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# Implementing Sustainable Food Preparation and Production Practices: Knowledge and Practices of PVMA Teachers in Malaysia

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**Abstract:** Sustainability in food preparation and production is critical in addressing environmental challenges and supporting the Sustainable Development Goals (SDGs). Within Technical and Vocational Education and Training (TVET), teachers play a vital role in embedding sustainable practices through knowledge and classroom application. This study investigates the relationship between sustainability knowledge and sustainable food preparation and production practices among teachers in the Upper Secondary Vocational Programme (PVMA) in Malaysia. A quantitative survey design was employed, involving 128 teachers selected through stratified random sampling. Data were collected using a structured questionnaire and analysed using SPSS version 30. Descriptive results indicated that both sustainability knowledge (M = 3.89, SD = .26) and practices (M = 4.10, SD = .47) were at a high level. However, Pearson correlation analysis showed a moderate and significant positive relationship between the two variables ($r = .493$, $p < .001$), implying that knowledge alone is not sufficient to ensure full implementation of sustainable practices. The study concludes that continuous professional development, sustainability-focused modules and supportive teaching environments are necessary to bridge the knowledge-practice gap in TVET food-related education.

**Keywords:** sustainability knowledge, sustainable practices, TVET, food preparation, PVMA

## 1. Introduction

Concerns over environmental degradation and the depletion of natural resources have led to the growing necessity of sustainability at the global level. Sustainability is not merely about reducing environmental impact; it also encompasses a holistic approach that considers ecological integrity, economic viability, and social equity (Viola & Marinelli, 2016).

The concept of sustainable development has increasingly garnered attention in recent years (Niloofar et al., 2023). The main objective of sustainable development is to meet the needs of the present without compromising the ability of future generations to meet their own needs (Klarin, 2018). In this regard, the United Nations (UN) introduced the Sustainable Development Goals (SDGs), comprising 17 global objectives aimed at protecting the environment and promoting global prosperity. Malaysia has demonstrated its commitment to the SDGs by addressing issues such as poverty, health, and education, as well as aiming to become a carbon-neutral nation by 2050 (Zahari et al., 2021).

Food is a fundamental human necessity, positioned at the base of Maslow's hierarchy of needs (Maslow, 1954). The food industry encompasses a range of operations, from small-scale to large-scale, closely linked to the production, processing, manufacturing, and distribution of food products (Hussain et al., 2022). According to Ritchie et al. (2019), the food sector contributes to approximately one-quarter of global greenhouse gas emissions. As a result, this industry has increasingly prioritised sustainability through various initiatives (Forster, 2013; Lu & Ko, 2023).

Teachers involved in vocational training programmes are well-positioned to influence students' knowledge and behaviour in preparation for the future workforce. Teachers who are committed to food and sustainability can inspire students to embrace sustainable practices in the culinary field (Godoy, 2019). The integration of sustainable practices in food preparation and production through real-world experiences enhances students' skills and their understanding of the direct impact on the environment. Students' comprehension and adoption of sustainability practices are essential in shaping a workforce capable of addressing the challenges posed by the rapidly evolving food landscape (Calicioglu et al., 2019; Zhang et al., 2022).

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## 1.1 Sustainability Practices in Food Preparation and Production

Sustainability refers to the continuous utilisation of resources without causing degradation to natural ecosystems and human capital (Crittenden et al., 2010). Food preparation and production encompass a chain of activities including the stages of production, processing, distribution, consumption, and food waste disposal (Hinrichs, 2016).

According to Gössling and Hall (2021), sustainability in food preparation and production comprises the following components:

- Use of local ingredients
- Use of organic materials
- Cooking methods
- Water usage
- Food packaging
- Food waste reduction
- Implementation of 3R (Reduce, Reuse, Recycle) concepts
- Carbon footprint awareness

Sustainability food practices refer to actions that promote environmental protection, economic stability, and equitable access to healthy food choices, while also preserving food-related cultural heritage and traditions (Abdou et al., 2023). According to Lewis (2024), food sustainability encompasses factors such as production, distribution, packaging, and preparation, with a focus not only on environmental impact but also on the promotion of sustainable food material usage.

When discussing sustainability in food preparation and production, it becomes increasingly evident that the practices involved go beyond merely selecting the right ingredients. Food professionals do not only consider the types of materials used but also the energy management and waste disposal following the preparation process. These practices include minimising food waste through composting, food preservation techniques, reuse of food scraps, and engaging local communities in sustainability initiatives (Godoy, 2019).

