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SUSTAINABLE LEADERSHIP IN HIGHER EDUCATION: INTEGRATING LITERACY, BEHAVIORAL, AND INSTITUTIONAL SUPPORT IN MALAYSIAN PUBLIC UNIVERSITIES

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ABSTRACT

Malaysia is progressing towards a sustainable management, and concepts such as a low-carbon future, circular economy, and clean and responsible consumption are making waves in the terminology under this field of study. In the aspect of education leadership and management, this study examines the relationships and understanding of sustainability-related literacy among lecturers at Malaysian public universities, their modelling of sustainable conduct, and their experiences with institutional assistance. The sample size includes 350 respondents who had participated in a survey and 20 interview participants from 12 public institutions. Interestingly, the study demonstrates that sustainability literacy is inconsistent, behavioral modelling differs significantly throughout fields, and institutional support is not as significantly impactful as hypothesized. In other words, this indicates that literacy alone does not forecast sustainable behavior, underscoring the necessity for enhanced institutional leadership, more explicit expectations, and robust structural support. Findings contextualize Sustainability Literacy (SL) literacy within the framework of sustainable leadership, contending that Malaysia's higher education system must amalgamate knowledge, behavior, and institutional frameworks to further sustainability objectives and cultivate future change agents. As implications, this study suggests a system-level leadership strategy that integrates professional development, policy alignment, and governance changes to establish sustainability as a fundamental academic and institutional priority.

Keywords: Sustainable leadership, higher education, literacy, behavioral modeling, institutional support, Malaysian public universities, sustainability education.



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INTRODUCTION

In recent years, the impact of climate change, resource scarcity, and environmental degradation has become a global issue that needs new kinds of leaders in many areas, including higher education. Globally, universities are required to do more than just share information; they should also show sustainable leadership via their policies, culture, and academic work (Murray et al., 2015; Renfors, 2024). Contextually, in Malaysia, public institutions are strategically positioned to impact national sustainability objectives by cultivating the attitudes, competencies, and behaviors of future leaders. It can be said that as understanding of the Sustainability Literacy (SL) has spread throughout the world, universities need more than just literacy to be leaders in sustainability. This field of study needs a well-thought-out mix of information, conduct, and help from institutions. As such, Lecturers are important educators, role models, and decision-makers who make sustainability ideas part of their everyday teaching, research, and campus life.

Nevertheless, current research predominantly emphasizes student awareness or campus efforts, with limited attention on the academic staff who are the foundation of university culture. This research recontextualizes the examination of SL via the perspective of sustainable leadership. It examines three interrelated leadership aspects within Malaysian public universities:

- a. Literacy, meaning knowledge and conceptual understanding of Sustainability Literacy (SL).
- b. Behavior, meaning the personal and professional actions that lecturers' model for students.
- c. Institutional support, meaning the systems and governance structures that empower academics to lead sustainability efforts.

The combination of these different aspects allows readers to better understand how sustainable leadership grows in higher education and what changes need to be made to make it stronger. On the other hand, Malaysia's public universities are well-positioned to influence national sustainability outcomes due to their reach, institutional resources, and influence over graduate competencies. However, the extent to which sustainable literacy has permeated academic teaching, research, and leadership across these institutions remains underexplored. While previous studies have examined student awareness and green campus initiatives (Hamid et al., 2023; Mendoza et al., 2019), limited empirical evidence exists on how lecturers themselves conceptualize SL, perceive their roles in sustainability, and translate SL understanding into academic behavior and campus initiatives.

PROBLEM STATEMENT

Following the United Nations' charter, sustainability is still an important concern in Malaysian higher education, even if not all students, researchers, and teachers employ sustainability ideals in their work every day. Some schools help the environment by making long-term strategies or starting green projects. But often, it is up to individual instructors to put these ideas into effect, not the whole institution. Despite growing national and international pressure to transition toward circular economy models, there is an uneven integration of sustainable principles in Malaysia's public universities (Hamid et al., 2023; Renfors, 2024). Although institutional policies may promote sustainability rhetorically, actual adoption at the faculty level varies widely and often depends on individual initiative, disciplinary background, and perceived institutional support (Giurea, 2025; Mendoza et al., 2019). This variation points to a knowledge–action gap in which some lecturers understand and advocate for Sustainability Literacy (SL), while others remain disconnected or constrained by curricular rigidity, lack of training, or insufficient administrative commitment (Kambanou et al., 2025; Melnychenko et al., 2024). Without understanding the current levels of SL literacy, the role perception of educators, and the barriers they face, Malaysia's higher education sector risks superficial engagement with SL principles rather than systemic adoption (Alonso-Almeida & Antón, 2020; Rahman et al., 2023). Empirical investigation into these dimensions is urgently needed to inform targeted interventions, policy reform, and professional development strategies (Fülöp & Cifuentes-Faura, 2024; Mendoza et



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al., 2017). Three persistent gaps justify this study:

- a. Literacy-practice gap: Many lecturers have limited sustainability or SL, and even knowledgeable lecturers struggle to convert understanding into practice.
- b. Behavioral inconsistency: Actual sustainable behavior differs widely among staff, and many lecturers feel unclear about their role as sustainability leaders.
- c. Weak structural support: Institutional policies, curriculum rigidity, and limited incentives prevent academics from acting as sustainability champions.

It is posited that without understanding these gaps, universities may continue promoting sustainability rhetorically without cultivating the leadership capacity needed to make long-term change.

