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Strengthening Nutrition Literacy and Scientific Skills through Multisensory Food Experience among Children at Al-Faruq Kindergarten in Kawahmanuk Village, Kuningan Regency

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Abstract
Nutrition literacy in early childhood should not be reduced to the memorisation of healthy and unhealthy foods; it should be developed through concrete, sensory, affective, and socially supported experiences that help children observe, classify, communicate, and make simple food-related decisions. This study aims to describe how multisensory food experience learning contributes to nutrition literacy and basic science process skills among children aged 5-6 years. A descriptive qualitative design was implemented at Al-Faruq Kindergarten, Kawahmanuk Village, Kuningan Regency, West Java, over eight weekly sessions from February 2 to March 30, 2026. Participants consisted of 15 children, two classroom teachers, and eight parents. Data were collected through participant observation, semi-structured interviews, children's work, teacher reflection notes, and activity documentation. The data were analysed through data condensation, thematic display, and conclusion verification, supported by source and method triangulation. The findings reveal four interrelated themes: improved nutrition understanding through sensory engagement, more positive emotional responses and willingness to try healthy foods, the emergence of simple healthy lifestyle practices, and the decisive role of school-family collaboration. The activities also stimulated basic science process skills, especially observation, classification, comparison, causal explanation, and communication. The study contributes a context-based pedagogical model that integrates early childhood science education, nutrition literacy, and health education through experiential and multisensory learning. Because the study is qualitative, single-site, and short-term, the findings should be interpreted as process evidence rather than causal effectiveness evidence.

Keywords: Early Childhood Science Education; Food Experience Learning; Multisensory Learning; Nutrition Literacy; Science Process Skills

INTRODUCTION

Early childhood is a strategic period for building the foundations of scientific reasoning, health awareness, and everyday decision-making. Contemporary early science education no longer positions young children as passive recipients of facts; rather, it recognises them as active meaning-makers who can observe, compare, classify, predict, communicate, and construct explanations from concrete phenomena (Eshach & Fried, 2005; Gelman & Brenneman, 2004; Larimore, 2020; Vartiainen & Kumpulainen, 2020). Science learning in early childhood is strongest when it is embedded in familiar, manipulable, and socially meaningful objects, because young children understand abstract concepts more effectively when they are mediated by sensory interaction and guided conversation (Fleer, 2019; Fleer, 2023; Kuhn & Pearsall, 2000).

Nutrition literacy has become an equally important agenda in early childhood education. Food literacy is widely understood as a multidimensional capacity involving knowledge, practical skills, behaviours, and contextual judgement in planning, selecting, preparing, and eating food (O'Brien et al., 2024; Truman et al., 2017; Vidgen & Gallegos, 2014). For children,

food literacy develops progressively through relational, functional, and, later, critical competencies; therefore, early childhood programmes should prioritise positive food experiences, sensory familiarity, enjoyment of healthy eating, and simple decision-making rather than abstract nutritional messages alone (Ares et al., 2024; Park et al., 2022). This perspective is aligned with public health concerns because unhealthy dietary patterns in childhood can become persistent habits and contribute to multiple forms of malnutrition, poor diet quality, and diet-related disease risks in later life (UNICEF, 2019; World Health Organization, 2020).

One barrier to healthy eating in early childhood is food neophobia, picky eating, and sensory rejection toward vegetables, fruits, or unfamiliar textures. Studies on vegetable acceptance show that repeated exposure, taste exposure, non-taste sensory exposure, visual familiarisation, storybook-based familiarisation, and cooking involvement can improve willingness to try healthy foods, although the effects vary depending on duration, fidelity, parental support, and the child's initial level of neophobia (Cappellotto et al., 2021; Caputi et al., 2021; Dazeley et al., 2015; Karagiannaki et al., 2021; Nekitsing et al., 2018; Owen et al., 2018; Roberts et al., 2022). Evidence from culinary and nutrition education interventions also suggests that food-related activities tend to improve food knowledge, food skills, self-efficacy, and involvement, while changes in actual dietary intake are more difficult to sustain without home and environmental reinforcement (Abderbwih et al., 2022; Collado-Soler et al., 2023; Muzaffar et al., 2018; van der Horst et al., 2024).