Sustainability in the food industry has emerged as a major consideration in recent years (Lu & Ko, 2023). According to Vermeir and Verbeke (2006), food products that embrace sustainability are gaining popularity among consumers, who perceive them as superior in taste, quality, safety, and freshness. In this context, Makan Kitchen at DoubleTree by Hilton Kuala Lumpur has implemented sustainability practices by sourcing ingredients from local and certified sustainable suppliers, and by reducing food waste through donations to charity organisations and composting initiatives (Chew, 2023). This approach not only raises awareness about sustainability but also promotes responsible and ethical food production within the industry.

By supporting sustainability practices, the food industry can simultaneously strengthen the local economy and reduce the carbon footprint associated with food transportation. Studies have shown that consumers are increasingly inclined to choose products and services that embrace sustainability, viewing it as both a social and personal responsibility (Jia et al., 2023). In the long term, food industries that prioritise sustainability hold the potential to increase customer satisfaction, enhance brand loyalty, and contribute positively to society. This suggests that businesses across all sectors must recognise the importance of sustainability and seek effective strategies to integrate sustainable practices in order to retain and attract socially conscious consumers (Forster, 2013).

## 1.2 Sustainability Knowledge

The concept of sustainability knowledge is vital for understanding and addressing various challenges related to sustainability. It encompasses awareness and comprehension of the principles, practices, and broader implications for the environment and society. The theoretical foundation of sustainability knowledge is rooted in the work of science sociologists such as Bruno Latour, who argued that knowledge is not merely a reflection of reality, but also shaped by social and political contexts (Murdoch & Clark, 1994). In this regard, knowledge plays a significant role in shaping ethical and sustainable actions in line with the need to balance development with environmental conservation.

Sustainability knowledge in food preparation and production emphasises the use of resources and ingredients (such as local and organic ingredients), methods of preparation and production (such as cooking techniques and water usage), packaging and waste management (including food packaging and food waste reduction), and the application of sustainability concepts to reduce environmental impacts (such as the 3R concept and carbon footprint).

Knowledge of sustainability among PVMA teachers is especially crucial in fostering sustainable practices in food preparation and production. For instance, teachers with a deep understanding of sustainability principles can integrate these concepts into their teaching to help students comprehend the environmental impacts associated with the field. Furthermore, they can provide students with the necessary knowledge to make responsible decisions in their future careers. As a result, students can develop a strong awareness of the importance of protecting the environment (Mudrikah et al., 2023).

Moreover, teachers who deliver sustainability education can inspire students to initiate behavioural changes that promote environmentally sustainable lifestyles (Thor & Karlsudd, 2020; Yang et al., 2022). According to Lewis (2020), such teachers are capable of instilling sustainability values within students and preparing them to become conscientious professionals who contribute meaningfully to sustainable food practices.

In addition, teachers' ability to connect sustainability knowledge with real-world applications is crucial for bridging the gap between theory and practice. One of the key features of vocational education is its emphasis on practical training, allowing students to directly engage with sustainability practices, thereby strengthening the teacher's role. By aligning sustainability practices with real-life food industry contexts, teachers can equip students with the essential skills to address the challenges of sustainable food preparation while safeguarding environmental well-being (Godoy, 2019). In this regard, PVMA teachers play a pivotal role in shaping a generation of professionals who are not only technically competent but also capable of making decisions grounded in sustainability knowledge.

## 2. Theory and Model

This study is based on the Theory of Planned Behavior (TPB) and Practice Theory.

The Theory of Planned Behavior (Ajzen, 1991) explains individual behaviour as a function of three components: attitude, subjective norms, and perceived behavioural control, all of which shape behavioural intention. In this study, teachers' attitude refers to their evaluation of sustainable food practices, such as using organic ingredients or reducing food waste. Subjective norms reflect perceived expectations from colleagues, school leadership, or policy frameworks. Perceived behavioural control relates to teachers' confidence in accessing sustainable resources or infrastructure. TPB is used here to explain how sustainability knowledge influences teachers' intention and action in applying sustainability practices during food preparation and production activities in vocational training.

Practice Theory (Shove et al., 2012) frames behaviour as a combination of materials (e.g., sustainable ingredients, equipment), competence (knowledge and skills), and meaning (values and cultural significance). In the context of this study, teachers' sustainable practices are shaped not only by their knowledge but also by the availability of resources and their pedagogical competence. The integration of sustainable food practices is understood as routine actions influenced by social structure and institutional setting (Maller, 2015; Bhatia et al., 2023).