PURPOSE OF STUDY

This study makes a unique addition by redirecting the emphasis from students and campus efforts to lecturers as the primary influencers of sustainability culture in higher education, a domain that has been little examined in previous SL literacy research. It builds on previous work by putting SL, role perception, sustainable behavior, and institutional support into one leadership-oriented framework. This makes it easier to comprehend how sustainability works at Malaysian public universities. It may potentially offer a distinct contribution by shifting the focus from students and campus initiatives to lecturers as the central actors shaping sustainability culture in higher education, an area that remains underexplored in prior SL literacy research. It further advances existing work by integrating SL, role perception, sustainable behavior, and institutional support into a single leadership-oriented framework, allowing a more comprehensive understanding of how sustainability is enacted within Malaysian public universities. Specifically, it seeks to assess how lecturers understand and apply SL concepts in academic contexts, how they perceive their responsibility in fostering sustainable behavior, the institutional and structural enablers or barriers they encounter, and whether SL translates into actual sustainable behavior modeling in classrooms and campus initiatives. The study combines quantitative and qualitative data to provide a comprehensive picture of the current state of SL integration at the academic staff level, with the goal of offering actionable recommendations for policy, training, and university governance. In essence, each research question for this study is listed as follows:

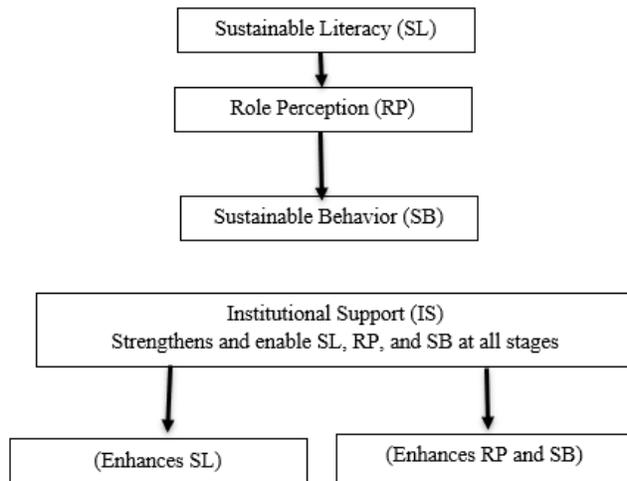
1. What is the level of Sustainable literacy (SL) among lecturers in Malaysian public universities?
2. How do lecturers perceive their roles in promoting sustainable behavioral change in academic settings?
3. What are the perceived challenges and enablers in integrating SL principles in curriculum and university practices?
4. Is there a relationship between lecturers' Sustainability Literacy (SL) and their modeling of sustainable behavior within universities?

As hypotheses, Figure 1 shows a linear pathway where SL shapes lecturers' Role Perception, which then contributes to Sustainable Behavior. Institutional Support acts as an enabling force that strengthens each stage, ensuring that knowledge and attitudes can translate into actual practice.



Figure 1

Hypothesized Relationships Among Sustainability Literacy, Role Perception, Sustainable Behavior, and Institutional Support



METHODOLOGY

Research Design

This study employed a convergent mixed-methods design combining quantitative survey data and qualitative interview insights to examine SL, role perceptions, and sustainable behaviors among academic staff. The design was chosen to provide both breadth and depth, quantifying SL-related patterns while exploring nuanced perceptions and institutional realities. The mixed-methods approach enables data triangulation, enhancing the credibility and interpretive richness of the findings.

Population and Sampling

The target population comprised lecturers from public universities in Malaysia. The sampling frame focused on academic staff across diverse faculties (e.g., education, engineering, business, environmental sciences) to capture discipline-specific nuances in SL and sustainability engagement. A purposive sampling technique was employed to ensure inclusion of lecturers from both sustainability-related and unrelated disciplines. A total of 350 lecturers from 12 public universities participated in the quantitative survey, while 20 lecturers were selected for follow-up semi-structured interviews based on their institution, discipline, and willingness to elaborate on their responses.

Instruments and Measures

To enhance clarity in instrument development, the nine Sustainability Literacy items were adapted from recognized circular economy and sustainability education frameworks, specifically referencing Mendoza et al. (2019) and Renfors (2024), and were tailored to the Malaysian higher education context. The deliberate use of purposive selection among 12 public universities aimed to ensure disciplinary variety and institutional representation, facilitating the study's examination of variations in sustainability literacy and practices across diverse academic settings.



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Table 1

Cronbach Alpha Values for Each Construct

Construct	Number of Items	Cronbach Alpha (α)
Sustainability Literacy (SL)	9	0.87
Role Perception (RP)	7	0.82
Sustainable Behavior (SB)	6	0.85
Institutional Support (IS)	5	0.8

The structured questionnaire used to collect the quantitative data included four parts: Sustainability Literacy (SL) (9 items), Role Perception (7 items), Sustainable Behavior (6 items), and Institutional Support (5 items). A 5-point Likert scale with values from 1 (Strongly Disagree) to 5 (Strongly Agree) was used to measure all items. The qualitative aspect included a semi-structured interview guide with open-ended questions corresponding to the study inquiries, addressing concepts such as CE comprehension, individual accountability, behavioral modeling, institutional obstacles, and support systems.

Reliability and Validity

To ensure reliability, internal consistency of the survey items was tested using Cronbach's alpha. All subscales met acceptable thresholds ($\alpha > .70$), indicating reliable constructs. Content validity was established through expert review involving three specialists in sustainability education and survey design. The instrument was also piloted with 15 lecturers not included in the final sample to ensure clarity and appropriateness. Qualitative validity was ensured through member checking and peer debriefing during the transcript analysis.