Multisensory food experience learning is pedagogically promising because it integrates health education and science education in a single activity system. When children see food colours, touch textures, smell aromas, taste ingredients, compare food groups, and communicate what they notice, they are simultaneously learning nutrition concepts and practising science process skills. In this sense, food becomes a scientific object: it can be observed, sorted, compared, described, questioned, and connected to bodily functions. This corresponds with embodied cognition theory, which argues that cognition is grounded in sensory-motor experience, and with socio-constructivist theory, which emphasises language, adult scaffolding, and peer interaction in meaning-making (Barsalou, 2008; Bruner, 1966; Vygotsky, 1978). It also corresponds with experiential learning theory, where concrete experience, reflective observation, conceptualisation, and active experimentation form a learning cycle (Dewey, 1938; Kolb, 1984).

Previous studies have examined sensory exposure, food familiarisation, school-based nutrition education, and early childhood science inquiry separately. However, research that explicitly connects multisensory food experience with nutrition literacy and basic science process skills in Indonesian kindergarten settings remains limited. Many nutrition education programmes still emphasise information transmission, while many early science activities use physical objects but do not connect them with daily health practices. This study addresses that gap by exploring how eight multisensory food experience sessions can function as an interdisciplinary learning model for children aged 5-6 years in a village kindergarten context.

Therefore, this study aims to describe the contribution of multisensory food experience learning to strengthening nutrition literacy and basic science process skills among children at Al-Faruq Kindergarten, Kawahmanuk Village, Kuningan Regency. The novelty of this study lies in its integration of three elements: nutrition literacy, early science process skills, and school-family supported healthy lifestyle practice. The study does not attempt to establish causal effectiveness; instead, it provides process-based qualitative evidence regarding how children's understanding, affective responses, scientific communication, and food-related behaviours emerge through concrete learning experiences.

METHODS

Research Design

This study employed a descriptive qualitative design to obtain an in-depth understanding of children's experiences, responses, and meaning-making during multisensory food experience learning. A qualitative design was considered appropriate because the research focus was not to measure statistical effectiveness but to describe the learning process, children's emerging nutrition literacy, basic science process skills, and contextual factors that supported or constrained implementation (Creswell & Poth, 2018; Miles et al., 2014). The study was informed by experiential learning theory and socio-constructivist learning theory, particularly the idea that young children build concepts through concrete activity, reflection, language mediation, and guided social interaction (Kolb, 1984; Vygotsky, 1978).

Setting and Participants

The study was conducted at Al-Faruq Kindergarten, Kawahmanuk Village, Kuningan Regency, West Java. The learning programme lasted eight weeks, from February 2 to March 30, 2026. Participants were selected through purposive sampling because they were directly involved in the food experience programme. They consisted of 15 children aged 5-6 years from Class B, two classroom teachers, and eight parents. The teachers acted as facilitators and informants, while parents provided information regarding children's eating behaviours at home. The small sample and single-site design are consistent with the exploratory and descriptive purpose of the study.

Learning Procedure

The intervention consisted of eight weekly food experience learning sessions. Each session lasted 60-90 minutes and was structured around concrete sensory engagement, guided discussion, simple classification, reflection, and application. The teacher's role was to create a safe learning climate, model scientific language, ask causal questions, and encourage children to communicate their observations without forcing them to taste foods they were not ready to try.

