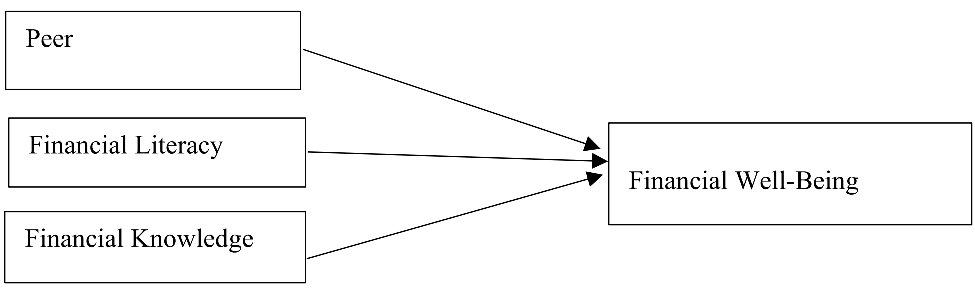

Figure 1: Research Framework

3. RESEARCH METHODOLOGY

This study employs a quantitative approach to examine the influence of peers, financial literacy and financial knowledge toward financial well-being of youth (Creswell, 2014). Quantitative method involves numerical data and statistical analysis to determine trends, relationships, and patterns. In this study, data collection was carried out using a structured questionnaire, which included 5-point Likert-scales. A five-point Likert scale was used in the questionnaire, which range from strongly agree = 5, agree = 4, neutral = 3, disagree = 2, and strongly disagree = 1. According to Department of Statistics Malaysia, youth population aged between 15 and 30 were 30.7 million (Department of Statistics Malaysia, 2024). A total of 400 respondents were selected in this study. Non-probability sampling method namely convenience sampling was used in this study. In general, this method is to ensure that the knowledge gained is representative of the population from which the sample was drawn. This method was chosen due to its ease of accessibility to participants, particularly within a limited timeframe and resource constraints (Etikan et al., 2016). For data analysis, the Statistical Package for the Social Sciences (SPSS) was utilized to examine both descriptive and inferential statistics. Regression analysis was conducted to determine the degree of influences for each independent variable predicts the dependent variable (Hair et al., 2010). Results were presented in Tables.

4. RESULTS & DISCUSSION

4.1. Descriptive Statistics

Demographic characteristics of the respondents are summarized in Table 1. A total of 291 female respondents, representing 72.8%, participated in the study, while 109 male respondents accounted for 27.3%. Most respondents were between 21 and 25 years old, totalling 340 individuals (85%). This was followed by 39 respondents (9.8%) aged between 15 and 20 years old and 21 respondents (5.2%) aged between 26 and 30 years old. In terms of educational level, the largest proportion of respondents were degree, comprising 315 individuals (78.8%). This was followed by 33 respondents (8.3%) were diploma, 29 respondents (7.2%) were STPM, 19 respondents (4.8%) were SPM, 3 respondents (0.7%) were Master, and 1 respondent (0.2%) were others. Regarding monthly personal income (RM), most respondents' income was between RM 1,000 and below (292 respondents, 73%), followed by RM 1,001-RM 2,000 (66 respondents, 16.5%), RM 2,001-RM 3,000 (29 respondents, 7.3%), RM 3,001-RM 4,000 (10 respondents, 2.5%), and RM 4,001-RM 5000 (3 respondents, 0.7%). For monthly household income (RM), majority of respondents were between RM 2,001 and RM 3,000 consisting of 120 respondents (30%). This was followed by 118 respondents (29.5%) income between RM 1,001 and RM 2,000, 83 respondents (20.8%) income between RM 1,000 and below, 45 respondents (11.3%) income between RM 3,001-RM 4,000, 19 respondents (4.7%) income between RM 5,001 and above. The smallest group was income between RM 4,001 and RM 5000, 15 respondents (3.7%).

Table 1: Demographic Profile

Category	**Frequency (N=400)**	**Percentage (100%)**
Gender		
Male	109	27.3
Female	291	72.8
Age		
15-20 Years Old	39	9.8
21-25 Years Old	340	85
26-30 Years Old	21	5.2
Education Level		
SPM	19	4.8
STPM	29	7.2
Diploma	33	8.3
Degree	315	78.8
Master	3	0.7
Other	1	0.2
Monthly Personal Income (RM)		
RM 1,000 and below	292	73
RM 1,001-RM 2,000	66	16.5
RM 2,001-RM 3,000	29	7.3
RM 3,001-RM 4,000	10	2.5
RM 4,001-RM 5000	3	0.7
Monthly Household Income (RM)		
RM 1,000 and below	83	20.8
RM 1,001-RM 2,000	118	29.5

RM 2,001-RM 3,000	120	30
RM 3,001-RM 4,000	45	11.3
RM 4,001-RM 5000	15	3.7
RM 5,001 and above	19	4.7

4.2. Regression Analysis

A multiple linear regression analysis was performed using the stepwise method, with the results illustrated in Table 2. Results revealed that peer (p = 0.000), financial literacy (p = 0.000), and financial knowledge (p = 0.007). Since all p-values are less than 0.05, therefore, these variables are significant predictors towards financial well-being.

Table 2: Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
	(Constant)	1.318	.321		4.108	.000
	Peer	.213	.029	.347	7.287	.000
	Financial Literacy	.172	.033	.266	5.283	.000
	Financial Knowledge	.092	.034	.132	2.723	.007

a. Dependent Variable: Financial Well-Being

From Table 2, regression equation can be written as

$$y = 1.318 + 0.213x_1 + 0.172x_2 + 0.092x_3 \quad (1)$$

where $y =$ Financial Well-being, $x_1 =$ Peer, $x_2 =$ Financial Literacy, $x_3 =$ Financial Knowledge.

