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## **Developing a framework for Green Curriculum in higher culinary education**

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### **ABSTRACT**

The accelerating global environmental crisis demands the integration of sustainability within higher culinary education. This study aims to analyze the implementation of the Green Curriculum (GC) framework at Universitas Negeri Surabaya (UNESA) and Universiti Pendidikan Sultan Idris (UPSI). Utilizing a qualitative content analysis with simple frequency quantification involving 50 participants, the findings reveal that implementation is in a transitional phase marked by three fundamental gaps. First, a significant gap exists between the high level of philosophical awareness among internal stakeholders and the lack of systemic action, despite new demands for sustainability competencies. Second, implementation is critically impeded by the university support system; infrastructure ('Facilities & Infrastructure,'  $f=84$ ) was the most frequent concern, creating a 'hidden curriculum' conflict in which poor facilities (e.g., wastewater treatment) contradict pedagogical goals. Third, the framework is overwhelmingly inward-looking, rendering the community participation pillar the least emphasised (frequency <2%). This research concludes that achieving a mature GC requires a radical shift from conceptual adoption to tangible systemic alignment, prioritizing investment in critical infrastructure and the institutionalization of external partnerships for holistic operational reality.

**Keywords:** Green Curriculum, framework, culinary education, sustainability, higher education

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### **INTRODUCTION**

The accelerating global environmental crisis, marked by climate change, resource depletion, and escalating food waste, has urged higher education institutions worldwide to integrate sustainability into their teaching and learning systems (Barth, 2014; Lozano et al., 2015). The food and culinary sector, as one of the largest contributors to environmental degradation, plays a pivotal role in addressing sustainability challenges through education and practice (Siregar et al., 2024; Sudirman, 2024). This sector not only produces significant greenhouse gas emissions but also influences consumption behaviors and food system ethics. Consequently, embedding sustainability principles within culinary higher education, commonly referred to as the Green Curriculum (GC), has become essential for cultivating environmentally conscious and socially responsible culinary professionals (Ni et al., 2024).

The Greening the Future: Curriculum for Sustainable Development framework proposed by UNESCO (2023) emphasizes that higher education should adopt a holistic and transformative approach, integrating environmental, social, and economic dimensions of sustainability across disciplines. In this regard, GC serves not merely as an instructional innovation but as an

institutional commitment to foster ecological citizenship, critical thinking, and practical engagement with sustainability issues (Tilbury, 2011). However, the degree of GC integration varies significantly among countries and educational institutions, particularly in vocational and applied sciences programs where technical skill mastery is often prioritized over sustainability-oriented values (Nasution et al., 2024; Suroto, 2023).

Both Indonesia and Malaysia share a common challenge in developing and institutionalizing GC within their educational systems. While national education policies in both countries support sustainability and the Sustainable Development Goals (SDGs), the operationalization of these policies in specific study programs, such as culinary education, remains limited (Lozano et al., 2015; Anggraini & Nugraheni, 2024 Universitas Negeri Surabaya (UNESA) in Indonesia and Universiti Pendidikan Sultan Idris (UPSI) in Malaysia represent two higher education institutions with comparable visions in advancing vocational education that integrates sustainability. However, the contextual and cultural differences between the two institutions offer valuable insights into how GC can be adapted and implemented effectively across distinct national settings (Gunawan, 2024).

This comparative perspective is crucial for understanding how internal and external factors influence the success of GC implementation. Internal factors include institutional policy, curriculum design, pedagogical practices, infrastructure, and the engagement of academic communities (Lozano et al., 2015). External factors encompass national education policies, industry and community partnerships, and socio-cultural contexts that shape institutional priorities (UNESCO, 2023; United Nations, 2015). Examining these factors across two institutions allows for cross-learning and benchmarking that can strengthen GC adoption in Southeast Asia's higher education context.