Data Collection Procedures

Survey distribution was conducted via institutional emails and online platforms (e.g., Google Forms) over three months. Reminders were sent periodically to increase response rates. For the qualitative phase, interviews were conducted online via Zoom or in-person, depending on the participant's preference. All interviews were recorded with consent and transcribed verbatim for thematic analysis. Ethical approval was obtained from the university ethics board, and all participants provided informed consent before participation. This study received ethical clearance from the University Research Ethics Committee.

Data Analysis

Quantitative data were analyzed using JAMOVI. Descriptive statistics (mean, standard deviation) were calculated for all variables across universities. Regression analyses were conducted to examine predictive relationships between CE literacy, role perception, and sustainable behavior. Additionally, university-specific analyses and cluster-based comparisons were performed. For qualitative data, a thematic analysis approach was used, where transcripts were coded inductively and organized around themes aligned with the research questions.

Integration of Quantitative and Qualitative Data

Findings from both quantitative and qualitative phases were integrated during the interpretation stage to ensure a holistic understanding of SL and sustainable practice in public universities. While survey results provided generalizable trends and relationships, interview insights added contextual meaning, especially around implementation challenges, institutional constraints, and lecturer motivation. This integration ensured a comprehensive response to the study's four research questions and supported both policy recommendations and academic contributions.



FINDINGS

1. What Is the Level of Sustainable Literacy (SL) Among Lecturers in Malaysian Public Universities?

The Sustainability Literacy (SL) scores among 350 lecturers range from 1 (low literacy) to 5 (high literacy), showing a broad spectrum of understanding. This wide range reveals SL varies significantly, with some lecturers demonstrating deep understanding while others possess only surface-level awareness. For instance, one lecturer explained, “Sustainable literacy means rethinking how we design and use materials in teaching. I embed this idea in my design thinking course” (Interviewee I001). In contrast, another shared, “Honestly, I only heard about SL during a recent seminar. It’s not yet part of our curriculum” (Interviewee I008). These contrasting responses highlight the inconsistency in exposure and engagement with SL principles across academic staff. To provide a clearer overview of lecturers’ overall SL levels, Table 2 summarizes the score distribution, central tendency, and variability of SL responses across the sample.

Table 2

Summary of Sustainability Literacy (SL) Score Distribution

Indicator	Observation / Value	Interpretation
Score range with highest frequency	2 to 4	Most lecturers show low to moderate SL awareness.
Cluster point	3	Indicates developing but not embedded SL literacy.
Mean SL score	2.13	SL understanding remains low across the cohort.
Standard deviation	0.99	Responses are consistently low to moderate.
Presence of high SL scores	Very few respondents scored above 4	High-level SL knowledge is uncommon.

The frequency distribution shows that a majority of respondents scored between 2 and 4, with a moderate cluster at 3. This indicates that while SL awareness is developing, it is not yet fully embedded in higher education pedagogy across the public university system. Additionally, the average SL score (mean) is 2.13, which falls on the lower side of the 5-point scale. This suggests that although SL principles may be referenced or acknowledged, they are not yet systematically understood or taught by most lecturers. The relatively narrow standard deviation (0.99) confirms a consistent pattern of low to moderate literacy across the cohort, with few lecturers reporting very high SL knowledge.

Moreover, other finding highlight that awareness is often dependent on disciplinary background, with engineering and environmental science lecturers more familiar with SL concepts. This is illustrated by one participant who noted, “In engineering, we talk about systems and efficiency. Sustainable Literacy fits well with that mindset” (Interviewee I005). This supports the observation that SL tends to be more naturally aligned with certain disciplines, leading to uneven integration across faculties. The findings imply that while the concept of SL may be present in policy and discourse, it has yet to translate into deep, operational knowledge at the faculty level. This may be attributed to limited exposure, training, or institutional emphasis on SL beyond environmental departments. Most faculties may not yet see SL as directly relevant to their disciplines. In light of this, it’s important for Malaysian public universities to integrate SL into professional development programs. This could include workshops, certification courses, and interdepartmental collaborations to help embed SL concepts into curriculum and academic planning. CE should not be confined to environmental science programs alone.

Furthermore, the low SL scores may be linked to a lack of policy visibility or leadership direction. If institutional leaders do not explicitly prioritize SL integration or provide incentives for sustainability-focused teaching, lecturers



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may perceive it as peripheral to their primary teaching roles. To address this gap, higher education policymakers should develop sector-wide strategies that position SL as a foundational component of academic quality and institutional excellence, especially under Malaysia's dual-carbon targets and broader SDG commitments.

2. How do lecturers perceive their roles in promoting sustainable behavioral change in academic settings?

The Role Perception scores indicate considerable variability among lecturers. While some respondents clearly recognize and embrace their responsibility to model and teach sustainability (scoring 4–5), others scored as low as 1, suggesting a limited perception of sustainability as part of their professional roles. This divide may reflect differences in departmental culture, institutional support, or personal values. Many lecturers view themselves as role models who should actively promote sustainability through classroom behavior and course design. As one lecturer stated, *"I see my role as setting the example. I reduce printing and encourage students to do digital submissions"* (Interviewee I010). This statement reflects a growing consciousness among faculty who internalize sustainability not only as content, but as conduct. To deepen the understanding of how lecturers view their responsibilities in promoting sustainability, Table 3 summarizes the key quantitative and qualitative indicators related to their role perception.