Table 3 presents the coefficient of determination (R^2), which indicates the proportion of variance in the dependent variable that is explained by the independent variables. 38.6% of the variation in financial well-being can be attributed to peers, financial literacy and financial knowledge.

Table 3: Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
	.621[a]	.386	.381	.90611	1.993

a. Predictors: (Constant), Peer, Financial Literacy, Financial Knowledge
b. Dependent Variable: Financial Well-Being

Table 4 presents the results of the analysis of variance (ANOVA). As the p-value is less than 0.05, it can be concluded that the model demonstrates a statistically significant fit.

Table 4: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	204.478	3	68.159	83.016	.000[b]
	Residual	325.132	396	.821		
	Total	529.610	399			

a. Dependent Variable: Financial Well-Being
b. Predictors: (Constant), Peer, Financial Literacy, Financial Knowledge

From regression analysis, results demonstrate that all predictors (peer, financial literacy, financial knowledge) significantly affect financial well-being among youth in Kelantan. According to Sabri et al. (2023), financial socialisation based on parents' behaviours significantly influences on financial well-being among youth. Financial learning experiences among youth are closely related to financial socialisation such as peers and parents which lead to positive or negative reinforcement of financial well-being. Lone and Bhat (2022) reported that financial literacy significantly positive impact towards financial well-being among the business school faculties. Financial literacy is the ability to understand and apply financial concepts such as budgeting and saving in financial well-being among youth. Laila et al. (2025) emphasized that financial knowledge has significant effects on financial well-being among micro-entrepreneurs. It is relevant because many youths engage in micro-enterprises, and this study shows empirical support that financial knowledge strongly influences well-being. Among these three predictors, peer is the most influential predictor, as youth often learn and validate financial practices within their social circles. Furthermore, these findings highlight that financial well-being among youth is an integration of peers, financial literacy, and financial knowledge.

5. CONCLUSION & RECOMMENDATION

The study investigates the key factors (peer, financial knowledge, financial literacy) influencing financial well-being among youth in Kelantan. Results identified that these three factors significantly influence financial well-being. Financial well-being can be strengthened by promoting peer-based financial learning platforms and the use of digital applications. Qualitative approach can be implemented for future studies to leverage the results.

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Chapter 5
Beyond Efficiency: Workers' Perceptions of Robotics and Social Sustainability in Malaysia's Food Manufacturing Sector

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ABSTRACT
This chapter explores how employees and managers in Malaysia's food manufacturing industry experience and interpret the social impacts of robotic technology (RT) adoption. Moving beyond the traditional focus on efficiency and productivity, it examines how automation reshapes the human dimensions of sustainability, including safety, dignity, learning, and inclusion. The study draws from four focus group discussions with managers, engineers, and production operators across multiple subsectors. Findings reveal that while robotics improves consistency, safety, and quality, it also introduces new emotional and cultural challenges such as technological anxiety, generational divides, and unequal access to training. Four main themes emerged: (1) productivity and operational gains, (2) safety and dignity at work, (3) cultural adaptation and resistance, and (4) workforce transformation and learning. Together, these themes highlight that sustainable automation depends not only on technological readiness but also on empathy, equity, and continuous engagement. The chapter concludes that true sustainability goes beyond efficiency, requiring organisations to align innovation with human values to ensure that technology enhances, rather than erodes, the meaning of work.

Keywords: Focus Group, Robotics, Social Sustainability, Malaysia, Food Manufacturing, Industry 4.0.

1. INTRODUCTION

While the discourse on Industry 4.0 often foregrounds smart technologies, automation, and data-driven efficiency, the human narratives underlying these transformations are frequently overlooked. Beyond the rhetoric of productivity and competitiveness lies a more complex social reality, one where workers, managers, and engineers continuously negotiate their identities, roles, and sense of belonging in the face of technological disruption.

In Malaysia's food manufacturing industry, this tension becomes particularly pronounced. The sector is labour-intensive, characterized by multicultural workforces, and embedded within a social fabric that values community and interdependence. The introduction of robotic systems therefore signifies more than a shift in production techniques; it marks a profound social transition that reshapes workplace hierarchies, skills, and human relationships. Robots, in this context, are not merely instruments of efficiency but catalysts that redefine how people perceive their work, their worth, and their contribution to organizational goals.

This chapter draws exclusively from focus group discussions involving managers, engineers, and operators across multiple subsectors within Malaysia's food manufacturing domain. Through these dialogues, it captures lived experiences, perceptions, and emotional responses that statistical analyses alone cannot reveal. The intention is not to quantify impact, but to interpret meanings, to explore how automation is understood, accepted, resisted, or adapted to within everyday organizational life.

By focusing on voices rather than variables, this chapter illuminates the social dimensions of sustainability, encompassing well-being, inclusivity, job security, and the evolving sense of purpose among workers. The emphasis is on how organizations and individuals adapt collectively to robotic integration: how management reconfigures training and communication, how engineers bridge technological and human interfaces, and how operators navigate feelings of uncertainty or pride as they engage with automated systems. Ultimately, the analysis reframes robotics not as a purely technical innovation but as a social phenomenon, one that transforms the nature of work, reshapes labour relations, and redefines what it means to sustain a workforce in an era of intelligent machines.

2. LITERATURE REVIEW

2.1 Industry 4.0 and the Human Dimension

Industry 4.0 represents the integration of cyber-physical systems, artificial intelligence (AI), and smart automation into industrial processes (Kagermann et al., 2013). While the global narrative highlights increased precision, speed, and data-driven decision-making, scholars have begun to critique its human blind spots (Pfeiffer, 2017; Almusharraf, 2025). Automation enhances operational control but simultaneously transforms labour structures, reducing manual work while demanding higher cognitive and digital skills (Buer et al., 2018).