Despite the global and regional momentum toward sustainable education, there remains a scarcity of empirical studies examining GC implementation in the field of culinary higher education, particularly through a comparative lens. Previous studies have mainly focused on policy analysis or single-institution case studies, leaving a gap in understanding how contextual factors influence curriculum sustainability practices across different educational systems (Ni et al., 2024; Husnita, 2024).

Therefore, this study aims to analyze and compare the internal and external factors influencing the implementation of Green Curriculum in higher culinary education at UNESA (Indonesia) and UPSI (Malaysia). Employing a qualitative research approach, this study utilizes in-depth interviews, observations, and qualitative content analysis involving 50 participants to examine the internal and external factors influencing Green Curriculum implementation in higher culinary education. The findings are expected to contribute to the theoretical enrichment of sustainability-based curriculum development and provide practical insights for higher education institutions in Indonesia, Malaysia, and beyond.

## **METHOD**

This study employed a qualitative comparative case study design to explore the internal and external factors influencing the implementation of the Green Curriculum (GC) in higher culinary education at Universitas Negeri Surabaya (UNESA), Indonesia, and Universiti Pendidikan Sultan Idris (UPSI), Malaysia. The qualitative approach was chosen to enable an in-depth understanding of contextual, institutional, and cultural aspects that shape curriculum sustainability practices in both institutions.

A qualitative descriptive was adopted to capture the similarities and differences in GC implementation between the two universities. This design allows for an in-depth exploration of real-world phenomena within their natural settings, emphasizing meaning, interpretation, and contextual understanding. The study was conducted in two higher education institutions offering culinary-related programs: UNESA in Indonesia and UPSI in Malaysia. These institutions were selected based on their commitment to promoting sustainable education within vocational and applied sciences. A total of 50 participants were purposively selected, consisting of lecturers, administrative staff, and students who were directly involved in curriculum design,

implementation, or learning processes. This composition provided a diverse perspective from both academic and operational standpoints, enriching the data with multiple viewpoints.

Data was collected through semi-structured interviews and non-participant observations conducted over a three-month period. The interviews were guided by an interview protocol focusing on institutional policies, curriculum integration strategies, infrastructure support, teaching practices, and external collaborations related to GC. Each interview lasted between 45 to 60 minutes and was conducted face-to-face or via online platforms, depending on participant availability. Observations were carried out in classrooms, laboratories, and campus facilities to capture tangible practices reflecting sustainability values. Field notes and institutional documents, such as syllabi, policy statements, and curriculum frameworks, were also examined to complement interview data.

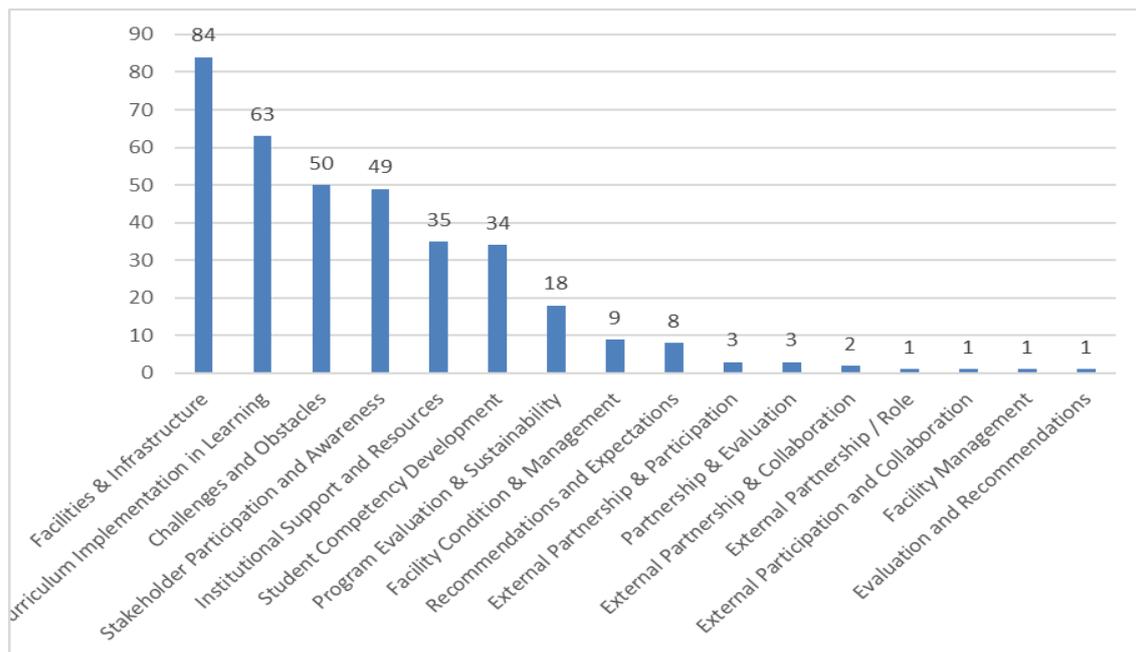
Data were analyzed using thematic analysis following the six-phase model by Braun and Clarke (Campbell et al., 2021); familiarization with data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report. Thematic patterns were developed to identify internal and external factors influencing GC implementation across both universities. Comparative coding was conducted to highlight convergences and divergences between UNESA and UPSI.