## 3. Methodology

This study used a correlational research design within a quantitative approach to determine the relationship between knowledge and sustainable practices in food preparation and production. The research instrument consisted of a questionnaire distributed online via Google Forms to respondents for data collection purposes.

Based on sample size calculation, a total of 128 teachers from secondary schools from the Upper Secondary Vocational Education Programme (PVMA) who teach in the field of Food Preparation and Production across Malaysia were identified as the required respondents. A stratified sampling technique was employed, whereby 14 states were categorised into zones: north, central, south, east, and East Malaysia.

The questionnaire comprised 62 items divided into three main sections. Section A gathered demographic information from the respondents. Section B, adapted from the instrument by Da Silva, Piccoli, and Pellanda (2020), contained items measuring nine dimensions of sustainability knowledge in food based on, the concept of food sustainability, use of local resources, organic ingredients, water usage, food waste reduction, composting, 3R practices, environmental impact, and carbon footprint. Section C, adapted from Kim and Hall (2020), assessed sustainable practices involving the use of local resources, organic ingredients, cooking methods, water usage, food packaging, food waste reduction, 3R implementation, and carbon footprint. Both sections utilised a five-point Likert scale.

A pilot study was conducted to assess the suitability of the items among a subset of the actual sample. The pilot was carried out in selected secondary schools in Selangor and Kuala Lumpur, involving PVMA teachers in the field of Food Preparation and Production. Analysis results showed that the Cronbach's Alpha (α) reliability coefficients for each variable ranged between 0.89 and 0.91. According to Leech, Barrett, and Morgan (2008), a coefficient value exceeding 0.70 indicates an acceptable level of reliability for studies in the social sciences.

## 4. Research Finding

### 4.1 Sustainability Knowledge in Food Preparation and Production among PVMA teachers

An analysis of the level of sustainability knowledge in food preparation and production among PVMA teachers revealed a high level of knowledge overall (M = 3.89, SD = .26). The construct of sustainability knowledge in food preparation and production was divided into nine dimensions.

As shown in Table 1, five dimensions were identified as having a high level of knowledge: organic ingredients (M = 4.40, SD = .51), followed by the concept of food sustainability (M = 4.35, SD = .44), food waste reduction (M = 4.29, SD = .53), environmental impact (M = 4.19, SD = .59), and water usage (M = 3.84, SD = .38).

Meanwhile, four dimensions were found to be at a moderate level: food waste composting (M = 3.67, SD = .30), local resource utilisation (M = 3.50, SD = .33), carbon footprint (M = 3.47, SD = .42), and the 3R concept (Reduce, Reuse, Recycle) (M = 3.39, SD = .43).

**Table 1: Sustainability Knowledge among PVMA teachers**

| Dimension | Mean | Standard Deviation | Interpretation |
|---|---|---|---|
| Food sustainability concept | 4.35 | .44 | High |
| Local products | 3.50 | .33 | Moderate |
| Organic products | 4.40 | .51 | High |
| Water usage | 3.84 | .38 | High |
| Food waste reduction | 4.29 | .53 | High |
| Food waste composting | 3.67 | .30 | Moderate |
| 3R concept | 3.39 | .43 | Moderate |
| Environmental impact | 4.19 | .59 | High |
| Carbon footprint | 3.47 | .42 | Moderate |

## 4.2 Sustainability Practices in Food Preparation and Production among PVMA teachers

Table 2 presents the overall mean score for sustainability practices in food preparation and production, which was high (M = 4.10, SD = .47). Sustainable food preparation and production practices are categorised into eight dimensions.

Based on Table 2, seven dimensions of sustainability food preparation and production practices recorded high mean scores in reducing food waste (M = 4.47, SD = .47), followed by water usage (M = 4.29, SD = .50), food packaging (M = 4.16, SD = .60), consumption of local products (M = 4.13, SD = .59), carbon footprint (M = 4.11, SD = .60), cooking methods (M = 4.07, SD = .70), and the implementation of the 3R concept (M = 4.01, SD = .67).

Only one dimension, namely the consumption of organic products, was found to be at a moderate level (M = 3.55, SD = .83).