In Malaysia, the Industry4WRD Policy (MITI, 2018) encourages manufacturing firms to adopt automation as a pathway to competitiveness and sustainability. However, studies have shown that human adaptation lags technological progress (Tan & Lim, 2022). Workers often face uncertainty about job displacement, retraining, and identity, leading to a phenomenon described as "technological anxiety" (Uhlemann et al., 2022). Thus, the human side of Industry 4.0 remains an underexamined dimension that directly affects organisational readiness and long-term social sustainability.

2.2 Robotics in Food Manufacturing

The food manufacturing industry is one of the earliest adopters of automation due to its emphasis on hygiene, quality, and consistency. Robotic systems are increasingly used in packaging, sorting, palletising, and quality inspection, improving both safety and throughput (Doran et al., 2025). However, studies also highlight that automation in food manufacturing is not purely technical, it interacts with workforce demographics, organisational culture, and skill dynamics (Xia et al., 2023).

In emerging economies such as Malaysia, automation introduces both promise and pressure. Rahmat et al. (2022) found that robotic integration enhances sustainability-based performance by improving economic, environmental, and social outcomes. Yet, the social dimension, including well-being, communication, and inclusiveness, remains inadequately explored. Workers' emotional responses to automation, particularly in mixed-gender and multicultural settings, shape how effectively technology is absorbed into daily routines.

2.3 Social Sustainability in the Workplace

Social sustainability refers to the preservation and enhancement of human well-being, equity, and social capital in the process of development (Colantonio, 2009; Boström, 2012). Within organisational contexts, it emphasises worker dignity, safety, empowerment, and inclusion (Kramar, 2014). A workplace that is socially sustainable supports not only productivity but also fairness, participation, and community trust (Missimer et al., 2017).

Automation challenges these ideals by shifting the balance between human and machine roles. While robots can relieve workers from hazardous tasks, they can also create alienation if implementation excludes human voices (Brougham & Haar, 2020). Hence, social sustainability in Industry 4.0 contexts depends on how organisations manage the social construction of technological change, whether technology is used to empower or marginalise (Bijker & Hughes, 1987).

2.4 Socio-technical and Human Adaptation Theories

Socio-technical systems theory argues that technology and social structures are interdependent (Pasmore, 2018). Effective automation therefore requires alignment between technical efficiency and human meaning. Workers' attitudes, values, and communication networks shape the success of technology integration more than hardware capabilities (Trist & Bamforth, 1951).

In this study, the socio-technical lens frames robotics as part of a human system, one that co-evolves with cultural norms, management empathy, and learning behaviours. Malaysian workplaces, often characterised by collectivism and respect for hierarchy, offer a distinctive context for understanding adaptation. As Hofstede (2011) notes, cultures with high power distance may experience slower bottom-up engagement in technological transitions unless inclusive dialogue is encouraged.

2.5 Research Gap

Existing studies on robotics and sustainability in Malaysia focus predominantly on quantitative models, correlating technology adoption with performance metrics (Rahmat et al., 2022; Doran et al., 2025). Yet, there is limited understanding of how workers make sense of these transitions, their fears, motivations, and evolving sense of purpose. This gap underscores the importance of qualitative inquiry that privileges lived experience. Hence, this chapter contributes by interpreting the social and emotional layers of automation through focus group evidence from Malaysia's food manufacturing sector.

3. METHODOLOGY

This study applied a qualitative research design to understand how robotics influences the social experience of work in Malaysia's food manufacturing sector. Rather than focusing on technical or economic indicators, the aim was to explore the meanings, perceptions, and feelings that workers associate with automation.

3.1 Research Approach

An interpretivist approach was used to capture the personal and social dimensions of technological change. This approach recognises that reality is shaped by people's experiences and interactions. The study sought to interpret how employees and managers perceive robotics as part of their daily work lives.

3.2 Data Collection

Data were collected through four focus group discussions (FGDs) held between March and July 2025. Each group included six participants, representing managers, engineers, and production operators from large and medium-sized food manufacturing firms across Selangor, Johor, and Penang.
Participants were selected based on their direct experience with robotic systems, such as automated packaging lines, palletising robots, and inspection units. Each session lasted about 60 to 90 minutes and followed a semi-structured format. Questions focused on how robotics affected their work, relationships, learning, and sense of job security. The discussions were conducted in both English and Bahasa Malaysia, recorded with consent, and later transcribed for analysis.

3.3 Data Analysis

Thematic analysis was used to identify patterns and meanings within the data, following Braun and Clarke's (2006) six-step process. Coding and theme development were conducted using NVivo software to ensure consistency and rigour. Four main themes emerged from the analysis:

1. Productivity and operational efficiency gains
2. Safety, well-being, and dignity at work
3. Cultural adaptation and resistance
4. Workforce transformation and learning

These themes reflect how workers and managers make sense of robotics as a social and emotional experience, not merely a technical one.

3.4 Trustworthiness and Ethics

To ensure credibility, the findings were cross-checked among research peers and verified with some participants for accuracy. Ethical approval was obtained from the Universiti Pertahanan Nasional Malaysia (UPNM) Research Ethics Committee. All participants gave informed consent, and their identities remain anonymous.

4. FINDINGS AND DISCUSSION: HUMANISING ROBOTICS IN MALAYSIA'S FOOD MANUFACTURING SECTOR

The focus group discussions provided rich insights into how automation is experienced and understood by individuals embedded in Malaysia's food manufacturing sector. While the adoption of robotic technology was generally associated with improvements in speed, precision, and reliability, participants' reflections revealed a much broader transformation—one that encompasses social values, work identity, and organizational culture. Four major themes emerged: (1) productivity and operational gains, (2) safety, well-being, and dignity at work, (3) cultural adaptation and resistance, and (4) workforce transformation and learning. Each theme highlights how workers and managers interpret robotics not only as a technical tool but as a catalyst for social change that influences how people relate to their work, to each other, and to the organization.