To enhance the credibility of findings, data triangulation was performed by comparing interview transcripts, observation notes, and document analyses. Member checking was also conducted by sharing summaries of interpretations with several participants to validate accuracy and interpretation consistency (Noble & Heale, 2019).

## FINDINGS AND DISCUSSION

### Findings

The findings of this research were extracted from questionnaire data involving 50 panelists. The collected qualitative data were analyzed descriptively, followed by a frequency quantification of keywords to identify the primary focus and priorities as perceived by the panelists. From the entire corpus of responses, 362 unique keywords were successfully identified and classified. The essential findings indicate a highly varied distribution of emphasis across the different components of the Green Curriculum (GC), as visually presented through the frequency distribution in Figure 1.



**Figure 1. Thematic Priority Mapping Based on Keyword Frequency Analysis**

As illustrated in Figure 1, the panelist’s primary focus was directed towards infrastructural aspects and practical implementation within the institutions. The keyword ‘Facilities & Infrastructure’ (f=84) demonstrated the highest frequency of occurrence, followed by ‘Curriculum Implementation in Learning’ (f=63). Furthermore, ‘Challenges and Obstacles’ (f=50) and internal ‘Stakeholder Participation and Awareness’ (f=49) were also identified as priority issues. In contrast, keywords representing external partnerships exhibited a significantly low frequency of occurrence (e.g., ‘External Partnership & Participation’ (f=3) and ‘External Partnership & Collaboration’ (f=2)). This finding implies that the aspect of external collaboration has not yet become a central discourse in the GC development at both institutions.

To map these frequency findings into the research’s conceptual framework, all keywords were classified based on the three primary research objectives and their specific measured aspects. This comprehensive mapping is presented in Table 1.

**Table 1. Analytical mapping of research objectives, aspects, and keyword categories**

Research Objective	Aspect	Keyword Category
Objective 1: To describe in-depth the implementation of the <i>green curriculum</i> within the curriculum system at UNESA and UPSI, focusing on the role of internal stakeholders (leadership, faculty, students, and academic staff) in the <i>green curriculum</i> development process	Theoretical and Empirical Aspects (Curriculum Implementation in Learning)	Curriculum Implementation in Learning Student Competency Development
Objective 2: To describe the role and characteristics of the (internal) university support system, encompassing human resources (HR), facilities, and infrastructure.	Study Program Leadership Aspect (Institutional Support)	Stakeholder Participation and Awareness Institutional Support and Resources
	Facilities and Infrastructure Aspect (Supporting Facilities)	Facilities & Infrastructure Facility Condition & Management Facility Management
Objective 3: To describe the role of community/ participatory education in the <i>Green Curriculum</i> at UNESA and UPSI, specifically the contribution of external stakeholders (government, industry, NGOs, and the community), as well as tangible student actions in environmental conservation programs integrated with learning.	External Partner Aspect (Collaboration and Impact)	External Partnership & Participation External Partnership / Role External Participation and Collaboration External Partnership & Collaboration
	Collaborative Evaluation and Feedback	Challenges and Obstacles Program Evaluation & Sustainability Partnership & Evaluation Evaluation and Recommendations Recommendations and Expectations