**Table 2: Sustainability Practices among PVMA teachers**

| Dimension | Mean | Standard Deviation | Interpretation |
|---|---|---|---|
| Consumption of local products | 4.13 | .59 | High |
| Consumption of organic products | 3.55 | .83 | Moderate |
| Cooking methods | 4.07 | .70 | High |
| Water usage | 4.29 | .50 | High |
| Food packaging | 4.16 | .60 | High |
| Reducing food waste | 4.47 | .47 | High |
| Implementation of 3R concept | 4.01 | .67 | High |
| Carbon footprint | 4.11 | .60 | High |

## 4.3 Relationship between Knowledge with Sustainability Practices in Food Preparation and Production among PVMA teachers

A Pearson correlation analysis was conducted to identify the relationship between sustainability knowledge and sustainability practices in food preparation and production practices among the PVMA teachers.

Table 3 presents the correlation between the variable of sustainability knowledge and the sustainability practices of food preparation and production. The findings indicate a positive, moderate, and significant relationship between the two variables ($r = .493$, $p < .001$).

This suggests that the higher the level of sustainability knowledge, the higher the level of sustainable food preparation and production practices demonstrated by PVMA teachers in Malaysia.

**Table 3: Correlation between Variables**

| Variable | Sustainability Practices in Food Preparation and Production | Interpretation Relationship | |
|---|---|---|---|
| Sustainability Knowledge | .493 | Moderate | Positive |

** At 0.01 level (2-tailed), the correlation is significant

# 5. Discussion

## 5.1 Sustainability Knowledge in Food Preparation and Production among PVMA teachers

Based on the findings, the level of sustainability knowledge in food preparation and production among PVMA teachers in Malaysia was found to be high. This finding is consistent with previous studies that reported high levels of sustainability knowledge among teachers (Aini et al., 2021; Yang et al., 2024). However, it contradicts the findings of Teresa et al. (2022), who reported that teachers' sustainability knowledge was at a moderate level.

The high level of knowledge observed reflects the positive impact of various initiatives implemented within the national education system, particularly through the integration of Education for Sustainable Development (ESD) into school curricula. Malaysia's commitment to achieving the Sustainable Development Goals (SDGs) by 2030 has driven the Ministry of Education to strengthen educational approaches that prioritise environmental awareness, social responsibility, and economic well-being (Adilla & Kadaruddin, 2021).

The role of teachers in education requires adequate knowledge to ensure effective execution of tasks and responsibilities (Karim et al., 2021). In order to implement sustainable practices effectively, teachers need to possess a strong understanding of sustainability concepts, the interrelation of components, and their real-life applications. Sustainability knowledge that encompasses social, economic, and environmental dimensions will reinforce the teacher's role as an agent of change (Parry & Metzger, 2023).

## 5.2 Sustainability Practices in Food Preparation and Production among PVMA teachers

The findings revealed that the level of sustainable food preparation and production practices among PVMA teachers is high. This result is consistent with previous studies that reported high levels of sustainability practices (Sarimah et al., 2021; Loh, 2023). However, it contradicts the findings of Abidin et al. (2022), who found that the level of food waste management practices among food handlers was low. This discrepancy may be attributed to differences in educational background, exposure to sustainability training, and varying practical demands between the education and industrial sectors.

In implementing sustainability food preparation and production practices, PVMA teachers must not only understand sustainability principles but also be capable of applying them during teaching and learning sessions. This includes detailed menu planning, considering nutritional balance, and avoiding food waste during practical classes. Continuous efforts such as optimising ingredient use, controlling portion sizes, and managing inventory efficiently are essential sustainable practices that should be maintained.

Although the level of sustainability practices among teachers is high, studies have shown that teachers worldwide still face various challenges in implementing sustainability comprehensively. These include fragmented curricula across disciplines (Conway et al., 2021; Parry & Metzger, 2023), excessive emphasis on high-stakes examinations (Parry & Metzger, 2023), lack of professional training (Hamwy et al., 2023), as well as time and resource constraints (Grauer et al., 2022).

Moreover, institutional support plays a critical role in encouraging teachers to implement sustainability practices. Continuous encouragement from school leadership is vital for fostering a culture of sustainability and ensuring that teachers feel empowered to drive change. Without consistent support from school management and administration, teachers may struggle to implement sustainable practices effectively (Hessah et al., 2022).

## 5.3 Relationship between Knowledge and Sustainability Practices in Food Preparation and Production among PVMA teachers

The findings of the study indicate a significant positive relationship between sustainability knowledge and sustainability practices among PVMA teachers. This is consistent with previous studies which have shown a significant relationship between knowledge level and the implementation of sustainability practices (Dato et al., 2020; Mohd & Mohammad, 2021; Ismail et al., 2023).