4.1 Productivity and Operational Efficiency Gains

Across all focus groups, participants acknowledged that robotics enhanced productivity and consistency in production lines. Managers reported fewer stoppages, reduced human fatigue, and improved quality assurance. As one packaging supervisor described,

"Our ABB robotic arm handles twenty cartons per minute—faster, more consistent, and no breaks needed."

For many, these efficiency improvements were a source of pride, symbolising Malaysia's entry into modern industrial practices. However, participants also conveyed emotional ambivalence. Operators expressed anxiety about being "outperformed" by machines or becoming redundant. One participant remarked:

"The robot doesn't get tired, doesn't make mistakes. Sometimes I think, why do they still need us?"

This comment reflects a deeper tension: while automation relieves physical strain, it simultaneously challenges human identity and self-worth. The findings echo Almusharraf's (2025) "automation paradox," which suggests that technology designed to enhance performance may also erode psychological empowerment if workers feel excluded from its purpose.

Managers who adopted a participatory approach, involving staff early in implementation, observed smoother transitions. By presenting robotics as a tool that complements rather than replaces human capability, they cultivated mutual respect between people and machines. Thus, efficiency alone is insufficient; social sustainability requires emotional alignment, helping workers see their continuing value in an automated system.

4.2 Safety, Well-being, and Dignity at Work

One of the most consistent findings was that robotics enhanced workplace safety. Operators previously responsible for repetitive or hazardous tasks—such as heavy lifting, hot-surface handling, or chemical exposure—experienced relief. An operator stated:

“Before the robot came, we used to lift trays all day. My back pain was terrible. Now, I just check the robot’s movement.”

This physical improvement fostered a new sense of dignity. Employees felt their safety was finally prioritised and that technology could serve human welfare rather than replace it. Such accounts confirm Colantonio’s (2009) concept of social sustainability, which views safety, health, and dignity as key to sustainable work environments.

However, new psychosocial stresses emerged. Some workers described feelings of mental exhaustion, especially when required to monitor machine errors or react quickly to alarms. A production technician explained:

“It’s safer now, but more stressful. If the robot stops, we panic because everything depends on us fixing it fast.”

This shift from physical to cognitive demand demonstrates that automation changes, not removes, labour pressure. Managers acknowledged that emotional well-being and mental workload management must become part of sustainability strategies, ensuring that technological advancement does not introduce new invisible risks.

4.3 Cultural Adaptation and Resistance

Resistance to automation varied according to age, education, and communication quality. Senior workers often perceived robotics as a threat to job security. One long-serving operator confessed:

“I feel the robot is replacing my hands. Younger staff like it more because they study computers. We just do what we’re told.”

This highlights a generational divide rooted in digital literacy and confidence. In contrast, younger employees viewed robotics as an opportunity for advancement, expressing enthusiasm for learning programming or troubleshooting.

Managers noted that early engagement and dialogue reduced resistance significantly. Firms that held informal sessions to explain the purpose of robotics, showing how it could relieve workload and improve safety, reported smoother acceptance. A plant manager observed:

“Once they saw that no one was losing jobs, only tasks changing, people started helping each other learn.”

Cultural dynamics also played a role. In Malaysian workplaces, characterised by collectivism and respect for hierarchy (Hofstede, 2011), employees often refrain from voicing concerns openly. Several operators admitted they initially hid their fears to “avoid problems.” This underscores that cultural sensitivity and trust are vital for successful technological adaptation. Leadership empathy, expressed through openness, fairness, and recognition, proved to be the strongest determinant of acceptance.

Therefore, resistance is not opposition but rather a social signal of uncertainty. Addressing it requires transparent communication, inclusive training, and a human-centred change process that respects emotional transitions.

4.4 Workforce Transformation and Learning

Perhaps the most transformative finding was how robotics redefined job identities. Workers who once relied on manual dexterity now took on supervisory or analytical roles. A technician described the shift proudly:

"We are not just operators anymore. We are problem-solvers."

Many reported a growing sense of empowerment through technical learning. Training in coding, maintenance, and data monitoring enhanced confidence and self-worth. However, unequal access to such opportunities was a recurring concern. Some participants revealed they were excluded from training due to limited English proficiency or assumptions about age. This reflects Brougham and Haar's (2020) warning that automation may reinforce inequality if upskilling opportunities are not equitably distributed.

Gender also surfaced subtly in discussions. Female workers expressed satisfaction that robotics reduced physical strain, enabling them to participate more actively in tasks previously considered "male." One participant noted:

"Before, we couldn't lift the heavy boxes, so we were given light work. Now, with the robot, everyone can do the same."

This illustrates how automation, when inclusively managed, can promote gender equity and broaden participation, an often-overlooked aspect of social sustainability.

Nevertheless, participants emphasised that learning must be continuous and collaborative. Peer mentoring and on-the-job practice were cited as more effective than one-off training sessions. Workers valued managers who allowed "learning by doing" and encouraged mistakes as part of growth. As one engineer summarised:

"We learn faster when the boss trusts us to try."

This resonates with socio-technical theory (Trist & Bamforth, 1951), which posits that innovation thrives when technical systems are aligned with social systems that foster communication and shared learning. Thus, workforce transformation in the robotic era is not just about digital skill acquisition, it is about nurturing a culture of curiosity, confidence, and mutual respect.

4.5 Humanising Efficiency: A Social Interpretation

Across all themes, a central pattern emerges: workers interpret robotics through social meaning rather than technical logic. Efficiency gains, though acknowledged, were only valued when they translated into human benefits, safety, dignity, and personal growth. When automation was imposed purely for output gains, participants framed it as a threat. When it was introduced through dialogue and shared learning, they saw it as progress.