A synthetic analysis of Figure 1 and Table 1 confirms the main research findings. The panelists focus was predominantly directed at elements relevant to Research Objective University Support System, as evidenced by the high cumulative frequency of keywords such as ‘Facilities & Infrastructure’ and ‘Institutional Support and Resources’. Similarly, Research Objective Curriculum Implementation also received substantial attention.

Significantly different, Research Objective Community/Participatory Role received far more minimal emphasis, wherein keywords related to the ‘External Partner Aspect’ collectively showed the lowest frequency. This finding indicates that the GC framework development in both

institutions is currently more inward-looking. The main priority appears to be placed on refining physical facilities and the core curriculum, while the pillar of systemic external collaboration has not yet been identified as a priority consideration. Furthermore, the high frequency of 'Challenges and Obstacles' implies that the implementation process across all aspects faces significant constraints requiring further optimization. The implications of these findings will be discussed in depth in the following section.

## **Discussion**

### ***The green curriculum implementation gap: Between philosophical adoption and systemic reality***

The first research objective focused on describing the implementation of the green curriculum (GC) and the role of internal stakeholders. Quantitative findings reinforce the centrality of this objective; the keywords 'Curriculum Implementation in Learning' ( $f=63$ ) were the second most frequent keywords identified in Figure 1. This high frequency indicates that the discourse among panelists was indeed highly focused on the level of practical implementation and the involvement of internal actors.

An in-depth analysis of these findings reveals a central paradox: GC implementation in both institutions is in a "dynamic phase," characterized by partial successes clashing with systemic challenges. On one hand, the findings show adoption at the philosophical level. Panelists affirmed that GC has been established as a "core principle" of the curriculum, and some implementations were rated as "good" or "well-integrated." This suggests that, theoretically, awareness and acceptance of the concept have been established among faculty members. However, on the other hand, the majority view, including that of students, asserts that this philosophical adoption has not yet been successfully translated into systematic execution. Panelists consistently reported that the curriculum is "not yet comprehensively/fully integrated" or "not yet maximal," and is often limited to specific learning modules.

The interpretation of this contradictory finding is that the identified successes were likely not driven by a standardized institutional framework, but rather by "individual initiatives" from faculty members with strong personal commitment to environmental issues. This gap reflects a common challenge in Education for Sustainable Development (ESD), often described as the disconnect between 'espoused theory' (the stated philosophy) and 'theory-in-use' (the actual practice) (Fischer et al., 2022). The study programs, therefore, appear to be in a "transitional phase", a phase where bottom-up enthusiasm from internal stakeholders (faculty and students) has outpaced the readiness of the top-down system (a structured curriculum and supporting infrastructure). Effective GC implementation requires moving beyond these "pockets of excellence," driven by individual champions, towards a systemic, Whole Institution Approach (WIA) (Peng et al., 2025).

### ***A paradigm shifts in student competencies for sustainability***

The second significant finding related to Objective 1 is the paradigm shift in competencies demanded by students, reflected in the keyword 'Student Competency Development' ( $f=34$ ). The qualitative data analysis shows that stakeholders (in this case, students) no longer view culinary education merely as the mastery of technical skills. There is a clear demand for holistic integration that includes management, environmental ethics, and sustainability innovation.