The current study demonstrates that the relationship between knowledge and sustainability practices in food preparation and production is moderately strong, suggesting that there remains room for improvement. Although the overall level of knowledge and practice among PVMA teachers is high, not all teachers with high knowledge levels fully translate sustainability concepts into their teaching and learning practices. This may be due to constraints such as limited time, lack of supporting materials, workload, or a lack of awareness of the importance of translating knowledge into actionable practices.

Therefore, enhancing teachers' knowledge must be supported by continuous professional development programmes and exposure to more contextual and practical learning approaches. Training that focuses on real-world application can assist teachers in bridging the gap between theory and practice. This is supported by Wrenn and Wrenn (2009), who emphasised the need for professional development models that directly link training with practice. According to Yadav and Singh (2023), professional development programmes that incorporate a holistic approach to sustainability can empower teachers to implement sustainability practices more effectively.

## 6. Conclusion

The findings of the study revealed that teachers' levels of sustainability knowledge and practices are high, while the level of exposure is moderate. The study also found a significant positive relationship between sustainability knowledge and practice, although the strength of this relationship is moderate. These findings underscore the need for continuous efforts to enhance teachers' knowledge through professional training, relevant exposure, and institutional support to ensure that sustainability practices are fully integrated into teaching and learning.

The results also highlight that despite having adequate knowledge, not all teachers are able to fully apply sustainability concepts in their teaching and learning process. This may be attributed to various factors such as limited resources, time constraints, lack of institutional support, or insufficient integration of sustainability into curriculum materials. Therefore, it is important to ensure that sustainability knowledge is accompanied by contextual training and support to encourage effective translation into practice.

The study provides insights for stakeholders, including the Ministry of Education and curriculum developers, to reinforce sustainability training through professional development programmes that focus on real-world application. Such initiatives should aim to empower teachers not only with theoretical understanding but also with practical strategies, including the efficient use of sustainable ingredients, waste reduction in practical classes, and eco-friendly food packaging practices.

Although this study focused on teachers in the food preparation and production field, the findings also suggest the need for broader research across other TVET areas such as electrical wiring, furniture making, and automotive. This could support comparative analyses to assess how sustainability practices can be effectively integrated across vocational disciplines.

Further research should also explore mediating factors that influence the implementation of sustainable practices, such as self-efficacy, intrinsic motivation, and institutional culture. A mixed-method or qualitative approach could provide richer, more nuanced insights into the barriers and enablers teachers face in applying sustainability principles. Ultimately, fostering a culture of sustainability in vocational education requires a systemic and collaborative effort from all stakeholders involved.

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## Appendix A: Survey Questionnaire

**SURVEY QUESTIONNAIRE**

**Title of Study:**
Knowledge and Sustainable Practices in Food Preparation and Production Among PVMA Teachers in Malaysia

**INSTRUCTIONS:**

1. This questionnaire consists of three sections:
   i. Section A: Demographic Information
   ii. Section B: Knowledge of Sustainability in Food Preparation and Production
   iii. Section C: Sustainable Practices in Food Preparation and Production
2. Please tick (/) the appropriate response for each item. You are required to respond honestly and sincerely.
3. All information will be kept confidential and used solely for research purposes.
4. Your cooperation is greatly appreciated.

**SECTION A: RESPONDENT DEMOGRAPHICS**

Please tick (✓) the appropriate box or fill in the blanks.

1. School Name: _____

2. State: _____

3. Gender:

| | |
|---|---|
| | Male |
| | Female |

4. Age:

| | |
|---|---|
| | 24-30 years |
| | 31- 37 years |
| | 38-45 years |
| | 46 years and above |

5. Academic Qualification:

| | |
|---|---|
| | Doctorate |
| | Master |
| | Degree<br>State : …….. |
| | Diploma in Education<br>State : …….. |

6. Exposure level to sustainability:

| **Source** | **Never** | **Rarely** | **Sometimes** | **Often** | **Very often** |
|---|---|---|---|---|---|
| Workshop/Profesionnal training | | | | | |
| Social media (Facebook, Instagram, Tiktok) | | | | | |
| Video/Education podcast | | | | | |
| Programme/campaign/community awareness | | | | | |
| Family or friends | | | | | |