Table 1. Outline of the Eight Multisensory Food Experience Learning Sessions

Session	Theme	Main Activities	Materials	Duration	Teacher Role	Reflection
1	Introducing the senses and healthy food	Visual, tactile, and olfactory exploration of fruits and vegetables	Fresh local fruits and vegetables	60 min	Facilitator and stimulus provider	Group discussion
2	Discovering five basic tastes	Exploring sweet, salty, sour, bitter, and umami through guided tasting	Fruits, vegetables, spices	70 min	Exploration guide	Picture and story reflection
3	Comparing food textures	Comparing crispy, soft, hard, sticky, and watery textures	Foods with contrasting textures	75 min	Observation partner and recorder	Class reflection
4	Healthy and less healthy food choices	Sorting, tasting, and discussing food choices	Healthy food examples and snack packages	80 min	Discussion moderator	Picture-card reflection
5	Food safety and preparation	Handwashing, cleaning ingredients, and safe preparation	Utensils, water, fresh ingredients	90 min	Practical guide	Reflection notes
6	Cooking together	Making salads and fruit juice in small groups	Vegetables, fruit, mini blender	90 min	Practical facilitator	Presentation of results
7	Practising healthy behaviour	Role play about choosing food, washing hands,	Props and behaviour cards	75 min	Role-play facilitator	Dialogue reflection

Session	Theme	Main Activities	Materials	Duration	Teacher Role	Reflection
		and sharing healthy snacks				
8	Reflection and evaluation	Presenting children's work and simple healthy meal plans	Children's drawings and documentation	80 min	Reflection facilitator	Final reflection

Based on the breakdown of activities by session for the Eight Food Experience Learning Sessions, these include sessions 1–2: Introduction to the Senses and Healthy Foods (activities: visual observation, touch, and smell of various fresh food ingredients). Sessions 3–4: Exploring flavors and textures (activity: tasting and comparing healthy vs. unhealthy foods). Sessions 5–6: Simple cooking and food safety. The last, sessions 7–8: Reflection and the application of healthy behaviors in daily life. In each session, the teacher serves as a facilitator who encourages multisensory exploration, while the researcher observes the participants. Each session concludes with a group reflection activity and the documentation of the children's work.

Instruments and Data Collection

Data were collected using participant observation, semi-structured interviews, and documentation. Observations were conducted in all eight sessions using an observation grid covering nutrition literacy and basic science process indicators. Interviews were conducted with children using play and drawing prompts, with teachers using reflective questions on children's participation and learning, and with parents using questions on eating practices at home. Documentation included photographs, videos, children's drawings, teacher notes, and researcher field notes. These multiple data sources were used to strengthen credibility through triangulation (Lincoln & Guba, 1985; Nowell et al., 2017).

Table 2. Observation Grid for Nutrition Literacy and Basic Science Process Skills

No.	Indicator	Operational Description	Scale
1	Identifying healthy foods	Children distinguish healthier and less healthy foods using visible and contextual cues.	1-4
2	Explaining food benefits	Children mention simple benefits of food, such as carrots for eyes or vegetables for strength.	1-4
3	Willingness to try new foods	Children approach, smell, touch, or taste unfamiliar foods voluntarily.	1-4
4	Choosing healthier foods	Children choose nutritious food when given developmentally appropriate options.	1-4
5	Practising food hygiene	Children wash hands and maintain cleanliness before handling or eating food.	1-4
6	Sensory observation	Children use sight, touch, smell, and taste to notice colour, texture, aroma, and flavour.	1-4
7	Classification	Children sort foods by colour, texture, taste, group, or perceived health benefit.	1-4
8	Communication	Children describe observations, explain choices, and present simple healthy meal ideas.	1-4

Semi-Structured Interviews

Semi-structured interviews were conducted with children, teachers, and parents to obtain deeper information about participants' experiences, observed changes, and contextual factors influencing the implementation of multisensory food experience learning. This technique complemented the observation data by capturing children's responses, teachers' reflections, and parents' perspectives on changes in nutrition literacy and healthy eating behavior.