The analysis of panelist proposals identifies five crucial new competency pillars. First, and most dominant, is Life Cycle Management of Materials and Zero Waste Production, encompassing portion control and zero waste cooking. Second, Operational Resource Efficiency, particularly energy and water. Third, Sustainable Logistics and Stock Management, focusing on FIFO principles and inventory management to prevent waste. Fourth, Integration of Local Ingredients and Green Supply Chains, linking the kitchen to the farm-to-table ecosystem. Fifth, a demand for Learning Methods that Foster Initiative, facilitating innovation and green entrepreneurship. These five pillars represent a domain-specific articulation of the key competencies required for sustainability (Greenland et al., 2022), encompassing systems-thinking (life cycle management), normative (ethics), and strategic (zero waste) capabilities.

### ***The gap between cognitive awareness and systemic action of institutional support***

The analysis of the university support system, specifically focusing on the aspect of leadership and institutional support (Research Objective 2), reveals a crucial finding. The importance of this aspect was quantitatively confirmed in Figure 1, where the keywords 'Stakeholder Participation and Awareness' (f=49) and 'Institutional Support and Resources' (f=35) emerged as priority issues. This finding indicates that internal stakeholders constitute both the foundation and the primary challenge in the implementation of the Green Curriculum (GC).

An in-depth discussion of the qualitative data uncovers a central paradox: the level of awareness among stakeholders has been established, yet it fails to translate into consistent, collective action. Panelists affirmed that at the faculty level, awareness is rated highly ("very concerned," "actively encouraging"). However, this high awareness does not correlate with behavior at the student level, whose participation was reported as "not yet maximal," "limited," or even "not involved at all". This finding reflects a classic phenomenon in environmental studies known as the "Attitude-Behaviour Gap" or "Value-Action Gap" (Portus et al., 2024). Panelists explicitly stated that students "still face obstacles when it comes to practicing it" even though they understand the importance of the issue. This leads to the analytical conclusion that the challenge of implementation of GC in both institutions has shifted. The challenge no longer lies in the cognitive domain (disseminating knowledge or awareness) but rather in the behavioral and systemic domains (creating conditions that enable sustainable action).

This is precisely where the role of study program leadership and institutional support becomes central. The analysis indicates that current institutional strategies still rely heavily on "moral appeals" alone. This approach has proven ineffective as it fails to address the structural barriers students face. The high awareness among faculty, which is the most valuable institutional asset, is not being managed systemically. Literature on change management in Higher Education Institutions (HEIs) for sustainability emphasizes that individual awareness must be "institutionalized" to be effective (Suklun & Bengü, 2024). Leadership cannot stop merely at socialization. Instead, leadership must proactively design a "choice architecture" (Ritchie-Dunham et al., 2023) that facilitates and encourages pro-environmental behavior. The findings of this study clearly demand a shift from "moral appeals" to tangible "institutionalization." This implies transforming faculty awareness into binding operational policies, mandatory structured courses, or resource allocations (Institutional Support and Resources) that directly facilitate sustainable practices for students.

### ***The university support system: infrastructure as the hidden curriculum***

The analysis of the university support system (Research Objective 2) was identified as the most deterministic factor in this research. Quantitative validation from Figure 1 demonstrates that the keyword 'Facilities & Infrastructure' (f=84) had the highest frequency of occurrence, surpassing all other aspects. This dominant frequency implies that, in the panelists' perception, physical infrastructure is not merely a supporting element but the primary foundation and, simultaneously, the most significant barrier to the implementation of the Green Curriculum (GC). The detail as shown in Table 2.

When the empirical findings from this study program are contextualized within academic literature and global best practices, it becomes evident that existing initiatives are positive first steps, yet they remain far from a holistic and integrated approach. In terms of waste management, the data show that the availability of "Segregated Waste Bins" (reported by 24 respondents) is an established foundation. However, literature on the zero-waste campus emphasizes that segregation is merely the first step (SGA, 2025). Success depends on the subsequent steps. The quantitative data indicating a minimal availability of "Composter" facilities (only 10 respondents) confirms a disruption in the waste management chain. A mature zero-waste approach focuses on prevention at the source (OoNorasak et al., 2022), an aspect not significantly reflected in the current data.