Table 3

Summary of Role Perception Scores, Correlations, and Interpretations Among Lecturers

Indicator / Theme	Observation / Value	Interpretation / Implication
Mean Role Perception score	2.75	Moderately low; lecturers vary in seeing sustainability as their role.
Standard deviation	1.98	Wide variation in how lecturers perceive their sustainability role.
Correlation: SL and Role Perception	-0.42	Higher SL does not necessarily lead to stronger role identity.
Interpretation of negative correlation	Some high-SL lecturers see sustainability as technical, not leadership; some low-SL lecturers still feel responsible.	Role perception shaped more by values, empowerment, and autonomy.
Implication	Universities must clarify expectations and strengthen institutional support.	Role perception is a leadership and culture issue, not just knowledge.

As shown above, the mean Role Perception score is 2.75, with a relatively wide spread (SD = 1.98). This indicates that while some lecturers see sustainability as a core responsibility, others do not yet identify with this role. This diversity of views underscores the need for universities to clarify the expectations of academic staff in promoting sustainability among students. However, as highlighted in other findings, some lecturers feel constrained by institutional structures, limiting their perceived ability to drive change. For example, *"I want to do more, but our syllabi are fixed. There's little room to add sustainability topics"* (Interviewee I007). This underscores how even motivated educators can be hampered by rigid curriculum frameworks or administrative inertia.

Interestingly, the correlation between SL and Role Perception is negative (-0.42). This counterintuitive finding suggests that lecturers who rate themselves highly in SL knowledge may not necessarily see themselves as agents of behavioral change, or they may view sustainability as a technical subject rather than a leadership responsibility. Conversely, some lecturers with lower SL may be strongly committed to promoting sustainability through other means. In this light, role perception emerges as a complex construct shaped not merely by knowledge levels but by values, empowerment, and perceived institutional autonomy.

This suggests that knowledge alone does not determine behavioral leadership. Role identity appears to be shaped by institutional culture, professional norms, and leadership signals rather than conceptual knowledge of SL alone. Faculty with strong sustainability values may act on them regardless of whether they have formal SL training.



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Therefore, strengthening role perception should not rely solely on SL programs but also on cultivating a culture of sustainability advocacy within academic environments.

The implication is that institutional culture and leadership framing are crucial for shaping lecturers' role perceptions. Universities should communicate clear sustainability goals and embed behavioral change expectations into job roles, KPIs, and academic leadership positions. In addition, enabling mechanisms, such as curriculum flexibility and faculty-level innovation grants, can provide the operational space needed to turn good intentions into action. To reinforce sustainable role perception, academic staff appraisal frameworks should include sustainability contributions, and sustainability ambassadors should be appointed within faculties to drive collective responsibility and bottom-up engagement. Ultimately, supporting both the mindset and the mechanism of sustainable leadership will empower lecturers to act as agents of change within the higher education ecosystem.

Additionally, Table 4 presents a comparative summary of five selected Malaysian public universities based on their mean scores in SL, role perception, sustainable behavior, and institutional support. These metrics align closely with Research Question 1 (i.e., the level of SL and role perception among lecturers) and Research Question 2 (i.e., the predictive influence of these variables on sustainable behavior).

Table 4

Comparative Summary of Circular Economy Literacy, Role Perception, Sustainable Behavior, and Institutional Support across Selected Malaysian Public Universities

University	Sustainability Literacy (SL)(M, SD)	Role Perception (M, SD)	Sustainable Behavior (M)	Institutional Support (M)	Insights
University 1	3.45, 1.54	3.30, NA	NA	NA	Highest Sustainability Literacy (SL) and role perception; potential leader in CE education
University 2	3.02, NA	3.02, NA	NA	NA	Second highest role perception; strong sense of responsibility among lecturers
University 10	3.00, NA	NA	2.86	3.17	Moderate SL low behavior; knowledge not translating into action
University 11	3.29, NA	NA	3.06	2.57	High across all variables; supportive institutional environment



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University 12	2.95, NA	NA	NA	NA	Lowest SL; needs targeted training interventions
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Notably, University 1 demonstrates the highest levels of both SL ($M = 3.45$, $SD = 1.54$) and role perception ($M = 3.30$), suggesting that lecturers at this institution possess strong SL awareness and view themselves as proactive agents in sustainability education. This positions the university as a potential leader in SL-focused academic initiatives. University 2 also records a relatively high role perception score ($M = 3.02$), implying that faculty members feel a clear responsibility in promoting sustainability through their professional roles, even if detailed statistics for other variables are not available.

In contrast, University 12 displays the lowest average SL ($M = 2.95$), which indicates a significant need for targeted capacity-building and training interventions. The absence of data for role perception and institutional support further suggests a gap in both self-perceived roles and organizational reinforcement in this university.

University 10 offers a different profile, with a moderate SL score ($M = 3.00$) but lower sustainable behavior ($M = 2.86$) and only moderate institutional support ($M = 3.17$). This disparity highlights the classic "knowledge–action gap," where awareness of SL principles does not necessarily translate into corresponding behavior without adequate institutional reinforcement.

Finally, University 11 shows relatively high values across SL ($M = 3.29$), sustainable behavior ($M = 3.06$), and institutional support ($M = 2.57$). This combination implies a more cohesive institutional environment where literacy is backed by practical behavior and some degree of structural support, reinforcing the regression analysis findings that institutional factors strengthen the impact of individual-level literacy and attitudes.

Overall, the table supports the argument that both individual awareness (literacy and role perception) and contextual support play critical roles in fostering sustainable behavior. Institutions demonstrating higher scores across all domains may serve as benchmarks for strategic improvements in universities with weaker profiles.