Interviews with Children

Interviews with children were conducted through play-based interaction and drawing activities to ensure that they could express their ideas comfortably. Children were asked to describe their sensory experiences when touching, smelling, and tasting food, explain which foods they

considered healthy, and state whether they were willing to try new foods after the activities. They were also invited to draw their favorite food and explain it. This process helped identify children's nutritional understanding, emotional responses, willingness to try unfamiliar foods, and simple communication skills.

Interviews with Teachers

Teacher interviews focused on children's participation, responses, and behavioral changes during the food experience sessions. Teachers were asked to describe children's enthusiasm, curiosity, hesitation, and interaction during the activities. They also provided information about changes in children's nutrition knowledge, food-related attitudes, hygiene practices, and healthy food choices, as well as challenges encountered during implementation. These interviews helped evaluate the suitability of the multisensory approach for early childhood learning.

Interviews with Parents

Parent interviews were conducted to explore whether changes observed at school also appeared at home. Parents were asked about children's eating habits after the program, including their interest in fruits and vegetables, willingness to try unfamiliar foods, and preference for healthier choices. Parents also explained remaining challenges, such as family eating routines, children's preference for processed foods, and consistency between school and home practices.

Documentation

Documentation was used to strengthen the data from observations and interviews. The documented materials included photos and videos of learning activities, children's drawings and written work, teacher and child reflection notes, and the researcher's daily field notes. These documents helped trace children's participation, learning processes, and behavioral changes across the eight sessions, while also supporting data credibility through triangulation.

Data Analysis and Trustworthiness

Data analysis followed the interactive model of Miles et al. (2014), consisting of data condensation, data display, conclusion drawing, and verification. Thematic analysis was used to identify repeated patterns across observation notes, interview excerpts, and documentation (Braun & Clarke, 2006). Coding focused on nutrition knowledge, affective response, willingness to try, science process skills, healthy behaviour, teacher facilitation, and home support. Trustworthiness was strengthened through source triangulation, method triangulation, member checking with teachers, comparison of observational and interview evidence, and an audit trail of analytic decisions (Lincoln & Guba, 1985; Nowell et al., 2017).

Ethical Considerations

The learning activities were conducted as ordinary classroom learning with additional observation and documentation. Parents and teachers were informed about the research purpose and the use of documentation. Children were not forced to taste unfamiliar foods; they were allowed to participate through seeing, touching, smelling, drawing, or verbal description according to their readiness. Child anonymity was maintained by using initials and participant codes.

RESULT AND DISCUSSION

This study identified four main themes that describe the process of strengthening nutrition literacy among 5–6-year-old children through food experience learning at Al Faruq Kindergarten over eight sessions. These findings were obtained through data triangulation, including participant observation, in-depth interviews and documentation (photos, videos, children's work, and reflection notes). Each theme is discussed in depth, accompanied by empirical evidence and participant quotes. The four main themes pertain to the enhancement of nutrition

literacy and healthy behaviors in young children through food experience-based learning. The findings are systematically presented in Table 3:

Table 3. Themes, Subthemes, Data Sources, Representative Quotes and Interpretations

No.	Main Theme	Data Sources	Representative Excerpt	Interpretation
1	Nutrition understanding through sensory engagement	Observation, child interview, teacher reflection, children's drawings	'Red fruits are good for your eyes; green vegetables make you strong. I know because I touched them and smelled them.' (NA, age 5)	Children moved from naming foods to connecting sensory features, food groups, and simple bodily benefits.
2	Positive emotional responses and willingness to try	Observation, parent interview, teacher interview	'My child used to refuse broccoli, but after making salad together, now he asks me to make rainbow food.' (Parent)	Direct experience created safe familiarity, reducing resistance to unfamiliar vegetables and textures.
3	Emergence of basic science process skills	Observation grid, documentation, presentation of work	'This is hard, this is soft, and this one smells stronger.' (A11, Session 3)	Children practised observation, comparison, classification, simple causal explanation, and oral communication.
4	Healthy lifestyle practices and school-family continuity	Observation, parent interview, teacher notes	'I will wash my hands first so my stomach does not hurt.' (A6, Session 6)	Healthy behaviours appeared at school and were partially transferred to home, but consistency depended on parental reinforcement.