Regarding energy efficiency, the adoption of LED lighting (8 respondents) and induction stoves (3 respondents) are recognized best practices. However, a comprehensive approach encourages the deeper integration of efficient technologies with passive building design and

renewable energy (Barnett-Itzhaki et al., 2025), where leading institutions do not just replace equipment but holistically redesign systems. The most critical gap was identified in water management. Quantitative data show that vital facilities such as Wastewater Treatment Plants (WWTP/IPAL) were reported by only 8 respondents (16%), and "Grease Traps" by 7 respondents (14%). These exceptionally low figures confirm this as a "critical area." Literature highlights the importance of low-flow fixtures, rainwater harvesting, and wastewater recycling systems (WaterSense, 2024), which are essential for practical kitchens to prevent pollution.

**Table 2. Inventory and condition of facilities & infrastructure based on respondent reports**

Category	Type of Facilities	Availability & Reported Condition	Key Quotes
Energy Efficiency	Energy-Efficient Stoves (Induction/Electric)	Available, but unevenly distributed	"Energy-efficient equipment (induction stoves, efficient electric ovens)"; "laboratory with induction stoves"; "still using gas stoves"; "energy-efficient equipment is unevenly distributed"
	Energy-Efficient LED Lighting	Widely available	"All lights... have been replaced with LED"
	Solar Panels/Renewable Energy	Available, limited scale	"solar-powered electricity & fans"; "partial electricity from sunlight"; "mentions solar panels"
Solid Waste Management & Circularity	Segregated Waste Bins (Organic/Inorganic)	Widely available, but management is often problematic	"equipped with waste segregation facilities"; "Special category waste bins"; "separate bins but management is poor"; "availability of bins is not yet segregated"
	Composter/Organic Waste Processor	Available, limited	"organic waste processing (compost)"; "composter"; "simple management (biopore)"
Physical Infrastructure & Building Design	Used Cooking Oil Processing	Not reported	(Indicator exists in instrument, but no data from respondents)
	Natural Ventilation & Lighting	Widely available	"natural ventilation and LED"; "cross-ventilation"; "natural lighting in the kitchen"; "ventilation does not yet adhere to a green building system"
	Exhaust Hoods (Cooker Hood)/Blowers	Available, unevenly distributed	"chimney (cafeteria lab)"; "10 blowers"; "cooker hood"
Wastewater Management (WWTP)	Green Open Spaces/Education Garden	Available	"garden arrangement"; "mini garden"; "food garden"; "education garden"
	Water Management System	Available, very limited	"efficient water system"; "Water drainage filter"; "kitchen waste containment (2 well units)"; "water recycling"
	Kitchen-Specific WWTP	Not reported	(Indicator exists in instrument, but no data from respondents)

More than just a collection of facilities, the infrastructure in higher education holds a profound and often unrealized pedagogical role. The physical campus environment functions as a "hidden curriculum," a concept positing that students implicitly absorb values and norms from their learning environment. In the context of the GC, sustainable infrastructure becomes a powerful learning medium, transforming physical space into a living laboratory. The data collected illustrate this educational dimension. The presence of "education gardens" or "food gardens" directly supports farm-to-table concepts, providing experiential learning about the food

cycle. Similarly, the use of induction stoves and the requirement to segregate waste are physical embodiments of learning objectives, transforming daily operations into moments of learning circular economic principles.

Environmental education literature recognizes the physical environment as a learning medium. Orr (Stone, 2012) stated that "buildings have a hidden curriculum that teaches us as effectively as any course". This perspective positions campus architecture not as a neutral backdrop, but as a text "read" by students. A building with natural ventilation teaches passive design; well-managed productive gardens teach food ecology (Okasha et al., 2016). By adopting this perspective, the campus can be consciously operated as a "living laboratory" (Stone, 2012), integrating campus operations with the academic mission. For instance, energy consumption data from kitchens can be analyzed by students, or compost from food waste can fertilize education gardens. This approach converts operational tasks into project-based and problem-based learning opportunities, which are effective in developing sustainability competencies (Harris, 2014; Wiek et al., 2014).