3. What Are the Perceived Challenges and Enablers in Integrating SL Principles in Curriculum and University Practices?

Sustainable behavior scores among lecturers ranged widely from 1 to 5. Although this indicates variability, many respondents scored in the 3–5 range, resulting in an average score of 3.38. This suggests a moderate level of engagement in sustainable academic practices, such as reducing paper use, encouraging recycling, integrating SL in student projects, or promoting resource-conscious classroom strategies. However, despite low Sustainability Literacy (SL) and variable role perception, many lecturers still reported engaging in sustainable behaviors. This finding aligns with previous studies suggesting that behavior may precede awareness, particularly in environments where digitalization or cost-saving mandates (e.g., paperless policies) push sustainability forward passively rather than intentionally. As Interviewee I004 noted, "There's no clear guideline from the top. We are left on our own to include CE if we want." This highlights the absence of structured institutional direction, leaving individual lecturers to determine whether and how to integrate SL into their teaching.

As shown in Table 5 below, the low correlation between SL and Sustainable Behavior (-0.12) reinforces the idea that sustainable practices are not necessarily driven by deep CE knowledge. Instead, they may stem from practical constraints, general environmental awareness, or habitual behaviors shaped by external pressures. In other words, many lecturers are being sustainable without deeply knowing them. Interestingly, Role Perception and Sustainable Behavior were found to be almost uncorrelated (0.03).



Table 5
Correlations and Interpretations

Variable Relationship	Correlation Value	Interpretation
Sustainability Literacy (SL) ↔ Sustainable Behavior	-0.12	SL knowledge does not strongly drive behavior; actions may stem from habits or external rules.
Role Perception (RP) ↔ Sustainable Behavior	0.03	Almost no relationship; feeling responsible does not always translate into actual behavior.
Overall implication	—	Many lecturers practice sustainability without deeply understanding it, showing a knowledge–action gap.

This unexpected result implies that lecturers who believe they are responsible for promoting sustainability may not always act in line with that belief, and conversely, those who act sustainably may not perceive such actions as central to their professional responsibilities. This behavior-belief gap presents a valuable opportunity for institutions to align values, expectations, and actual behavior through reflection and dialogue. Nevertheless, some enablers emerged that foster sustainable actions. Interviewee I011 shared that *“When the university promotes green campus campaigns, it motivates us to align our teaching with those goals.”* This quotation supports the idea that when sustainability is institutionally endorsed and made visible, it reinforces positive behavior among staff.

Summarily, to enhance sustainable behavior meaningfully, universities should focus not just on training but also on behavioral nudges, such as making sustainable choices more visible, easier, and celebrated. For instance, departments can introduce green teaching awards or highlight low-carbon practices during faculty events. Additionally, it is vital to shift sustainable behavior from being an incidental by-product of policy to a deliberate pedagogical goal. When lecturers intentionally embed SL and sustainability principles into learning outcomes, they become amplifiers of change within the institution.

4: Is there a relationship between lecturers’ Sustainability Literacy (SL) and their modeling of sustainable behavior within universities?

The correlation analysis between SL and Sustainable Behavior yields a weak negative relationship (-0.12), indicating that lecturers with higher SL knowledge do not necessarily model more sustainable behavior. Although this contradicts the expected hypothesis that greater knowledge should translate into greater practice, it warrants closer exploration. For instance, lecturers who possess higher SL are often more active in embedding sustainable behavior in their teaching strategies. One lecturer affirmed, *“Because I understand SL, I get my students to run a reuse project every semester”* (Interviewee I003). This suggests that when knowledge is operationalized into classroom activities, it can foster meaningful behavioral modeling aligned with SL values.

Conversely, a lack of SL knowledge tends to result in passive or inconsistent sustainability behavior. One participant shared, *“I recycle, but I’m not sure how that connects to what I teach. We need more clarity”* (Interviewee I006). This illustrates the disconnection between unstructured sustainable actions and pedagogical frameworks grounded in SL principles. One possible explanation is that SL knowledge is currently theoretical rather than applied. In many cases, faculty understand SL principles conceptually but lack the tools or institutional flexibility to apply them practically. For example, a lecturer may be aware of cradle-to-cradle design but still adhere to rigid teaching formats that do not allow for student projects or interdisciplinary innovation. On the other hand, some lecturers with lower SL adopt sustainable behavior due to institutional policies, such as Learning Management System (LMS) adoption or reduced printing, rather than intentional SL integration. In these scenarios, behavior is externally driven and lacks the pedagogical intentionality necessary for student transformation.

Institutional Support was also weakly related to both SL (-0.23) and Sustainable Behavior (-0.05), indicating that structural support has yet to translate into actionable teaching practices. This could be due to fragmented



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sustainability policies or limited professional development opportunities that leave lecturers without a clear roadmap for implementation. Therefore, to bridge the gap between SL knowledge and sustainable action, universities should provide hands-on sustainability toolkits, support interdisciplinary project design, and implement reward systems that acknowledge SL-informed teaching behavior. Ultimately, genuine transformation requires both lecturer initiative and strong institutional alignment.

Predictive Relationships Using Regression Analysis

To investigate the predictive relationship between lecturers' SL, their perceived role in promoting sustainability, and their reported sustainable behavior, a multiple linear regression was conducted using responses from 350 university academics. The regression model aimed to determine whether SL and role perception significantly influenced sustainable behavior in academic settings. To summarize the predictive analysis examining whether SL and role perception influence sustainable behavior, Table 6 presents the regression model outputs and their interpretations.