**SECTION B : KNOWLEDGE OF SUSTAINABLE FOOD PREPARATION AND PRODUCTION**

Direction : Please indicate your level of agreement with each statement using the following scale::

**1= Strongly Disagree (SD), 2= Disagree (D), 3= Neutral (N),**

**4= Agree (A), 5 = Strongly Agree (SA)**

| No | Statement | LIKERT SCALE |
|---|---|---|

| CONCEPT OF FOOD SUSTAINABILITY | | SD | D | N | A | SA |
|---|---|---|---|---|---|---|
| 1 | Food sustainability encompasses the integration of sustainable kitchens, food product innovation, and renewable energy. | 1 | 2 | 3 | 4 | 5 |
| 2 | It refers to a food system that ensures adequate food supply for future generations without causing environmental degradation. | 1 | 2 | 3 | 4 | 5 |
| 3 | Food sustainability enables equitable access to food for all individuals without imposing undue burden on any party. | 1 | 2 | 3 | 4 | 5 |
| 4 | The main objective is to reduce environmental impact across the entire food supply chain. | 1 | 2 | 3 | 4 | 5 |

| LOCAL PRODUCT | | SD | D | N | A | SA |
|---|---|---|---|---|---|---|
| 5 | Consumers can interact with local farmers to learn how locally produced food is cultivated. | 1 | 2 | 3 | 4 | 5 |
| 6 | Local ingredients are free from harmful chemicals such as pesticides, preservatives, and synthetic fertilisers. | 1 | 2 | 3 | 4 | 5 |
| 7 | Local produce contains high nutritional value and is best consumed during its seasonal peak. | 1 | 2 | 3 | 4 | 5 |

| ORGANIC PRODUCT | | SD | D | N | A | SA |
|---|---|---|---|---|---|---|
| 8 | Organic food is cultivated in an environmentally friendly setting, free from synthetic pesticides and nitrogen-based fertilisers. | 1 | 2 | 3 | 4 | 5 |
| 9 | Organic farming promotes ethical practices that support sustainability in food preparation. | 1 | 2 | 3 | 4 | 5 |
| 10 | Food prepared using organic ingredients tends to result in dishes with enhanced and more appealing flavours. | 1 | 2 | 3 | 4 | 5 |

| WATER USAGE | | SD | D | N | A | SA |
|---|---|---|---|---|---|---|
| 11 | The hospitality industry should install industrial water filtration systems and water recycling plants to promote sustainability within industrial kitchen environments. | 1 | 2 | 3 | 4 | 5 |
| 12 | Reducing kitchen waste enables more effective water conservation. | 1 | 2 | 3 | 4 | 5 |
| 13 | Utilising recipes that require precise and innovative water usage can minimise the water footprint during operations. | 1 | 2 | 3 | 4 | 5 |
| 14 | Bottled drinking water in the global market is increasingly designed to be easily biodegradable. | 1 | 2 | 3 | 4 | 5 |

| FOOD WASTE REDUCTION | | SD | D | N | A | SA |
|---|---|---|---|---|---|---|
| 15 | Food waste occurs along the food supply chain during harvesting, storage, or transportation. | 1 | 2 | 3 | 4 | 5 |
| 16 | When food is discarded, the water, land, energy, labour, and capital used to produce it are also wasted. | 1 | 2 | 3 | 4 | 5 |
| 17 | Industrial kitchens can reduce food waste by effectively monitoring and managing the usage and ordering of food ingredients. | 1 | 2 | 3 | 4 | 5 |

| FOOD WASTE COMPOSTING | | SD | D | N | A | SA |
|---|---|---|---|---|---|---|
| 18 | Food waste management can reduce environmental impacts on soil, water, and air. | 1 | 2 | 3 | 4 | 5 |
| 19 | Food waste is organic in nature and decomposes slowly, producing foul odours and attracting pests. | 1 | 2 | 3 | 4 | 5 |
| 20 | Compost provides nutrients such as nitrogen, phosphorus, and calcium to plants. | 1 | 2 | 3 | 4 | 5 |
| 21 | Food waste suitable for composting includes fruit and vegetable scraps, dairy products, and eggshells. | 1 | 2 | 3 | 4 | 5 |