However, this hidden curriculum is a double-edged sword. When green infrastructure is well-managed, it teaches positive lessons. Conversely, when facilities are in poor condition or mismanaged, they teach powerful negative lessons. Segregated bins that are later mixed teach that the effort is futile and ceremonial. A neglected composter teaches that the idea is impractical. This cognitive dissonance, between what is taught ("we must be sustainable") and what is experienced ("the institution itself does not practice this"), can foster cynicism and delegitimize the GC's pedagogical goals. The failure to manage infrastructure (such as the low availability of WWTPs) is not just an operational failure, but a fundamental pedagogical one. This underscores the urgency of aligning the formal curriculum's message with the physical reality experienced by students.

### ***Assessing the role of community and participatory education in the green curriculum***

The third research objective focused on describing the role of community and participatory education, encompassing the contribution of external stakeholders and tangible student actions. The research findings indicate that this pillar is the weakest and most neglected component in the development of the *Green Curriculum* (GC) at both institutions. Quantitative validation from the keyword frequency data (Figure 1) clearly demonstrates the low priority of this aspect. Data analyzed in the file reveals that keywords explicitly referring to external collaboration (e.g., External Partnership & Participation<sup>3</sup>) have a very limited frequency of occurrence, accounting for less than 2% of the total 362 keywords. This implies that within the panelists' discourse, the aspect of external partnership has not received emphasis as strongly as the internal curriculum (Objective 1) or the university support system (Objective 2).

This finding presents a critical note. Academic literature consistently identifies external collaboration as a vital component in Education for Sustainable Development (ESD), which serves as the conceptual umbrella for GC (UNESCO, 2020). Effective GC implementation demands a 'Whole-Institution Approach' (WIA), where the university is not viewed as an isolated entity but as an integral part of the broader social, economic, and environmental ecosystem (Ron, G., et al., 2020). Within the WIA framework, external partnership is not merely an *add-on* but a strategic component. The low frequency of this data indicates that the GC development model in both institutions has not yet fully adopted the WIA framework and still positions partnerships merely as operational activities (e.g., internships) rather than as strategic collaborations in curriculum design.

The second dimension of Objective 3 is integrated tangible student actions. Findings on this aspect show a similar weakness. The frequency data indicate that keywords directly related to "tangible student actions" or "community projects" also have a very low frequency, accounting for less than 1% of the total data. The interpretation of this finding is that the GC currently being developed is *inward-looking*. The emphasis on Objective 1 (Curriculum Implementation) and Objective 2 (Facilities & Infrastructure) shows a focus on mastering *green skills* within the campus environment (kitchens, laboratories, internal waste management). However, a disconnect occurs between the mastery of these internal skills and their implementation in the external community. As emphasized by Mohammadi et al. (2025), there is a fundamental difference

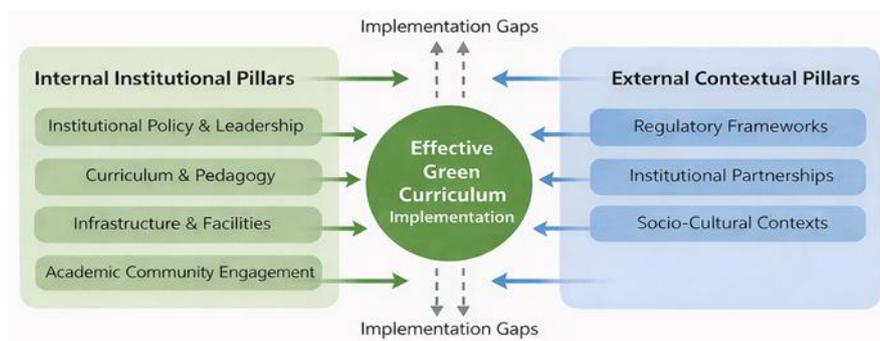
between learning *for* the community (studying theory in class) and learning *in* or *with* the community (*service-learning*). The data indicate that the current GC is still limited to the "learning for the community" level.