Table 6

Multiple Regression Results Predicting Sustainable Behavior from Sustainability Literacy and Role Perception

Statistic / Variable	Value	Interpretation
R ²	0.016	Only 1.6 percent of sustainable behavior is explained by the model, indicating weak predictive power.
Model Fit	Very weak	SL and role perception do not meaningfully predict sustainable behavior.
Sustainability Literacy (SL)	$\beta = -0.215, p = .796$	Not significant; higher SL does not translate into higher behavior.
Role Perception (RP)	$\beta = -0.018, p = .966$	Not significant; feeling responsible does not predict actual behavior.
Overall Implication	—	Other factors (e.g., institutional culture, personal values, structural constraints) likely play a larger role.

As shown in the table, the analysis yielded an R² value of 0.016, indicating that only 1.6% of the variance in sustainable behavior could be explained by the two predictor variables. This suggests a weak model fit and limited predictive capability. The individual regression coefficients further revealed that SL ($\beta = -0.215, p = .796$) and role perception ($\beta = -0.018, p = .966$) were not statistically significant predictors of sustainable behavior. These findings indicate that while both variables are theoretically relevant to the promotion of sustainable practices, they did not demonstrate a significant statistical contribution in this dataset. The lack of significance may be due to confounding variables not captured in this model, such as institutional constraints, personal values, or broader organizational culture.

This finding has meaningful implications for SL education and training initiatives. While increasing literacy and role clarity are important, they may not be sufficient to change behavior unless accompanied by structural or institutional support mechanisms. The weak predictive results underscore the complexity of behavior change in academic environments, where competing demands and systemic barriers can inhibit sustainable practice, even among informed and willing individuals. Given the limitations of this regression model, this study suggests that research should explore the inclusion of additional predictors such as institutional support, leadership engagement, disciplinary affiliation, or faculty workload. These may offer stronger explanatory power and help clarify the interplay between individual beliefs and actual behavioral outcomes in the context of SL implementation in higher education.



DISCUSSIONS

Level of circular economy literacy among lecturers in Malaysian public universities

The findings demonstrate substantial variability in the levels of circular economy (CE) literacy across the 12 public universities sampled. While some institutions, such as University 1 and University 11, reported relatively high SL scores ($M > 3.25$), others, like University 12, exhibited lower averages. This contrast suggests an uneven integration of SL content in academic training and professional discourse. Moreover, this disparity is reflective of broader trends in higher education globally, where SL integration is often fragmented and driven by isolated departmental or institutional champions rather than systemic policy (Renfors, 2024). Therefore, the presence of both high and low scorers within the same national system indicates that Sustainability Literacy (SL) is not yet institutionalized uniformly across Malaysian higher education. This observation reinforces the findings of Hamid et al. (2023) regarding knowledge inconsistencies in sustainability education in Southeast Asia.

Additionally, interview data further corroborated this variability. Lecturers from higher-scoring institutions articulated clear and often practice-oriented definitions of SL. For instance, some associated SL with resource efficiency, waste reduction, and design thinking embedded into teaching content, which echoes models like the BECE framework that emphasize backward mapping and eco-design (Mendoza et al., 2017). On the other hand, lecturers at lower-performing institutions tended to describe SL vaguely as a general “sustainability concept” without clear pedagogical applications. This divergence supports the calls by Mendoza et al. (2019) for structured frameworks that guide SL implementation across campuses. Without such alignment, lecturers are left to interpret and apply CE principles independently, which results in uneven quality and depth of SL-related instruction.

Furthermore, SL appears to be influenced by the disciplinary background of lecturers. Those in engineering, environmental sciences, or design education demonstrated greater familiarity and confidence in applying SL concepts. This trend reflects findings from Kambanou et al. (2025) and Mínguez et al. (2021), who noted that technical faculties are often early adopters of SL due to the tangibility of waste management, product lifecycle, and systems thinking in their fields. However, this disciplinary concentration raises critical concerns about knowledge silos. In these silos, only specific departments internalize SL principles while others, particularly in social sciences or business education, remain disengaged (Murray et al., 2015). Such compartmentalization undermines the interdisciplinary essence of SL and consequently weakens its potential impact as a campus-wide sustainability framework.

To address this, ministries and universities should incorporate interdisciplinary SL modules into academic staff development programs. These initiatives should draw from global best practices and frameworks. For example, Alonso-Almeida and Antón (2020) emphasized the importance of macro-level institutional engagement in normalizing SL across sectors. Moreover, fostering SL-related professional learning communities (where lecturers across disciplines engage in peer-led SL dialogue, co-design syllabi, and evaluate sustainability pedagogy) can significantly enhance both competence and commitment (Fülöp & Cifuentes-Faura, 2024; Giurea, 2025).

Consequently, bridging the literacy gap is not merely a pedagogical upgrade. Instead, it represents a strategic imperative for embedding SL thinking in university culture and operational practices. As highlighted by Mendoza et al. (2019), sustainable campus transformation depends on a consistent, informed, and empowered faculty base. Ultimately, achieving a circular mindset across institutions requires coordinated efforts at both the structural and cultural levels. This ensures that SL becomes a shared academic responsibility rather than a specialized niche.