Improving Nutritional Knowledge Through Sensory Engagement

The first finding indicates that sensory-based learning significantly improves children's nutritional knowledge. At the start of the study, most children had only very limited and intuitive knowledge (such as "tasty food = sweet or savory"). After participating in the exploration sessions (particularly Sessions 1, 3, and 5), the children showed tangible progress in recognizing colors, textures, shapes, food groups, and the benefits of food for the body.

Children begin to understand the concept of a "balanced plate" and the relationship between food and bodily functions. Observations show an improvement in children's ability to classify foods into carbohydrates, proteins, vitamins, and minerals.

"This is green spinach; it's good for building muscle so you can run fast." (A9, Session 3) "Carrots are orange; they're good for your eyes so you can see pictures clearly." (A3, interview after Session 5)

Children's drawings and oral explanations also became more elaborate by the final session. In the early sessions, most drawings only showed one favourite food without explanation. By the final session, several children were able to draw a simple balanced plate consisting of rice, egg, vegetables, and fruit, then explain that the meal could help them become strong, avoid sickness, or run faster. The classroom teacher noted that sensory experience made nutrition concepts easier to understand than lecture-based explanation because children could directly compare food properties and express their observations using their own language.

Changes in Attitudes and Positive Emotional Responses to Healthy Foods

This theme illustrates a shift in children's attitudes and emotions toward healthy foods. At the start of the study, many children exhibited a negative attitude (neophobia) toward vegetables and fruits. However, through direct experiences of smelling, touching, and tasting, the children began to show positive emotional responses such as joy, pride and a strong sense of curiosity. This change was most evident from Session 2 through Session 6. Children who initially avoided vegetables began actively approaching and trying new foods. Parents reported behavioral changes at home.

"Now he says, 'Mom, this is healthy, right? Can I eat a lot of it?' every time he sees vegetables." (Parent of A7) "I like lemons—they taste tart and refreshing!" (A11, Session 5—with

a happy expression). The teacher also noted an increase in the children's enthusiasm during the cooking sessions. The children have become more confident in trying new foods and are no longer afraid of textures they previously avoided (such as sticky or watery ones).

The Rise of Healthy Lifestyle Behaviors

The third theme shows that increased knowledge and positive attitudes are followed by actual behavioral changes. Children not only know about healthy habits but also begin to put them into practice in their daily lives at school and at home.

The behaviors observed included: washing hands before and after meals, choosing healthy foods when given a choice, sharing healthy foods with friends, maintaining hygiene while preparing food, and practicing balanced portion sizes. In Session 8, nearly all the children were able to design a simple healthy meal plan for their families that included a combination of carbohydrates, protein, vegetables, and fruit.

"I'm going to wash my hands first, Mom, so I don't get a stomachache." (A6, Session 6 observation) "Here's a healthy family meal: rice, eggs, spinach, and bananas." (A14, Session 8 presentation) Parents reported that their children were more diligent about reminding family members to eat vegetables and fruit.

Factors Supporting and Hindering Implementation

The fourth theme identifies the internal and external factors that influence the program's success. The supporting factors in this study include a fun food experience approach that directly engages children's senses; the teacher's active role as a facilitator and role model; increasing parental support, especially after the 8th session; the availability of affordable and easily accessible local food ingredients in Kuningan and a supportive school environment (open spaces for gardening and cooking). Meanwhile, the factors hindering implementation include the influence of eating habits at home, which are still dominated by junk food; the session time is limited, so some shy children need more time to participate; the challenge of maintaining consistency when a child returns to a family environment that is not yet fully supportive and there is considerable variation in children's developmental levels.