This duality supports Bijker and Hughes' (1987) argument that technologies are socially constructed, shaped by the values, narratives, and relationships of their users. In Malaysia's food manufacturing sector, robotic systems are embedded in cultural expectations of respect, fairness, and collective well-being. Workers evaluate success not by productivity figures but by how technology affects their *sense of belonging and purpose*.

Hence, the path to sustainable automation lies in humanising efficiency, redefining productivity as a relationship between human capability and machine reliability, grounded in empathy and inclusion.

5. CONCLUSION AND RECOMMENDATION

This chapter shows that robotics in Malaysia's food manufacturing sector is not only a story of technology but also of people. While automation improves speed, quality, and safety, its real impact lies in how workers and organisations adapt socially and emotionally to change. The focus group discussions revealed that employees viewed robotics as both helpful and unsettling. It reduced physical strain and improved safety but also created uncertainty about job security and skill relevance. Managers noticed similar challenges, technology was easy to install, but people needed time, communication, and trust to adapt.

The results highlight that sustainability in automation must go beyond efficiency. Productivity alone does not ensure success unless workers feel valued, trained, and included. Empathy, fairness, and continuous learning must be part of every automation strategy.

For organisations, this means combining technology with care, listening to workers' concerns and providing equal training opportunities. For leaders, it means moving from control to collaboration. For policymakers, it means aligning the Industry4WRD agenda with social inclusion and decent work.

In essence, robotics can enhance both productivity and well-being when people remain at the centre. Sustainable progress is achieved not only when machines work faster, but when humans and technology grow together, with dignity, safety, and shared purpose.

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Chapter 6
The JuniorLestari Programme: Early Exposure to Sustainable Development Education at the Primary School Level in Malaysia

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ABSTRACT
To promote sustainable development (SD), particularly in relation to sustainable consumption, a new educational initiative known as Education for Sustainable Development (ESD) was introduced in 2005. This initiative aims to help individuals better understand the environmental and social impacts of their everyday lifestyle choices. In alignment with the demand for quality education outlined by the ESD framework, the JuniorLestari Programme was launched. Its main goal is to introduce primary school students to fundamental SD concepts early on. The programme focused on four Sustainable Development Goals (SDGs) topics: Good Health and Well-being (SDG 3), Clean Water and Sanitation (SDG 6), Responsible Consumption and Production (SDG 12), and Life Below Water (SDG 14). These topics were taught to students at three primary schools in the Kuala Nerus district using accessible teaching methods based on the Sustainable Earth Camp Module 1.0. Overall, the JuniorLestari Programme (through the 2020 Sustainable Earth Camp) significantly improved primary school students' understanding of SD concepts by 72.2%. This was demonstrated by an increase in quiz scores, with all respondents achieving 80% or higher comprehension after participating in SDG-related activities, compared to their understanding beforehand. On average, the programme boosted students' understanding of the selected SDG topics by 23.9%. With further improvements, particularly in the techniques for delivering educational materials and conducting activities, the JuniorLestari Programme is expected to make an even greater impact on shaping the thinking and behavior of future generations.

Keywords: JuniorLestari Programme, Education for Sustainable Development (ESD), Sustainable Development Goals (SDGs), Sustainable Development

1. INTRODUCTION

In response to the demand for quality education outlined by the Education for Sustainable Development (ESD) framework and Goal 4 of the Sustainable Development Goals (SDGs), a basic education initiative called the JuniorLestari Programme has been implemented since 2019, targeting primary school students. The primary aim of the programme is to serve as a platform for imparting foundational knowledge on sustainability, aligning with the SDGs, and fostering students' understanding of noble values alongside providing quality education.

The JuniorLestari Programme has three specific objectives. First, to introduce primary school students to the fundamental concepts of sustainable development; second, to instill noble values such as responsibility, along with encouraging active participation and practical application during the 2020 Sustainable Earth Camp (SEC); and finally, to support the implementation of the Education for Sustainable Development (ESD) concept and the Malaysia Education Development Plan (2013–2025).

The JuniorLestari Programme is structured around two key activities: the basic learning activity on sustainable development (2020 SEC) and the subsequent Sustainable Earth Quiz Competition (SEQC2020). The 2020 SEC, which ran from February 17 to March 10, 2020, was specifically designed for Year Three primary school students (aged nine), the final year of Level 1 in Malaysian primary schools. The teaching approach employed in this activity was moderate, focusing on simplified discussions of selected Sustainable Development Goals (SDGs) to match the cognitive level of Year Three students. Given the scope of the 2030 SDGs, which consist of 17 goals, the JuniorLestari researchers chose to prioritize four SDGs, which were most recommended during the selection process for the 2020 SEC topics.

2. LITERATURE REVIEW

Education for Sustainable Development (ESD) originated from the evolution of environmental education (EE), which began in 1972. Over time, it expanded to include two additional dimensions namely, social and economic by 1992, enhancing its scope. ESD is notably addressed in Chapter 36 of Agenda 21, entitled "Promoting Education, Public Awareness, and Training," under the Means of Implementation Division. This chapter urges educators worldwide to embed sustainability principles and values into their curricula (Bell, 2016).

The concept of ESD was further developed at the World Summit on Sustainable Development (WSSD) in 2002, where the goal of creating "Education for a Sustainable World" became a key objective of modern education. To reinforce the role of education in ESD, the United Nations (UN) designated the decade from 2005 to 2014 as the Decade of Education for Sustainable Development (DESD), with UNESCO tasked with leading the initiative. This demonstrates that ESD has become a central element of the new educational agenda outlined by DESD (Wals & Kieft, 2010).