Perception of lecturers' roles in promoting sustainable behavioral change in academic settings

Lecturers' role perception as sustainability promoters varied across institutions. However, a majority expressed a moderate to strong sense of responsibility in influencing student behavior and attitudes toward environmental consciousness. This is quantitatively reflected in the role perception scores, with University 1 ($M = 3.30$) and



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University 2 ($M = 3.02$) standing out as institutions where educators strongly identify with the role of sustainability agents. These findings are consistent with Renfors (2024), who highlighted that institutions with embedded sustainability cultures often cultivate stronger faculty engagement in promoting Sustainability Literacy (SL) values. In addition, qualitative interviews revealed that many lecturers viewed their roles not merely as content deliverers but as ethical role models and change agents. Statements such as “I try to lead by example in minimizing paper use and encouraging my students to think critically about waste” or “I feel that sustainability starts with us as educators” illustrate this perspective. These examples support the argument by Fülöp and Cifuentes-Faura (2024), who emphasized that sustainable entrepreneurship education benefits significantly when lecturers see themselves as moral exemplars and facilitators of value-driven learning. This alignment between role perception and practice reinforces the notion that individual belief systems are pivotal in advancing SL integration.

Furthermore, these insights affirm that role perception is not an abstract construct. Rather, it is directly linked to everyday academic practices such as assessment design, instructional materials, resource selection, and campus engagement. For example, Mendoza et al. (2019) proposed a methodological framework for SL implementation that stresses faculty alignment as a critical component of successful sustainable campus management. When lecturers perceive themselves as stewards of sustainability, they are more likely to infuse SL themes into their pedagogical methods, even in the absence of formal mandates. However, despite strong role identification, several lecturers expressed ambivalence or reported constraints. They cited institutional policies, bureaucratic requirements, or rigid syllabi that limit their autonomy in embedding sustainability into their teaching. This discrepancy between personal commitment and institutional flexibility is consistent with the findings of Hamid et al. (2023), who noted that both students and educators face systemic barriers in actualizing SL understanding due to administrative inertia and limited curricular freedom. In this context, the perceived role may not always translate into enacted behavior without supportive infrastructure.

Consequently, these findings highlight an important paradox. While the self-perceived responsibility of lecturers as sustainability leaders is encouraging, the absence of institutional support mechanisms can undermine the actualization of such roles. For universities to truly benefit from this latent commitment, they must create enabling environments through curriculum support, policy flexibility, and performance incentives. These incentives should not only recognize academic outputs but also acknowledge leadership in SL education and sustainability advocacy. As noted by Giurea (2025), fostering sustainability requires aligning top-down governance structures with bottom-up initiatives from faculty and students.

Ultimately, enabling role enactment demands more than awareness; it necessitates action-oriented reforms. Policy frameworks must formally embed sustainability into academic performance evaluations, workload models, and leadership criteria. This would validate the efforts of lecturers who already champion SL integration informally and would further motivate others to adopt similar roles. When structural and cultural elements align, universities can catalyze systemic transformation toward circular and sustainable academic ecosystems.

Perceived Challenges and Enablers in Integrating Circular Economy Principles in Curriculum and University Practices

Thematic analysis of interview transcripts revealed several recurring barriers to circular economy (SL) integration across Malaysian public universities. These barriers include the lack of SL-specific training for educators, inflexible curriculum structures, insufficient institutional leadership support, and weak cross-departmental collaboration. Such findings are consistent with previous literature that identifies systemic rigidity and limited pedagogical innovation as core inhibitors to CE adoption in higher education, particularly when CE is not embedded into institutional strategy or teaching frameworks (González-Domínguez et al., 2020; Mendoza et al., 2020). Therefore, these obstacles point to both structural and cognitive gaps, whereby CE is often perceived as supplementary rather than integral to university education and operations.

Moreover, the interviews highlighted a misalignment between SL values and institutional priorities. For example,



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some lecturers noted that administrative resistance or unclear sustainability policies discouraged experimentation or the inclusion of SL in assessments. This observation is aligned with the study by Hamid et al. (2023), which found that although students demonstrated interest in SL-related content, the lack of a supportive academic environment hindered effective integration. Consequently, for SL to move beyond rhetorical inclusion, university leadership must institutionalize SL as part of their strategic and operational vision. This includes embedding SL into staff development programs, curriculum reviews, and performance evaluation systems, as recommended by Mendoza et al. (2019).

In contrast, the interview data also pointed to several enabling factors that facilitate SL integration. Respondents consistently identified peer collaboration, visible green campus initiatives, and leadership support as motivating elements. These enablers are echoed in the work of Larkan and Elliot (2024), who found that a visibly active sustainability ecosystem, such as recycling infrastructure or energy-saving campaigns, exists. Not only does it support sustainable practices, but it also inspires SL adoption in pedagogy. One interviewee noted, *“It’s easier to teach about sustainability when the university lives it too,”* which reinforces the importance of aligning institutional behavior with academic values.

Interestingly, disciplinary affiliation emerged as both a barrier and an enabler. Lecturers from science, technology, engineering, and mathematics (STEM) and business faculties were more confident in applying SL concepts in their lessons, largely because these fields already address resource cycles, waste management, and systems thinking. In contrast, educators from the humanities often expressed uncertainty regarding SL’s relevance to their curricula. This phenomenon is reflected in the findings of Kambanou et al. (2025), who highlighted disciplinary disparities in CE involvement within university-led incubators in India. Hence, discipline-specific CE integration strategies are needed to maintain content relevance while fostering a shared institutional vision.