Discussion

Multisensory Experience as a Mechanism for Nutrition Literacy

The findings show that children's nutrition understanding improved when food was encountered as a concrete, multisensory object rather than as an abstract message. This pattern supports the food literacy framework that emphasises knowledge, practical skills, preparation, eating, and contextual decision-making as interrelated components (O'Brien et al., 2024; Truman et al., 2017; Vidgen & Gallegos, 2014). For preschool children, the most relevant dimension is not critical food-system analysis, which is developmentally advanced, but relational and functional food literacy: enjoyment, familiarity, naming, simple benefit recognition, food hygiene, and basic choice-making (Ares et al., 2024; Park et al., 2022). The present study contributes by showing how those competencies can be stimulated in a classroom through seeing, touching, smelling, tasting, sorting, and talking about food.

Scientifically, this process can be explained through embodied cognition. Children did not first receive verbal concepts and then apply them; they built concepts from bodily encounters with colour, smell, texture, and taste. Barsalou (2008) argues that cognition is grounded in perceptual and motor systems, while experiential learning theory explains learning as a cycle from concrete experience to reflection, conceptualisation, and experimentation (Dewey, 1938; Kolb, 1984). The eight sessions operationalised this cycle: children explored foods, reflected through teacher-guided dialogue, constructed simple concepts such as 'rainbow plate' and 'food helps the body', and applied them in role play, meal planning, and home conversation.

Food Experience Learning as Early Science Inquiry

The strengthened scientific contribution of this study lies in the integration of nutrition literacy with basic science process skills. The children's activities were not merely cooking or

tasting; they included observation, comparison, classification, communication, and simple causal explanation. This aligns with early science education literature stating that young children's scientific thinking develops through guided inquiry with concrete materials, imaginative play, and adult scaffolding (Eshach & Fried, 2005; Fleer, 2019; Fleer, 2023; Gelman & Brenneman, 2004; Vartiainen & Kumpulainen, 2020). Food was pedagogically powerful because it is familiar, culturally meaningful, sensory-rich, and directly connected with children's bodies.

The observed development of observation and classification is particularly important. Observation is the entry point of scientific inquiry because children first learn to notice similarities, differences, patterns, and changes. Classification then helps them organise those observations into categories, such as colour, texture, taste, or health benefit. Kuhn and Pearsall (2000) argue that early scientific thinking emerges when children begin to coordinate evidence and explanation. In this study, children's statements such as 'carrots are good for eyes' and 'wash hands so the stomach does not hurt' represent early causal explanations. Although still simple and sometimes scientifically incomplete, such utterances indicate the beginning of evidence-linked communication.

Reducing Food Neophobia through Safe Familiarisation

The affective shift from hesitation to curiosity is consistent with research on food neophobia and sensory familiarisation. Taste exposure tends to increase intake, while nutrition education and sensory learning can increase willingness to try unfamiliar vegetables, especially when children are not pressured (Nekitsing et al., 2018; Nekitsing et al., 2019a; Nekitsing et al., 2019b). The VeggieSense study also found that multisensory non-taste exposure can increase vegetable acceptance in young children, suggesting that children may benefit from touching, smelling, and looking at foods before tasting them (Roberts et al., 2022). The present study confirms this mechanism qualitatively: children who initially avoided vegetables became more willing to interact with them after repeated playful exposure.

The findings also support evidence that visual familiarisation through picture books or e-books can increase children's interest in vegetables, but tactile and social engagement may add further value because children become active participants in the food experience (Caputi et al., 2021; Owen et al., 2018). Sensory sensitivity and food texture remain important barriers, as shown in studies linking texture preferences and food neophobia (Cappellotto et al., 2021; de Oliveira Torres et al., 2020). Therefore, the pedagogical implication is that teachers should avoid coercive tasting and instead design progressive exposure: seeing, naming, touching, smelling, comparing, and only then tasting when children are ready.