Currently, ESD continues to play a significant role within the Sustainable Development Goals (SDGs) for the period from 2015 to 2030 (Laurie et al., 2016). Education is emphasized as Goal 4 of the SDGs, which aims to ensure inclusive and equitable quality education while promoting lifelong learning opportunities for all (Schreiber & Siege, 2016). Within Goal 4, there are seven targets to be achieved over the next 15 years, one of which is to ensure that all learners acquire the knowledge and skills necessary to support sustainable development. This includes fostering ESD and sustainable lifestyles, promoting human rights and gender equality, encouraging a culture of peace and non-violence, and valuing cultural diversity as a contributor to sustainable development (Grosseck et al., 2019).

As pioneers in promoting ESD to younger generations, particularly primary school students in Terengganu, Malaysia, lecturers from the Centre for Foundation and Continuing Education (PPAL), who are also researchers from the Research Interest Group (RIG): Sustainability and Community at the University of Malaysia, Terengganu (UMT), have been leading the JuniorLestari Programme since 2019. This paper will discuss the contributions of the JuniorLestari Programme, with a focus on its implementation and the outcomes of the 2020 Sustainable Earth Camp (2020 SEC).

3. METHODOLOGY

For the 2020 SEC, three primary schools in the Kuala Nerus District were chosen as study sites: Mengabang Telipot Primary School (108 Year Three students), Tanjung Gelam Primary School (60 Year Three students), and Kompleks Mengabang Telipot Primary School (93 Year Three students). The programme received strong support and approval from both the Kuala Nerus District Education Office (PPD Kuala Nerus) and the Terengganu State Education Department (JPNT). The four SDGs covered in the 2020 SEC were SDG 3 (Good Health and Well-being), SDG 6 (Clean Water and Sanitation), SDG 12 (Responsible Consumption and Production), and SDG 14 (Life Below Water) (Table 1).

All the teaching and learning activities for the 2020 SEC, such as teaching video presentations, PowerPoint slides, and student activities, were executed as planned and outlined in the Teaching Module of the Sustainable Earth Camp Edition 1 (2019). The teaching sessions at 2020 SEC were scheduled for one hour per week per school, focusing on a single selected SDG topic each week (with 30 minutes dedicated to each issue within that topic). Over the course of a month, the programme covered four SDG topics with four hours of instruction. To assess the students' understanding of the topics, brief quizzes (lasting two to three minutes) with ten multiple-choice questions related to the content were administered before and after each session on the four selected SDG topics. In total, 979 quiz answer sheets were collected and analyzed.

The instructors for the 2020 SEC were 16 second-year Bachelor of Economics (Natural Resources) students from the University of Malaysia, Terengganu (UMT), who were selected through informal interviews conducted by the researchers. To maintain focus, the instructors were divided into four groups, with each group responsible for teaching one of the selected SDG topics. The instructors received training on the teaching methods outlined in the Teaching Module of the Sustainable Earth Camp Edition 1 (2019) during a "Training of Trainers" workshop held at PPAL on 13 February 2020, as well as through informal discussions with researchers in the week leading up to the 2020 SEC.

Table 1. Selected topics of SDGs and issues discussed in 2020 SEC

SDGs Selected Topics	
SDG3: Good Health and Well-being	1) Healthy diet for body care 2) What is Coronavirus (Covid19)
SDG6: Clean Water and Sanitation	1) Clean water cycle 2) Clean water and sanitation
SDG12: Responsible Consumption and Production	1) 3R Concept 2) Energy-saving practices
SDG14: Life Below Water	1) Sea and water pollution 2) Importance of coral reefs

4. RESULTS AND DISCUSSION

Across the three selected primary schools, a total of 239 to 251 Year 3 students participated in the 2020 SEC. These participants represented 92% to 96% of the total Year 3 student enrollment in the three schools (Table 2).

To assess the understanding of the SDG topics among respondents from the three schools, each student answered 9 multiple-choice questions for Topic 1 (SDG3) and 10 multiple-choice questions for Topics 2 (SDG6), 3 (SDG12), and 4 (SDG14) both before and after the instructional activities. The number of respondents who achieved scores ranging from 0% to 100% was recorded for both pre- and post-activity assessments. The change in understanding was calculated by comparing the percentage of respondents' scores before and after the 2020 SEC activities. This difference was divided by the percentage of scores before the activities and multiplied by one hundred to determine the percentage increase in understanding of the SDG topics. Overall, the respondents' quiz scores for all SDG topics during the 2020 SEC, based on 979 quiz answer sheets, are summarized in Table 3 to reflect the measured level of understanding.

According to Table 3, before the SDG topic activities of the 2020 SEC, a total of 248 quiz answer sheets (representing the number of respondents) achieved scores of 80% or higher. After the SDG topic activities were conducted, this number increased to 427 quiz sheets within the same score range. This indicates that the JuniorLestari Programme, through the 2020 SEC, successfully enhanced primary school students' understanding of sustainable development by 72.2%, as demonstrated by the increase in the number of quiz sheets with scores of 80% and above following the SDG topic activities.

Table 2. Total involvement of Year 3 students in 2020 SEC

School Name	Number of registered Year 3 students	Involvement in SDG3 Topic Activities	Involvement in SDG6 Topic Activities	Involvement in SDG12 Topic Activities	Involvement in SDG14 Topic Activities
MTPS	108	106	96	93	104
TGPS	60	57	56	56	57
KMTPS	93	87	87	90	90
Total	261	250 (96%)[1]	239 (92%)[1]	239 (92%)[1]	251 (96%)[1]

1) MTPS = Mengabang Telipot Primary School ; TGPS = Tanjung Gelam Primary School; KMTPS = Kompleks Mengabang Telipot Primary School
2) [1] = Total number of Quiz answer sheets received and analysed = 979 units (based on total number of students participated in 2020 SEC for all SDGs Topics)