| **3R CONCEPT** | | **SD** | **D** | **N** | **A** | **SA** |
|---|---|---|---|---|---|---|
| 22 | The 3R concept refers to reuse, repair, and recycle, aiming to reduce the amount of waste generated. | 1 | 2 | 3 | 4 | 5 |
| 23 | Food stock purchases should exceed order quantities to meet inventory management requirements. | 1 | 2 | 3 | 4 | 5 |
| 24 | Standardized portion sizes during serving can help prevent food waste. | 1 | 2 | 3 | 4 | 5 |
| 25 | Chicken bones obtained during the deboning process can be used for making stock and soups. | 1 | 2 | 3 | 4 | 5 |

| **IMPACT TO ENVORIMENT** | | **SD** | **D** | **N** | **A** | **SA** |
|---|---|---|---|---|---|---|
| 26 | Agriculture has a significant impact on the global environment due to extensive land use. | 1 | 2 | 3 | 4 | 5 |
| 27 | Half of the world's habitable land is used for agricultural purposes. | 1 | 2 | 3 | 4 | 5 |
| 28 | Organic farming practices can reduce water and air pollution as they do not involve the use of harmful chemicals. | 1 | 2 | 3 | 4 | 5 |

| **CARBON FOOTPRINT** | | **SD** | **D** | **N** | **A** | **SA** |
|---|---|---|---|---|---|---|
| 29 | The use of local ingredients in food preparation can reduce carbon footprint during the transportation process. | 1 | 2 | 3 | 4 | 5 |
| 30 | Food production is a major contributor to global greenhouse gas emissions. | 1 | 2 | 3 | 4 | 5 |
| 31 | Maritime food transportation emits more greenhouse gases compared to air transport. | 1 | 2 | 3 | 4 | 5 |

**SECTION C : SUSTAINABILITY PRACTICES IN FOOD PREPARATION AND PRODUCTION**

Direction : Please indicate your level of agreement with each statement using the following scale:

**1= Strongly Disagree (SD), 2= Disagree (D), 3= Neutral (N),**

**4= Agree (A), 5 = Strongly Agree (SA)**

| No | Statement | LIKERT SCALE |
|---|---|---|

| CONSUMPTION OF LOCAL PRODUCTS | | SD | D | N | A | SA |
|---|---|---|---|---|---|---|
| 1 | I seek local ingredient sources for use during practical cooking classes. | 1 | 2 | 3 | 4 | 5 |
| 2 | I choose to purchase ingredients from local farmers for practical cooking class purposes. | 1 | 2 | 3 | 4 | 5 |
| 3 | The freshness of ingredients improves when I use local sources during practical cooking sessions. | 1 | 2 | 3 | 4 | 5 |
| 4 | I encourage suppliers to obtain local ingredients for use in my practical cooking classes. | 1 | 2 | 3 | 4 | 5 |

| CONSUMPTION OF ORGANIC PRODUCTS | | SD | D | N | A | SA |
|---|---|---|---|---|---|---|
| 5 | I use organic ingredients during practical cooking classes even though they are slightly more expensive. | 1 | 2 | 3 | 4 | 5 |
| 6 | I choose organic ingredients because they are healthier for use during practical cooking classes. | 1 | 2 | 3 | 4 | 5 |
| 7 | I allocate a budget for the purchase of organic ingredients during practical cooking classes. | 1 | 2 | 3 | 4 | 5 |

| COOKING METHOD | | SD | D | N | A | SA |
|---|---|---|---|---|---|---|
| 8 | I incorporate cooking methods that utilise energy-efficient appliances such as induction cookers, air fryers, pressure cookers, and electric rotisseries during practical cooking classes. | 1 | 2 | 3 | 4 | 5 |
| 9 | I train students to use energy-saving cooking techniques such as slow cooking, braising, and pressure cooking. | 1 | 2 | 3 | 4 | 5 |
| 10 | I consistently include vegetables in practical cooking classes to support environmental sustainability. | 1 | 2 | 3 | 4 | 5 |

| WATER USAGE | | SD | D | N | A | SA |
|---|---|---|---|---|---|---|
| 11 | I ensure that students use water efficiently during practical cooking classes. | 1 | 2 | 3 | 4 | 5 |
| 12 | I reuse water that has been used (e.g. for washing vegetables or fruits) to water plants around the cooking workshop. | 1 | 2 | 3 | 4 | 5 |
| 13 | I promptly seek assistance to repair leaking pipes to prevent water wastage.. | 1 | 2 | 3 | 4 | 5 |