From Knowledge to Behaviour: The Role of Practice and Home Continuity

The emergence of handwashing, healthier choices, and home conversations indicates that nutrition literacy becomes more meaningful when children practise it in situated routines. Cooking and preparation activities can strengthen food skills, self-efficacy, and involvement, even though systematic reviews caution that dietary intake outcomes are often inconsistent unless interventions are intensive, repeated, and supported by the home environment (Muzaffar et al., 2018; van der Horst et al., 2024). The present findings are aligned with that caution. The programme generated promising behavioural signs, but it cannot claim durable intake change because there was no quantitative dietary measurement or long-term follow-up.

School-family collaboration emerged as a decisive ecological factor. Reviews of school-based nutrition interventions show that parental and family involvement can improve nutrition knowledge and, in some cases, household food-related practices, although the evidence for dietary intake is mixed (Abderbwih et al., 2022; Collado-Soler et al., 2023; Omidvar et al., 2023; Pongutta et al., 2022). In this study, children were more likely to continue healthy practices when parents provided vegetables and fruit at home, responded positively to children's questions, and repeated school messages. Thus, the programme should be viewed not only as a classroom innovation but as a school-family health literacy strategy.

Novelty, Theoretical Contribution, and Practical Implications

The novelty of this study is its integrative framing. Many nutrition interventions focus on food knowledge and intake, while early science studies often focus on inquiry skills without connecting them to daily health behaviour. This study demonstrates that food experience learning can serve as an interdisciplinary pedagogical medium that simultaneously develops nutrition literacy, science process skills, affective food familiarity, and simple healthy lifestyle practice. Theoretically, the findings strengthen experiential and embodied accounts of early learning by showing how sensory-motor food encounters become the basis for language, classification, and causal reasoning (Barsalou, 2008; Bruner, 1966; Kolb, 1984; Vygotsky, 1978).

Practically, early childhood teachers can adapt this model by integrating local food ingredients, guided sensory exploration, picture-based reflection, simple cooking, hygiene routines, and parent communication. The model should be implemented with clear safety procedures, allergy checks, voluntary tasting, teacher modelling, and culturally familiar foods. Schools should also provide parent take-home prompts so that classroom messages are repeated in household routines. This is important because current food literacy literature stresses that interventions are stronger when they are theory-informed, practical, and connected with real food environments (Ares et al., 2024; O'Brien et al., 2024; Vidgen & Gallegos, 2014).

Limitations and Future Research

This study has several limitations. First, it used a single-site descriptive qualitative design with 15 children; therefore, the findings cannot be generalised statistically. Second, the programme lasted only eight weeks, so the durability of behavioural change could not be assessed. Third, parental reports may contain social desirability bias. Fourth, the observation scale was used as a descriptive guide rather than as a validated quantitative measurement tool. Future studies should use mixed-methods or quasi-experimental designs, larger and more diverse samples, validated measures of nutrition literacy and science process skills, and long-term follow-up of food choice and dietary behaviour. Comparative studies between urban and rural kindergartens would also clarify how local food availability and family routines influence programme success.

CONCLUSION

This study concludes that multisensory food experience learning provides a meaningful pedagogical pathway for strengthening nutrition literacy and basic science process skills among children aged 5-6 years. Through eight sessions involving sensory exploration, classification, simple cooking, food safety routines, role play, and reflection, children showed emerging understanding of food benefits, more positive emotional responses toward healthy foods, improved willingness to interact with unfamiliar foods, and basic practices such as handwashing and healthier food selection. The scientific contribution of this study is the demonstration that nutrition literacy and early science inquiry can be integrated through concrete food-based experiences that stimulate observation, comparison, classification, causal language, and communication. The practical implication is that kindergarten teachers can use local food materials as interdisciplinary learning media, provided that the programme is supported by careful facilitation, voluntary tasting, safety procedures, and continuous school-family collaboration. However, because this study is qualitative, small-scale, single-site, and short-term, the findings should be interpreted as contextual process evidence rather than causal proof of effectiveness. Future research should employ mixed-methods, longitudinal, and multi-site designs to test the sustainability of children's nutrition literacy, science process skills, and healthy eating behaviours across different early childhood education contexts.

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