Table 3. Respondents' level of understanding to SDGs Topics of 2020 SEC

Quiz Scores (%)	Number of Quiz answer sheets by Quiz Scores (pre-activity of 2020 SEC)	Number of Quiz answer sheets by Quiz Scores (post-activity of 2020 SEC)	Percentage increase in respondents' understanding (%)
0	4	3	-25.0
10	36	9	-75.0
20	46	30	-34.8
30	98	30	-69.4
40	113	78	-31.0
50	132	103	-22.0
60	125	123	-1.6
70	177	176	-0.6
80	*158*[1]	*191*[1]	20.9
90	*70*[1]	*134*[1]	91.4
100	*20*[1]	*102*[1]	410.0
Total	979	979	263.0
Average percentage of improved respondents' understanding			23.9

A total of 248 units of quiz answer sheets (i.e. indicated by summation of bold numbers) scored 80% to 100% for 2020 SEC pre-activity while a total of 427 units of quiz answer sheets (also shown by the summation of bold numbers) scored in the same interval for post-activity of 2020 SEC

Additionally, considering the overall percentage increase in respondents' understanding based on quiz scores (ranging from 0% to 100%), the average improvement in understanding across the four SDG topics during the 2020 SEC was 23.9%.

5. CONCLUSION AND RECOMMENDATION

The JuniorLestari Programme is an educational initiative based on ESD, designed to establish the ethical values necessary for achieving the sustainable development goals by 2030. These values should be integrated into informal education programs or awareness campaigns and incorporated directly or indirectly into the national education system in the near future. Given that ESD-based education is still underdeveloped in Malaysia, particularly in Terengganu, the JuniorLestari Programme has been introduced and implemented since 2019.

As the first ESD programme in Terengganu, it necessitates effective teaching materials and aids suitable for educational activities. Researchers published the first edition of the Sustainable Earth Camp Teaching Module in 2019, which serves as the primary resource for the 2020 SEC's teaching and learning activities. However, the programme's success is also influenced by the availability of teaching aids (e.g., microphones, laptops, LCD projectors, audio system support materials, and learning activity aids) at the participating primary schools. Funding is crucial for acquiring updated and advanced instructional aids to enhance future teaching and learning activities. Additionally, the Sustainable Earth Camp Teaching Module should be continuously updated with current and comprehensive materials to align with global progress towards sustainable development by 2030.

It is hoped that ongoing improvements to teaching materials and extensive teaching aids will better engage the younger generation, particularly primary school students, in understanding sustainable development through informal education. Moreover, the government should encourage more informal education programs related to sustainable development, such as the JuniorLestari Programme, to raise awareness among young people about environmental appreciation in line with sustainable development principles.

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Chapter 7
Empowering Women Entrepreneurs through Financial Literacy: Insights from a State Creditor in Sabah

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ABSTRACT
The role of women entrepreneurs in the Malaysian economic sector is acknowledged, particularly in the SME sector. Therefore, many incentives are designed by the government to empower them, especially financial incentives in the form of soft business loans, venture capital, and the like, through various government programs and agencies. However, as literature suggests, these incentives must be equipped with financial literacy. Failing which, the business will be exposed to failure risk as reported by many, for various reasons. This study focuses on the women entrepreneurs who experienced business survival issues based on the list of respondents provided by the managers and officers of government agencies concerned. Their level of financial literacy was assessed. Information obtained from interviews conducted with both women entrepreneurs and officers/managers was cross-checked for validation. It was found that the respondents' level of financial literacy was low, as they experienced difficulties in understanding basic terms used in financial management and were unable to perform basic forms of financial report preparation and interpretation. The sufficiency level of training provided to the agencies is also alarming. As a conclusion, this study advocates the importance of financial literacy among women entrepreneurs, considering the efforts and amount of money spent by the government to nurture them; therefore, the training program should be reviewed to better suit the needs of women entrepreneurs in Sabah.

Keywords: Business Sustainability, Women Entrepreneurs, Financial Literacy, Business Opportunity, Financial Education, Financial Management

1. INTRODUCTION

Women's roles in global business ventures are widely acknowledged. These roles are essential in addressing global issues such as gender bias, human capital optimization, sectoral productivity, and other related issues. Despite the domination of male entrepreneurs in large-scale enterprises, high-growth industries, and advanced technology, the rate of women's involvement is progressing aggressively. In Malaysia, this pattern is extremely noticeable, as stated by a Professor of Entrepreneurship and Business from Universiti Malaysia Kelantan (UMK), Datuk Dr Nik Maheran Nik Muhammad, women's involvement in entrepreneurship is growing quickly.[1] More interestingly, as the president of UMK Women Entrepreneurship and Leadership Linkages, she also said that surveys showed Malaysian women have stronger business aspirations than the global average, with 80% expressing interest in entrepreneurship compared with 72% worldwide. Whereby factors such as digital opportunities, policy support, and evolving societal norms contribute to the increasing number of women entrepreneurs.

Likewise, in West Malaysia, Sabah's growing number of women entrepreneurs over the last five years gives a positive sign when many of them are seen as courageous and vibrant for "mastering" the commercial world[2]. Furthermore, the increase in numbers is driven by various initiatives, among other things, such as financial assistance and skills training courses provided by the government to empower them in the business world.

1.1 Problem Statement

In Sabah, government agencies offer various support initiatives, including funding and loan programs for women entrepreneurs. Indeed, these sorts of financial incentives are necessary for women entrepreneurs, either to start their business or to enhance investment capacity. This notion is well addressed by Andriamahery and Qamruzzaman (2022), who advocated that efficient financial policies are needed to support and empower women entrepreneurs that address the issues of grant accessibility, technical support, skill development, and other external elements. Besides those external elements provided by various agencies, the importance of internal factors should not be sidelined, especially the element of financial literacy. Failing which, the entrepreneur herself, as the main actor in the process, will not be able to fully optimize the opportunities. To the worst, financial illiteracy could lead to business failure and create new liabilities.