Overall, the findings for Objective 3 indicate a structural imbalance in the GC framework being developed. There is a very strong emphasis on the internal pillars (curriculum and infrastructure) but a very weak emphasis on the external pillars (partnerships and community action). The failure to adequately integrate this external pillar risks creating what is known as an "ivory tower" curriculum, a curriculum that may be internally perfect but fails to fulfill the social transformative mission mandated by ESD (Kohl et al., 2021). As emphasized by Azmi et al. (2024), effective sustainability integration demands active engagement with society. The challenge for both institutions moving forward is to transform *ad-hoc* partnerships into institutionalized collaborations, and to consciously design programs that encourage students to apply their *green skills* to solve real-world problems in the community.

When synthesized, the "implementation gap" discussed earlier becomes more complex. The high frequency of the keyword 'Challenges and Obstacles' (f=50) can be interpreted as a reflection of the institution's difficulty in responding to this competency paradigm shift. The challenge of GC implementation (Objective 1) is no longer merely "adding" environmental material into the syllabus. Instead, it involves transforming the entire pedagogical and operational system to produce the five practical and managerial competencies demanded by students and the sustainable industry, a shift that requires transformative, rather than merely additive, learning.

**Proposed Green Curriculum framework**

Drawing on the qualitative findings, this study proposes a Green Curriculum (GC) framework that conceptualizes sustainability implementation as the alignment between internal institutional capacities and external contextual drivers in higher culinary education. Figure 2 illustrates the proposed Green Curriculum framework as an interaction between internal institutional pillars and external contextual pillars that jointly shape the implementation of sustainability-oriented curricula in higher culinary education. The framework emphasizes that effective Green Curriculum implementation is not driven by a single factor, but by the alignment across institutional structures, learning processes, and broader contextual conditions.



**Figure 2. Proposed Green Curriculum Framework**

The internal pillars represent the institution’s internal readiness to operationalize sustainability values. The findings indicate that misalignment among these elements, such as strong policy commitment without pedagogical integration or adequate facilities, contributes to implementation gaps. This suggests that sustainability remains symbolic when internal components function in isolation rather than as an integrated system.

The external pillars provide the enabling environment that supports or constrains curriculum implementation. While national sustainability policies and cultural culinary practices offer strategic opportunities, their influence depends on how effectively institutions translate external expectations into internal curriculum practices. Overall, the framework reflects the principles of the Whole Institution Approach to Education for Sustainable Development (ESD), in which sustainability is embedded across governance, curriculum, campus operations, and

external engagement. Rather than serving as a prescriptive instructional model, the framework functions as an analytical lens to understand alignment and gaps in Green Curriculum implementation within higher culinary education contexts.

## CONCLUSION

This research confirms the urgency of developing a Green Curriculum (GC) in higher culinary education as articulated in the introduction; however, the main findings reveal that implementation at UNESA and UPSI is still in a transitional phase marked by three fundamental gaps. While philosophical awareness and new competency demand among internal stakeholders have been established, they fail to be translated into systemic action due to weak institutional support. The implementation of the green curriculum is significantly impeded by supporting infrastructure. The current framework remains highly inward-looking, rendering the community participation pillar as the aspect most in need of improvement (frequency <2%). Future prospects for developing a mature GC demand a radical shift in focus. Future research and institutional interventions must shift from mere conceptual adoption to tangible systemic alignment, particularly through investment in critical infrastructure (such as Wastewater Treatment Plants and circular waste management) and the institutionalization of external partnerships, to transform the GC from a theoretical discourse into a holistic operational reality.

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