| FOOD PACKAGING | | SD | D | N | A | SA |
|---|---|---|---|---|---|---|
| 14 | I use environmentally friendly food packaging during practical cooking classes. | 1 | 2 | 3 | 4 | 5 |
| 15 | I encourage students to use appropriate food containers when packing leftover food produced in class. | 1 | 2 | 3 | 4 | 5 |
| 16 | I consistently remind suppliers to minimise excessive plastic packaging when delivering food commodities for practical cooking classes. | 1 | 2 | 3 | 4 | 5 |

| REDUCING FOOD WASTE | | SD | D | N | A | SA |
|---|---|---|---|---|---|---|
| 17 | I plan the menu during practical cooking classes to avoid food surplus. | 1 | 2 | 3 | 4 | 5 |
| 18 | I control the portion sizes prepared by students to prevent food waste. | 1 | 2 | 3 | 4 | 5 |
| 19 | I create different dishes using leftover food commodities. | 1 | 2 | 3 | 4 | 5 |

| IMPLEMENTATION OF 3R CONCEPT | | SD | D | N | A | SA |
|---|---|---|---|---|---|---|
| 20 | I emphasize the reduction of single-use plastic materials during practical cooking classes. | 1 | 2 | 3 | 4 | 5 |
| 21 | I reuse kitchen waste (such as vegetable scraps) for other purposes, such as composting or making stock. | 1 | 2 | 3 | 4 | 5 |
| 22 | I ensure kitchen waste is separated and recycled during practical cooking classes. | 1 | 2 | 3 | 4 | 5 |

| CARBON FOOTPRINT | | SD | D | N | A | SA |
|---|---|---|---|---|---|---|
| 23 | I ensure that the temperature in the kitchen workshop is not excessively hot during practical cooking classes by turning on fans and exhaust systems. | 1 | 2 | 3 | 4 | 5 |
| 24 | I encourage students to use plant-based ingredients in every practical cooking session. | 1 | 2 | 3 | 4 | 5 |
| 25 | I discuss the carbon footprint associated with different cooking methods with students during class. | 1 | 2 | 3 | 4 | 5 |

**THANK YOU**

## Appendix B: Research Ethics Approval Letter

PEJABAT TIMBALAN NAIB CANSELOR (PENYELIDIKAN DAN INOVASI)
*OFFICE OF THE DEPUTY VICE CHANCELLOR (RESEARCH AND INNOVATION*

*Rujukan kami* : UPM.TNCPI.800-2/1/7
*Tarikh* : 15 March 2025

Pn. Anis binti Zakaria
Department of Science and Technical Education
Faculty of Educational Studies
Universiti Putra Malaysia
Serdang, Selangor.

Dear Madam,

**RESEARCH PROJECT: HUBUNGAN ANTARA PENGETAHUAN DENGAN AMALAN KELESTARIAN PENYEDIAAN DAN PEMBUATAN MAKANAN DALAM KALANGAN GURU PVMA DI MALAYSIA**

**REFERENCE NO: JKEUPM-2025-065**

**PRINCIPAL INVESTIGATOR : PN. ANIS BINTI ZAKARIA**

**CO-INVESTIGATOR : NUR SHAIRAH BINTI ANUA (STUDENT)**

The Ethics Committee for Research involving Human Subjects of University Putra Malaysia (JKEUPM) has studied the proposal for the above project and found that there were no objectionable ethical issues involved in the proposed study.

Please find the list of documents received and reviewed with reference to the study and committee members who reviewed the documents (as attached).

Notwithstanding above, we will not be responsible for any misconduct on the part of researcher in the course of carrying out the research.

**Ethical approval is required in the case of amendments / changes to the study documents / study sites / study team.**

Thank you.

**"WITH KNOWLEDGE WE SERVE"**

Sincerely yours,

**PROF. DR. JOHNSON STANSLAS**
Chair
Ethics Committee for Research involving Human Subjects
Universiti Putra Malaysia

Pejabat Timbalan Naib Canselor (Penyelidikan dan Inovasi), Universiti Putra Malaysia, 43400 UPM Serdang, Selangor Darul Ehsan, Malaysia Pejabat Timbalan Naib Canselor (P&I) 603-89471002 : 603-8945 1646, Pejabat Pentadbiran TNCPI 603-89471608 / 603-8945 1673, Pejabat Pengarah, Pusat Pengurusan Penyelidikan (RMC) 603-8947 1601603-8945 1596, Pejabat Pengarah, Putra Science Park (PSP) 603-8947 1291 603-8946 4121 http://www.tncpi.upm.edu.my,