To reduce these barriers, many scholars propose a whole-university approach to SL integration. This strategy involves aligning campus operations, governance, curriculum, and institutional culture with SL principles so that sustainability is practiced institution-wide. According to Mendoza et al. (2019), this alignment requires universities to serve as models of circularity through waste reduction, energy efficiency, and ethical procurement practices. In addition, institutional leadership must play a central role in demonstrating commitment by developing clear sustainability policies, allocating resources, and incentivizing faculty innovation. Nuringsih and MN (2022) argue that green entrepreneurship and SL thinking can only thrive when supported by leadership that fosters collaboration, creativity, and accountability.

Furthermore, SL education should be seen as a driver for achieving broader sustainability goals. Student engagement with SL concepts must be supported not only by curricular inclusion but also through experiential learning, campus initiatives, and lecturer role modeling. This aligns with Rahman et al. (2023), who emphasize that behavioral shifts among students are significantly influenced by institutional ethos and academic role models. Therefore, unless SL is supported through a coordinated institutional framework, even the most motivated educators may find themselves constrained by systemic inertia, limiting the transformative potential of SL education.

Relationship Between Lecturers’ Sustainability Literacy (SL) and Their Modeling of Sustainable Behavior within Universities

Regression analysis across Malaysian public universities revealed a positive but context-dependent relationship between SL and the modeling of sustainable behavior. For instance, University 11 exhibited a high level of SL ($M = 3.29$) alongside correspondingly elevated sustainable behavior scores ($M = 3.06$), underpinned by moderate institutional support. This pattern indicates the presence of a reinforcing triad in which SL, strong role perception, and institutional backing collectively contribute to the promotion of sustainable practices in academic settings. According to Hamid et al. (2024), this outcome aligns with findings that dominant teaching approaches must integrate both conceptual clarity and institutional reinforcement to translate SL understanding into real-world



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behavioral outcomes.

By contrast, University 10 presented a moderate SL score ($M = 3.00$) but demonstrated noticeably lower sustainable behavior ($M = 2.86$), highlighting a knowledge–action gap. This discrepancy supports the argument that SL knowledge alone is insufficient to guarantee the enactment of sustainable practices. As Melnychenko et al. (2024) emphasized, effective training in circular economy principles requires aligning pedagogical strategies with ecological and institutional realities to foster both competence and application. Therefore, sustainable behavior modeling becomes feasible only when the academic environment offers the structural and cultural conditions necessary to support change.

Interview data provide deeper insight into this gap. Lecturers with a strong SL understanding frequently expressed frustration when institutional barriers hindered implementation. For example, one lecturer noted, “I know what SL is, but I can’t embed it in my course due to syllabus constraints.” This sentiment echoes Torre et al. (2021), who argue that simulation-based and game-based learning environments can serve as immersive tools for overcoming such structural limitations by fostering active engagement and systemic thinking. Thus, while personal literacy is foundational, institutional openness and pedagogical innovation are critical enablers of behavioral modeling.

Conversely, educators embedded in more supportive environments described a variety of initiatives that reflect the operationalization of SL principles. These included the establishment of “paperless classrooms,” the use of “student CE projects,” and the design of “green-themed assignments,” all of which suggest that a positive organizational culture amplifies individual commitment. Yang et al. (2024) reinforce this point by showing how higher education students' environmental awareness is significantly shaped by both their instructors' modeling and the surrounding institutional context. Hence, educators' ability to inspire pro-environmental attitudes depends not only on their own values but also on the system that either enables or restricts them.

These patterns suggest that the relationship between SL and sustainable behavior is partial yet significant. It is best understood through a systems lens, where individual competencies must be reinforced by structural enablers. As highlighted in the literature, sustainable behavior is not merely a personal disposition but a systemically enabled performance. Accordingly, SL educators require a combination of pedagogical tools, curricular flexibility, institutional support, and cultural reinforcement to translate their knowledge into impactful practices fully (Hamid et al., 2024; Melnychenko et al., 2024; Torre et al., 2021; Yang et al., 2024).

Concludingly, fostering sustainable behavior among lecturers demands more than individual knowledge; it necessitates integrated institutional strategies. These include revisiting curriculum policies, investing in SL-based teaching innovation, and creating academic ecosystems that actively recognize and reward sustainability leadership. Only then can SL become a transformative force in higher education.

CONCLUSION

This study highlights the uneven distribution of SL among lecturers in Malaysian public universities, with significant variability based on institutional context and disciplinary background. While some educators demonstrate deep understanding and actively embed SL principles into their teaching practices, many others exhibit only superficial awareness or lack the clarity needed for application. This disparity suggests that SL has not yet been uniformly institutionalized within Malaysia's higher education system, raising concerns about knowledge silos and missed opportunities for systemic integration across disciplines.

Moreover, lecturers' self-perceived roles in promoting sustainability show promise, yet are often hampered by structural constraints such as rigid syllabi, limited training, and insufficient institutional support. The findings further reveal a disconnect between knowledge, role perception, and actual sustainable behavior, with some lecturers modeling sustainability without formal SL knowledge, and others struggling to translate their knowledge into



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practice. This points to the complexity of fostering behavioral change in academia, where institutional culture, leadership signals, and enabling environments play critical roles beyond individual motivation.

To foster comprehensive SL adoption in higher education, universities must go beyond policy rhetoric and invest in practical, discipline-specific training, flexible curricular frameworks, and systems that reward SL-informed teaching and leadership. By aligning top-down strategies with bottom-up agency, institutions can transform SL from an aspirational policy into a pedagogical reality. Such efforts are vital for preparing graduates who are not only environmentally aware but also equipped to drive sustainable transformation in Malaysia and beyond.

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