Despite several initiatives set by various government agencies[3], many failure cases are reported due to financial literacy issues. Many advocate that financial illiteracy creates the inability of women entrepreneurs to manage their business, particularly in the areas of planning and controlling. For instance, Topimin and Mohd. Hashim (2020) investigated the level of financial literacy of the entrepreneurs of microbusinesses in Sabah and its influence on their financial management. Surprisingly, they discovered that most microbusiness owners have little knowledge of basic financial terms. Furthermore, they found that the owners' perceptions of financial literacy were restricted only to specific financial activities, such as record keeping and seeking simple access to financial resources. This finding indicates that the level of financial literacy is rather alarming, considering the number of efforts and the number of financial incentives put forth by the government to support them. To the worst part, this study is also highlighting the inability of the entrepreneurs to understand more complex elements of financial literacy, such as the necessary skills for planning and deciding the right financing structure. Whereas the need for these skills to run and manage today's business and to stay competitive is obviously acknowledged.

Considering the critical position of financial literacy among women entrepreneurs in Sabah, as the above premises argued, several research questions are developed:

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1. Without a basic and strong background of accounting knowledge, are the women entrepreneurs in Sabah able to sustain their businesses in the long term?
2. Is the current training provided by the government agencies to women entrepreneurs sufficient?
3. Do the training programs achieve the main objective, which is to improve the level of financial literacy among women entrepreneurs?
4. Given the shrinking budget (the sustainability of the program itself), are the women entrepreneurs able to pay back their loans systematically?

The above questions were developed based on a series of discussions with several officers and managers who are responsible for disseminating and monitoring financial assistance to women entrepreneurs in Sabah, particularly to provide business loans and other related technical services. Furthermore, these managers and officers are taking charge of government agencies whose prime focus, among others, is to develop and nurture women entrepreneurs.

1.2 Research Objectives

This study aims are twofold, which is to assess the level of financial literacy among women entrepreneurs in Sabah and their ability to sustain their business. Besides that, this study is also to address the level of sufficiency of training provided and its effect on the effort to improve financial literacy among women entrepreneurs. In the end, this study intends to provide insight into the level of financial literacy among women entrepreneurs and its effect on their business sustainability, and the effects of related training provided by government agencies.

2. LITERATURE REVIEW

Nowadays, women's involvement in the business world is very encouraging. However, in the pursuit of success, they are also facing many challenges. According to Rudhumbu, du Plessis, and Maphosa (2020), women entrepreneurs faced an extensive variety of difficulties, including limited financial resources, inadequate training that resulted in a lack of technical skills, ignorance of funding and technical support sources, intense market competition, marginalization of women, and no knowledge of marketing strategies. Furthermore, financial literacy is a crucial and intangible resource that is highly beneficial for business growth, success, and long-term competitive advantage (Baporikar & Akino, 2020). Baporikar and Akino (2020) also contended that the main obstacle to the expansion of women entrepreneurs' businesses is a lack of financial knowledge.

According to Calderon, Cunha, and Giorgi (2020), women entrepreneurs needed to equip themselves with business skills, particularly financial literacy, which led to the success of their business. They also claimed that women entrepreneurs who possess strong financial literacy are more likely to employ formal accounting methods, serve a wider clientele, and produce higher earnings and revenues. Additionally, Gichuru (2025) pointed out that women entrepreneurs who possess crucial debt management and strategic investment competencies are more likely to maintain business continuity and avoid insolvency. Those criteria are significant and will beneficially impact the success of businesses (Kurniasari & Lestari, 2024).

Although women entrepreneurs in Sabah were assisted with various support initiatives by the state government agencies, without strong basic financial knowledge, it will be difficult for them to succeed or even to maintain their business in the future. This is because effective access to finance through financial institutions is highly dependent on financial literacy (Younas & Rafay, 2021). In addition, Desai, Sensarma, and Thomas (2024) agreed that financial literacy and entrepreneurial orientation play important roles in enhancing financial well-being. The results urged the development of interventions aimed at promoting financial literacy, specifically among low-income women entrepreneurs. In fact, higher financial literacy among women entrepreneurs will provide many benefits, which include better financial management, access to finance, business sustainability, and overall business growth (Kondolo et. al., 2005). Thus, it is important to raise knowledge of financial literacy among women entrepreneurs in order to empower them to make wise financial decisions and to improve their financial decision-making skills (IRAM, Bilal, & Ahmad, 2023).

3. RESEARCH METHODOLOGY

This research is mainly informed by an interview process with several officers and managers taking charge of financial incentives provided by government agencies to women entrepreneurs in Sabah. These respondents provide details on financial incentives, the recipients, the outcomes, and the records of recipients' business performance. Purposive sampling was done to select respondents with business performance issues to assess their views and experience with the incentive and training program, as well as to assess the level of their financial literacy. The findings from both types of respondents were later cross-checked for validation to conclude the effort to answer the research question.

4. RESULT AND DISCUSSION

The finding shows that financial literacy issues are pertinent among women entrepreneurs in Sabah. This can be seen from the level of their knowledge of basic financial terms used in daily financial management affairs, at the lower level, and the technical knowledge on how to prepare basic financial reports, at the higher level. To make it worse, the respondents are unable to evaluate and interpret the transaction report and borrowing statement, which are crucially important to monitor and make decisions in relation to their business sustainability. This finding is also alarming in relation to the level of training sufficiency provided by the agencies concerned.

5. CONCLUSION

This study demonstrates the critical position of financial literacy among women entrepreneurs and, accordingly, the effect on their business survival. This is in line with the assertion of many previous studies as reported in related literature. In addition, the sufficiency and effectiveness level of training provided by related agencies should be reviewed consistently to ensure the achievement of their objective, particularly to improve financial literacy among women entrepreneurs.

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